

### **Motivating scholars' responses in academic social networking sites: An empirical study on ResearchGate Q&A behavior**

The advent of academic social networking sites (ASNS) has offered an unprecedented opportunity for scholars to obtain peer support online. However, little is known about the characteristics that make questions and answers popular among scholars on ASNS. Focused on the statements embedded in questions and answers, this study strives to explore the precursors that motivate scholars to respond, such as reading, following, or recommending a question or an answer. We collected empirical data from ResearchGate and coded the data via the act4teams coding scheme. Our analysis revealed a threshold effect—when the length of question description is over circa 150 words, scholars would quickly lose interest and thus not read the description. In addition, we found that questions, including positive action-oriented statements, are more likely to entice subsequent reads from other scholars. Furthermore, scholars prefer to recommend an answer with positive procedural statements or negative action-oriented statements.

#### **General information**

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Organisations: Information and Knowledge Management, Wuhan University, Aalto University

Contributors: Deng, S., Tong, J., Lin, Y., Li, H., Liu, Y.

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ASJC Scopus subject areas: Information Systems, Media Technology, Computer Science Applications, Management Science and Operations Research, Library and Information Sciences

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### **Deliberate or Instinctive? Proactive and Reactive Coping for Technostress**

Employees in organizations face technostress that is, stress from information technology (IT) use. Although technostress is a highly prevalent organizational phenomenon, there is a lack of theory-based understanding on how IT users can cope with it. We theorize and validate a model for deliberate proactive and instinctive reactive coping for technostress. Drawing from theories on coping, our model posits that the reactive coping behaviors of distress venting and distancing from IT can alleviate technostress by diminishing the negative effect of technostress creators on IT-enabled productivity. The proactive coping behaviors of positive reinterpretation and IT control can help IT users by influencing the extent to which reactive coping behaviors are effective and by positively influencing IT-enabled productivity. The findings of a cross-sectional survey study of 846 organizational IT users support the model. The paper provides a new theoretical contribution by identifying ways in which organizational IT users can cope with technostress.

#### **General information**

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Organisations: Information and Knowledge Management, Research group: Business Data Research Group, University of Jyväskylä, Information Systems and Co-Director of the Centre for Technological Futures at Lancaster University (Management School)

Contributors: Pirkkalainen, H., Salo, M., Tarafdar, M., Makkonen, M.

Number of pages: 34

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ASJC Scopus subject areas: Management Information Systems, Computer Science Applications, Management Science and Operations Research, Information Systems and Management

Keywords: information systems use, proactive coping, reactive coping, technostress, technostress coping

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### Bibliographical note

EXT="Makkonen, Markus"

Source: Scopus

Source ID: 85073528603

Research output: Contribution to journal › Article › Scientific › peer-review

### Automatic word count estimation from daylong child-centered recordings in various language environments using language-independent syllabification of speech

Automatic word count estimation (WCE) from audio recordings can be used to quantify the amount of verbal communication in a recording environment. One key application of WCE is to measure language input heard by infants and toddlers in their natural environments, as captured by daylong recordings from microphones worn by the infants. Although WCE is nearly trivial for high-quality signals in high-resource languages, daylong recordings are substantially more challenging due to the unconstrained acoustic environments and the presence of near- and far-field speech. Moreover, many use cases of interest involve languages for which reliable ASR systems or even well-defined lexicons are not available. A good WCE system should also perform similarly for low- and high-resource languages in order to enable unbiased comparisons across different cultures and environments. Unfortunately, the current state-of-the-art solution, the LENA system, is based on proprietary software and has only been optimized for American English, limiting its applicability. In this paper, we build on existing work on WCE and present the steps we have taken towards a freely available system for WCE that can be adapted to different languages or dialects with a limited amount of orthographically transcribed speech data. Our system is based on language-independent syllabification of speech, followed by a language-dependent mapping from syllable counts (and a number of other acoustic features) to the corresponding word count estimates. We evaluate our system on samples from daylong infant recordings from six different corpora consisting of several languages and socioeconomic environments, all manually annotated with the same protocol to allow direct comparison. We compare a number of alternative techniques for the two key components in our system: speech activity detection and automatic syllabification of speech. As a result, we show that our system can reach relatively consistent WCE accuracy across multiple corpora and languages (with some limitations). In addition, the system outperforms LENA on three of the four corpora consisting of different varieties of English. We also demonstrate how an automatic neural network-based syllabifier, when trained on multiple languages, generalizes well to novel languages beyond the training data, outperforming two previously proposed unsupervised syllabifiers as a feature extractor for WCE.

### General information

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Organisations: Computing Sciences, Aalto University, Laboratoire de Sciences Cognitives et Psycholinguistique, Carnegie Mellon University, University of Manitoba, Max Planck Institute for Psycholinguistics, CONICET, Duke University  
Contributors: Räsänen, O., Seshadri, S., Karadayi, J., Riebling, E., Bunce, J., Cristia, A., Metze, F., Casillas, M., Rosemberg, C., Bergelson, E., Soderstrom, M.

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ASJC Scopus subject areas: Software, Modelling and Simulation, Communication, Language and Linguistics, Linguistics and Language, Computer Vision and Pattern Recognition, Computer Science Applications

Keywords: Automatic syllabification, Daylong recordings, Language acquisition, Noise robustness, Word count estimation

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Source: Scopus

Source ID: 85070952723

Research output: Contribution to journal › Article › Scientific › peer-review

### **DevOps in practice: A multiple case study of five companies**

Context: DevOps is considered important in the ability to frequently and reliably update a system in operational state. DevOps presumes cross-functional collaboration and automation between software development and operations. DevOps adoption and implementation in companies is non-trivial due to required changes in technical, organisational and cultural aspects. Objectives: This exploratory study presents detailed descriptions of how DevOps is implemented in practice. The context of our empirical investigation is web application and service development in small and medium sized companies. Method: A multiple-case study was conducted in five different development contexts with successful DevOps implementations since its benefits, such as quick releases and minimum deployment errors, were achieved. Data was mainly collected through interviews with 26 practitioners and observations made at the companies. Data was analysed by first coding each case individually using a set of predefined themes and thereafter perform a cross-case synthesis. Results: Our analysis yielded some of the following results: (i) software development team attaining ownership and responsibility to deploy software changes in production is crucial in DevOps. (ii) toolchain usage and support in deployment pipeline activities accelerates the delivery of software changes, bug fixes and handling of production incidents. (iii) the delivery speed to production is affected by context factors, such as manual approvals by the product owner (iii) steep learning curve for new skills is experienced by both software developers and operations staff, who also have to cope with working under pressure. Conclusion: Our findings contributes to the overall understanding of DevOps concept, practices and its perceived impacts, particularly in small and medium sized companies. We discuss two practical implications of the results.

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Organisations: Computing Sciences, University of Oulu, Aalto University, University of Helsinki

Contributors: Lwakatare, L. E., Kilamo, T., Karvonen, T., Sauvola, T., Heikkilä, V., Itkonen, J., Kuvaja, P., Mikkonen, T., Oivo, M., Lassenius, C.

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ASJC Scopus subject areas: Software, Information Systems, Computer Science Applications

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#### **Bibliographical note**

EXT="Mikkonen, Tommi"

Source: Scopus

Source ID: 85068546035

Research output: Contribution to journal › Article › Scientific › peer-review

### **The Internet of Things and Sensor Networks**

The articles in this special section focus on the Internet of Things (IoT) and sensor networks. IoT is being embraced by numerous companies across most industries. This transformation is all about the adoption of digital technologies underpinning essential societal and human activities, while at its heart is the digital transformation of businesses. As more Internet-connected devices are being deployed to automate and collect various data, the adoption of IoT efficiently boosts business life all over the world, which is further supported by breakthrough innovations. The latter are remarkable as they employ the IoT technologies to mitigate global warming, save water, increase yields in smart farming, provide a backbone for autonomous vehicles, and many more.

#### **General information**

Publication status: Published

MoE publication type: B1 Article in a scientific magazine

Organisations: Electrical Engineering, University Politehnica of Bucharest

Contributors: Andreev, S., Dobre, C.

Number of pages: 1

Pages: 70-70

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ASJC Scopus subject areas: Computer Science Applications, Computer Networks and Communications, Electrical and Electronic Engineering

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Research output: Contribution to journal › Editorial › Scientific

### Hermitian normalized Laplacian matrix for directed networks

In this paper, we extend and generalize the spectral theory of undirected networks towards directed networks by introducing the Hermitian normalized Laplacian matrix for directed networks. In order to start, we discuss the Courant–Fischer theorem for the eigenvalues of Hermitian normalized Laplacian matrix. Based on the Courant–Fischer theorem, we obtain a similar result towards the normalized Laplacian matrix of undirected networks: for each  $i \in \{1, 2, \dots, n\}$ , any eigenvalue of Hermitian normalized Laplacian matrix  $\lambda_i \in [0, 2]$ . Moreover, we prove some special conditions if 0, or 2 is an eigenvalue of the Hermitian normalized Laplacian matrix  $L(X)$ . On top of that, we investigate the symmetry of the eigenvalues of  $L(X)$  and the edge-version for the eigenvalue interlacing result. Finally we present two expressions for the coefficients of the characteristic polynomial of the Hermitian normalized Laplacian matrix. As an outlook, we sketch some novel and intriguing problems to which our apparatus could generally be applied.

### General information

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MoE publication type: A1 Journal article-refereed

Organisations: Computing Sciences, Research group: Predictive Society and Data Analytics (PSDA), Guizhou University of Finance and Economics, University of Applied Sciences Upper Austria, Nankai University, Hall in Tyrol, Institute of Biosciences and Medical Technology

Contributors: Yu, G., Dehmer, M., Emmert-Streib, F., Jodlbauer, H.

Number of pages: 10

Pages: 175-184

Publication date: 1 Aug 2019

Peer-reviewed: Yes

### Publication information

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Original language: English

ASJC Scopus subject areas: Software, Control and Systems Engineering, Theoretical Computer Science, Computer Science Applications, Information Systems and Management, Artificial Intelligence

Keywords: Characteristic polynomial, Courant–Fischer theorem, Directed networks, Eigenvalue interlacing inequality, Hermitian normalized Laplacian matrix

DOIs:

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Source: Scopus

Source ID: 85065248406

Research output: Contribution to journal › Article › Scientific › peer-review

### Visibility-Aware Part Coding for Vehicle Viewing Angle Estimation

A number of spatially-localised semantic parts of vehicles sensitive to pose changes are encoded their visible probabilities into a mid-level feature vector. Car pose estimation is then formulated into a regression on concatenated low- and mid-level features to continuously changing viewing angles. Each dimension of our visibility-Aware part codes separates all the training samples into two groups according to its visual existence in images, which provides additional part-specific range constraint of viewing angles. Moreover, the proposed codes can alleviate the suffering from sparse and imbalanced data distribution in the light of modelling latent dependency across angle targets. Experimental evaluation for car pose estimation on the EPFL Multi-View Car benchmark demonstrates significant improvement of our method over the state-of-the-art regression methods, especially when only sparse and imbalanced data is available.

### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication  
Organisations: Computing Sciences, Research group: Vision, South China University of Technology  
Contributors: Yang, D., Qian, Y., Cai, D., Yan, S., Kämäräinen, J., Chen, K.  
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Pages: 65-70  
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ASJC Scopus subject areas: Computer Science Applications, Computer Vision and Pattern Recognition, Information Systems, Computational Mathematics, Control and Optimization  
Keywords: Car pose estimation, Coding, Pose-sensitive parts, Regression forests, Visibility-Aware  
DOIs:  
10.1109/ICIST.2019.8836907

#### Bibliographical note

EXT="Chen, Ke"  
jufoid=79229  
Source: Scopus  
Source ID: 85073236772  
Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

#### High-performance SIMD implementation of the lattice-Boltzmann method on the Xeon Phi processor

We present a high-performance implementation of the lattice-Boltzmann method (LBM) on the Knights Landing generation of Xeon Phi. The Knights Landing architecture includes 16GB of high-speed memory (MCDRAM) with a reported bandwidth of over 400 GB/s, and a subset of the AVX-512 single instruction multiple data (SIMD) instruction set. We explain five critical implementation aspects for high performance on this architecture: (1) the choice of appropriate LBM algorithm, (2) suitable data layout, (3) vectorization of the computation, (4) data prefetching, and (5) running our LBM simulations exclusively from the MCDRAM. The effects of these implementation aspects on the computational performance are demonstrated with the lattice-Boltzmann scheme involving the D3Q19 discrete velocity set and the TRT collision operator. In our benchmark simulations of fluid flow through porous media, using double-precision floating-point arithmetic, the observed performance exceeds 960 million fluid lattice site updates per second.

#### General information

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Organisations: Physics, CSC - IT center for science, Abo Akad Univ, Abo Akademi University, Dept Phys, Jyväskylän yliopisto  
Contributors: Robertsén, F., Mattila, K., Westerholm, J.  
Number of pages: 16  
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Keywords: Lattice Boltzmann, prefetching, SIMD, Xeon Phi  
DOIs:  
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Source ID: 85056764195  
Research output: Contribution to journal > Article > Scientific > peer-review

#### MAST: Mask-accelerated shearlet transform for densely-sampled light field reconstruction

Shearlet Transform (ST) is one of the most effective algorithms for the Densely-Sampled Light Field (DSLRF) reconstruction from a Sparsely-Sampled Light Field (SSLF) with a large disparity range. However, ST requires a precise estimation of the disparity range of the SSLF in order to design a shearlet system with decent scales and to pre-shear the sparsely-sampled

Epipolar-Plane Images (EPIs) of the SSLF. To overcome this limitation, a novel coarse-to-fine DSLF reconstruction method, referred to as Mask-Accelerated Shearlet Transform (MAST), is proposed in this paper. Specifically, a state-of-the-art learning-based optical flow method, FlowNet2, is employed to estimate the disparities of a SSLF. The estimated disparities are then utilized to roughly estimate the densely-sampled EPIs for the sparsely-sampled EPIs of the SSLF. Finally, an elaborately-designed soft mask for a coarsely-inpainted EPI is exploited to perform an iterative refinement on this EPI. Experimental results on nine challenging horizontal-parallax real-world SSLF datasets with large disparity ranges (up to 35 pixels) demonstrate the effectiveness and efficiency of the proposed method over the other state-of-the-art approaches.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Computing Sciences, Research group: 3D MEDIA, Computer Science Institute

Contributors: Gao, Y., Bregovic, R., Gotchev, A., Koch, R.

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Pages: 187-192

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ISBN (Electronic): 9781538695524

ASJC Scopus subject areas: Computer Networks and Communications, Computer Science Applications

Keywords: Densely-sampled light field reconstruction, Mask-accelerated shearlet transform, Parallax view generation, Shearlet transform, View synthesis

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DOIs:

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Source ID: 85070959105

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

#### **Modeling mmWave Channels in High-Fidelity Simulations of Unmanned Aerial Systems**

As the capabilities of Unmanned Aerial Systems (UASs) evolve, their novel and demanding applications emerge, which require improved capacity and reduced latency. Millimeter-wave (mmWave) connections are particularly attractive for UASs due to their predominantly line-of-sight regime and better signal locality. In this context, understanding the interactions between the environment, the flight dynamics, and the beam tracking capabilities is a challenge that has not been resolved by today's simulation environments. In this work, we develop the means to model these crucial considerations as well as provide the initial insights into the performance of mmWave-based UAS communications made available with the use of our proposed platform.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Electrical Engineering, Research group: Wireless Communications and Positioning, Tampere University, University of Pennsylvania

Contributors: Godbole, T. R., Calvo-Fullana, M., Pyattaev, A., Mox, D., Andreev, S., Ribeiro, A., Valkama, M.

Publication date: 1 Jul 2019

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ASJC Scopus subject areas: Electrical and Electronic Engineering, Computer Science Applications, Information Systems

Keywords: beamforming, Millimeter-wave (mmWave), Robot Operating System (ROS), Unmanned Aerial System (UAS)

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#### **Bibliographical note**

jufoid=57486

INT=elen,"Godbole, Tanmay Ram"

Source: Scopus

Source ID: 85072324343

Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

### **Portrait instance segmentation for mobile devices**

Accurate and efficient portrait instance segmentation has become a crucial enabler for many multimedia applications on mobile devices. We present a novel convolutional neural network (CNN) architecture to explicitly address the long standing problems in portrait segmentation, i.e., semantic coherence and boundary localization. Specifically, we propose a cross-granularity categorical attention mechanism leveraging the deep supervisions to close the semantic gap of CNN feature hierarchy by imposing consistent category-oriented information across layers. Furthermore, a cross-granularity boundary enhancement module is proposed to boost the boundary awareness of deep layers by integrating the shape context cues from shallow layers of the network. We further propose a novel and efficient non-parametric affinity model to achieve efficient instance segmentation on mobile devices. We present a portrait image dataset with instance level annotations dedicated to evaluating portrait instance segmentation algorithms. We evaluate our approach on challenging datasets which obtains state-of-the-art results.

### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Computing Sciences, Research group: Vision, Nokia Technologies

Contributors: Zhu, L., Wang, T., Aksu, E., Kämäräinen, J.

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Publication date: 1 Jul 2019

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Publisher: IEEE

ISBN (Electronic): 9781538695524

ASJC Scopus subject areas: Computer Networks and Communications, Computer Science Applications

Keywords: Convolutional neural networks, Instance segmentation, Portrait segmentation, Semantic segmentation

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Source: Scopus

Source ID: 85071050950

Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

### **Acceptance and perceptions of interactive location-tracking displays**

Tracking the location of people and their mobile devices creates opportunities for new and exciting ways of interacting with public technology. For instance, users can transfer content from public displays to their mobile device without touching it, because location tracking allows automatic recognition of the target device. However, many uncertainties remain regarding how users feel about interactive displays that track them and their mobile devices, and whether their experiences vary based on the setting. To close this research gap, we conducted a 24-participant user study. Our results suggest that users are largely willing - even excited - to adopt novel location-tracking systems. However, users expect control over when and where they are tracked, and want the system to be transparent about its ownership and data collection. Moreover, the deployment setting plays a much bigger role on people's willingness to use interactive displays when location tracking is involved.

### **General information**

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Organisations: Computing Sciences, Ludwig Maximilian University, Tampere University

Contributors: Mäkelä, V., Linna, J., Keskinen, T., Hakulinen, J., Turunen, M.

Publication date: 12 Jun 2019

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Editors: Gentile, V., Cauchard, J. R.

Article number: a17

ISBN (Electronic): 9781450367516

ASJC Scopus subject areas: Computer Science Applications, Hardware and Architecture, Computer Networks and Communications, Computer Graphics and Computer-Aided Design

Keywords: Acceptance, Location tracking, Location-based services, Mobile devices, Perceptions, Privacy, Public displays, Trust, Ubiquitous computing

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Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

### **Energy Efficiency of Multi-Radio Massive Machine-Type Communication (MR-MMTC): Applications, Challenges, and Solutions**

While the IoT has made significant progress along the lines of supporting its individual applications, there are many MMTC scenarios in which the performance offered by any single RAT available today might be insufficient. To address these use cases, we introduce the concept of MR-MMTC, which implies the availability and utilization of several RATs within a single IoT device. We begin by offering insights into which use cases could be beneficial and what the key challenges for MR-MMTC implementation are. We continue by discussing the potential technical solutions and employing our own prototype of an MR-MMTC device capable of using LoRaWAN and NB-IoT RATs to characterize its energy-centric performance across the alternative feasible MR-MMTC implementation strategies. The obtained results reveal that an increased flexibility delivered by MR-MMTC permits the selection of more energy-efficient RAT options. The IoT devices capable of utilizing multiple radios simultaneously can thus improve their energy utilization by leveraging the synergy between RATs. The novel vision of MR-MMTC outlined in this work could be impactful across multiple fields, and calls for cross-community research efforts in order to adequately design, implement, and deploy future multi-RAT MMTC solutions.

#### **General information**

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Organisations: Electrical Engineering, University of Oulu, Actility S.A., King's College London

Contributors: Mikhaylov, K., Petrov, V., Gupta, R., Lema, M. A., Galinina, O., Andreev, S., Koucheryavy, Y., Valkama, M., Pouttu, A., Dohler, M.

Number of pages: 7

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ASJC Scopus subject areas: Computer Science Applications, Computer Networks and Communications, Electrical and Electronic Engineering

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Research output: Contribution to journal > Article > Scientific > peer-review

### **Face verification and recognition for digital forensics and information security**

In this paper, we present an extensive evaluation of face recognition and verification approaches performed by the European COST Action MULTI-modal Imaging of FOREnsic SciEnce Evidence (MULTI-FORESEE). The aim of the study is to evaluate various face recognition and verification methods, ranging from methods based on facial landmarks to state-of-the-art off-the-shelf pre-trained Convolutional Neural Networks (CNN), as well as CNN models directly trained for the task at hand. To fulfill this objective, we carefully designed and implemented a realistic data acquisition process, that corresponds to a typical face verification setup, and collected a challenging dataset to evaluate the real world performance of the aforementioned methods. Apart from verifying the effectiveness of deep learning approaches in a specific scenario, several important limitations are identified and discussed through the paper, providing valuable insight for future research directions in the field.

#### **General information**

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Organisations: Computing Sciences, Inst. of Info. Sci. and Technol. of the Natl. Res. Cncl. of Italy (ISTI-CNR), University of Milan Bicocca, Department of Informatics, Aristotle University of Thessaloniki, University of Applied Sciences of Southern Switzerland

Contributors: Amato, G., Falchi, F., Gennaro, C., Massoli, F. V., Passalis, N., Tefas, A., Trivilini, A., Vairo, C.  
Publication date: 1 Jun 2019

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ASJC Scopus subject areas: Health Informatics, Pathology and Forensic Medicine, Computer Networks and Communications, Computer Science Applications, Safety, Risk, Reliability and Quality  
Keywords: Deep learning, Face verification, Forensics, Security, Surveillance  
DOIs:  
10.1109/ISDFS.2019.8757511

#### Bibliographical note

EXT="Tefas, Anastasios"  
Source: Scopus  
Source ID: 85070520041  
Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

#### Socially inspired relaying and proactive mode selection in mmWave vehicular communications

As the Internet of Vehicles matures and acquires its social flavor, novel wireless connectivity enablers are being demanded for reliable data transfer in high-rate applications. The recently ratified New Radio communications technology operates in millimeter-wave (mmWave) spectrum bands and offers sufficient capacity for bandwidth-hungry services. However, seamless operation over mmWave is difficult to maintain on the move, since such extremely high frequency radio links are susceptible to unexpected blockage by various obstacles, including vehicle bodies. As a result, proactive mode selection, that is, migration from infrastructure- to vehicle-based connections and back, is becoming vital to avoid blockage situations. Fortunately, the very social structure of interactions between the neighboring smart cars and their passengers may be leveraged to improve session continuity by relaying data via proximate vehicles. This paper conceptualizes the socially inspired relaying scenarios, conducts underlying mathematical analysis, continues with a detailed 3-D modeling to facilitate proactive mode selection, and concludes by discussing a practical prototype of a vehicular mmWave platform.

#### General information

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Organisations: Electrical Engineering, University of California, Los Angeles  
Contributors: Moltchanov, D., Kovalchukov, R., Gerasimenko, M., Andreev, S., Koucheryavy, Y., Gerla, M.  
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ASJC Scopus subject areas: Signal Processing, Information Systems, Hardware and Architecture, Computer Science Applications, Computer Networks and Communications  
Keywords: Internet of Things, Millimeter wave (mmWave) communication, Social network services, Vehicular ad hoc networks  
DOIs:  
10.1109/JIOT.2019.2898420  
Source: Scopus  
Source ID: 85067875266  
Research output: Contribution to journal > Article > Scientific > peer-review

#### Approximate robust output regulation of boundary control systems

We extend the internal model principle for systems with boundary control and boundary observation, and construct a robust controller for this class of systems. However, as a consequence of the internal model principle, any robust controller for a plant with infinite-dimensional output space necessarily has infinite-dimensional state space. We proceed to formulate the approximate robust output regulation problem and present a finite-dimensional controller structure to solve it. Our main motivating example is a wave equation on a bounded multidimensional spatial domain with force control and

velocity observation at the boundary. In order to illustrate the theoretical results, we construct an approximate robust controller for the wave equation on an annular domain and demonstrate its performance with numerical simulations.

#### General information

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Mathematics, Abo Akad Univ, Abo Akademi University, Dept Phys

Contributors: Humaloja, J. P., Kurula, M., Paunonen, L.

Pages: 2210-2223

Publication date: Jun 2019

Peer-reviewed: Yes

Early online date: 2018

#### Publication information

Journal: IEEE Transactions on Automatic Control

Volume: 64

Issue number: 6

ISSN (Print): 0018-9286

Original language: English

ASJC Scopus subject areas: Control and Systems Engineering, Computer Science Applications, Electrical and Electronic Engineering

Keywords: Controlled wave equation, Distributed parameter systems, Linear systems, Robust control

Electronic versions:

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DOIs:

10.1109/TAC.2018.2884676

URLs:

<http://urn.fi/URN:NBN:fi:tty-201901231144>

Source: Scopus

Source ID: 85057826955

Research output: Contribution to journal > Article > Scientific > peer-review

#### Linearization of BJTs with logarithmic predistortion

This paper proposes a novel linearization technique for bipolar junction transistors (BJT) and their derivatives, e.g., heterojunction BJTs. Since the non-linearity of BJTs is exponential by nature, analog predistortion caused by a logarithmic amplifier should linearize the response completely, in theory. This paper reports that, in practice, cascading a logarithmic amplifier in front of a simple one-transistor BJT amplifier boosted its output third-order inter-modulation intercept point (OIP3) by 10 dB. The proposed linearization scheme is extremely simple and it is inherently broadband. To the best of our knowledge, this idea has not been reported previously.

#### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Electrical Engineering

Contributors: Lunden, O., Paldanius, T.

Publication date: 14 May 2019

#### Host publication information

Title of host publication: 2019 IEEE Radio and Wireless Symposium, RWS 2019

Publisher: IEEE

ISBN (Electronic): 9781538659441

#### Publication series

Name: IEEE Radio and Wireless Symposium, RWS

ISSN (Print): 2164-2958

ISSN (Electronic): 2164-2974

ASJC Scopus subject areas: Computer Networks and Communications, Computer Science Applications, Electrical and Electronic Engineering, Communication

Keywords: Analogue predistortion, Linearization techniques, Log amplifier, Logarithmic amplifier, Nonlinearity, Power amplifier

Electronic versions:

manuscript 1570495472

DOIs:

10.1109/RWS.2019.8714520

URLs:

<http://urn.fi/URN:NBN:fi:tuni-201910224000>

### **Bibliographical note**

jufoid=57478

Source: Scopus

Source ID: 85068700610

Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

### **OFDM radar with LTE waveform: Processing and performance**

Nokia Mobile Networks, Ulm, Germany This paper addresses the processing principles and performance of OFDM based radar, with particular focus on the LTE mobile network base-stations and the use of the LTE downlink transmit waveform for radar/sensing purposes. We specifically address the problem stemming from the unused subcarriers, within the transmit signal passband, and their impact on the frequency domain radar processing. We also formulate and adopt a computationally efficient interpolation approach to mitigate the effects of such empty subcarriers in the radar processing. We evaluate the target range and velocity estimation performance through computer simulations, and show that high-quality target detection can be achieved, with LTE waveform, when combined with the interpolation approach. Impacts of the different LTE carrier bandwidths and number of transmitted LTE sub-frames are also evaluated, together with aggregating up to 5 individual 20 MHz LTE carriers.

### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Electrical Engineering, Research group: Wireless Communications and Positioning, Nokia Mobile Networks

Contributors: Barneto, C. B., Anttila, L., Fleischer, M., Valkama, M.

Publication date: 14 May 2019

### **Host publication information**

Title of host publication: 2019 IEEE Radio and Wireless Symposium, RWS 2019

Publisher: IEEE COMPUTER SOCIETY PRESS

Article number: 8714410

ISBN (Electronic): 9781538659441

### **Publication series**

Name: IEEE Radio and Wireless Symposium, RWS

ISSN (Print): 2164-2958

ISSN (Electronic): 2164-2974

ASJC Scopus subject areas: Computer Networks and Communications, Computer Science Applications, Electrical and Electronic Engineering, Communication

Keywords: Joint communications and sensing, LTE, OFDM, Radar, Rf convergence

DOIs:

10.1109/RWS.2019.8714410

### **Bibliographical note**

jufoid=57478

Source: Scopus

Source ID: 85068660156

Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

### **Asterism: Decentralized file sharing application for mobile devices**

Most applications and services rely on central authorities. This introduces a single point of failure to the system. The central authority must be trusted to have data stored by the application available at any given time. More importantly, the privacy of the user depends on the service provider capability to keep the data safe. A decentralized system could be a solution to remove the dependency from a central authority. Moreover, due to the rapid growth of mobile device usage, the availability of decentralization must not be limited only to desktop computers. In this work we aim at studying the possibility to use mobile devices as a decentralized file sharing platform without any central authorities. This was done by implementing Asterism, a peer-to-peer file-sharing mobile application based on the Inter-Planetary File System. We validate the results by deploying and measuring the application network usage and power consumption in multiple different devices. Results show that mobile devices can be used to implement a worldwide distributed file sharing network. However, the file sharing application generated large amounts of network traffic even when no files were shared. This was caused by the chattiness of the protocol of the underlying peer-to-peer network. Consequently, constant network traffic prevented the mobile devices from entering to deep sleep mode. Due to this the battery life of the devices was greatly degraded.

### **General information**

Publication status: Published  
MoE publication type: A4 Article in a conference publication  
Organisations: Computing Sciences, Tampere University of Applied Sciences  
Contributors: Heinisuo, O., Lenarduzzi, V., Taibi, D.  
Number of pages: 10  
Pages: 38-47  
Publication date: 9 May 2019

#### Host publication information

Title of host publication: 2019 7th IEEE International Conference on Mobile Cloud Computing, Services, and Engineering, MobileCloud 2019  
Publisher: IEEE  
ISBN (Electronic): 9781728104638  
ASJC Scopus subject areas: Computer Science Applications, Hardware and Architecture, Computer Networks and Communications  
Keywords: Decentralized file sharing, InterPlanetary File System, Mobile, Peer-to-peer, Sailfish OS  
DOIs:  
10.1109/MobileCloud.2019.00013  
Source: Scopus  
Source ID: 85066483944  
Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

#### Error analysis of NOMA-based user cooperation with SWIPT

The present contribution analyzes the performance of non-orthogonal multiple access (NOMA)-based user cooperation with simultaneous wireless information and power transfer (SWIPT). In particular, we consider a two-user NOMA-based cooperative SWIPT scenario, in which the near user acts as a SWIPT-enabled relay that assists the farthest user. In this context, we derive analytic expressions for the pairwise error probability (PEP) of both users assuming the both amplify-and-forward (AF) and decode-and-forward (DF) relay protocols. The derived expressions are expressed in closed-form and have a tractable algebraic representation which renders them convenient to handle both analytically and numerically. In addition to this, we derive a simple asymptotic closed-form expression for the PEP in the high signal-to-noise ratio (SNR) regime which provide useful insights on the impact of the involved parameters on the overall system performance. Capitalizing on this, we subsequently quantify the maximum achievable diversity order of both users. It is shown that numerical and simulation results corroborate the derived analytic expressions. Furthermore, the offered results provide interesting insights into the error rate performance of each user, which are expected to be useful in future designs and deployments of NOMA based SWIPT systems.

#### General information

Publication status: Published  
MoE publication type: A4 Article in a conference publication  
Organisations: Research group: Wireless Communications and Positioning, Electrical Engineering, Taiyuan University of Science and Technology, Khalifa University, University of Surrey, Center on Cyber-Physical Systems, Simon Fraser University  
Contributors: Li, S., Bariah, L., Muhaidat, S., Sofotasios, P., Liang, J., Wang, A.  
Number of pages: 7  
Pages: 507-513  
Publication date: 1 May 2019

#### Host publication information

Title of host publication: Proceedings - 15th Annual International Conference on Distributed Computing in Sensor Systems, DCOSS 2019  
Publisher: IEEE  
ISBN (Electronic): 9781728105703  
ASJC Scopus subject areas: Computer Networks and Communications, Computer Science Applications, Hardware and Architecture, Health Informatics, Instrumentation, Transportation, Communication  
Keywords: NOMA, Wireless Power Transfer  
DOIs:  
10.1109/DCOSS.2019.00098  
Source: Scopus  
Source ID: 85071915507  
Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

#### Effects of percutaneous transluminal angioplasty of superficial femoral artery on photoplethysmographic pulse transit times

We analyze the changes in upper and lower limb pulse transit times (PTT) caused by peripheral artery disease (PAD) and its treatment with percutaneous transluminal angioplasty (PTA) of the superficial femoral artery. PTTs were extracted from

the photoplethysmograms (PPG) recorded from an index finger and 2nd toes. PTTs were defined between the R-peaks of the ECG and different reference points of the (PPG): foot and peak points, maxima of 1st and 2nd derivative, and by means of intersecting tangents method. Also the PTTs between the toe and finger pulses were analyzed. Our sample consists of 24 subjects examined before and after the PTA and in 1-month follow-up visit. Also 28 older than 65 years controls having normal ankle-to-brachial pressure index (ABI) and no history in cardiovascular diseases as well as 21 younger subjects were examined. The differences between the groups and pre- and post-treatment phases were analyzed by means of non-parametric statistical tests. The changes in the PTTs of upper limb and non-treated lower limb were negligible. The agreement with the reference values, ABI and toe pressures, was studied by kappa-analysis, resulting in kappa-values of  $0.33 \times 0.91$ . Differences in PTTs were found between pre-treatment state of the treated limb, post-treatment state and the follow-up visit, as well as between the pre-treatment state and controls. If patients' age and systolic blood pressure were taken into consideration, the method of lower limb PTT calculation from the peak point turns out feasible in finding the markers of PAD and monitoring post-treatment vascular remodellation.

### General information

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Faculty of Biomedical Sciences and Engineering, Research group: Sensor Technology and Biomeasurements (STB), Division of Vascular Surgery, Division of Interventional Radiology, Oulu University Hospital, Tampere University Hospital

Contributors: Peltokangas, M., Suominen, V., Vakhitov, D., Korhonen, J., Verho, J., Mattila, V. M., Romsa, P., Lekkala, J., Vehkaoja, A., Oksala, N.

Pages: 1058-1065

Publication date: May 2019

Peer-reviewed: Yes

Early online date: 27 Jun 2018

### Publication information

Journal: IEEE Journal of Biomedical and Health Informatics

Volume: 23

Issue number: 3

ISSN (Print): 2168-2194

Original language: English

ASJC Scopus subject areas: Biotechnology, Computer Science Applications, Electrical and Electronic Engineering, Health Information Management

Keywords: Atherosclerosis, Peripheral artery disease, Photoplethysmography, Pulse wave measurements

Electronic versions:

peltokangas\_Effects of percutaneous transluminal angioplasty of superficial femoral artery on photoplethysmographic pulse transit times

DOIs:

10.1109/JBHI.2018.2851388

URLs:

<http://urn.fi/URN:NBN:fi:ty-201808172165>

Additional files:

SUPPLEMENTARY\_MATERIAL

Source: Scopus

Source ID: 85049142393

Research output: Contribution to journal > Article > Scientific > peer-review

### On the complexity of restoring corrupted colorings

In the  $r$ -Fix problem, we are given a graph  $G$ , a (non-proper) vertex-coloring  $c: V(G) \rightarrow [r]$ , and a positive integer  $k$ . The goal is to decide whether a proper  $r$ -coloring  $c'$  is obtainable from  $c$  by recoloring at most  $k$  vertices of  $G$ . Recently, Junosza-Szaniawski et al. (in: SOFSEM 2015: theory and practice of computer science, Springer, Berlin, 2015) asked whether the problem has a polynomial kernel parameterized by the number of recolorings  $k$ . In a full version of the manuscript, the authors together with Garnero and Montealegre, answered the question in the negative: for every  $r \geq 3$ , the problem  $r$ -Fix does not admit a polynomial kernel unless [InlineEquation not available: see fulltext.]. Independently of their work, we give an alternative proof of the theorem. Furthermore, we study the complexity of  $r$ -Swap, where the only difference from  $r$ -Fix is that instead of  $k$  recolorings we have a budget of  $k$  color swaps. We show that for every  $r \geq 3$ , the problem  $r$ -Swap is [InlineEquation not available: see fulltext.]-hard whereas  $r$ -Fix is known to be FPT. Moreover, when  $r$  is part of the input, we observe both Fix and Swap are [InlineEquation not available: see fulltext.]-hard parameterized by the treewidth of the input graph. We also study promise variants of the problems, where we are guaranteed that a proper  $r$ -coloring  $c'$  is indeed obtainable from  $c$  by some finite number of swaps. For instance, we prove that for  $r = 3$ , the problems  $r$ -Fix-Promise and  $r$ -Swap-Promise are [InlineEquation not available: see fulltext.]-hard for planar graphs. As a consequence of our reduction, the problems cannot be solved in  $2^{o(n)}$  time unless the Exponential Time Hypothesis fails.

### General information

Publication status: Published  
MoE publication type: A1 Journal article-refereed  
Organisations: Mathematics, Bell Labs  
Contributors: De Biasi, M., Lauri, J.  
Number of pages: 20  
Pages: 1150-1169  
Publication date: May 2019  
Peer-reviewed: Yes

### Publication information

Journal: Journal of Combinatorial Optimization  
Volume: 37  
Issue number: 4  
ISSN (Print): 1382-6905  
Original language: English  
ASJC Scopus subject areas: Computer Science Applications, Discrete Mathematics and Combinatorics, Control and Optimization, Computational Theory and Mathematics, Applied Mathematics  
Keywords: Combinatorial reconfiguration, Computational complexity, Graph coloring, Local search, Parameterized complexity  
DOIs:  
10.1007/s10878-018-0342-2  
Source: Scopus  
Source ID: 85053264976  
Research output: [Contribution to journal](#) > [Article](#) > [Scientific](#) > [peer-review](#)

### Energy-efficient and high-precision control of hydraulic robots

In addition to high-precision closed-loop control performance, energy efficiency is another vital characteristic in field-robotic hydraulic systems as energy source(s) must be carried on board in limited space. This study proposes an energy-efficient and high-precision closed-loop controller for the highly nonlinear hydraulic robotic manipulators. The proposed method is twofold: 1) A possibility for energy consumption reduction is realized by using a separate meter-in separate meter-out (SMISMO) control set-up, enabling an independent metering (pressure control) of each chamber in hydraulic actuators. 2) A novel subsystem-dynamics-based and modular controller is designed for the system actuators, and it is integrated to the previously designed state-of-the-art controller for multiple degrees-of-freedom (n-DOF) manipulators. Stability of the overall controller is rigorously proven. The comparative experiments with a three-DOF redundant hydraulic robotic manipulator (with a payload of 475 kg) demonstrate that: 1) It is possible to design the triple objective of high-precision piston position, piston force and chamber pressure trackings for the hydraulic actuators. 2) In relation to the previous SMISMO-control methods, unprecedented motion and chamber pressure tracking performances are reported. 3) In comparison to the state-of-the-art motion tracking controller with a conventional energy-inefficient servovalve control, the actuators' energy consumption is reduced by 45% without noticeable motion control (position-tracking) deterioration.

### General information

Publication status: Published  
MoE publication type: A1 Journal article-refereed  
Organisations: Research group: Innovative Hydraulic Automation, Automation Technology and Mechanical Engineering, Canadian Space Agency  
Contributors: Koivumäki, J., Zhu, W. H., Mattila, J.  
Number of pages: 18  
Pages: 176-193  
Publication date: 1 Apr 2019  
Peer-reviewed: Yes

### Publication information

Journal: Control Engineering Practice  
Volume: 85  
ISSN (Print): 0967-0661  
Original language: English  
ASJC Scopus subject areas: Control and Systems Engineering, Computer Science Applications, Electrical and Electronic Engineering, Applied Mathematics  
Keywords: Energy efficiency, Hydraulic robots, Independent metering, Nonlinear control, SMISMO control, Stability analysis  
Electronic versions:  
1-s2.0-S0967066118307238-main  
DOIs:  
10.1016/j.conengprac.2018.12.013

URLs:

<http://urn.fi/URN:NBN:fi:tyy-201905141598>

Source: Scopus

Source ID: 85061341920

Research output: [Contribution to journal](#) > [Article](#) > [Scientific](#) > [peer-review](#)

### **DGC-Net: Dense geometric correspondence network**

This paper addresses the challenge of dense pixel correspondence estimation between two images. This problem is closely related to optical flow estimation task where Con-vNets (CNNs) have recently achieved significant progress. While optical flow methods produce very accurate results for the small pixel translation and limited appearance variation scenarios, they hardly deal with the strong geometric transformations that we consider in this work. In this paper, we propose a coarse-to-fine CNN-based framework that can leverage the advantages of optical flow approaches and extend them to the case of large transformations providing dense and subpixel accurate estimates. It is trained on synthetic transformations and demonstrates very good performance to unseen, realistic, data. Further, we apply our method to the problem of relative camera pose estimation and demonstrate that the model outperforms existing dense approaches.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Computing Sciences, Aalto University, Univ of Oulu, HCI e 486.1

Contributors: Melekhov, I., Tiulpin, A., Sattler, T., Pollefeys, M., Rahtu, E., Kannala, J.

Number of pages: 9

Pages: 1034-1042

Publication date: 4 Mar 2019

#### **Host publication information**

Title of host publication: 2019 IEEE Winter Conference on Applications of Computer Vision, WACV 2019

Publisher: IEEE

ISBN (Electronic): 9781728119755

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Name: IEEE Winter Conference on Applications of Computer Vision

ISSN (Print): 1550-5790

ASJC Scopus subject areas: Computer Vision and Pattern Recognition, Computer Science Applications

DOIs:

10.1109/WACV.2019.00115

#### **Bibliographical note**

jufoid=57596

Source: Scopus

Source ID: 85063572728

Research output: [Chapter in Book/Report/Conference proceeding](#) > [Conference contribution](#) > [Scientific](#) > [peer-review](#)

### **Digging deeper into egocentric gaze prediction**

This paper digs deeper into factors that influence egocentric gaze. Instead of training deep models for this purpose in a blind manner, we propose to inspect factors that contribute to gaze guidance during daily tasks. Bottom-up saliency and optical flow are assessed versus strong spatial prior baselines. Task-specific cues such as vanishing point, manipulation point, and hand regions are analyzed as representatives of top-down information. We also look into the contribution of these factors by investigating a simple recurrent neural model for ego-centric gaze prediction. First, deep features are extracted for all input video frames. Then, a gated recurrent unit is employed to integrate information over time and to predict the next fixation. We also propose an integrated model that combines the recurrent model with several top-down and bottom-up cues. Extensive experiments over multiple datasets reveal that (1) spatial biases are strong in egocentric videos, (2) bottom-up saliency models perform poorly in predicting gaze and underperform spatial biases, (3) deep features perform better compared to traditional features, (4) as opposed to hand regions, the manipulation point is a strong influential cue for gaze prediction, (5) combining the proposed recurrent model with bottom-up cues, vanishing points and, in particular, manipulation point results in the best gaze prediction accuracy over egocentric videos, (6) the knowledge transfer works best for cases where the tasks or sequences are similar, and (7) task and activity recognition can benefit from gaze prediction. Our findings suggest that (1) there should be more emphasis on hand-object interaction and (2) the egocentric vision community should consider larger datasets including diverse stimuli and more subjects.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Computing Sciences, Aalto University

Contributors: Tavakoli, H. R., Rahtu, E., Kannala, J., Borji, A.

Number of pages: 10  
Pages: 273-282  
Publication date: 4 Mar 2019

#### Host publication information

Title of host publication: 2019 IEEE Winter Conference on Applications of Computer Vision, WACV 2019  
Publisher: IEEE  
ISBN (Electronic): 9781728119755

#### Publication series

Name: IEEE Winter Conference on Applications of Computer Vision  
ISSN (Print): 1550-5790  
ASJC Scopus subject areas: Computer Vision and Pattern Recognition, Computer Science Applications  
DOIs:  
10.1109/WACV.2019.00035

#### Bibliographical note

jufoid=57596  
Source: Scopus  
Source ID: 85063594608  
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

#### How do academics experience use of recorded audio feedback in higher education? A thematic analysis

Our Work in Progress Paper in Research to Practice Category focuses on use of recorded audio feedback (RAF) in higher education. RAF is one method for providing feedback that is becoming increasingly popular, especially in e-education. According to previous studies, most learners have an overall positive attitude towards RAF. However, many of the studies have been carried out from learners' point of view. To complement RAF research, we study how academics experience use of RAF as a feedback method. We adopted a qualitative content analysis approach, applying thematic network analysis to the data received from four case academics. This approach proposes graphical networks as an aid for analyzing and synthesizing qualitative data into basic, organizing and global themes. The thematic network analysis produced two global, nine organizational and 45 basic themes. The two global themes were named 'Dialogue diversification' and 'Load reduction'. Based on our analysis, academics can, by using RAF, provide learners more relaxed and dialogic feedback and reduce their own workload both mentally and physically.

#### General information

Publication status: Published  
MoE publication type: A4 Article in a conference publication  
Organisations: Computing Sciences, Jyväskylän yliopisto  
Contributors: Heimbirger, A., Isomottonen, V., Nieminen, P., Keto, H.  
Publication date: 4 Mar 2019

#### Host publication information

Title of host publication: Frontiers in Education : Fostering Innovation Through Diversity, FIE 2018 - Conference Proceedings  
Publisher: IEEE  
Article number: 8658635  
ISBN (Electronic): 9781538611739

#### Publication series

Name: Proceedings - Frontiers in Education Conference  
ISSN (Print): 1539-4565  
ASJC Scopus subject areas: Software, Education, Computer Science Applications  
Keywords: Academics, Distance learning, E-education, Higher education, RAF, Recorded audio feedback, Thematic network analysis, Work in Progress  
DOIs:  
10.1109/FIE.2018.8658635

#### Bibliographical note

jufoid=70484  
Source: Scopus  
Source ID: 85063507477  
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

#### Iterative unsupervised domain adaptation for generalized cell detection from brightfield z-stacks

Background: Cell counting from cell cultures is required in multiple biological and biomedical research applications. Especially, accurate brightfield-based cell counting methods are needed for cell growth analysis. With deep learning, cells

can be detected with high accuracy, but manually annotated training data is required. We propose a method for cell detection that requires annotated training data for one cell line only, and generalizes to other, unseen cell lines. Results: Training a deep learning model with one cell line only can provide accurate detections for similar unseen cell lines (domains). However, if the new domain is very dissimilar from training domain, high precision but lower recall is achieved. Generalization capabilities of the model can be improved with training data transformations, but only to a certain degree. To further improve the detection accuracy of unseen domains, we propose iterative unsupervised domain adaptation method. Predictions of unseen cell lines with high precision enable automatic generation of training data, which is used to train the model together with parts of the previously used annotated training data. We used U-Net-based model, and three consecutive focal planes from brightfield image z-stacks. We trained the model initially with PC-3 cell line, and used LNCaP, BT-474 and 22Rv1 cell lines as target domains for domain adaptation. Highest improvement in accuracy was achieved for 22Rv1 cells.  $F_1$ -score after supervised training was only 0.65, but after unsupervised domain adaptation we achieved a score of 0.84. Mean accuracy for target domains was 0.87, with mean improvement of 16 percent. Conclusions: With our method for generalized cell detection, we can train a model that accurately detects different cell lines from brightfield images. A new cell line can be introduced to the model without a single manual annotation, and after iterative domain adaptation the model is ready to detect these cells with high accuracy.

### General information

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: BioMediTech, Tampere University of Applied Sciences, University of Eastern Finland

Contributors: Liimatainen, K., Kananen, L., Latonen, L., Ruusuvoori, P.

Publication date: 15 Feb 2019

Peer-reviewed: Yes

### Publication information

Journal: BMC Bioinformatics

Volume: 20

Issue number: 1

Article number: 80

ISSN (Print): 1471-2105

Original language: English

ASJC Scopus subject areas: Structural Biology, Biochemistry, Molecular Biology, Computer Science Applications, Applied Mathematics

Keywords: Brightfield, Cell detection, Deep learning, Semi-supervised learning, Unsupervised domain adaptation

Electronic versions:

s12859-019-2605-z

DOIs:

10.1186/s12859-019-2605-z

URLs:

<http://urn.fi/URN:NBN:fi:tty-201906111883>

### Bibliographical note

DUPL=47150514

Source: Scopus

Source ID: 85061610929

Research output: Contribution to journal > Article > Scientific > peer-review

### Challenges and recommended practices for software architecting in global software development

Context: Global software development (GSD), although now a norm in the software industry, carries with it enormous challenges mostly regarding communication and coordination. Aforementioned challenges are highlighted when there is a need to transfer knowledge between sites, particularly when software artifacts assigned to different sites depend on each other. The design of the software architecture and associated task dependencies play a major role in reducing some of these challenges. Objective: The current literature does not provide a cohesive picture of how the distributed nature of software development is taken into account during the design phase: what to avoid, and what works in practice. The objective of this paper is to gain an understanding of software architecting in the context of GSD, in order to develop a framework of challenges and solutions that can be applied in both research and practice. Method: We conducted a systematic literature review (SLR) that synthesises (i) challenges which GSD imposes on software architecture design, and (ii) recommended practices to alleviate these challenges. Results: We produced a comprehensive set of guidelines for performing software architecture design in GSD based on 55 selected studies. Our framework comprises nine key challenges with 28 related concerns, and nine recommended practices, with 22 related concerns for software architecture design in GSD. These challenges and practices were mapped to a thematic conceptual model with the following concepts: Organization (Structure and Resources), Ways of Working (Architecture Knowledge Management, Change Management and Quality Management), Design Practices, Modularity and Task Allocation. Conclusion: The synthesis of findings resulted in a thematic conceptual model of the problem area, a mapping of the key challenges to practices, and a concern framework providing concrete questions to aid the design process in a distributed setting. This is a first step in creating more concrete architecture design practices and guidelines.

### General information

Publication status: Published  
MoE publication type: A1 Journal article-refereed  
Organisations: Pervasive Computing, Research area: Software engineering, University of Limerick  
Contributors: Sievi-Korte, O., Beecham, S., Richardson, I.  
Number of pages: 20  
Pages: 234-253  
Publication date: 1 Feb 2019  
Peer-reviewed: Yes  
Early online date: 2018

### Publication information

Journal: Information and Software Technology  
Volume: 106  
ISSN (Print): 0950-5849  
Original language: English  
ASJC Scopus subject areas: Software, Information Systems, Computer Science Applications  
Keywords: Design practice, Global software development, Software architecture, Software design, Systematic literature review  
DOIs:  
10.1016/j.infsof.2018.10.008  
URLs:  
<http://urn.fi/URN:NBN:fi:tty-201908232006>. Embargo ends: 29/11/20  
Source: Scopus  
Source ID: 85055646041  
Research output: Contribution to journal › Article › Scientific › peer-review

### Towards sustainable manufacturing by extending Manufacturing Execution System functions

Sustainability performance targets of products and production systems can be seen as non-functional requirements. Current manufacturing systems do not take sustainability metrics into account during production, rather sustainability performance evaluation is performed a posteriori. This research analyzes how standard manufacturing execution system (MES) functions can support building more sustainable products by extending the functions with relevant sustainability questions. We identify an approach for addressing sustainability for eleven MES functions.

### General information

Publication status: Published  
MoE publication type: A4 Article in a conference publication  
Organisations: Automation Technology and Mechanical Engineering, School of Mechanical Industrial and Manufacturing Engineering, Oregon State University  
Contributors: Lobov, A., Haapala, K. R.  
Number of pages: 7  
Pages: 1329-1335  
Publication date: 1 Feb 2019

### Host publication information

Title of host publication: 2019 IEEE International Conference on Industrial Technology, ICIT 2019  
Publisher: IEEE  
ISBN (Electronic): 9781538663769  
ASJC Scopus subject areas: Computer Science Applications, Electrical and Electronic Engineering  
Keywords: ERP, Manufacturing systems, MES, Sustainability  
DOIs:  
10.1109/ICIT.2019.8755102

### Bibliographical note

EXT="Haapala, Karl R."  
Source: Scopus  
Source ID: 85069050672  
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

### Towards detecting structural branching and cyclicity in graphs: A polynomial-based approach

Structural properties of graphs and networks have been investigated across scientific disciplines ranging from mathematics to structural chemistry. Structural branching, cyclicity and, more generally, connectedness are well-known examples of such properties. In particular, various graph measures for detecting structural branching and cyclicity have been investigated. These measures are of limited applicability since their interpretation relies heavily on a certain definition of structural branching. In this paper we define a related measure, taking an approach to measurement similar to that of

Lovász and Pelikán (On the eigenvalues of trees, *Periodica Mathematica Hungarica*, Vol. 3 (1–2), 1973, 175–182). We define a complex valued polynomial which also has a unique positive root. Analytical and numerical results demonstrate that this measure can be interpreted as a structural branching and cyclicity measure for graphs. Our results generalize the work of Lovász and Pelikán since the measure we introduce is not restricted to trees.

#### General information

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Faculty of Biomedical Sciences and Engineering, Research group: Computational Medicine and Statistical Learning Laboratory (CMSL), Research group: Predictive Society and Data Analytics (PSDA), University of Applied Sciences Upper Austria, Nankai University, Hall in Tyrol, The City College of New York (CUNY), Shandong University at Weihai

Contributors: Dehmer, M., Chen, Z., Emmert-Streib, F., Mowshowitz, A., Shi, Y., Tripathi, S., Zhang, Y.

Number of pages: 10

Pages: 19-28

Publication date: 1 Jan 2019

Peer-reviewed: Yes

Early online date: 29 Aug 2018

#### Publication information

Journal: Information Sciences

Volume: 471

ISSN (Print): 0020-0255

Original language: English

ASJC Scopus subject areas: Software, Control and Systems Engineering, Theoretical Computer Science, Computer Science Applications, Information Systems and Management, Artificial Intelligence

Keywords: Data science, Graphs, Networks, Quantitative graph theory, Structural branching

DOIs:

10.1016/j.ins.2018.08.043

Source: Scopus

Source ID: 85052883508

Research output: Contribution to journal > Article > Scientific > peer-review

#### 1.3 $\mu$ m U-bend traveling wave SOA devices for high efficiency coupling to silicon photonics

We present a U-bend design for traveling wave III-V gain devices, such as semiconductor optical amplifiers and laser diodes. The design greatly simplifies the butt-coupling between the III-V chip and silicon-on-insulator photonic circuit by bringing the I/O ports on one facet. This removes the need for precise dimension control otherwise required for 2-side coupling, therefore increasing the yield of mounted devices towards 100%. The design, fabrication and characterization of the U-bend device based on Euler bend geometry is presented. The losses for a bend with a minimum bending radius of 83  $\mu$ m are 1.1 dB. In addition, we present an analysis comparing the yield and coupling losses of the traditionally cleaved devices with the results that the Euler bend approach enable, with the final conclusion that the yield is improved by several times while the losses are decreased by several dB.

#### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Physics, VTT Technical Research Centre of Finland

Contributors: Viheriälä, J., Tuorila, H., Zia, N., Cherchi, M., Aalto, T., Guina, M.

Publication date: 2019

#### Host publication information

Title of host publication: Silicon Photonics XIV

Publisher: SPIE, IEEE

Editors: Reed, G. T., Knights, A. P.

Article number: 109230E

ISBN (Electronic): 9781510624887

#### Publication series

Name: Proceedings of SPIE - The International Society for Optical Engineering

Volume: 10923

ISSN (Print): 0277-786X

ISSN (Electronic): 1996-756X

ASJC Scopus subject areas: Electronic, Optical and Magnetic Materials, Condensed Matter Physics, Computer Science Applications, Applied Mathematics, Electrical and Electronic Engineering

Keywords: Coupling losses, Hybrid integration, III-V, Semiconductor optical amplifiers, Silicon-on-insulator

DOIs:

10.1117/12.2505935

#### Bibliographical note

jufoid=71479

Source: Scopus

Source ID: 85065404814

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

#### 1.55- $\mu\text{m}$ wavelength wafer-fused OP-VECSELs in flip-chip configuration

Optically-pumped vertical external cavity surface emitting lasers (VECSELs) based on flip-chip gain mirrors emitting at the 1.55- $\mu\text{m}$  wavelength range are reported. The gain mirrors employ wafer-fused InAlGaAs/InP quantum well heterostructures and GaAs/AIAs distributed Bragg reflectors, which were incorporated in a linear and a V-cavity configurations. A maximum output power of 3.65 W was achieved for a heatsink temperature of 11°C and employing a 2.2% output coupler. The laser exhibited circular beam profiles for the full emission power range. The demonstration represents more than 10-fold increase of the output power compared to state-of-the-art flip-chip VECSELs previously demonstrated at the 1.55- $\mu\text{m}$  wavelength range, and opens a new perspective for developing practical VECSEL-based laser system for applications such as LIDAR, spectroscopy, communications and distributed sensing.

#### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Physics, CRPP, LakeDiamond SA

Contributors: Mereuta, A., Nechay, K., Caliman, A., Suruceanu, G., Gallo, P., Guina, M., Kapon, E.

Publication date: 2019

#### Host publication information

Title of host publication: Vertical External Cavity Surface Emitting Lasers (VECSELs) IX

Publisher: SPIE, IEEE

Editor: Keller, U.

Article number: 1090103

ISBN (Electronic): 9781510624443

#### Publication series

Name: Proceedings of SPIE - The International Society for Optical Engineering

Volume: 10901

ISSN (Print): 0277-786X

ISSN (Electronic): 1996-756X

ASJC Scopus subject areas: Electronic, Optical and Magnetic Materials, Condensed Matter Physics, Computer Science Applications, Applied Mathematics, Electrical and Electronic Engineering

Keywords: Optically-pumped VECSELs, Semiconductor lasers, Wafer-Fusion

DOIs:

10.1117/12.2508342

#### Bibliographical note

jufoid=71479

Source: Scopus

Source ID: 85066636665

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

#### 405-nm pumped $\text{Ce}^{3+}$ -doped silica fiber for broadband fluorescence from cyan to red

A pure Ce-doped silica fiber is fabricated using modified chemical vapor deposition (MCVD) technique. Fluorescence characteristics of a Ce-doped silica fiber are experimentally investigated with continuous wave pumping from 440 nm to 405 nm. Best pump absorption and broad fluorescence spectrum is observed for ~ 405 nm laser. Next, the detailed analysis of spectral response as a function of pump power and fiber length is performed. It is observed that a-10dB spectral width of ~ 280 nm can be easily achieved with different combinations of the fiber length and pump power. Lastly, we present, for the first time to the best of our knowledge, a broadband fluorescence spectrum with-10dB spectral width of 301 nm, spanning from ~ 517.36 nm to ~ 818 nm, from such fibers with non-UV pump lasers.

#### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Physics, Aston University, Fiber Optics Research Center of the Russian Academy of Sciences, Russian Academy of Sciences

Contributors: Yadav, A., Chichkov, N. B., Gumenyuk, R., Zhrebtsov, E., Melkumov, M. A., Yashkov, M. V., Dianov, E. M., Rafailov, E. U.

Publication date: 2019

### Host publication information

Title of host publication: Optical Components and Materials XVI

Publisher: SPIE, IEEE

Editors: Dignonnet, M. J. F., Jiang, S.

Article number: 1091406

ISBN (Electronic): 9781510624702

### Publication series

Name: Proceedings of SPIE - The International Society for Optical Engineering

Volume: 10914

ISSN (Print): 0277-786X

ISSN (Electronic): 1996-756X

ASJC Scopus subject areas: Electronic, Optical and Magnetic Materials, Condensed Matter Physics, Computer Science Applications, Applied Mathematics, Electrical and Electronic Engineering

Keywords: Broadband spectrum, Ce-doped fiber, Ce-ion, Rare earth doped

DOIs:

10.1117/12.2509599

### Bibliographical note

jufoid=71479

Source: Scopus

Source ID: 85066046508

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

### Action and power efficiency in self-organization: The case for growth efficiency as a cellular objective in *Escherichia coli*

Complex systems of different nature self-organize using common mechanisms. One of those is increase of their efficiency. The level of organization of complex systems of different nature can be measured as increased efficiency of the product of time and energy for an event, which is the amount of physical action consumed by it. Here we apply a method developed in physics to study the efficiency of biological systems. The identification of cellular objectives is one of the central topics in the research of microbial metabolic networks. In particular, the information about a cellular objective is needed in flux balance analysis which is a commonly used constrained-based metabolic network analysis method for the prediction of cellular phenotypes. The cellular objective may vary depending on the organism and its growth conditions. It is probable that nutritionally scarce conditions are very common in the nature, and, in order to survive in those conditions, cells exhibit various highly efficient nutrient-processing systems like enzymes. In this study, we explore the efficiency of a metabolic network in transformation of substrates to new biomass, and we introduce a new objective function simulating growth efficiency. We are searching for general principles of self-organization across systems of different nature. The objective of increasing efficiency of physical action has been identified previously as driving systems toward higher levels of self-organization. The flow agents in those networks are driven toward their natural state of motion, which is governed by the principle of least action in physics. We connect this to a power efficiency principle. Systems structure themselves in a way to decrease the average amount of action or power per one event in the system. In this particular example, action efficiency is examined in the case of growth efficiency of *E. coli*. We derive the expression for growth efficiency as a special case of action (power) efficiency to justify it through first principles in physics. Growth efficiency as a cellular objective of *E. coli* coincides with previous research on complex systems and is justified by first principles in physics. It is expected and confirmed outcome of this work. We examined the properties of growth efficiency using a metabolic model for *Escherichia coli*. We found that the maximal growth efficiency is obtained at a finite nutrient uptake rate. The rate is substrate dependent and it typically does not exceed 20 mmol/h/gDW. We further examined whether the maximal growth efficiency could serve as a cellular objective function in metabolic network analysis and found that cellular growth in batch cultivation can be predicted reasonably well under this assumption. The fit to experimental data was found slightly better than with the commonly used objective function of maximal growth rate. Based on our results, we suggest that the maximal growth efficiency can be considered a plausible optimization criterion in metabolic modeling for *E. coli*. In the future, it would be interesting to study growth efficiency as an objective also in other cellular systems and under different cultivation conditions.

### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: BioMediTech, Wireless Innovation Laboratory at Worcester Polytechnic Institute, Assumption College, Tufts University, Complex Systems Center, University of Vermont

Contributors: Georgiev, G. Y., Aho, T., Kesseli, J., Yli-Harja, O., Kauffman, S. A.

Number of pages: 16

Pages: 229-244

Publication date: 2019

### Host publication information

Title of host publication: Evolution, Development and Complexity - Multiscale Evolutionary Models of Complex Adaptive Systems

Publisher: Springer

Editors: Flores Martinez, C. L., Georgiev, G. Y., Smart, J. M., Price, M. E.

ISBN (Print): 9783030000745

#### Publication series

Name: Springer Proceedings in Complexity

ISSN (Print): 2213-8684

ISSN (Electronic): 2213-8692

ASJC Scopus subject areas: Applied Mathematics, Modelling and Simulation, Computer Science Applications

Keywords: Action efficiency, Constraint-based modeling, Metabolism, Microorganism, Principle of least action

DOIs:

10.1007/978-3-030-00075-2\_8

#### Bibliographical note

jufoid=84878

Source: Scopus

Source ID: 85071889407

Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

#### Benchmarking of several disparity estimation algorithms for light field processing

A number of high-quality depth imaged-based rendering (DIBR) pipelines have been developed to reconstruct a 3D scene from several images taken from known camera viewpoints. Due to the specific limitations of each technique, their output is prone to artifacts. Therefore, the quality cannot be ensured. To improve the quality of the most critical and challenging image areas, an exhaustive comparison is required. In this paper, we consider three questions of benchmarking the quality performance of eight DIBR techniques on light fields: First, how does the density of original input views affect the quality of the rendered novel views? Second, how does disparity range between adjacent input views impact the quality? Third, how does each technique behave for different object properties? We compared and evaluated the results visually as well as quantitatively (PSNR, SSIM, AD, and VDP2). The results show some techniques outperform others in different disparity ranges. The results also indicate using more views not necessarily results in visually higher quality for all critical image areas. Finally, we have shown a comparison for different scene's complexity such as non-Lambertian objects.

#### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Computing Sciences, Moving Picture Technologies

Contributors: Zakeri, F. S., Bätz, M., Jaschke, T., Keinert, J., Chuchvara, A.

Publication date: 2019

#### Host publication information

Title of host publication: Fourteenth International Conference on Quality Control by Artificial Vision

Publisher: SPIE, IEEE

Editors: Bazeille, S., Verrier, N., Cudel, C.

Article number: 111721C

ISBN (Electronic): 9781510630536

#### Publication series

Name: Proceedings of SPIE - The International Society for Optical Engineering

Volume: 11172

ISSN (Print): 0277-786X

ISSN (Electronic): 1996-756X

ASJC Scopus subject areas: Electronic, Optical and Magnetic Materials, Condensed Matter Physics, Computer Science Applications, Applied Mathematics, Electrical and Electronic Engineering

Keywords: Depth image-based rendering, Disparity estimation, Quality evaluation

DOIs:

10.1117/12.2521747

#### Bibliographical note

jufoid=71479

Source: Scopus

Source ID: 85070208910

Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

### **Code ABC hackathons: Teachers as tinkerers**

Motto 'hands-on exercises are the most efficient means to learn coding' prevails the design of Code ABC hackathons. Hackathons are emergent and challenge-based ways to engage participants. The participants of this study comprise Finnish comprehensive schoolteachers that are willing to develop their coding skills. Perceiving hackathon participants as players grants employing the same motivation and engagement theories that game researchers and developers exploit in developing serious games. This paper represents two subsequent Code ABC hackathon iterations, the autumn of 2017 and the spring of 2018. The development of hackathon challenges was based on the previous semester-long Code ABC MOOC exercises field-tested since autumn 2015. As the data, we exploit the returned work from participants (multiple-choice questions, open-ended responses, programming exercises, N = 10, the first, N = 30, the second) and the instructors' reflections (N = 5). In particular, we address the topics considered challenging, engaging, and the lessons learned; the analysis utilizes mixed methods. Results show that the hackathons were almost too demanding yet engaging; however, their full potential was left unexploited.

### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Computing Sciences, City of Tampere, City of Espoo, LifeLearn, Oulu City Hospital, Ylivieska City

Contributors: Niemelä, P., Partanen, T., Toivanen, T., Toikkanen, T., Kangas, V., Översti, M.

Number of pages: 13

Pages: 157-169

Publication date: 2019

### **Host publication information**

Title of host publication: Digital Turn in Schools - Research, Policy, Practice : Proceedings of ICEM 2018 Conference

Publisher: Springer International Publishing

ISBN (Print): 978-981-13-7360-2

ISBN (Electronic): 978-981-13-7361-9

### **Publication series**

Name: Lecture Notes in Educational Technology

ISSN (Print): 2196-4963

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ASJC Scopus subject areas: Education, Computer Science Applications, Computer Networks and Communications

Keywords: Engagement, Flow, Hackathon, Knowmad, K-12 computer science education, Teacher in-service training

DOIs:

10.1007/978-981-13-7361-9\_11

### **Bibliographical note**

jufoid=85162

Source: Scopus

Source ID: 85066928045

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

### **Customized dimensional analysis conceptual modelling framework for design optimization—a case study on the cross-flow micro turbine model**

Dimensional Analysis Conceptual Modelling (DACM) is a framework used for conceptual modelling and simulation in system and product designs. The framework is based on cause-effect analysis between variables and functions in a problem. This article presents an approach that mobilizes concepts from the DACM framework to assist solve high-dimensional expensive optimization problems with lower computational costs. The latter fundamentally utilizes theories and concepts from well-practised dimensional analysis, functional modelling and bond graphing. Statistical design-of-experiments theory is also utilized in the framework to measure impact levels of variables towards the objective. Simplifying as well as decomposing followed by optimization of expensive problems are the focuses of the article. To illustrate the approach, a case study on the performance optimization of a cross-flow micro hydro turbine is presented. The customized DACM framework assisted optimization approach converges faster and returns better results than the one without. A single-step simplification approach is employed in the case study and it returns a better average optimization result with about only one fifth of the function evaluations compared to optimization using the original model.

### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Mechanical Engineering and Industrial Systems, Research area: Manufacturing and Automation, University of Stavanger, Simon Fraser University

Contributors: Woldemariam, E. T., Coatanéa, E., Wang, G. G., Lemu, H. G., Wu, D.

Pages: 1168-1184

Publication date: 2019

Peer-reviewed: Yes

Early online date: 2018

### Publication information

Journal: Engineering Optimization

Volume: 51

Issue number: 7

ISSN (Print): 0305-215X

Original language: English

ASJC Scopus subject areas: Computer Science Applications, Management Science and Operations Research, Control and Optimization, Industrial and Manufacturing Engineering, Applied Mathematics

Keywords: Causality analysis, conceptual modelling, DACM assisted optimization, high-dimensional optimization, micro cross-flow turbine

DOIs:

10.1080/0305215X.2018.1519556

Source: Scopus

Source ID: 85054818014

Research output: Contribution to journal › Article › Scientific › peer-review

### DNA Molecular Storage System: Transferring Digitally Encoded Information through Bacterial Nanonetworks

Since the birth of computer and networks, fuelled by pervasive computing, Internet of Things and ubiquitous connectivity, the amount of data stored and transmitted has exponentially grown through the years. Due to this demand, new storage solutions are needed. One promising media is the DNA as it provides numerous advantages, which includes the ability to store dense information while achieving long-term reliability. However, the question as to how the data can be retrieved from a DNA-based archive, still remains. In this paper, we aim to address this question by proposing a new storage solution that relies on bacterial nanonetworks properties. Our solution allows digitally-encoded DNA to be stored into motility-restricted bacteria, which compose an archival architecture of clusters, and to be later retrieved by engineered motile bacteria, whenever reading operations are needed. We conducted extensive simulations, in order to determine the reliability of data retrieval from motility-restricted storage clusters, placed spatially at different locations. Aiming to assess the feasibility of our solution, we have also conducted wet lab experiments that show how bacteria nanonetworks can effectively retrieve a simple message, such as "Hello World", by conjugation with motility-restricted bacteria, and finally mobilize towards a target point for delivery.

### General information

Publication status: E-pub ahead of print

MoE publication type: A1 Journal article-refereed

Organisations: Electrical Engineering, Research group: Emerging Technologies for Nano-Bio-Info-Cogno, Universita degli Studi di Padova, Italy, Örebro University, Waterford Institute of Technology

Contributors: Tavella, F., Giaretta, A., Dooley-Cullinane, T. M., Conti, M., Coffey, L., Balasubramaniam, S.

Publication date: 2019

Peer-reviewed: Yes

### Publication information

Journal: IEEE Transactions on Emerging Topics in Computing

ISSN (Print): 2168-6750

Original language: English

ASJC Scopus subject areas: Computer Science (miscellaneous), Information Systems, Human-Computer Interaction, Computer Science Applications

Keywords: Bacterial Nanonetworks, Data Storage, DNA Encoding, Molecular Communications

DOIs:

10.1109/TETC.2019.2932685

Source: Scopus

Source ID: 85070665316

Research output: Contribution to journal › Article › Scientific › peer-review

### From monolithic systems to microservices: A decomposition framework based on process mining

Decomposition is one of the most complex tasks during the migration from monolithic systems to microservices, generally performed manually, based on the experience of the software architects. In this work, we propose a 6-step framework to reduce the subjectivity of the decomposition process. The framework provides software architects with a set of decomposition options, together with a set of measures to evaluate and compare their quality. The decomposition options are identified based on the independent execution traces of the system by means of the application of a process-mining tool to the log traces collected at runtime. We validated the process, in an industrial project, by comparing the proposed decomposition options with the one proposed by the software architect that manually analyzed the system. The application of our framework allowed the company to identify issues in their software that the architect did not spot manually, and to discover more suitable decomposition options that the architect did not consider. The framework could be very useful also in other companies to improve the quality of the decomposition of any monolithic system, identifying different

decomposition strategies and reducing the subjectivity of the decomposition process. Moreover, researchers could extend our approach increasing the support and further automating the decomposition support.

#### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Computing Sciences, TASE - Tampere Software Engineering Research Group

Contributors: Taibi, D., Systä, K.

Number of pages: 12

Pages: 153-164

Publication date: 2019

#### Host publication information

Title of host publication: CLOSER 2019 - Proceedings of the 9th International Conference on Cloud Computing and Services Science

Publisher: SCITEPRESS

Editors: Ferguson, D., Munoz, V. M., Helfert, M., Pahl, C.

ISBN (Electronic): 9789897583650

ASJC Scopus subject areas: Computer Science (miscellaneous), Computer Science Applications

Keywords: Cloud-native, Microservice decomposition, Microservice migration, Microservice slicing, Microservices

DOIs:

10.5220/0007755901530164

Source: Scopus

Source ID: 85067463647

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

#### Measuring stem diameters with TLS in boreal forests by complementary fitting procedure

Point clouds generated by terrestrial laser scanners (TLS) have enabled new ways to measure stem diameters. A common method for diameter calculation is to fit cylindrical or circular shapes into the TLS point cloud, which can be based either on a single scan or a co-registered combination of several scans. However, as various defects in the point cloud may affect the final diameter results, we propose an automatized processing chain which takes advantage of complementing steps. Processing consists of two fitting phases and an additional taper curve calculation to define the final diameter measurements. First, stems are detected from co-registered data of several scans using surface normals and cylinder fitting. This provides a robust framework for localizing the stems and estimating diameters at various heights. Then, guided by the cylinders and their indicative diameters, another fitting round is performed by cutting the stems into thin horizontal slices and reassessing their diameters by circular shape. For each slice, the quality of the cylinder-modelled diameter is evaluated first with co-registered data and if it is found to be deficient, potentially due to modelling defects or co-registration errors, diameter is detected through single scans. Finally, slice diameters are applied to construct a spline-based taper curve model for each tree, which is used to calculate the final stem dimensions. This methodology was tested in southern Finland using a set of 505 trees. At the breast height level (1.3 m), the results indicate 5.2 mm mean difference (3.2%), -0.4 mm bias (-0.3%) and 7.3 mm root mean squared error (4.4%) to reference measurements, and at the height of 6.0 m, respective values are 6.5 mm (3.6%), +1.6 mm (0.9%) and 8.4 mm (4.8%). These values are smaller compared to most of the corresponding contemporary studies, and outperform the initial cylinder models. This indicates that the applied processing chain is capable of producing relatively accurate diameter measurements, which can, at the cost of computational heaviness, remove various defects and improve the modelling results.

#### General information

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Mathematics, Natural Resources Institute Finland (Luke)

Contributors: Pitkänen, T. P., Raunonen, P., Kangas, A.

Number of pages: 13

Pages: 294-306

Publication date: 2019

Peer-reviewed: Yes

Early online date: 8 Dec 2018

#### Publication information

Journal: ISPRS Journal of Photogrammetry and Remote Sensing

Volume: 147

ISSN (Print): 0924-2716

Original language: English

ASJC Scopus subject areas: Atomic and Molecular Physics, and Optics, Engineering (miscellaneous), Computer Science Applications, Computers in Earth Sciences

Keywords: Circle fitting, Cylinder fitting, Stem extraction, Taper curve, Terrestrial laser scanning

Electronic versions:

1-s2.0-S0924271618303290-main

DOIs:

10.1016/j.isprsjprs.2018.11.027

URLs:

<http://urn.fi/URN:NBN:fi:tty-201812212897>

Source: Scopus

Source ID: 85057752987

Research output: Contribution to journal > Article > Scientific > peer-review

### **MECSELS with direct emission in the 760 nm to 810 nm spectral range: A single- and double-side pumping comparison and high-power continuous-wave operation**

We compared single-side pumping (SSP) and double-side pumping (DSP) of a semiconductor membrane external-cavity surface-emitting laser (MECSEL). The MECSEL's active region was based on a 4×3 AlGaAs quantum well (QW) structure. This structure was embedded between two silicon carbide (SiC) wafer pieces that were used as transparent intra-cavity (IC) heat spreaders creating a symmetrical cooling environment. The MECSEL structure targeted emission at 780nm and was operated at 20°C heat sink temperature. Via DSP the differential efficiency was improved from 31.9% to 34.4 %. The laser threshold was reduced from 0.79 W to 0.69 W of absorbed pump power while the maximum output power was increased from 3.13 W to 3.22 W. The DSP configuration enabled these improvements by a reduced thermal resistance of the gain element by 9 %. The MECSEL operated at a fundamental Gaussian TEM<sub>00</sub> mode profile and the beam quality was measured to be  $M^2 < 1.09$ . We further demonstrate a maximum tuning range from 767 nm to 811 nm. A similar active region with about half the thickness (2×3 AlGaAs QWs) was investigated using the DSP configuration and first results are presented here. 500-µm-thick sapphire IC heat spreaders were used instead of SiC. The output power exceeded 0.5W and the emission was spectrally located around 770 nm.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Physics

Contributors: Kahle, H., Penttinen, J. P., Phung, H. M., Rajala, P., Tukiainen, A., Ranta, S., Guina, M.

Publication date: 2019

#### **Host publication information**

Title of host publication: Vertical External Cavity Surface Emitting Lasers (VECSELS) IX

Publisher: SPIE, IEEE

Editor: Keller, U.

Article number: 109010D

ISBN (Electronic): 9781510624443

#### **Publication series**

Name: Proceedings of SPIE - The International Society for Optical Engineering

Volume: 10901

ISSN (Print): 0277-786X

ISSN (Electronic): 1996-756X

ASJC Scopus subject areas: Electronic, Optical and Magnetic Materials, Condensed Matter Physics, Computer Science Applications, Applied Mathematics, Electrical and Electronic Engineering

Keywords: AlGaAs, DBR-free, MECSEL, Near infra-red, Thermal management, Thermal resistance, VECSEL

DOIs:

10.1117/12.2512111

#### **Bibliographical note**

INT=phys,"Rajala, Patrik"

jufoid=71479

Source: Scopus

Source ID: 85066635597

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

### **Modeling mass transfer in fracture flows with the time domain-random walk method**

The time domain-random walk method was developed further for simulating mass transfer in fracture flows together with matrix diffusion in surrounding porous media. Specifically, a time domain-random walk scheme was developed for numerically approximating solutions of the advection-diffusion equation when the diffusion coefficient exhibits significant spatial variation or even discontinuities. The proposed scheme relies on second-order accurate, central-difference approximations of the advective and diffusive fluxes. The scheme was verified by comparing simulated results against analytical solutions in flow configurations involving a rectangular channel connected on one side with a porous matrix. Simulations with several flow rates, diffusion coefficients, and matrix porosities indicate good agreement between the numerical approximations and analytical solutions.

## General information

Publication status: E-pub ahead of print

MoE publication type: A1 Journal article-refereed

Organisations: Physics, Geological Survey of Finland, University of Helsinki, University of Jyväskylä

Contributors: Kuva, J., Voutilainen, M., Mattila, K.

Publication date: 2019

Peer-reviewed: Yes

## Publication information

Journal: COMPUTATIONAL GEOSCIENCES

ISSN (Print): 1420-0597

Original language: English

ASJC Scopus subject areas: Computer Science Applications, Computers in Earth Sciences, Computational Theory and Mathematics, Computational Mathematics

Keywords: Advection, Breakthrough curve, Matrix diffusion, Porous media, Simulation, Solute transport

Electronic versions:

Kuva2019\_Article\_ModelingMassTransferInFracture

DOIs:

10.1007/s10596-019-09852-5

URLs:

<http://urn.fi/URN:NBN:fi:tty-201909062074>

Source: Scopus

Source ID: 85069698468

Research output: Contribution to journal > Article > Scientific > peer-review

## Observation of local electroluminescent cooling and identifying the remaining challenges

The cooling of a light emitting diode (LED) by photons carrying out more energy than was used to electrically bias the device, has been predicted decades ago.<sup>1, 2</sup> While this effect, known as electroluminescent cooling (ELC), may allow e.g. fabricating thermophotonic heat pumps (THP) providing higher efficiencies than the existing solid state coolers,<sup>3</sup> ELC at powers sufficient for practical applications is still not demonstrated. To study high-power ELC we use double diode structures (DDSs), which consist of a double heterojunction (DHJ) LED and a photodiode (PD) grown within a single technological process and, thus, enclosed in a cavity with a homogeneous refractive index.<sup>4, 5</sup> The presence of the PD in the structure allows to more directly probe the efficiency of the LED, without the need for light extraction from the system, reducing undesirable losses. Our analysis of experimentally measured I - V curves for both the LED and the PD suggests that the local efficiency of the high-performance LEDs we have fabricated is approximately 110%, exceeding unity over a wide range of injection current densities of up to about 100A/cm<sup>2</sup>. At present the efficiency of the full DDS, however, still falls short of unity, not allowing direct evidence of the extraction of thermal energy from the LED. Here we review our previous studies of DDS for high-power EL cooling and discuss in more detail the remaining bottlenecks for demonstrating high-power ELC in the DDS context: the LED surface states, resistive and photodetection losses. In particular we report our first surface passivation measurements. Further optimization therefore mainly involves reducing the influence of the surface states, e.g. using more efficient surface passivation techniques and optimizing the PD. This combined with the optimization of the DDS layer thicknesses and contact metallization schemes is expected to finally allow purely experimental observation of high-power ELC.

## General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Physics, Aalto University

Contributors: Radevici, I., Sadi, T., Tripurari, T., Tiira, J., Ranta, S., Tukiainen, A., Guina, M., Oksanen, J.

Publication date: 2019

## Host publication information

Title of host publication: Photonic Heat Engines : Science and Applications

Publisher: SPIE, IEEE

Editors: Seletskiy, D. V., Epstein, R. I., Sheik-Bahae, M.

Article number: 109360A

ISBN (Electronic): 9781510625143

## Publication series

Name: Proceedings of SPIE - The International Society for Optical Engineering

Volume: 10936

ISSN (Print): 0277-786X

ISSN (Electronic): 1996-756X

ASJC Scopus subject areas: Electronic, Optical and Magnetic Materials, Condensed Matter Physics, Computer Science Applications, Applied Mathematics, Electrical and Electronic Engineering

Keywords: Double diode structures, Electroluminescent cooling, III-V semiconductors, Quantum efficiency, Surface states  
DOIs:

10.1117/12.2505814

#### **Bibliographical note**

jufoid=71479

Source: Scopus

Source ID: 85065604697

Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

#### **Positioning and Location-Aware Communications for Modern Railways with 5G New Radio**

Providing high-capacity radio connectivity for high-speed trains (HSTs) is one of the most important use cases of emerging fifth generation (5G) New Radio (NR) networks. In this article, we show that 5G NR technology can also facilitate high-accuracy continuous localization and tracking of HSTs. Furthermore, we describe and demonstrate how the NR network can utilize the continuous location information for efficient beam management and beamforming, as well as for downlink Doppler precompensation in the single-frequency network context. Additionally, with particular focus on millimeter-wave networks, novel concepts for low-latency inter-carrier interference (ICI) estimation and compensation, due to residual Doppler and oscillator phase noise, are described and demonstrated. The provided numerical results at 30 GHz operating band show that sub-meter positioning and sub-degree beam direction accuracies can be obtained with very high probabilities on the order of 95-99 percent. The results also show that the described Doppler precompensation and ICI estimation and cancellation methods substantially improve the throughput of the single-frequency HST network.

#### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Electrical Engineering, Nokia Bell Labs

Contributors: Talvitie, J., Levanen, T., Koivisto, M., Ihalainen, T., Pajukoski, K., Valkama, M.

Number of pages: 7

Pages: 24-30

Publication date: 2019

Peer-reviewed: Yes

#### **Publication information**

Journal: IEEE Communications Magazine

Volume: 57

Issue number: 9

ISSN (Print): 0163-6804

Original language: English

ASJC Scopus subject areas: Computer Science Applications, Computer Networks and Communications, Electrical and Electronic Engineering

DOIs:

10.1109/MCOM.001.1800954

#### **Bibliographical note**

EXT="Ihalainen, Tero"

Source: Scopus

Source ID: 85072768579

Research output: Contribution to journal › Article › Scientific › peer-review

#### **Quality and Capacity Analysis of Molecular Communications in Bacterial Synthetic Logic Circuits**

Synthetic logic circuits have been proposed as potential solutions for theranostics of biotechnological problems. One proposed model is the engineering of bacteria cells to create logic gates, and the communication between the bacteria populations will enable the circuit operation. In this paper, we analyse the quality of bacteria-based synthetic logic circuit through molecular communications that represent communication along a bus between three gates. In the bacteria-based synthetic logic circuit, the system receives environmental signals as molecular inputs and will process this information through a cascade of synthetic logic gates and free diffusion channels. We analyse the performance of this circuit by evaluating its quality and its relationship to the channel capacity of the molecular communications links that interconnect the bacteria populations. Our results show the effect of the molecular environmental delay and molecular amplitude differences over both the channel capacity and circuit quality. Furthermore, based on these metrics we also obtain an optimum region for the circuit operation resulting in an accuracy of 80%; for specific conditions. These results show that the performance of synthetic biology circuits can be evaluated through molecular communications, and lays the groundwork for combined systems that can contribute to future biomedical and biotechnology applications.

#### **General information**

Publication status: Accepted/In press

MoE publication type: A1 Journal article-refereed  
Organisations: Electrical Engineering, Waterford Institute of Technology  
Contributors: Martins, D. P., Barros, M. T., Balasubramaniam, S.  
Publication date: 2019  
Peer-reviewed: Yes

#### Publication information

Journal: IEEE Transactions on Nanobioscience  
ISSN (Print): 1536-1241  
Original language: English  
ASJC Scopus subject areas: Biotechnology, Bioengineering, Medicine (miscellaneous), Biomedical Engineering, Pharmaceutical Science, Computer Science Applications, Electrical and Electronic Engineering  
Keywords: Engineered bacteria, Logic circuits, Logic gates, Microorganisms, Molecular communication (telecommunication), Molecular communications, Sensors, Sociology, Statistics, Synthetic logic circuits  
DOIs:  
10.1109/TNB.2019.2930960  
Source: Scopus  
Source ID: 85070392121  
Research output: Contribution to journal › Article › Scientific › peer-review

#### Revisiting gray pixel for statistical illumination estimation

We present a statistical color constancy method that relies on novel gray pixel detection and mean shift clustering. The method, called Mean Shifted Grey Pixel – MSGP, is based on the observation: true-gray pixels are aligned towards one single direction. Our solution is compact, easy to compute and requires no training. Experiments on two real-world benchmarks show that the proposed approach outperforms state-of-the-art methods in the camera-agnostic scenario. In the setting where the camera is known, MSGP outperforms all statistical methods.

#### General information

Publication status: Published  
MoE publication type: A4 Article in a conference publication  
Organisations: Computing Sciences, Czech Technical University in Prague, Intel Finland  
Contributors: Qian, Y., Pertuz, S., Nikkanen, J., Kämäräinen, J., Matas, J.  
Number of pages: 11  
Pages: 36-46  
Publication date: 2019

#### Host publication information

Title of host publication: VISIGRAPP 2019 - Proceedings of the 14th International Joint Conference on Computer Vision, Imaging and Computer Graphics Theory and Applications  
Publisher: SCITEPRESS  
Editors: Kerren, A., Hurter, C., Braz, J.  
ISBN (Electronic): 9789897583544  
ASJC Scopus subject areas: Computer Science Applications, Computer Vision and Pattern Recognition, Computer Graphics and Computer-Aided Design  
Keywords: Color Constancy, Gray Pixel, Illumination Estimation  
Electronic versions:  
VISAPP\_2019\_201  
DOIs:  
10.5220/0007406900360046  
URLs:  
<http://urn.fi/URN:NBN:fi:tty-201908282042>  
Source: Scopus  
Source ID: 85068208950  
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

#### Single exposure lensless subpixel phase imaging

Lensless phase-retrieval system with phase modulation of free propagation wavefront is proposed. Contrary to the traditional super-resolution phase-retrieval, the method in this paper requires a single observation only and uses advanced SR-SPAR iterative technique. Successful object imaging relies on modulation of the object wavefront with a random phase-mask, which generates enlarged intensity patterns, allowing us to extract more information than it is possible without such a mask. The achieved high-quality super-resolution phase-imaging is demonstrated by simulation-tests produced with the parameters corresponding to the physical prototype of the considered optical system.

#### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Computing Sciences, Research group: Computational Imaging-CI, Computing Sciences

Contributors: Kocsis, P., Shevkunov, I., Katkovnik, V., Egiazarian, K.

Number of pages: 9

Publication date: 2019

#### Host publication information

Title of host publication: Digital Optical Technologies 2019

Publisher: SPIE, IEEE

Editors: Kress, B. C., Schelkens, P.

ISBN (Electronic): 9781510628038

#### Publication series

Name: Proceedings of SPIE - The International Society for Optical Engineering

Volume: 11062

ISSN (Print): 0277-786X

ISSN (Electronic): 1996-756X

ASJC Scopus subject areas: Electronic, Optical and Magnetic Materials, Condensed Matter Physics, Computer Science Applications, Applied Mathematics, Electrical and Electronic Engineering

Keywords: Diffractive optical element, Lensless imaging, Lensless system design, Phase imaging, Phase measurement, Phase retrieval, Sparse representation, Sub-pixel resolution

DOIs:

10.1117/12.2525679

Source: Scopus

Source ID: 85074197001

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

#### Smartphone teleoperation for self-balancing telepresence robots

Self-balancing mobile platforms have recently been adopted in many applications thanks to their light-weight and slim build. However, inherent instability in their behaviour makes both manual and autonomous operation more challenging as compared to traditional self-standing platforms. In this work, we experimentally evaluate three teleoperation user interface approaches to remotely control a self-balancing telepresence platform: 1) touchscreen button user interface, 2) tilt user interface and 3) hybrid touchscreen-tilt user interface. We provide evaluation in quantitative terms based on user trajectories and recorded control data, and qualitative findings from user surveys. Both quantitative and qualitative results support our finding that the hybrid user interface (a speed slider with tilt turn) is a suitable approach for smartphone-based teleoperation of self-balancing telepresence robots. We also introduce a client-server based multi-user telepresence architecture using open source tools.

#### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Computing Sciences

Contributors: Ainasoja, A. E., Pertuz, S., Kämäräinen, J.

Number of pages: 8

Pages: 561-568

Publication date: 2019

#### Host publication information

Title of host publication: VISGRAPP 2019 - Proceedings of the 14th International Joint Conference on Computer Vision, Imaging and Computer Graphics Theory and Applications

Publisher: SCITEPRESS

Editors: Kerren, A., Hurter, C., Braz, J.

ISBN (Electronic): 9789897583544

ASJC Scopus subject areas: Computer Science Applications, Computer Vision and Pattern Recognition, Computer Graphics and Computer-Aided Design

Keywords: Teleoperation, Telepresence, User Interface

Electronic versions:

VISAPP\_2019\_199

DOIs:

10.5220/0007406405610568

URLs:

<http://urn.fi/URN:NBN:fi:tty-201908282038>

Source: Scopus

Source ID: 85068231086

### **Uses and Gratifications of Pokémon Go: Why do People Play Mobile Location-Based Augmented Reality Games?**

In recent years, augmented reality games (ARGs) such as Pokémon Go have become increasingly popular. These games not only afford a novel gaming experience but also have the potential to alter how players view their physical realities. In addition to the common experiences and gratifications people derive from games, (location-based) ARGs can afford, for example outdoor adventures, communal activities, and health benefits, but also create problems stemming from, for example privacy concerns and poor usability. This raises some important research questions as to what drives people to use these new applications, and why they may be willing to spend money on the content sold within them. In this study, we investigate the various gratifications people derive from ARGs (Pokémon Go) and the relationship of these gratifications with the players' intentions to continue playing and spending money on them. We employ data drawn from players of Pokémon Go (N = 1190) gathered through an online survey. The results indicate that game enjoyment, outdoor activity, ease of use, challenge, and nostalgia are positively associated with intentions to reuse (ITR), meanwhile outdoor activity, challenge, competition, socializing, nostalgia and ITR are associated with in-app purchase intentions (IPI). In contrast with our expectations, privacy concerns or trendiness were not associated with reuse intentions or IPI.

#### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Pervasive Computing, Gamification Group, George Mason University, University of Turku School of Cultural Production and Landscape Studies

Contributors: Hamari, J., Malik, A., Koski, J., Johri, A.

Publication date: 2019

Peer-reviewed: Yes

Early online date: 2018

#### **Publication information**

Journal: International Journal of Human-Computer Interaction

Volume: 35

Issue number: 9

ISSN (Print): 1044-7318

Original language: English

ASJC Scopus subject areas: Human Factors and Ergonomics, Human-Computer Interaction, Computer Science Applications

Keywords: Augmented reality, freemium, gamification, location-based games, Uses and Gratifications

DOIs:

10.1080/10447318.2018.1497115

Source: Scopus

Source ID: 85050562939

Research output: Contribution to journal › Article › Scientific › peer-review

### **SCIP: a single-cell image processor toolbox**

Summary: Each cell is a phenotypically unique individual that is influenced by internal and external processes, operating in parallel. To characterize the dynamics of cellular processes one needs to observe many individual cells from multiple points of view and over time, so as to identify commonalities and variability. With this aim, we engineered a software, 'SCIP', to analyze multi-modal, multi-process, time-lapse microscopy morphological and functional images. SCIP is capable of automatic and/or manually corrected segmentation of cells and lineages, automatic alignment of different microscopy channels, as well as detect, count and characterize fluorescent spots (such as RNA tagged by MS2-GFP), nucleoids, Z rings, Min system, inclusion bodies, undefined structures, etc. The results can be exported into \*mat files and all results can be jointly analyzed, to allow studying not only each feature and process individually, but also find potential relationships. While we exemplify its use on Escherichia coli, many of its functionalities are expected to be of use in analyzing other prokaryotes and eukaryotic cells as well. We expect SCIP to facilitate the finding of relationships between cellular processes, from small-scale (e.g. gene expression) to large-scale (e.g. cell division), in single cells and cell lineages. Availability and implementation: [http://www.ca3-uninova.org/project\\_scip](http://www.ca3-uninova.org/project_scip). Supplementary information: Supplementary data are available at Bioinformatics online.

#### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Faculty of Biomedical Sciences and Engineering, Campus FCT-UNL

Contributors: Martins, L., Neeli-Venkata, R., Oliveira, S. M., Häkkinen, A., Ribeiro, A. S., Fonseca, J. M.

Number of pages: 3

Pages: 4318-4320

Publication date: 15 Dec 2018

Peer-reviewed: Yes

### Publication information

Journal: Bioinformatics

Volume: 34

Issue number: 24

ISSN (Print): 1367-4803

Ratings:

Scopus rating (2018): CiteScore 5.94 SJR 4.549 SNIP 1.869

Original language: English

ASJC Scopus subject areas: Statistics and Probability, Biochemistry, Molecular Biology, Computer Science Applications, Computational Theory and Mathematics, Computational Mathematics

DOIs:

10.1093/bioinformatics/bty505

Source: Scopus

Source ID: 85058436519

Research output: Contribution to journal › Article › Scientific › peer-review

### Active scanner control on paper machines

The cross-directional (CD) basis weight control on paper machines is improved by optimizing the path of the scanning measurement. The optimal path results from an LQG problem and depends on how the uncertainty of the present estimate of the basis weight and the intensity of process noise vary in CD. These factors are assessed by how accurately the CD basis weight estimate predicts the measured optical transmittance with a linear adaptive model on synchronized basis weight and transmittance data. Simulations on optimized scanner path in disturbance scenarios are presented, and the practical implementation of scanner control is discussed.

### General information

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Automation and Hydraulic Engineering

Contributors: Raunio, J., Ritala, R.

Number of pages: 17

Pages: 74-90

Publication date: 1 Dec 2018

Peer-reviewed: Yes

### Publication information

Journal: Journal of Process Control

Volume: 72

ISSN (Print): 0959-1524

Ratings:

Scopus rating (2018): CiteScore 4.05 SJR 0.967 SNIP 2.022

Original language: English

ASJC Scopus subject areas: Control and Systems Engineering, Modelling and Simulation, Computer Science Applications, Industrial and Manufacturing Engineering

Keywords: basis weight, linear-quadratic-Gaussian, optimal measurement, paper machine, scanner, transmittance, variance estimation, web-wide measurement

DOIs:

10.1016/j.jprocont.2018.09.012

Source: Scopus

Source ID: 85056176314

Research output: Contribution to journal › Article › Scientific › peer-review

### A Portable Microscale Cell Culture System with Indirect Temperature Control

A physiologically relevant environment is essential for successful long-term cell culturing in vitro. Precise control of temperature, one of the most crucial environmental parameters in cell cultures, increases the fidelity and repeatability of the experiments. Unfortunately, direct temperature measurement can interfere with the cultures or prevent imaging of the cells. Furthermore, the assessment of dynamic temperature variations in the cell culture area is challenging with the methods traditionally used for measuring temperature in cell culture systems. To overcome these challenges, we integrated a microscale cell culture environment together with live-cell imaging and a precise local temperature control that is based on an indirect measurement. The control method uses a remote temperature measurement and a mathematical model for estimating temperature at the desired area. The system maintained the temperature at  $37 \pm 0.3$  °C for more than 4 days. We also showed that the system precisely controls the culture temperature during temperature transients and compensates for the disturbance when changing the cell cultivation medium, and presented the portability of the heating system. Finally, we demonstrated a successful long-term culturing of human induced stem cell-derived beating cardiomyocytes, and analyzed their beating rates at different temperatures.

### General information

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Faculty of Biomedical Sciences and Engineering, Research group: Computational Biophysics and Imaging Group, Research group: Sensor Technology and Biomeasurements (STB), Research group: Micro and Nanosystems Research Group, Tampere University Hospital

Contributors: Mäki, A. J., Verho, J., Kreutzer, J., Ryyänen, T., Rajan, D., Pekkanen-Mattila, M., Ahola, A., Hyttinen, J., Aalto-Setälä, K., Lekkala, J., Kallio, P.

Pages: 566-579

Publication date: 1 Dec 2018

Peer-reviewed: Yes

Early online date: 1 Apr 2018

### Publication information

Journal: SLAS Technology

Volume: 23

Issue number: 6

ISSN (Print): 2472-6303

Ratings:

Scopus rating (2018): CiteScore 1.96 SJR 0.511 SNIP 0.508

Original language: English

ASJC Scopus subject areas: Computer Science Applications, Medical Laboratory Technology

Keywords: cell culture, feedback control, microfluidics, modeling, temperature

Electronic versions:

Revised\_Manuscript\_AnttiMaki\_TUTCRISversio

DOIs:

10.1177/2472630318768710

URLs:

<http://urn.fi/URN:NBN:fi:tty-201809052273>

Source: Scopus

Source ID: 85046801632

Research output: Contribution to journal › Article › Scientific › peer-review

### Empirical Effects of Dynamic Human-Body Blockage in 60 GHz Communications

The millimeter-wave (mmWave) bands and other high frequencies above 6 GHz have emerged as a central component of fifth generation cellular standards to deliver high data rates and ultra-low latency. A key challenge in these bands is blockage from obstacles, including the human body. In addition to the reduced coverage, blockage can result in highly intermittent links where the signal quality varies significantly with motion of obstacles in the environment. The blockages have widespread consequences throughout the protocol stack including beam tracking, link adaptation, cell selection, handover, and congestion control. Accurately modeling these blockage dynamics is therefore critical for the development and evaluation of potential mmWave systems. In this work, we present a novel spatial dynamic channel sounding system based on phased array transmitters and receivers operating at 60 GHz. Importantly, the sounder can measure multiple directions rapidly at high speed to provide detailed spatial dynamic measurements of complex scenarios. The system is demonstrated in an indoor home entertainment type setting with multiple moving blockers. Preliminary results are presented on analyzing this data with a discussion of the open issues toward developing statistical dynamic models.

### General information

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Electronics and Communications Engineering, NYU Tandon School of Engineering, Peoples' Friendship University of Russia

Contributors: Slezak, C., Semkin, V., Andreev, S., Koucheryavy, Y., Rangan, S.

Number of pages: 7

Pages: 60-66

Publication date: 1 Dec 2018

Peer-reviewed: Yes

### Publication information

Journal: IEEE Communications Magazine

Volume: 56

Issue number: 12

ISSN (Print): 0163-6804

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Original language: English

ASJC Scopus subject areas: Computer Science Applications, Computer Networks and Communications, Electrical and Electronic Engineering

DOIs:

10.1109/MCOM.2018.1800232

Source: Scopus

Source ID: 85058494833

Research output: Contribution to journal › Article › Scientific › peer-review

### **Organizing for openness: six models for developer involvement in hybrid OSS projects**

This article examines organization and governance of commercially influenced Open Source Software development communities by presenting a multiple-case study of six contemporary, hybrid OSS projects. The findings provide in-depth understanding on how to design the participatory nature of the software development process, while understanding the factors that influence the delicate balance of openness, motivations, and governance. The results lay ground for further research on how to organize and manage developer communities where needs of the stakeholders are competing, yet complementary.

#### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Pervasive Computing, University of Helsinki, Lappeenranta University of Technology

Contributors: Mäenpää, H., Mäkinen, S., Kilamo, T., Mikkonen, T., Männistö, T., Ritala, P.

Publication date: 1 Dec 2018

Peer-reviewed: Yes

#### **Publication information**

Journal: Journal of Internet Services and Applications

Volume: 9

Issue number: 1

Article number: 17

ISSN (Print): 1867-4828

Ratings:

Scopus rating (2018): CiteScore 3.24 SJR 0.397 SNIP 1.544

Original language: English

ASJC Scopus subject areas: Computer Science Applications, Computer Networks and Communications

Keywords: Community management, Governance, Hybrid open source, Open source, Software development process

Electronic versions:

s13174-018-0088-1

DOIs:

10.1186/s13174-018-0088-1

URLs:

<http://urn.fi/URN:NBN:fi:tty-201809032258>

Source: Scopus

Source ID: 85051727092

Research output: Contribution to journal › Article › Scientific › peer-review

### **Benefits of Positioning-Aided Communication Technology in High-Frequency Industrial IoT**

The future of industrial applications is shaped by intelligent moving IoT devices, such as flying drones, advanced factory robots, and connected vehicles, which may operate (semi-)autonomously. In these challenging scenarios, dynamic radio connectivity at high frequencies, augmented with timely positioning-related information, becomes instrumental to improve communication performance and facilitate efficient computation offloading. Our work reviews the main research challenges and reveals open implementation gaps in IIoT applications that rely on location awareness and multi-connectivity in super high and extremely high frequency bands. It further conducts a rigorous numerical investigation to confirm the potential of precise device localization in the emerging IIoT systems. We focus on positioning-aided benefits made available to multi-connectivity IIoT device operation at 28 GHz, which notably improve data transfer rates, communication latency, and the extent of control overhead.

#### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Electronics and Communications Engineering, Research group: Wireless Communications and Positioning, Research group: Emerging Technologies for Nano-Bio-Info-Cogno, Univ of Oulu, Huawei Technologies Oy (Finland). Co. Ltd.

Contributors: Lohan, E. S., Koivisto, M., Galinina, O., Andreev, S., Tölli, A., Destino, G., Costa, M., Leppänen, K., Koucheryavy, Y., Valkama, M.

Number of pages: 7  
Pages: 142-148  
Publication date: 14 Nov 2018  
Peer-reviewed: Yes

#### Publication information

Journal: IEEE Communications Magazine

Volume: 56

Issue number: 12

Article number: 8535084

ISSN (Print): 0163-6804

Ratings:

Scopus rating (2018): CiteScore 11.27 SJR 2.373 SNIP 4.681

Original language: English

ASJC Scopus subject areas: Computer Science Applications, Computer Networks and Communications, Electrical and Electronic Engineering

DOIs:

10.1109/MCOM.2018.1701057

Source: Scopus

Source ID: 85056574017

Research output: Contribution to journal › Article › Scientific › peer-review

#### Kalman-Type Filters and Smoothers for Pedestrian Dead Reckoning

In this paper, we present a method for device localization based on the fusion of location data from Global Navigation Satellite System and data from inertial sensors. We use a Kalman filter as well as its non-linear variants for realtime position estimation, and corresponding smoothers for offline position estimation. In all filters we use information about changes of user's heading, which are computed from the acceleration and gyroscope data. Models used with Extended and Unscented Kalman filters also take into account information about step length, whereas Kalman Filter does not, because the measurement is non-linear. In order to overcome this shortcoming, we introduce a modified Kalman Filter which adjusts the state vector according to the step length measurements. Our experiments show that use of step length information does not significantly improve performance when location measurements are constantly available. However, in real situations, when location data is partially unavailable, information about step length and its appropriate integration into the filter design is important, and improve localization accuracy considerably.

#### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Automation and Hydraulic Engineering, HERE Technologies, Department of Electrical Engineering and Automation, Aalto University

Contributors: Ivanov, P., Raitoharju, M., Piché, R.

Number of pages: 7

Publication date: 13 Nov 2018

#### Host publication information

Title of host publication: IPIN 2018 - 9th International Conference on Indoor Positioning and Indoor Navigation

Publisher: IEEE

ISBN (Electronic): 9781538656358

ASJC Scopus subject areas: Artificial Intelligence, Computer Science Applications, Control and Optimization

Electronic versions:

PID5487111

DOIs:

10.1109/IPIN.2018.8533753

URLs:

<http://urn.fi/URN:NBN:fi:tty-201901161101>

#### Bibliographical note

jufoid=72210

Source: Scopus

Source ID: 85059102314

Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

#### Chromatographic studies of n-Propyl Propionate: Adsorption equilibrium, modelling and uncertainties determination

The n-Propyl Propionate (ProPro) is a compound that has several possible industrial applications. However, the current production route of this component presents several problems, such as the downstream purification. In this way, chromatographic separation could be an alternative solution to the downstream purification. In this work experimental

studies of the ProPro reaction system separation in a chromatographic fixed bed unit packed with Amberlyst 46 were performed. The adsorption equilibrium isotherms and the corresponding Langmuir model parameters were determined. A phenomenological model to represent the process was developed and validated through the experimental data. Meanwhile, it is proposed the characterization of the uncertainties of all steps and its extension to the model prediction, which allowed to estimate the model parameters with a reduced number of experiments, when compared with other reports in the literature; nevertheless, the final results lead to a statistically more reliable model.

#### General information

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Automation and Hydraulic Engineering, Research group: Automation and Systems Theory, Universidade do Porto, Federal Univ. of Bahia

Contributors: Nogueira, I. B., Faria, R. P., Requião, R., Koivisto, H., Martins, M. A., Rodrigues, A. E., Loureiro, J. M., Ribeiro, A. M.

Number of pages: 12

Pages: 371-382

Publication date: 2 Nov 2018

Peer-reviewed: Yes

#### Publication information

Journal: Computers and Chemical Engineering

Volume: 119

ISSN (Print): 0098-1354

Ratings:

Scopus rating (2018): CiteScore 3.98 SJR 0.932 SNIP 1.562

Original language: English

ASJC Scopus subject areas: Chemical Engineering(all), Computer Science Applications

Keywords: Adsorption equilibrium isotherms, Confidence region, Fixed bed adsorptive unit, n-Propyl Propionate, Particle swarm optimization

DOIs:

10.1016/j.compchemeng.2018.09.020

Source: Scopus

Source ID: 85054180293

Research output: Contribution to journal > Article > Scientific > peer-review

#### Computation of Dynamic Polarizabilities and van der Waals Coefficients from Path-Integral Monte Carlo

We demonstrate computation of total dynamic multipole polarizabilities using path-integral Monte Carlo method (PIMC). The PIMC approach enables accurate thermal and nonadiabatic mixing of electronic, rotational, and vibrational degrees of freedom. Therefore, we can study the thermal effects, or lack thereof, in the full multipole spectra of the chosen one- and two-electron systems: H, Ps, He, Ps<sub>2</sub>, H<sub>2</sub>, and HD<sup>+</sup>. We first compute multipole-multipole correlation functions up to octupole order in imaginary time. The real-domain spectral function is then obtained by analytical continuation with the maximum entropy method. In general, sharpness of the active spectra is limited, but the obtained off-resonant polarizabilities are in good agreement with the existing literature. Several weak and strong thermal effects are observed. Furthermore, the polarizabilities of Ps<sub>2</sub> and some higher multipole and higher frequency data have not been published before. In addition, we compute isotropic dispersion coefficients C<sub>6</sub>, C<sub>8</sub>, and C<sub>10</sub> between pairs of species using the simplified Casimir-Polder formulas.

#### General information

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Physics, Research group: Electronic Structure Theory, Research area: Computational Physics

Contributors: Tiihonen, J., Kylänpää, I., Rantala, T. T.

Number of pages: 14

Pages: 5750-5763

Publication date: 2 Oct 2018

Peer-reviewed: Yes

#### Publication information

Journal: Journal of Chemical Theory and Computation

Volume: 14

ISSN (Print): 1549-9618

Ratings:

Scopus rating (2018): CiteScore 5.7 SJR 2.236 SNIP 1.562

Original language: English

ASJC Scopus subject areas: Computer Science Applications, Physical and Theoretical Chemistry

Electronic versions:

dynamicpolarizability\_achemso. Embargo ended: 2/10/19

DOIs:

10.1021/acs.jctc.8b00859

URLs:

<http://urn.fi/URN:NBN:fi:tyy-201811162595>. Embargo ended: 2/10/19

Source: Scopus

Source ID: 85055154322

Research output: [Contribution to journal](#) › [Article](#) › [Scientific](#) › [peer-review](#)

### **Olfactory display prototype for presenting and sensing authentic and synthetic odors**

The aim was to study if odors evaporated by an olfactory display prototype can be used to affect participants' cognitive and emotion-related responses to audio-visual stimuli, and whether the display can benefit from objective measurement of the odors. The results showed that odors and videos had significant effects on participants' responses. For instance, odors increased pleasantness ratings especially when the odor was authentic and the video was congruent with odors. The objective measurement of the odors was shown to be useful. The measurement data was classified with 100 % accuracy removing the need to speculate whether the odor presentation apparatus is working properly.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Pervasive Computing, Faculty of Biomedical Sciences and Engineering, Research group: Sensor Technology and Biomeasurements (STB), Research group: Micro and Nanosystems Research Group

Contributors: Salminen, K., Rantala, J., Isokoski, P., Lehtonen, M., Müller, P., Karjalainen, M., Väliäho, J., Kontunen, A., Nieminen, V., Leivo, J., Telembeci, A. A., Lekkala, J., Kallio, P., Surakka, V.

Number of pages: 5

Pages: 73-77

Publication date: 2 Oct 2018

#### **Host publication information**

Title of host publication: ICMI 2018 - Proceedings of the 2018 International Conference on Multimodal Interaction

Publisher: ACM

ISBN (Electronic): 9781450356923

ASJC Scopus subject areas: Computer Science Applications, Computer Vision and Pattern Recognition, Hardware and Architecture, Human-Computer Interaction

Keywords: Emotions, Multimodal interaction, Olfaction

Electronic versions:

olfactory-display-prototype

DOIs:

10.1145/3242969.3242999

URLs:

<http://urn.fi/URN:NBN:fi:tuni-201909233451>

#### **Bibliographical note**

INT=tut-bmt,"Nieminen, Ville"

Source: Scopus

Source ID: 85056660798

Research output: [Chapter in Book/Report/Conference proceeding](#) › [Conference contribution](#) › [Scientific](#) › [peer-review](#)

### **Breaking the limits in urban video monitoring: Massive crowd sourced surveillance over vehicles**

Contemporary urban environments are in prompt need of the means for intelligent decision-making, where a crucial role belongs to smart video surveillance systems. While existing deployments of stationary monitoring cameras already deliver notable societal benefits, the proposed concept of massive video surveillance over connected vehicles that we contribute in this article may further augment these important capabilities. We therefore introduce the envisioned system concept, discuss its implementation, outline the high-level architecture, and identify major data flows, while also offering insights into the corresponding design and deployment aspects. Our conducted case study confirms the potential of the described crowd sourced vehicular system to effectively complement and eventually surpass even the best of today's static video surveillance setups. We expect that our proposal will become of value and integrate seamlessly into the future Internet-of-Things landscape, thus enabling a plethora of advanced urban applications.

#### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Electronics and Communications Engineering, Electrical Engineering Department, University of California, Los Angeles (UCLA), National Research University Higher School of Economics  
Contributors: Petrov, V., Andreev, S., Gerla, M., Koucheryav, Y.  
Number of pages: 9  
Pages: 104-112  
Publication date: 1 Oct 2018  
Peer-reviewed: Yes

#### **Publication information**

Journal: IEEE Wireless Communications  
Volume: 25  
Issue number: 5  
ISSN (Print): 1536-1284  
Ratings:  
Scopus rating (2018): CiteScore 11.8 SJR 2.352 SNIP 4.039  
Original language: English  
ASJC Scopus subject areas: Computer Science Applications, Electrical and Electronic Engineering  
DOIs:  
10.1109/MWC.2018.1700415  
Source: Scopus  
Source ID: 85054226112  
Research output: [Contribution to journal](#) › [Article](#) › [Scientific](#) › [peer-review](#)

#### **Focus model for metric depth estimation in standard plenoptic cameras**

In recent years, a lot of efforts have been devoted to the problem of depth estimation from lightfield images captured by standard plenoptic cameras. However, most of the metric depth estimation methods in the state-of-the-art leverage pixel disparity only. In this paper, we tackle the problem of focus-based metric depth estimation in standard plenoptic cameras. For this purpose we propose a closed-form model that relates the refocusing parameter with the focus distance of a plenoptic camera in order to allow for metric depth estimation. Based on the proposed model, we develop a calibration procedure that allows finding the parameters of the model. Using measurements of a time-of-flight sensor as ground-truth, experimental validation in a distance range of 0.2–1.6 m shows that focus-based depth estimation is feasible with a root-mean-squared error of less than 5 cm.

#### **General information**

Publication status: Published  
MoE publication type: A1 Journal article-refereed  
Organisations: Signal Processing, Universidad Industrial de Santander, Universidad Antonio Nariño  
Contributors: Pertuz, S., Pulido-Herrera, E., Kämäräinen, J.  
Number of pages: 10  
Pages: 38-47  
Publication date: 1 Oct 2018  
Peer-reviewed: Yes

#### **Publication information**

Journal: ISPRS Journal of Photogrammetry and Remote Sensing  
Volume: 144  
ISSN (Print): 0924-2716  
Ratings:  
Scopus rating (2018): CiteScore 8.64 SJR 2.979 SNIP 2.862  
Original language: English  
ASJC Scopus subject areas: Atomic and Molecular Physics, and Optics, Engineering (miscellaneous), Computer Science Applications, Computers in Earth Sciences  
Keywords: Calibration, Depth estimation, Focus, Lightfield, Plenoptic camera  
DOIs:  
10.1016/j.isprsjprs.2018.06.020  
Source: Scopus  
Source ID: 85049523458  
Research output: [Contribution to journal](#) › [Article](#) › [Scientific](#) › [peer-review](#)

#### **Graph measures with high discrimination power revisited: A random polynomial approach**

Finding graph measures with high discrimination power has been triggered by searching for so-called complete graph invariants. In a series of papers, we have already investigated highly discriminating measures to distinguish graphs (networks) based on their topology. In this paper, we propose an approach where the graph measures are based on the roots of random graph polynomials. The polynomial coefficients have been defined by utilizing information functionals which capture structural information of the underlying networks. Our numerical results obtained by employing exhaustively

generated graphs reveal that the new approach outperforms earlier results in the literature.

#### General information

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Faculty of Biomedical Sciences and Engineering, Research group: Computational Medicine and Statistical Learning Laboratory (CMSL), Research group: Predictive Society and Data Analytics (PSDA), University of Applied Sciences Upper Austria, School of Management, Nankai University

Contributors: Dehmer, M., Chen, Z., Emmert-Streib, F., Shi, Y., Tripathi, S.

Number of pages: 8

Pages: 407-414

Publication date: 1 Oct 2018

Peer-reviewed: Yes

#### Publication information

Journal: Information Sciences

Volume: 467

ISSN (Print): 0020-0255

Ratings:

Scopus rating (2018): CiteScore 6.9 SJR 1.62 SNIP 2.636

Original language: English

ASJC Scopus subject areas: Software, Control and Systems Engineering, Theoretical Computer Science, Computer Science Applications, Information Systems and Management, Artificial Intelligence

Keywords: Data science, Graphs, Networks, Quantitative graph theory, Statistics

DOIs:

10.1016/j.ins.2018.07.072

#### Bibliographical note

EXT="Tripathi, Shailesh"

Source: Scopus

Source ID: 85051518614

Research output: Contribution to journal > Article > Scientific > peer-review

### Guest Editorial Special Issue on Multimedia Big Data in Internet of Things

#### General information

Publication status: Published

MoE publication type: B1 Article in a scientific magazine

Organisations: Signal Processing, Research group: Multimedia Research Group - MRG, Beijing University of Posts and Telecommunications, University of Technology Sydney, IBM Research

Contributors: Ma, H., Yu, S., Gabbouj, M., Mueller, P.

Number of pages: 3

Pages: 3405-3407

Publication date: Oct 2018

Peer-reviewed: No

#### Publication information

Journal: IEEE Internet of Things Journal

Volume: 5

Issue number: 5

Article number: 8534720

ISSN (Print): 2327-4662

Ratings:

Scopus rating (2018): CiteScore 11.33 SJR 1.396 SNIP 3.874

Original language: English

ASJC Scopus subject areas: Signal Processing, Information Systems, Hardware and Architecture, Computer Science Applications, Computer Networks and Communications

DOIs:

10.1109/JIOT.2018.2875580

Source: Scopus

Source ID: 85056768996

Research output: Contribution to journal > Editorial > Scientific

### **Molecular Communications Pulse-based Jamming Model for Bacterial Biofilm Suppression**

Studies have recently shown that the bacteria survivability within biofilms is responsible for the emergence of superbugs. The combat of bacterial infections, without enhancing its resistance to antibiotics, includes the use of nanoparticles to quench the quorum sensing of these biofilm-forming bacteria. Several sequential and parallel multi-stage communication processes are involved in the formation of biofilms. In this paper, we use proteomic data from a wet lab experiment to identify the communication channels that are vital to these processes. We also identified the main proteins from each channel and propose the use of jamming signals from synthetically engineered bacteria to suppress the production of those proteins. This biocompatible technique is based on synthetic biology and enables the inhibition of biofilm formation. We analyse the communications performance of the jamming process, by evaluating the path loss for a number of conditions that include different engineered bacterial population sizes, distances between the populations and molecular signal power. Our results show that sufficient molecular pulsebased jamming signals are able to prevent the biofilm formation by creating lossy communications channels (almost -3 dB for certain scenarios). From these results, we define the main design parameters to develop a fully operational bacteria-based jamming system.

#### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Electronics and Communications Engineering, Research group: Emerging Technologies for Nano-Bio-Info-Cogno, Waterford Institute of Technology, Kasetsart University

Contributors: Martins, D. P., Leetanasaksakul, K., Barros, M. T., Thamchaipenet, A., Donnelly, W., Balasubramaniam, S.

Number of pages: 12

Pages: 533-542

Publication date: Oct 2018

Peer-reviewed: Yes

Early online date: 19 Sep 2018

#### **Publication information**

Journal: IEEE Transactions on Nanobioscience

Volume: 17

Issue number: 4

ISSN (Print): 1536-1241

Ratings:

Scopus rating (2018): CiteScore 2.23 SJR 0.541 SNIP 0.741

Original language: English

ASJC Scopus subject areas: Biotechnology, Bioengineering, Medicine (miscellaneous), Biomedical Engineering, Pharmaceutical Science, Computer Science Applications, Electrical and Electronic Engineering

Keywords: Biofilm suppression, Communications systems, Jamming, Synthetic logic circuits

DOIs:

10.1109/TNB.2018.2871276

Source: Scopus

Source ID: 85053611196

Research output: Contribution to journal › Article › Scientific › peer-review

### **Comparative analysis of tissue reconstruction algorithms for 3D histology**

Motivation: Digital pathology enables new approaches that expand beyond storage, visualization or analysis of histological samples in digital format. One novel opportunity is 3D histology, where a three-dimensional reconstruction of the sample is formed computationally based on serial tissue sections. This allows examining tissue architecture in 3D, for example, for diagnostic purposes. Importantly, 3D histology enables joint mapping of cellular morphology with spatially resolved omics data in the true 3D context of the tissue at microscopic resolution. Several algorithms have been proposed for the reconstruction task, but a quantitative comparison of their accuracy is lacking. Results: We developed a benchmarking framework to evaluate the accuracy of several free and commercial 3D reconstruction methods using two whole slide image datasets. The results provide a solid basis for further development and application of 3D histology algorithms and indicate that methods capable of compensating for local tissue deformation are superior to simpler approaches.

#### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Faculty of Biomedical Sciences and Engineering, Mechanical Engineering and Industrial Systems, Signal Processing, Research group: Data-analytics and Optimization, Tampere University Hospital, Faculty of Medicine and Life Sciences, BioMediTech, Fimlab Laboratories Ltd, BioMediTech Institute

Contributors: Kartasalo, K., Latonen, L., Vihinen, J., Visakorpi, T., Nykter, M., Ruusuvoori, P.

Number of pages: 9

Pages: 3013-3021

Publication date: 1 Sep 2018

Peer-reviewed: Yes

### Publication information

Journal: Bioinformatics

Volume: 34

Issue number: 17

ISSN (Print): 1367-4803

Ratings:

Scopus rating (2018): CiteScore 5.94 SJR 4.549 SNIP 1.869

Original language: English

ASJC Scopus subject areas: Statistics and Probability, Biochemistry, Molecular Biology, Computer Science Applications, Computational Theory and Mathematics, Computational Mathematics

Electronic versions:

bty210

DOIs:

10.1093/bioinformatics/bty210

URLs:

<http://urn.fi/URN:NBN:fi:ty-201811162594>

Source: Scopus

Source ID: 85055091427

Research output: Contribution to journal › Article › Scientific › peer-review

### Intellectual capital and bi-tools in private healthcare value creation

The demand for data-driven decision making in the healthcare sector has increased, not only on the clinical side, but also from the managerial perspective; this is especially true in the private healthcare sector. Utilisation of internal and external data requires certain capabilities, such as intellectual capital (IC), as different data sources (structural capital) and organisational competences (human capital) can become organisational value. We study the utilisation of business intelligence (BI) tools and IC dimensions in creating value in the Finnish private healthcare sector. IC components and a modified value creation capabilities model are used as a framework for considering data utilisation and BI tools' role in value creation. Our study includes private healthcare organisations in Finland and management and BI technology consulting representatives. Thematic interviews of key personnel responsible for BI were conducted to elucidate the value creation capabilities, IC components and BI tool utilisation in the Finnish private healthcare industry. Data-driven decision making is currently one of the most discussed topics in private healthcare sector organisations. By analysing the current data source utilisation and organisational competences in data utilisation, we gain a better understanding of IC and BI tool-enabled value creation in private healthcare organisations. The study's outcomes will provide valuable information and a deep understanding concerning the influence of BI tools and IC dimensions on value creation in private health care in Finland. In addition, it will provide insight into future-oriented value creation factors that can enable new business concepts for private healthcare companies. Advanced capability of data utilisation will increase the value creation ability in private healthcare sector companies. However, in addition to the technology and data, human capital or capability of BI tool utilisation and data-driven decision making are crucial.

### General information

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Industrial and Information Management

Contributors: Ratia, M.

Number of pages: 12

Pages: 143-154

Publication date: 1 Sep 2018

Peer-reviewed: Yes

### Publication information

Journal: Electronic Journal of Knowledge Management

Volume: 16

Issue number: 2

ISSN (Print): 1479-4411

Original language: English

ASJC Scopus subject areas: Management Information Systems, Management of Technology and Innovation, Computer Networks and Communications, Computer Science Applications

Keywords: business intelligence, external data sources, intellectual capital, Private healthcare, value creation

Electronic versions:

ejkm-volume16-issue2-article861

URLs:

<http://urn.fi/URN:NBN:fi:ty-201901071023>

Source: Scopus

Source ID: 85056996165

### Nocturnal Heart Rate Variability Spectrum Characterization in Preschool Children with Asthmatic Symptoms

Asthma is a chronic lung disease that usually develops during childhood. Despite that symptoms can almost be controlled with medication, early diagnosis is desirable in order to reduce permanent airway obstruction risk. It has been suggested that abnormal parasympathetic nervous system (PSNS) activity might be closely related with the pathogenesis of asthma, and that this PSNS activity could be reflected in cardiac vagal control. In this work, an index to measure the spectral regularity of the high frequency (HF) component of heart rate variability (HRV) spectrum, named peakness (P), is proposed. Three different implementations of P, based on electrocardiogram (ECG) recordings, impedance pneumography (IP) recordings and a combination of both, were employed in the characterization of a group of pre-school children classified attending to their risk of developing asthma. Peakier components were observed in the HF band of those children classified as high-risk ( $p < 0.005$ ), who also presented reduced sympathovagal balance. Results suggest that high-risk of developing asthma might be related with a lack of adaptability of PSNS.

#### General information

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Faculty of Biomedical Sciences and Engineering, Research group: Physiological Measurement Systems and Methods Group, University of Zaragoza, KU Leuven, University of Helsinki

Contributors: Milagro, J., Gil, E., Lazaro, J., Seppae, V. P., Malmberg, L. P., Pelkonen, A. S., Kotaniemi-Syrjanen, A., Makela, M., Viik, J., Bailon, R.

Pages: 1332-1340

Publication date: Sep 2018

Peer-reviewed: Yes

Early online date: 16 Nov 2017

#### Publication information

Journal: IEEE Journal of Biomedical and Health Informatics

Volume: 22

Issue number: 5

ISSN (Print): 2168-2194

Ratings:

Scopus rating (2018): CiteScore 5.67 SJR 1.122 SNIP 2.4

Original language: English

ASJC Scopus subject areas: Biotechnology, Computer Science Applications, Electrical and Electronic Engineering, Health Information Management

Keywords: asthma, children, Electrocardiography, Heart rate variability, heart rate variability, Informatics, parasympathetic nervous system, peakness, Pediatrics, Pregnancy, Respiratory system, Signal to noise ratio

DOIs:

10.1109/JBHI.2017.2775059

Source: Scopus

Source ID: 85035749268

Research output: Contribution to journal › Article › Scientific › peer-review

### Inertial Sensor-Based State Estimation of Flexible Links Subject to Bending and Torsion

In this study, we propose an observer design based on inertial sensors and the finite element (FE) method to estimate the flexural states of a long-reach and highly flexible manipulator in a 3D plane of motion. Vertical and lateral dynamic bendings are considered, along with deformation due to torsion. The aim is to achieve accurate end-point positioning by using the estimated flexural degrees-of-freedom, which are formulated using an FE model. The states are reconstructed based on angular velocity measurements, which are obtained from strap-on inertial sensors placed along the flexible link. For validation, a motion-capture setup consisting of three OptiTrack cameras is used. The experiments are conducted on a hydraulic manipulator that has a single 4.5-m long flexible link with a tip mass. The validation is carried out by comparing the estimates to the OptiTrack reference measurements. The results demonstrate that this method provides satisfactory end-point positioning, while also being convenient for use in heavy-duty mobile manipulators.

#### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Automation and Hydraulic Engineering, Research group: Innovative Hydraulic Automation

Contributors: Mäkinen, P., Mononen, T., Mattila, J.

Number of pages: 8

Publication date: 27 Aug 2018

#### Host publication information

Title of host publication: 2018 14th IEEE/ASME International Conference on Mechatronic and Embedded Systems and Applications, MESA 2018  
Publisher: IEEE  
Article number: 8449188  
ISBN (Print): 9781538646434  
ASJC Scopus subject areas: Control and Optimization, Computer Science Applications, Electrical and Electronic Engineering, Mechanical Engineering, Instrumentation  
Keywords: finite element method, inertial sensors, state estimation  
DOIs:  
10.1109/MESA.2018.8449188  
Source: Scopus  
Source ID: 85053925148  
Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

### **Real-time and Robust Collaborative Robot Motion Control with Microsoft Kinect © v2**

Recent development in depth sensing provide various opportunities for the development of new methods for Human Robot Interaction (HRI). Collaborative robots (co-bots) are redefining HRI across the manufacturing industry. However, little work has been done yet in the field of HRI with Kinect sensor in this industry. In this paper, we will present a HRI study using nearest-point approach with Microsoft Kinect v2 sensor's depth image (RGB-D). The approach is based on the Euclidean distance which has robust properties against different environments. The study aims to improve the motion performance of Universal Robot-5 (UR5) and interaction efficiency during the possible collaboration using the Robot Operating System (ROS) framework and its tools. After the depth data from the Kinect sensor has been processed, the nearest points differences are transmitted to the robot via ROS.

#### **General information**

Publication status: Published  
MoE publication type: A4 Article in a conference publication  
Organisations: Mechanical Engineering and Industrial Systems, Research area: Manufacturing and Automation, Signal Processing, Research group: Vision  
Contributors: Teke, B., Lanz, M., Kämäräinen, J., Hietanen, A.  
Number of pages: 6  
Publication date: 27 Aug 2018

#### **Host publication information**

Title of host publication: 2018 14th IEEE/ASME International Conference on Mechatronic and Embedded Systems and Applications, MESA 2018  
Publisher: IEEE  
Article number: 8449156  
ISBN (Print): 9781538646434  
ASJC Scopus subject areas: Control and Optimization, Computer Science Applications, Electrical and Electronic Engineering, Mechanical Engineering, Instrumentation  
Keywords: collaborative robots, human-robot collaboration, Human-robot interaction, Microsoft Kinect v2, ROS, trajectory planning  
Electronic versions:  
08449156  
DOIs:  
10.1109/MESA.2018.8449156  
URLs:  
<http://urn.fi/URN:NBN:fi:tty-201907151956>

#### **Bibliographical note**

INT=mei,"Teke, Burak"  
Source: Scopus  
Source ID: 85053893135  
Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

### **Role-based visualization of industrial IoT-based systems**

The competition among manufacturers in the global markets calls for the enhancement of the agility and performance of the production process and the quality of products. As a result, the production systems should be designed in such a way to provide decision makers with visibility and analytics. To fulfill these objectives, the development of information systems in manufacturing industries has intensified in the past few years. On the other hand, the volume of data which is being generated on the shop floor is rising. To improve the efficiency of manufacturing processes, this amount of data should be analyzed by decision makers. To cope with this challenge, advanced visualization is needed to assist users to gain insight into data and make effective decisions faster. This paper describes an approach for building a role-based visualization of industrial IoT. We propose an extendible architecture that anticipates the future growth of data. By using the IoT platform

introduced in this paper, selected Key Performance Indicators(KPI) can be monitored by different levels of enterprise. The prototype IoT dashboard has been implemented for a pilot production line 'Festo didactic training line' located in Seinäjoki University of Applied Sciences(SeAMK) and results have been validated.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Mechanical Engineering and Industrial Systems, Research area: Manufacturing and Automation, Seinäjoki University of Applied Sciences

Contributors: Mahmoodpour, M., Lobov, A., Lanz, M., Mäkelä, P., Rundas, N.

Number of pages: 8

Publication date: 27 Aug 2018

#### **Host publication information**

Title of host publication: 2018 14th IEEE/ASME International Conference on Mechatronics and Embedded Systems and Applications, MESA 2018

Publisher: IEEE

Article number: 8449183

ISBN (Print): 9781538646434

ASJC Scopus subject areas: Control and Optimization, Computer Science Applications, Electrical and Electronic Engineering, Mechanical Engineering, Instrumentation

Keywords: Data Collection, Information Visualization, Internet of Things (IoT)

DOIs:

10.1109/MESA.2018.8449183

Source: Scopus

Source ID: 85053938410

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

#### **Dimensional analysis conceptual modeling supporting adaptable reasoning in simulation-based training**

How to measure and train for adaptability has emerged as a priority in military contexts in response to emergent threats and technologies associated with asymmetric warfare. While much research effort has attempted to characterize adaptability in terms of accuracy and response time using traditional executive function cognitive tests, it remains unclear and undefined how adaptability should be measured and thus how simulation-based training should be designed to instigate and modulate adaptable behavior and skills. Adaptable reasoning is well-exemplified in the rescue effort of Apollo 13 by NASA engineers who repurposed available materials available in the spacecraft to retrieve the astronauts safely back to earth. Military leaders have anecdotally referred to adaptability as 'improvised thinking' that repurposes 'blocks of knowledge' to devise alternative solutions in response to changes in conditions affecting original tasks while maintaining end-state commander's intent. We review a previous feasibility study that explored the specification of Reusable Modeling Primitives for models and simulation systems building on Dimensional Analysis and Design Structure Matrix for Complexity Management formal methods. This Dimensional Analysis Conceptual Modeling (DACM) paradigm is rooted in science and engineering critical thinking and is consistent with the stated anecdotal premises as it facilitates the objective dimensional decomposition of a problem space to guide the corresponding dimensional composition of possible solutions. Arguably, adaptability also concerns the capability to overcome contradictions, detections, and reductions, which we present in an exemplar addressing the contradiction of increased drag due to increased velocity inherent to torpedoes. We propose that the DACM paradigm may be repurposed as a critical thinking framework for teaching the identification of relevant components in a theater of military operations and how the properties of those components may be repurposed to fashion alternative solutions to tasks involving navigation, call-for-fires, line-of-sight cover, weather and atmospheric effect responses, and others.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Mechanical Engineering and Industrial Systems, Simulated Instruments

Contributors: Coatanea, E., Roca, R.

Number of pages: 8

Pages: 245-252

Publication date: 7 Aug 2018

#### **Host publication information**

Title of host publication: 2018 13th System of Systems Engineering Conference, SoSE 2018

Publisher: IEEE

ISBN (Print): 9781538648766

ASJC Scopus subject areas: Computer Networks and Communications, Computer Science Applications, Hardware and Architecture, Control and Systems Engineering, Information Systems and Management

Keywords: Adaptable Reasoning, Conceptual Modeling, Modeling Simulation

DOIs:

10.1109/SYSOSE.2018.8428785

Source: Scopus

Source ID: 85052311344

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

### **High surface quality welding of aluminum using adjustable ring-mode fiber laser**

A method to improve penetration and stabilize the welding phenomenon at a high welding speed has been described through experimental and numerical investigations. Using a high power laser beam consisting of a center and a ring part, influences of shielding gas direction and flow rate, laser power density, and welding mode defined by variable intensity distribution have been clarified. The weld bead was evaluated in terms of width, height, shape and roughness. Dual-mode laser irradiation of center and ring power made it possible to stabilize the welding process. The center power helps to achieve sufficient deep penetration, while ring power ensures good temperature distribution. Good surface quality and deep penetration welding could be achieved with dual-mode welding, using low flow rate of shielding gas supplied from the backside direction.

#### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Mechanical Engineering and Industrial Systems, Okayama University, Corelase Oy

Contributors: Maina, M. R., Okamoto, Y., Okada, A., Närhi, M., Kangastupa, J., Vihinen, J.

Number of pages: 9

Pages: 180-188

Publication date: 1 Aug 2018

Peer-reviewed: Yes

#### **Publication information**

Journal: Journal of Materials Processing Technology

Volume: 258

ISSN (Print): 0924-0136

Ratings:

Scopus rating (2018): CiteScore 5.08 SJR 1.719 SNIP 2.773

Original language: English

ASJC Scopus subject areas: Ceramics and Composites, Computer Science Applications, Metals and Alloys, Industrial and Manufacturing Engineering

Keywords: Adjustable ring-mode fiber laser, Aluminum, Laser welding, Shielding gas, Surface quality

DOIs:

10.1016/j.jmatprotec.2018.03.030

Source: Scopus

Source ID: 85044959061

Research output: Contribution to journal > Article > Scientific > peer-review

### **Summarization of User-Generated Sports Video by Using Deep Action Recognition Features**

Automatically generating a summary of sports video poses the challenge of detecting interesting moments, or highlights, of a game. Traditional sports video summarization methods leverage editing conventions of broadcast sports video that facilitate the extraction of high-level semantics. However, user-generated videos are not edited, and thus traditional methods are not suitable to generate a summary. In order to solve this problem, this work proposes a novel video summarization method that uses players' actions as a cue to determine the highlights of the original video. A deep neural network-based approach is used to extract two types of action-related features and to classify video segments into interesting or uninteresting parts. The proposed method can be applied to any sports in which games consist of a succession of actions. Especially, this work considers the case of Kendo (Japanese fencing) as an example of a sport to evaluate the proposed method. The method is trained using Kendo videos with ground truth labels that indicate the video highlights. The labels are provided by annotators possessing different experience with respect to Kendo to demonstrate how the proposed method adapts to different needs. The performance of the proposed method is compared with several combinations of different features, and the results show that it outperforms previous summarization methods.

#### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Signal Processing, University of Tokyo, Osaka University, Graduate School of Information Science, Univ of Oulu

Contributors: Tejero-de-Pablos, A., Nakashima, Y., Sato, T., Yokoya, N., Linna, M., Rahtu, E.

Pages: 2000-2011

Publication date: Aug 2018

Peer-reviewed: Yes

Early online date: 15 Jan 2018

### Publication information

Journal: IEEE Transactions on Multimedia

Volume: 20

Issue number: 8

ISSN (Print): 1520-9210

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Scopus rating (2018): CiteScore 7.41 SJR 1.222 SNIP 2.951

Original language: English

ASJC Scopus subject areas: Signal Processing, Media Technology, Computer Science Applications, Electrical and Electronic Engineering

Keywords: 3D convolutional neural networks, action recognition, Cameras, deep learning, Feature extraction, Games, Hidden Markov models, long short-term memory, Semantics, Sports video summarization, Three-dimensional displays, user-generated video

DOIs:

10.1109/TMM.2018.2794265

Source: Scopus

Source ID: 85041689127

Research output: Contribution to journal › Article › Scientific › peer-review

### A multi-purpose automated vehicular platform with multi-radio connectivity capabilities

Internet access has become commonplace in the modern world. As the number of users and the amount of data traffic in the Internet keep rising exponentially, while the requirements of novel applications are becoming more stringent, there is a clear need for new networking solutions. Therefore, one of the key concepts in resolving the challenges of the upcoming 5G era of communications will be represented by multi-radio heterogeneous networks, where the users can gain benefits by either being connected to multiple different radio technologies simultaneously or seamlessly changing from one network to another based on their needs. In this work, we propose a multi-purpose automated vehicular platform prototype equipped with multiple radio access technologies, which was constructed to demonstrate the potential performance gains provided by the use of multi-radio heterogeneous networks in terms of network throughput, latency, and reliability. We discuss the potential drawbacks of using multiple radio interfaces at the same time. The constructed vehicular platform prototype constitutes a flexible research framework for communications technology within heterogeneous networks and becomes helpful for supporting future use cases of industrial IoT applications.

### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Electronics and Communications Engineering, Brno University of Technology

Contributors: Urama, J., Gerasimenko, M., Stusek, M., Masek, P., Andreev, S., Hosek, J., Koucheryavy, Y.

Number of pages: 7

Pages: 1-7

Publication date: 20 Jul 2018

### Host publication information

Title of host publication: 2018 IEEE 87th Vehicular Technology Conference, VTC Spring 2018

Publisher: IEEE

ISBN (Electronic): 9781538663554

ASJC Scopus subject areas: Computer Science Applications, Electrical and Electronic Engineering, Applied Mathematics

DOIs:

10.1109/VTCSpring.2018.8417708

Source: Scopus

Source ID: 85050987115

Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

### Ergodic Capacity Analysis of Wireless Transmission over Generalized Multipath/Shadowing Channels

Novel composite fading models were recently proposed based on inverse gamma distributed shadowing conditions. These models were extensively shown to provide remarkable modeling of the simultaneous occurrence of multipath fading and shadowing phenomena in emerging wireless scenarios such as cellular, off-body and vehicle-to-vehicle communications. Furthermore, the algebraic representation of these models is rather tractable, which renders them convenient to handle both analytically and numerically. Based on this, the present contribution analyzes the ergodic capacity over the recently proposed  $\kappa$ - $\mu$  inverse gamma composite fading channels, which were shown to characterize excellently multipath fading and shadowing in line-of-sight communication scenarios, including realistic vehicular communications. Novel analytic expressions are derived which are subsequently used in the analysis of the corresponding system performance. In this context, the offered results are compared with respective results from cases assuming conventional fading conditions, which leads to the development of numerous insights on the effect of the multipath fading

and shadowing severity on the achieved capacity levels. It is expected that these results will be useful in the design of timely and demanding wireless technologies such as wearable, cellular and inter-vehicular communications.

#### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Research group: Wireless Communications and Positioning, Electronics and Communications Engineering, Department of Electrical and Computer Engineering, Khalifa University, Queen's University, Belfast, Northern Ireland, University of Surrey, Aristotle University of Thessaloniki

Contributors: Sofotasios, P. C., Yoo, S. K., Muhaidat, S., Cotton, S. L., Matthaïou, M., Valkama, M., Karagiannidis, G. K.

Number of pages: 5

Pages: 1-5

Publication date: 20 Jul 2018

#### Host publication information

Title of host publication: 2018 IEEE 87th Vehicular Technology Conference

Publisher: IEEE

ISBN (Electronic): 9781538663554

ASJC Scopus subject areas: Computer Science Applications, Electrical and Electronic Engineering, Applied Mathematics

DOIs:

10.1109/VTCSpring.2018.8417509

Source: Scopus

Source ID: 85050971918

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

#### Optical Asymmetric Modulation for VLC Systems - Invited Paper

The explosive growth of connected devices and the increasing number of broadband users have led to an unprecedented growth in traffic demand. To this effect, the next generation wireless systems are envisioned to meet this growth and offer a potential data rate of 10 Gbps or more. In this context, an attractive solution to the current spectrum crunch issue is to exploit the visible light spectrum for the realization of high-speed communication systems. However, this requires solutions to certain challenges relating to visible light communications (VLC), such as the stringent requirements of VLC-based intensity modulation and direct detection (IM/DD), which require signals to be real and unipolar. The present work proposes a novel power-domain multiplexing based optical asymmetric modulation (OAM) scheme for indoor VLC systems, which is particularly adapted to transmit high-order modulation signals using linear real and unipolar constellations that fit into the restrictions of IM/DD systems. It is shown that the proposed scheme provides improved system performance that outperforms alternative modulation schemes, at no extra complexity.

#### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Research group: Wireless Communications and Positioning, Electronics and Communications Engineering, Khalifa University, University of Glasgow, Aristotle University of Thessaloniki

Contributors: Marshoud, H., Muhaidat, S., Sofotasios, P. C., Imran, M., Sharif, B. S., Karagiannidis, G. K.

Number of pages: 5

Pages: 1-5

Publication date: 20 Jul 2018

#### Host publication information

Title of host publication: 2018 IEEE 87th Vehicular Technology Conference, VTC Spring 2018

Publisher: IEEE

ISBN (Electronic): 9781538663554

ASJC Scopus subject areas: Computer Science Applications, Electrical and Electronic Engineering, Applied Mathematics

DOIs:

10.1109/VTCSpring.2018.8417541

Source: Scopus

Source ID: 85050962279

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

#### Performance Analysis of Single Carrier Coherent and Noncoherent Modulation under I/Q Imbalance

In-phase/quadrature-phase imbalance (IQI) is considered a major performance-limiting impairment in direct-conversion transceivers. Its effects become even more pronounced at higher carrier frequencies such as the millimeter-wave frequency bands considered for 5G systems. In this work, we quantify the effects of IQI on the performance of different modulations under multipath fading channels. This is realized by developing a comprehensive framework for the symbol error rate (SER) analysis of coherent phase shift keying (PSK), noncoherent differential phase shift keying (DPSK) and noncoherent frequency shift keying (FSK) under IQI effects. In this context, the moment generating function of the signal-

to-interference-plus-noise-ratio is first derived for single-carrier systems suffering from transmitter (TX) IQI only, receiver (RX) IQI only and joint TX/RX IQI. Capitalizing on this, we derive analytic expressions for the SER of the different modulation schemes considered. These expressions are corroborated with simulation results and they provide insights into the dependence of IQI on the system parameters. We further demonstrate that, while in some cases, IQI can cause a slight degradation of the SER performance and, hence, it can be neglected, in other cases it should be compensated in order to achieve a reliable communication link.

#### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Research group: Wireless Communications and Positioning, Electronics and Communications Engineering, Khalifa University, Department of Electrical and Computer Engineering, Aristotle University of Thessaloniki, University of Texas at Dallas

Contributors: Selim, B., Muhaidat, S., Sofotasios, P. C., Sharif, B. S., Stouraitis, T., Karagiannidis, G. K., Al-Dhahir, N.

Number of pages: 5

Pages: 1-5

Publication date: 20 Jul 2018

#### Host publication information

Title of host publication: 2018 IEEE 87th Vehicular Technology Conference, VTC Spring 2018

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ISBN (Electronic): 9781538663554

ASJC Scopus subject areas: Computer Science Applications, Electrical and Electronic Engineering, Applied Mathematics  
DOIs:

10.1109/VTCSpring.2018.8417514

Source: Scopus

Source ID: 85050981792

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

#### Performance Evaluation of Coordinated Multipoint Transmission at 28 GHz Frequency Using 3D Ray Tracing

The main target of this paper is to evaluate the performance of Coordinated Multipoint (CoMP) transmission technique at Millimeter Wave (mmWave) frequency through a comprehensive set of simulations. A new metric for the performance evaluation of CoMP functionality called the Net CoMP utilization gain is introduced in this paper that takes into account the expected loading of the coordinating cells. Other performance metrics considered are the Signal to Interference plus Noise Ratio (SINR), throughput and dominance area. The acquired results show that the adoption of CoMP functionality provides higher gain in improving the Quality of Service (QoS) for the cell edge users compared with the other users. The net CoMP utilization gain as well as the overhead increases with the increase in number of transmission points (TPs). However, in highly loaded networks the risk of having negative impact (capacity loss) also increases with the increase in number of transmission points.

#### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Electronics and Communications Engineering

Contributors: Sheikh, M. U., Biswas, R., Lempiäinen, J.

Number of pages: 6

Pages: 1-6

Publication date: 20 Jul 2018

#### Host publication information

Title of host publication: 2018 IEEE 87th Vehicular Technology Conference, VTC Spring 2018 - Proceedings

Publisher: IEEE

ISBN (Electronic): 9781538663554

ASJC Scopus subject areas: Computer Science Applications, Electrical and Electronic Engineering, Applied Mathematics  
Keywords: 3D ray tracing, CoMP, macro cellular, mmWave propagation, performance analysis

DOIs:

10.1109/VTCSpring.2018.8417593

Source: Scopus

Source ID: 85050982698

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

#### Ray-based evaluation of dual-polarized MIMO in (Ultra-)dense millimeter-wave urban deployments

Dense deployments of millimeter-wave (mmWave) base stations (BSs) are being considered as the most feasible solution to meet the steadily growing data rate demands of mobile users. Accordingly, the achievable performance gains of mmWave-based dense networks in real deployments have to be studied carefully, since mmWave radio technology

features specific transceiver, antenna, and propagation properties. In this paper, we contribute an accurate performance evaluation of single- versus dual-polarized MIMO systems operating over the mmWave channel in typical urban scenarios as well as address the impact of device- and network-centric parameters on the performance gains enabled by MIMO in dense to ultra-dense BS deployments. This study relies on our in-house ray-based modeler and takes into account the key mmWave system effects, such as multi-path propagation, utilization of dual-polarized antennas, and characteristic interference models. Our results show that the benefit of using mmWave- MIMO grows with increasing BS density, thus encouraging a further study of this technology especially for (ultra-)dense setups. We also demonstrate that non-coherent non-polarized diffuse scattering component may reduce the capacity gain of dual-polarized vs. single- polarized MIMO.

#### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Electronics and Communications Engineering, Intel Corporation

Contributors: Solomitckii, D., Petrov, V., Nikopour, H., Akdeniz, M., Orhan, O., Himayat, N., Talwar, S., Andreev, S., Koucheryavy, Y.

Number of pages: 7

Pages: 1-7

Publication date: 20 Jul 2018

#### Host publication information

Title of host publication: 2018 IEEE 87th Vehicular Technology Conference, VTC Spring 2018 - Proceedings

Publisher: IEEE

ISBN (Electronic): 9781538663554

ASJC Scopus subject areas: Computer Science Applications, Electrical and Electronic Engineering, Applied Mathematics  
DOIs:

10.1109/VTCSpring.2018.8417788

Source: Scopus

Source ID: 85050986035

Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

#### Effects of blockage in deploying mmWave drone base stations for 5g networks and beyond

Due to their unconstrained mobility and capability to carry goods or equipment, unmanned aerial vehicles (UAVs) or drones are considered as a part of the fifth-generation (5G) wireless networks and become attractive candidates to carry a base station (BS). As 5G requirements apply to a broad range of uses cases, it is of particular importance to satisfy those during spontaneous and temporary events, such as a marathon or a rural fair. To be able to support these scenarios, mobile operators need to deploy significant radio access resources quickly and on demand. Accordingly, by focusing on 5G cellular networks, we investigate the use of drone-assisted communication, where a drone is equipped with a millimeter-wave (mmWave) BS. Being a key technology for 5G, mmWave is able to facilitate the provisioning of the desired per-user data rates as drones arrive at the service area whenever needed. Therefore, in order to maximize the benefits of mmWave-drone-BS utilization, this paper proposes a methodology for its optimized deployment, which delivers the optimal height, coordinates, and coverage radius of the drone-BS by taking into account the human body blockage effects over a mmWave-specific channel model. Moreover, our methodology is able to maximize the number of offloaded users by satisfying the target signal quality at the cell edge and considering the maximum service capacity of the drone-BS. It was observed that the mmWave-specific features are extremely important to consider when targeting efficient drone-BS utilization and thus should be carefully incorporated into analysis.

#### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Electronics and Communications Engineering, Carleton University

Contributors: Gapeyenko, M., Bor-Yaliniz, I., Andreev, S., Yanikomeroglu, H., Koucheryavy, Y.

Number of pages: 6

Pages: 1-6

Publication date: 3 Jul 2018

#### Host publication information

Title of host publication: 2018 IEEE International Conference on Communications Workshops

Publisher: IEEE

ISBN (Electronic): 9781538643280

ASJC Scopus subject areas: Computer Networks and Communications, Computer Science Applications, Hardware and Architecture

Keywords: 5G networks and beyond, Drone-cell communications, Human body blockage, MmWave, Network slicing

DOIs:

10.1109/ICCW.2018.8403671

Source: Scopus

Source ID: 85050308378

Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

### **Modeling and cancellation of self-interference in full-duplex radio transceivers: Volterra series-based approach**

This paper presents a novel digital self-interference canceller for inband full-duplex radio transceivers. The proposed digital canceller utilizes a Volterra series with sparse memory to model the residual SI signal, and it can thereby accurately reconstruct the self-interference even under a heavily nonlinear transmitter power amplifier. To the best of our knowledge, this is the first time such a sparse-memory Volterra series has been used to model the self-interference within an inband full-duplex device. The performance of the Volterra-based canceller is evaluated with real-life measurements that incorporate also an active analog canceller. The results show that the novel digital canceller suppresses the SI by 34 dB in the digital domain, outperforming the state-of-the-art memory polynomial-based solution by a margin of 5 dB. The total amount of cancellation is nearly 110 dB with a transmit power of +30 dBm, even though a shared transmit/receive antenna is used. To the best of our knowledge, this is the highest reported cancellation performance for a shared-antenna full-duplex device with such a high transmit power level.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Electronics and Communications Engineering

Contributors: Korpi, D., Turunen, M., Anttila, L., Valkama, M.

Number of pages: 6

Pages: 1-6

Publication date: 3 Jul 2018

#### **Host publication information**

Title of host publication: 2018 IEEE International Conference on Communications Workshops

Publisher: IEEE

ISBN (Electronic): 9781538643280

ASJC Scopus subject areas: Computer Networks and Communications, Computer Science Applications, Hardware and Architecture

Keywords: Digital cancellation, Full-duplex, Nonlinear power amplifier, Self-interference, Volterra series

DOIs:

10.1109/ICCW.2018.8403638

#### **Bibliographical note**

INT=elt,"Turunen, Matias"

Source: Scopus

Source ID: 85050263594

Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

### **Optimizing wirelessly powered crowd sensing: Trading energy for data**

To overcome the limited coverage in traditional wireless sensor networks, mobile crowd sensing (MCS) has emerged as a new sensing paradigm. To achieve longer battery lives of user devices and incentivize human involvement, this paper presents a novel approach that seamlessly integrates MCS with wireless power transfer, named wirelessly powered crowd sensing (WPCS), for supporting crowd sensing with energy consumption and offering rewards as incentives. An optimization problem is formulated to simultaneously maximize the data utility and minimize the energy consumption for service operator, by jointly controlling wireless-power allocation at the access point (AP) as well as sensing-data size, compression ratio, and sensor transmission duration at the mobile sensor (MS). Given the fixed compression ratios, the optimal power allocation policy is shown to have a threshold-based structure with respect to a defined crowd-sensing priority function for each MS. Given fixed sensing-data utilities, the compression policy achieves the optimal compression ratio. Extensive simulations are also presented to verify the efficiency of the contributed mechanisms.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Electronics and Communications Engineering, University of Hong Kong, Southern University of Science and Technology

Contributors: Li, X., You, C., Andreev, S., Gong, Y., Huang, K.

Number of pages: 6

Pages: 1-6

Publication date: 3 Jul 2018

#### **Host publication information**

Title of host publication: 2018 IEEE International Conference on Communications Workshops

Publisher: IEEE

ISBN (Electronic): 9781538643280

ASJC Scopus subject areas: Computer Networks and Communications, Computer Science Applications, Hardware and Architecture

DOIs:

10.1109/ICCW.2018.8403562

Source: Scopus

Source ID: 85050274665

Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

### **Cybersecurity Attacks and Defences for Unmanned Smart Ships**

By 2020, unmanned ships such as remotely controlled boats and autonomous vessels would become operational, marking a technological revolution for the maritime industry. Such ships are expected to serve needs ranging from coastal ferries to open sea cargo handling. In this paper we detail the security vulnerabilities of such unmanned ships. The attack surface as well as motivations for attack attempts also are discussed to provide a perspective of how and why attacks are undertaken. Finally defence strategies are proposed as countermeasures.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Research area: Information security, Computing Sciences, Ericsson, F-Secure

Contributors: Silverajan, B., Ocak, M., Nagel, B.

Number of pages: 6

Pages: 15-20

Publication date: 1 Jul 2018

#### **Host publication information**

Title of host publication: Proceedings - IEEE 2018 International Congress on Cybermatics : 2018 IEEE Conferences on Internet of Things, Green Computing and Communications, Cyber, Physical and Social Computing, Smart Data, Blockchain, Computer and Information Technology, iThings/GreenCom/CPSCoM/SmartData/Blockchain/CIT 2018

Publisher: IEEE

ISBN (Electronic): 9781538679753

ASJC Scopus subject areas: Business, Management and Accounting (miscellaneous), Artificial Intelligence, Computer Networks and Communications, Computer Science Applications, Hardware and Architecture, Information Systems and Management, Health Informatics, Communication

Keywords: Autonomous vehicles, IoT, Security, Smart Ships

DOIs:

10.1109/Cybermatics\_2018.2018.00037

Source: Scopus

Source ID: 85067864061

Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

### **Secure Firmware Updates for IoT: A Survey**

The evolution of the Internet to an ubiquitous computing environment where massive amounts of devices will be connected. Sharing, receiving and acting upon data has brought in a problem of security. There are as many firmware and software update procedures as there are manufacturers. Therefore it would be good if a common solution could be found. We looked for suitable mechanisms in the past three years, to be used in Internet of Things networks as well as an up and coming research and standardization work. Our findings show that there indeed are good options for firmware update mechanisms that use state-of-The-Art technologies to deliver updates in a secure manner. While not all the mechanisms were specifically targeting deployment scenarios found in the Internet of Things, we still believe the concept of such update mechanism is suitable also for IoT use and thus can be adapted trivially to IoT networks and devices. We also propose a generic four-element model for secure firmware updates.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Research area: Information security, Computing Sciences

Contributors: Kolehmainen, A.

Number of pages: 6

Pages: 112-117

Publication date: 1 Jul 2018

#### **Host publication information**

Title of host publication: Proceedings - IEEE 2018 International Congress on Cybermatics : 2018 IEEE Conferences on Internet of Things, Green Computing and Communications, Cyber, Physical and Social Computing, Smart Data, Blockchain, Computer and Information Technology, iThings/GreenCom/CPSCoM/SmartData/Blockchain/CIT 2018

Publisher: IEEE

ISBN (Electronic): 9781538679753

ASJC Scopus subject areas: Business, Management and Accounting (miscellaneous), Artificial Intelligence, Computer Networks and Communications, Computer Science Applications, Hardware and Architecture, Information Systems and Management, Health Informatics, Communication

Keywords: Firmware updates, IoT, Lifecycle Management

DOIs:

10.1109/Cybermatics\_2018.2018.00051

Source: Scopus

Source ID: 85067883718

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

### **Wireless Communications for Optogenetics-Based Brain Stimulation: Present Technology and Future Challenges**

The ability to decipher brain functions and understand the neuronal communication networking properties to develop innovative solutions to treat neurodegenerative diseases remains one of the biggest challenges in biomedicine. Since the early days, numerous solutions have been proposed for BMI, largely concentrating on the use of tethered electrodes that are inserted into the brain to either stimulate or suppress neural activities. In recent years, the field of optogenetics has provided a new alternative of utilizing light to stimulate genetically engineered neurons. While the original approach proposed the use of tethered optical cables inserted into the skull to transfer light into the brain for stimulation, numerous advances have been made to incorporate wireless technologies that will allow these devices to be attached to the skull or implanted in the brain. This article presents a review on the current technologies that have been proposed for different wireless optogenetics solutions, ranging from devices that are head mounted to miniature devices that can be embedded deep in the brain. We focus on a comparative analysis of the architecture and structure of the devices, the wireless technology used for signaling to the unit, as well as the energy consumption profile for each of the devices. Finally, the article presents future challenges to further miniaturize wireless optogenetic devices, concentrating specifically on the communication properties.

#### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Electronics and Communications Engineering, Waterford Institute of Technology, State University of New York

Contributors: Balasubramaniam, S., Wirdatmadja, S. A., Barros, M. T., Koucheryavy, Y., Stachowiak, M., Jornet, J. M.

Number of pages: 7

Pages: 218-224

Publication date: 1 Jul 2018

Peer-reviewed: Yes

#### **Publication information**

Journal: IEEE Communications Magazine

Volume: 56

Issue number: 7

Article number: 8419204

ISSN (Print): 0163-6804

Ratings:

Scopus rating (2018): CiteScore 11.27 SJR 2.373 SNIP 4.681

Original language: English

ASJC Scopus subject areas: Computer Science Applications, Computer Networks and Communications, Electrical and Electronic Engineering

DOIs:

10.1109/MCOM.2018.1700917

Source: Scopus

Source ID: 85051078230

Research output: Contribution to journal > Article > Scientific > peer-review

### **Activation game for older adults - Development and initial user experiences**

The purpose of this study is to introduce a new type of activation game and evaluate the attitudes and user experiences of Chinese elderly people. The game controlling is done with a specific 3D-printed handle and is based on an acceleration sensor. The developed activation game, which requires both cognitive and motor skills was tested with test groups in three Chinese eldercare homes. The game was played by the residents and user feedback was collected by researchers' observations and players' comments in the gaming event. The most significant finding was the positive user experience of the elderly and the experience of the game being both cognitively stimulating and supportive for player activation. The game controller handle was found to be convenient for elderly people as it supports active use of hands, which was seen important by the players. Based on the observations, the developed game also seemed to provide great potential for social interaction. However, also some challenges were noticed, related to the game controller handle and game

implementation. These positive findings as well as the discovered challenges are reported in this study. As a conclusion, the results are a strong encouragement for continuing activation game development for older adults.

#### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Faculty of Biomedical Sciences and Engineering, Research group: Wireless Identification and Sensing Systems Research Group, Satakunta University of Applied Sciences

Contributors: Merilampi, S., Koivisto, A., Virkki, J.

Number of pages: 5

Pages: 1-5

Publication date: 29 Jun 2018

#### Host publication information

Title of host publication: 2018 IEEE 6th International Conference on Serious Games and Applications for Health, SeGAH 2018

Publisher: IEEE

ISBN (Electronic): 9781538662984

ASJC Scopus subject areas: Health(social science), Computer Science Applications, Human-Computer Interaction

Keywords: Activation, cognitive impairment, mobile game, motor impairment, older adults, recreation, self-managed rehabilitation, serious games

DOIs:

10.1109/SeGAH.2018.8401351

#### Bibliographical note

EXT="Merilampi, Sari"

Source: Scopus

Source ID: 85050242350

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

#### Effect of surfactant type and sonication energy on the electrical conductivity properties of nanocellulose-CNT nanocomposite films

We present a detailed study on the influence of sonication energy and surfactant type on the electrical conductivity of nanocellulose-carbon nanotube (NFC-CNT) nanocomposite films. The study was made using a minimum amount of processing steps, chemicals and materials, to optimize the conductivity properties of free-standing flexible nanocomposite films. In general, the NFC-CNT film preparation process is sensitive concerning the dispersing phase of CNTs into a solution with NFC. In our study, we used sonication to carry out the dispersing phase of processing in the presence of surfactant. In the final phase, the films were prepared from the dispersion using centrifugal cast molding. The solid films were analyzed regarding their electrical conductivity using a four-probe measuring technique. We also characterized how conductivity properties were enhanced when surfactant was removed from nanocomposite films; to our knowledge this has not been reported previously. The results of our study indicated that the optimization of the surfactant type clearly affected the formation of freestanding films. The effect of sonication energy was significant in terms of conductivity. Using a relatively low 16 wt. % concentration of multiwall carbon nanotubes we achieved the highest conductivity value of 8.4 S/cm for nanocellulose-CNT films ever published in the current literature. This was achieved by optimizing the surfactant type and sonication energy per dry mass. Additionally, to further increase the conductivity, we defined a preparation step to remove the used surfactant from the final nanocomposite structure.

#### General information

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Materials Science, Faculty of Biomedical Sciences and Engineering, VTT Technical Research Centre of Finland

Contributors: Siljander, S., Keinänen, P., Rätty, A., Ramakrishnan, K. R., Tuukkanen, S., Kunnari, V., Harlin, A., Vuorinen, J., Kanerva, M.

Publication date: 20 Jun 2018

Peer-reviewed: Yes

#### Publication information

Journal: International Journal of Molecular Sciences

Volume: 19

Issue number: 6

Article number: 1819

ISSN (Print): 1661-6596

Ratings:

Scopus rating (2018): CiteScore 4.32 SJR 1.312 SNIP 1.224

Original language: English

ASJC Scopus subject areas: Catalysis, Molecular Biology, Spectroscopy, Computer Science Applications, Physical and Theoretical Chemistry, Organic Chemistry, Inorganic Chemistry

Keywords: Carbon nanotubes, Conductivity, Nanocellulose, Nanocomposite, Surfactant

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URLs:

<http://urn.fi/URN:NBN:fi:tty-201807302026>

#### **Bibliographical note**

INT=mol,"Räty, Anna"

EXT="Harlin, Ali"

Source: Scopus

Source ID: 85048936349

Research output: Contribution to journal > Article > Scientific > peer-review

#### **Caching-Aided Collaborative D2D Operation for Predictive Data Dissemination in Industrial IoT**

Industrial automation deployments constitute challenging environments where moving IoT machines may produce high-definition video and other heavy sensor data during surveying and inspection operations. Transporting massive contents to the edge network infrastructure and then eventually to the remote human operator requires reliable and high-rate radio links supported by intelligent data caching and delivery mechanisms. In this work, we address the challenges of contents dissemination in characteristic factory automation scenarios by proposing to engage moving industrial machines as D2D caching helpers. With the goal of improving the reliability of high-rate mmWave data connections, we introduce alternative contents dissemination modes and then construct a novel mobility-aware methodology that helps develop predictive mode selection strategies based on the anticipated radio link conditions. We also conduct a thorough system-level evaluation of representative data dissemination strategies to confirm the benefits of predictive solutions that employ D2D-enabled collaborative caching at the wireless edge to lower contents delivery latency and improve data acquisition reliability.

#### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Electronics and Communications Engineering

Contributors: Orsino, A., Kovalchukov, R., Samuylov, A., Moltchanov, D., Andreev, S., Koucheryavy, Y., Valkama, M.

Number of pages: 8

Pages: 50-57

Publication date: 1 Jun 2018

Peer-reviewed: Yes

#### **Publication information**

Journal: IEEE Wireless Communications

Volume: 25

Issue number: 3

ISSN (Print): 1536-1284

Ratings:

Scopus rating (2018): CiteScore 11.8 SJR 2.352 SNIP 4.039

Original language: English

ASJC Scopus subject areas: Computer Science Applications, Electrical and Electronic Engineering

DOIs:

10.1109/MWC.2018.1700320

Source: Scopus

Source ID: 85049615601

Research output: Contribution to journal > Article > Scientific > peer-review

#### **Last Meter Indoor Terahertz Wireless Access: Performance Insights and Implementation Roadmap**

The terahertz band, 0.1-10 THz, has sufficient resources not only to satisfy the 5G requirements of 10 Gb/s peak data rate but to enable a number of tempting rate-greedy applications. However, the terahertz band brings novel challenges, never addressed at lower frequencies. Among others, the scattering of terahertz waves from any object, including walls and furniture, and ultra-wideband highly directional links lead to fundamentally new propagation and interference structures. In this article, we review the recent progress in terahertz propagation modeling, and antenna and testbed designs, and propose a step-by-step roadmap for wireless terahertz Ethernet extension for indoor environments. As a side effect, the described concept provides a second life to the currently underutilized Ethernet infrastructure by using it as a universally available backbone. By applying real terahertz band propagation, reflection, and scattering measurements as well as ray-tracing simulations of a typical office, we analyze two representative scenarios at 300 GHz and 1.25 THz frequencies,

illustrating that extremely high rates can be achieved with realistic system parameters at room scales.

#### General information

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Electronics and Communications Engineering, University of Oulu

Contributors: Petrov, V., Kokkonen, J., Moltchanov, D., Lehtomäki, J., Koucheryavy, Y., Juntti, M.

Number of pages: 8

Pages: 158-165

Publication date: 1 Jun 2018

Peer-reviewed: Yes

#### Publication information

Journal: IEEE Communications Magazine

Volume: 56

Issue number: 6

ISSN (Print): 0163-6804

Ratings:

Scopus rating (2018): CiteScore 11.27 SJR 2.373 SNIP 4.681

Original language: English

ASJC Scopus subject areas: Computer Science Applications, Computer Networks and Communications, Electrical and Electronic Engineering

DOIs:

10.1109/MCOM.2018.1600300

Source: Scopus

Source ID: 85048785161

Research output: Contribution to journal > Article > Scientific > peer-review

#### PIVO: Probabilistic inertial-visual odometry for occlusion-robust navigation

This paper presents a novel method for visual-inertial odometry. The method is based on an information fusion framework employing low-cost IMU sensors and the monocular camera in a standard smartphone. We formulate a sequential inference scheme, where the IMU drives the dynamical model and the camera frames are used in coupling trailing sequences of augmented poses. The novelty in the model is in taking into account all the cross-terms in the updates, thus propagating the inter-connected uncertainties throughout the model. Stronger coupling between the inertial and visual data sources leads to robustness against occlusion and feature-poor environments. We demonstrate results on data collected with an iPhone and provide comparisons against the Tango device and using the EuRoC data set.

#### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Signal Processing, Aalto University

Contributors: Solin, A., Cortés, S., Rahtu, E., Kannala, J.

Number of pages: 10

Pages: 616-625

Publication date: 3 May 2018

#### Host publication information

Title of host publication: Proceedings - 2018 IEEE Winter Conference on Applications of Computer Vision, WACV 2018

Publisher: IEEE

ISBN (Electronic): 9781538648865

ASJC Scopus subject areas: Computer Vision and Pattern Recognition, Computer Science Applications

DOIs:

10.1109/WACV.2018.00073

Source: Scopus

Source ID: 85050916529

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

#### Preface: Special Issue on 'New Hydraulic Components for Tough Robots'

#### General information

Publication status: Published

MoE publication type: B1 Article in a scientific magazine

Organisations: Automation and Hydraulic Engineering, Research group: Innovative Hydraulic Automation, Tokyo Institute of Technology, Ritsumeikan University, Italian Institute of Technology, Okayama University

Contributors: Suzumori, K., Hyon, S. H., Semini, C., Mattila, J., Kanda, T.  
Number of pages: 1  
Publication date: 3 May 2018  
Peer-reviewed: No

#### Publication information

Journal: Advanced Robotics

Volume: 32

Issue number: 9

ISSN (Print): 0169-1864

Ratings:

Scopus rating (2018): CiteScore 1.6 SJR 0.346 SNIP 0.862

Original language: English

ASJC Scopus subject areas: Control and Systems Engineering, Software, Human-Computer Interaction, Hardware and Architecture, Computer Science Applications

DOIs:

10.1080/01691864.2018.1466427

Source: Scopus

Source ID: 85047515551

Research output: Contribution to journal > Editorial > Scientific

#### The effect of percutaneous transluminal angioplasty of superficial femoral artery on pulse wave features

We aimed to analyze the effects of percutaneous transluminal angioplasty (PTA) of the superficial femoral artery (SFA) on arterial pulse waves (PWs). Altogether 24 subjects i.e. 48 lower limbs were examined including 26 treated lower limbs having abnormal ankle-to-brachial pressure index (ABI) ( $ABI < 0.9$  or  $ABI > 1.3$ ) and 22 non-treated lower limbs. The measurements were conducted in pre-, peri- and post-treatment phases as well as in follow-up visit after 1 month. Both ABI and toe pressures measured by standard equipment were used as reference values. PW-derived parameters include ratios of different peaks of the PW and time differences between them as well as aging index. Both treated and non-treated limbs were compared in pre- and post-treatment as well as follow-up visit conditions. The results were evaluated in terms of statistical tests, Bland-Altman-plots, free-marginal multirater  $\kappa$ -analysis and multiple linear regression analysis. PTA was found to cause small changes to the studied PW-derived parameters of the treated limb which were observed immediately after the treatment, but the changes were more pronounced in the follow-up visit. In addition, we observed that the endovascular instrumentation itself does not cause significant changes to the PW-derived parameters. The results show that PW-analysis could be a useful tool for monitoring the treatment-effect of the PTA. However, because the pre-treatment differences of the treated and non-treated limb were small, further studies with subjects having no arterial diseases are required. The study demonstrates the potential of the PW analysis in monitoring vascular abnormalities.

#### General information

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Faculty of Biomedical Sciences and Engineering, Research group: Sensor Technology and Biomeasurements (STB), Tampere University Hospital

Contributors: Peltokangas, M., Suominen, V., Vakhitov, D., Verho, J., Korhonen, J., Lekkala, J., Vehkaoja, A., Oksala, N.

Number of pages: 9

Pages: 274-282

Publication date: 1 May 2018

Peer-reviewed: Yes

#### Publication information

Journal: Computers in Biology and Medicine

Volume: 96

ISSN (Print): 0010-4825

Ratings:

Scopus rating (2018): CiteScore 2.79 SJR 0.57 SNIP 1.123

Original language: English

ASJC Scopus subject areas: Computer Science Applications, Health Informatics

Keywords: Atherosclerosis, Electromechanical sensors, Peripheral arterial disease, Photoplethysmography, Pulse wave measurements

Electronic versions:

The\_effect\_of\_percutaneous. Embargo ended: 14/04/19

DOIs:

10.1016/j.combiomed.2018.04.003

URLs:

<http://urn.fi/URN:NBN:fi:tty-201805021587>. Embargo ended: 14/04/19

Source: Scopus

Source ID: 85045471212

Research output: Contribution to journal › Article › Scientific › peer-review

### **Backshoring of production in the context of a small and open Nordic economy**

**Purpose** – The purpose of this paper is to investigate the extent, drivers, and conditions underlying backshoring in the Finnish manufacturing industry, comparing the results to the wider ongoing relocation of production in the international context. **Design/methodology/approach** – The survey of 229 Finnish manufacturing firms reveals the background, drivers, and patterns of offshoring and backshoring. **Findings** – Companies that had transferred their production back to Finland were more commonly in industries with relatively higher technology intensity and they were typically larger than the no-movement companies, and with a higher number of plants. They also reported more commonly having a corporate-wide strategy for guiding production location decisions. **Research limitations/implications** – Backshoring activity in the small and open economy of Finland seems to be higher compared to earlier studies in larger countries. The findings suggest that there is a transformation in the manufacturing industries with some gradual replacement of labor-intensive and lower technology-intensive industries toward higher technology-intensive industries. **Practical implications** – Moving production across national borders is one option in the strategies of firms to stay competitive. Companies must carefully consider the relevance of various decision-making drivers when determining strategies for their production networks. **Social implications** – Manufacturing industries have traditionally been important for employment in the relatively small and open economies of the Nordic countries. From the social perspective, it is important to understand the ongoing transformation and its implications. **Originality/value** – There are few empirical studies available of the ongoing backshoring movement, utilizing data from company decision makers instead of macroeconomic factors.

### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Industrial and Information Management, Research group: Center for Research on Operations Projects and Services

Contributors: Heikkilä, J., Martinsuo, M., Nenonen, S.

Number of pages: 19

Pages: 658-675

Publication date: May 2018

Peer-reviewed: Yes

Early online date: 27 Nov 2017

### **Publication information**

Journal: Journal of Manufacturing Technology Management

Volume: 29

Issue number: 4

ISSN (Print): 1741-038X

Ratings:

Scopus rating (2018): CiteScore 3.92 SJR 0.954 SNIP 1.355

Original language: English

ASJC Scopus subject areas: Software, Control and Systems Engineering, Computer Science Applications, Strategy and Management, Industrial and Manufacturing Engineering

Keywords: Manufacturing, Manufacturing strategy, Production

DOIs:

10.1108/JMTM-12-2016-0178

URLs:

<http://www.scopus.com/inward/record.url?scp=85039840754&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 85039840754

Research output: Contribution to journal › Article › Scientific › peer-review

### **Photovoltaic plant cloud shadowing and energy drops in Northern Europe**

In this paper the effect of shadowing due to clouds on the energy production of a photovoltaic power plant installed in northern latitudes in Finland is analyzed. Numerical techniques, which can be also implemented on an embedded system because of their low computational and memory requirements, have been used for having an efficient processing of millions of experimental current vs. voltage curves acquired on the photovoltaic plant. The analysis allows to affirm that, at high latitudes, clouds can have a significant instantaneous effect on the power produced by the plant, but the time duration of the power drop is so short that the energy production is only marginally affected. This result is in full agreement with other studies appeared in the recent literature and suggests that, in such contexts, control electronics producers should avoid to implement related maximum power point tracking techniques for facing mismatched conditions, since their effect on energy production appears to be negligible.

### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Electrical Energy Engineering, Università di Salerno

Contributors: Petrone, G., Romanelli, S., Spagnuolo, G., Valkealahti, S.

Number of pages: 6

Pages: 1055-1060

Publication date: 27 Apr 2018

### Host publication information

Title of host publication: 2018 IEEE International Conference on Industrial Technology (ICIT)

Publisher: IEEE

ISBN (Electronic): 9781509059492

ASJC Scopus subject areas: Computer Science Applications, Electrical and Electronic Engineering

Keywords: Energy production, Maximum power point tracking, Mismatching effect, Photovoltaic, Shadowing

DOIs:

10.1109/ICIT.2018.8352324

Source: Scopus

Source ID: 85046942161

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

### Towards secure cloud orchestration for multi-cloud deployments

Cloud orchestration frameworks are commonly used to deploy and operate cloud infrastructure. Their role spans both vertically (deployment on infrastructure, platform, application and microservice levels) and horizontally (deployments from many distinct cloud resource providers). However, despite the central role of orchestration, the popular orchestration frameworks lack mechanisms to provide security guarantees for cloud operators. In this work, we analyze the security landscape of cloud orchestration frameworks for multi-cloud infrastructure. We identify a set of attack scenarios, define security enforcement enablers and propose an architecture for a security-enabled cloud orchestration framework for multi-cloud application deployments.

### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Pervasive Computing, RISE SICS, University of Westminster

Contributors: Paladi, N., Michalas, A., Dang, H. V.

Publication date: 23 Apr 2018

### Host publication information

Title of host publication: CrossCloud 2018 - 5th Workshop on CrossCloud Infrastructures and Platforms, colocated with EuroSys 2018

Publisher: ACM

Article number: a4

ISBN (Electronic): 9781450356534

ASJC Scopus subject areas: Information Systems, Software, Computer Science Applications

Keywords: Cloud infrastructure, Microservices, Orchestration, Security, Virtualization

DOIs:

10.1145/3195870.3195874

Source: Scopus

Source ID: 85049685222

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

### Detection of beat-to-beat intervals from wrist photoplethysmography in patients with sinus rhythm and atrial fibrillation after surgery

Wrist photoplethysmography (PPG) allows unobtrusive monitoring of the heart rate (HR). PPG is affected by the capillary blood perfusion and the pumping function of the heart, which generally deteriorate with age and due to the presence of cardiac arrhythmia. The performance of wrist PPG in monitoring beat-to-beat HR in older patients with arrhythmia has not been reported earlier. We monitored PPG from wrist in 18 patients recovering from surgery in the post-anesthesia care unit, and evaluated the inter-beat interval (IBI) detection accuracy against ECG based R-to-R intervals (RRI). Nine subjects had sinus rhythm (SR,  $68.0y \pm 10.2y$ , 6 males) and nine subjects had atrial fibrillation (AF,  $71.3y \pm 7.8y$ , 4 males) during the recording. For the SR group, 99.44% of the beats were correctly identified, 2.39% extra beats were detected, and the mean absolute error (MAE) was 7.34 ms. For the AF group, 97.49% of the heartbeats were correctly identified, 2.26% extra beats were detected, and the MAE was 14.31 ms. IBI from the PPG were hence in close agreement with the ECG reference in both groups. The results suggest that wrist PPG provides a comfortable alternative to ECG during low motion and can be used for long-term monitoring and screening of AF episodes.

### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Faculty of Biomedical Sciences and Engineering, PulseOn SA, Tampere University Hospital, Pulseon Oy, Centre Suisse d'Electronique et de Microtechnique SA

Contributors: Tarniceriu, A., Harju, J., Vehkaoja, A., Parak, J., Delgado-Gonzalo, R., Renevey, P., Yli-Hankala, A., Korhonen, I.

Number of pages: 4

Pages: 133-136

Publication date: 6 Apr 2018

### Host publication information

Title of host publication: 2018 IEEE EMBS International Conference on Biomedical and Health Informatics, BHI 2018

Publisher: IEEE

ISBN (Electronic): 9781538624050

ASJC Scopus subject areas: Computer Science Applications, Biomedical Engineering, Health Informatics

Electronic versions:

Detection of Beat-to-Beat Intervals from Wrist Photoplethysmography in Patients with Sinus Rhythm and Atrial Fibrillation after Surgery - post-print

DOIs:

10.1109/BHI.2018.8333387

URLs:

<http://urn.fi/URN:NBN:fi:tyy-201809252333>

Source: Scopus

Source ID: 85050860184

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

### Wirelessly powered urban crowd sensing over wearables: Trading energy for data

In this article, we put forward the paradigm of mobile crowd sensing based on ubiquitous wearable devices carried by human users. The key challenge for mass user involvement in prospective urban crowd sensing applications, such as monitoring of large-scale phenomena (e.g., traffic congestion and air pollution levels), is the appropriate sources of motivation. We thus advocate for the use of wireless power transfer provided in exchange for sensed data to incentivize the owners of wearables to participate in collaborative data collection. Based on this construction, we develop a novel concept of wirelessly powered crowd sensing and offer the corresponding network architecture considerations together with a systematic review of wireless charging techniques to support implementation. Further, we contribute a detailed system-level feasibility study that reports on the achievable performance levels for the envisioned setup. Finally, the underlying energy- data trading mechanisms are discussed, and the work concludes with outlining open research opportunities.

### General information

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Electronics and Communications Engineering, Peoples' Friendship University of Russia, Univ of Oulu, University of Hong Kong

Contributors: Galinina, O., Mikhaylov, K., Huang, K., Andreev, S., Koucheryavy, Y.

Number of pages: 10

Pages: 140-149

Publication date: 1 Apr 2018

Peer-reviewed: Yes

### Publication information

Journal: IEEE Wireless Communications

Volume: 25

Issue number: 2

ISSN (Print): 1536-1284

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Scopus rating (2018): CiteScore 11.8 SJR 2.352 SNIP 4.039

Original language: English

ASJC Scopus subject areas: Computer Science Applications, Electrical and Electronic Engineering

DOIs:

10.1109/MWC.2018.1600468

Source: Scopus

Source ID: 85046828147

Research output: Contribution to journal > Article > Scientific > peer-review

### **Generic platform for manufacturing execution system functions in knowledge-driven manufacturing systems**

Information technologies grow rapidly nowadays with the advance and extension of computing capabilities. This growth affects several fields, which consume these technologies. Industrial Automation is not an exception. This publication describes a general and flexible architecture for implementing Manufacturing Execution System (MES) function, which can be deployed in multiple industrial cases. These features are achieved by combining the flexibility of knowledge-driven systems with the vendor-independent property of RESTful web services. With deployment of this solution, MES functions may gain more versatility and independency. This research work is a continuation of the development of the OKD-MES (Open Knowledge-Driven Manufacturing Execution System) framework during the execution of the eScop project. The OKD-MES framework consists on a semantic-based solution for controlling and enhancing the flexibility and re-configurability of MES. In such scope, this research presents MES functions architecture that might be implemented in the OKD-MES framework in order to increase the flexibility of event-driven manufacturing systems.

#### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Automation and Hydraulic Engineering, Research group: Factory automation systems technology, Politecnico di Milano

Contributors: Mohammed, W. M., Ramis Ferrer, B., Iarovyi, S., Negri, E., Fumagalli, L., Lobov, A., Martinez Lastra, J. L.

Number of pages: 13

Pages: 1-13

Publication date: 4 Mar 2018

Peer-reviewed: Yes

#### **Publication information**

Journal: International Journal of Computer Integrated Manufacturing

ISSN (Print): 0951-192X

Ratings:

Scopus rating (2018): CiteScore 3.08 SJR 0.878 SNIP 1.397

Original language: English

ASJC Scopus subject areas: Aerospace Engineering, Mechanical Engineering, Computer Science Applications, Electrical and Electronic Engineering

Keywords: Knowledge-driven manufacturing systems, manufacturing execution system functions, semantics

DOIs:

10.1080/0951192X.2017.1407874

Source: Scopus

Source ID: 85034843058

Research output: Contribution to journal > Article > Scientific > peer-review

### **Noise minimized high resolution digital holographic microscopy applied to surface topography**

The topography of surface relief gratings was studied by digital holographic microscopy. The applicability of the method for quantitative measurements of surface microstructure at nanoscale was demonstrated. The method for wavefront reconstruction of surface relief from a digital hologram recorded in off-axis configuration was also applied. The main feature is noise filtration due to the presence of noise in the recorded intensity distribution and the use of all orders of the hologram. Reconstruction results proved a better effectiveness of our approach for topography studying of relief grating patterned on a ChG  $As_2S_3$  - Se nanomultilayers in comparison with standard Fourier Transform and Atom Force Microscope methods.

#### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Signal Processing, Research group: Computational Imaging-CI, Institute of Applied Physics Academy of Sciences of Moldova, University of Stuttgart, St. Petersburg State University, Department of Signal Processing

Contributors: Achimova, E., Abaskin, V., Claus, D., Pedrini, G., Shevkunov, I., Katkovnik, V.

Number of pages: 6

Pages: 267-272

Publication date: 1 Mar 2018

Peer-reviewed: Yes

#### **Publication information**

Journal: Computer Optics

Volume: 42

Issue number: 2

ISSN (Print): 0134-2452

Ratings:

Scopus rating (2018): CiteScore 2.37 SJR 0.535 SNIP 2.389

Original language: English

ASJC Scopus subject areas: Atomic and Molecular Physics, and Optics, Computer Science Applications, Electrical and Electronic Engineering

Keywords: Diffraction gratings, Digital holography, Digital image processing

DOIs:

10.18287/2412-6179-2018-42-2-267-272

Source: Scopus

Source ID: 85046122008

Research output: Contribution to journal > Article > Scientific > peer-review

### **A multi-agent approach for processing industrial enterprise data**

The C2NET project aims to provide cloud-based platform for the supply chain interactions. The architecture of such platform includes a Data Collection Framework (DCF) for managing the collection of the company's data. The DCF collects, transforms and stores data from both Internet of Things (IoT) devices in the factory shopfloor and company enterprises data via two types of hub; Legacy system hub (LSH) and IoT hub. Since the C2NET, targets the Small and Medium-sized Enterprises (SMEs), the enterprise data, or legacy data as called in the C2NET project, can be provided via excel files. Thus, this research work highlights a technique for processing the excel files in the LSHs. This technique adopts the concept of Multi-Agent Systems for processing the data as table in the excel files in the LSH. The multi-agent approach allows the LSH to process any excel file regardless the complexity in the data structure or in the file table. Furthermore, the presented approach enhances the processing of the excel files in different aspects, such as the size of the excel file or the required processing power.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Automation and Hydraulic Engineering, Research group: Automation and Systems Theory, Universitat Politècnica de València, Instituto de Desenvolvimento de Novas Tecnologias

Contributors: Mohammed, W. M., Ferrer, B. R., Martinez, J. L., Sanchis, R., Andres, B., Agostinho, C.

Number of pages: 7

Pages: 1209-1215

Publication date: 2 Feb 2018

#### **Host publication information**

Title of host publication: 2017 International Conference on Engineering, Technology and Innovation : Engineering, Technology and Innovation Management Beyond 2020: New Challenges, New Approaches, ICE/ITMC 2017 - Proceedings

Publisher: IEEE

ISBN (Electronic): 9781538607749

ASJC Scopus subject areas: Computer Science Applications, Software, Engineering (miscellaneous), Computer Networks and Communications

Keywords: Cloud Based, Data Collection, Enterprise, Multi-Agent Systems, supply Chain

DOIs:

10.1109/ICE.2017.8280018

Source: Scopus

Source ID: 85047492606

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

### **An approach to production scheduling optimization a case of an oil lubrication and hydraulic systems manufacturer**

Cloud-enabled tools developed in the Cloud Collaborative Manufacturing Networks (C2NET) project address the needs of small and medium enterprises with respect to information exchange and visibility across the collaboration partners in the supply network, coupled with automated and collaborative production planning and supply management. This paper analyses a case of an oil lubrication and hydraulic systems manufacturer and describes a pilot application of C2NET where the production schedule is optimized according to the priorities of the pilot company. In this case the goal is a highly adaptive just-in-time manufacturing schedule with guaranteed on time delivery.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Automation and Hydraulic Engineering, VTT Technical Research Centre of Finland, Roberto Camp Fluidhouse Ltd.

Contributors: Katasonov, A., Lastusilta, T., Korvola, T., Saari, L., Bendas, D., Mohammed, W. M., Lee, A. N.

Number of pages: 8

Pages: 1123-1130  
Publication date: 2 Feb 2018

#### Host publication information

Title of host publication: 2017 International Conference on Engineering, Technology and Innovation : Engineering, Technology and Innovation Management Beyond 2020: New Challenges, New Approaches, ICE/ITMC 2017 - Proceedings

Publisher: IEEE

ISBN (Electronic): 9781538607749

ASJC Scopus subject areas: Computer Science Applications, Software, Engineering (miscellaneous), Computer Networks and Communications

Keywords: cloud-supported manufacturing, enterprise collaboration, information exchange, just-in-time manufacturing, Mixed-Integer Linear Programming, on time delivery, optimization, production scheduling, Small and Medium size Enterprise, supply network

DOIs:

10.1109/ICE.2017.8280007

Source: Scopus

Source ID: 85047524893

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

#### Configuring and visualizing the data resources in a cloud-based data collection framework

The Manufacturing Enterprise Solutions Association (MESA) provided the abstract and general definition of the Manufacturing Execution Systems (MES). A dedicated function has been reserved for the data collection activities. In this matter, the Cloud Collaborative Manufacturing Networks (C2NET) project tends to provide a cloud based platform for hosting the interactions of the supply chain in a collaborative network. Within the architecture of the C2NET project, a Data Collection Framework (DCF) is designed to fulfill the function of data collection. This allows the companies to provide their data, which can be both enterprise and Internet of Things (IoT) devices type of data to the platform for further use. The collection of the data is achieved by a specific third party application, i.e., the Legacy System Hub (LSH). This research work presents the approach of configuring and visualizing the data resources in the C2NET platform. This approach employs the web-based applications and the help of the LSH. This permits the C2NET platform to adapt to any kind of third party application, which manipulates enterprise data, following the generic and flexible solution of this approach.

#### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Automation and Hydraulic Engineering, Research group: Automation and Systems Theory, Instituto de Desenvolvimento de Novas Tecnologias

Contributors: Mohammed, W. M., Ferrer, B. R., Jose, L., Lastra, M., Aleixo, D., Agostinho, C.

Number of pages: 8

Pages: 1201-1208

Publication date: 2 Feb 2018

#### Host publication information

Title of host publication: 2017 International Conference on Engineering, Technology and Innovation : Engineering, Technology and Innovation Management Beyond 2020: New Challenges, New Approaches, ICE/ITMC 2017 - Proceedings

Publisher: IEEE

ISBN (Electronic): 9781538607749

ASJC Scopus subject areas: Computer Science Applications, Software, Engineering (miscellaneous), Computer Networks and Communications

Keywords: Cloud Based, Data Collection, Data Resources, Supply Chain, Visualization

DOIs:

10.1109/ICE.2017.8280017

#### Bibliographical note

INT=aut,"Jose, L."

Source: Scopus

Source ID: 85047476305

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

#### Exploiting suppliers' potential in construction innovations

There is a need to understand ways to enhance innovations in the construction industry. It is argued that suppliers have potential to develop new innovations, but they are largely neglected in earlier construction-related research. This research focuses on suppliers' role in construction innovations, and the aim of the research is to increase understanding of practices for exploiting suppliers' potential in that context. A qualitative, explanatory research strategy is employed in the

context of construction industry in Finland. Eighteen interviews are conducted with contractors to discover experiences and practices related to suppliers' potential in construction innovations. The results reveal practices for exploiting supplier's potential in construction innovations. As a key contribution, the research shows that suppliers have an important role in construction innovation but exploitation of suppliers' potential is still rather underdeveloped.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Research group: Center for Research on Operations Projects and Services, Industrial and Information Management

Contributors: Sariola, R.

Number of pages: 7

Pages: 678-684

Publication date: 2 Feb 2018

#### **Host publication information**

Title of host publication: 2017 International Conference on Engineering, Technology and Innovation : Engineering, Technology and Innovation Management Beyond 2020: New Challenges, New Approaches, ICE/ITMC 2017 - Proceedings

Publisher: IEEE

ISBN (Electronic): 9781538607749

ASJC Scopus subject areas: Computer Science Applications, Software, Engineering (miscellaneous), Computer Networks and Communications

Keywords: construction innovation, project networks, supplier management

DOIs:

10.1109/ICE.2017.8279950

Source: Scopus

Source ID: 85047528988

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

#### **Analyzing Effects of Directional Deafness on mmWave Channel Access in Unlicensed Bands**

Directional deafness problem is one of the most important challenges in beamforming-based channel access at mmWave frequencies, which is believed to have detrimental effects on system performance in form of excessive delays and significant packet drops. In this paper, we contribute a quantitative analysis of deafness in directional random access systems operating in unlicensed bands by relying on stochastic geometry formulations. We derive a general numerical approach that captures the behavior of deafness probability as well as provide a closed-form solution for a typical sector-shaped antenna model, which is then may be extended to a more realistic two-sector pattern. Finally, employing contemporary IEEE 802.11ad modeling numerology, we illustrate our analysis revealing the importance of deafness-related considerations and their system- level impact.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Electronics and Communications Engineering, Intel Corporation

Contributors: Galinina, O., Pyattaev, A., Johnsson, K., Andreev, S., Koucheryavy, Y.

Number of pages: 7

Pages: 1-7

Publication date: 24 Jan 2018

#### **Host publication information**

Title of host publication: 2017 IEEE Globecom Workshops, GC Wkshps 2017 - Proceedings

Publisher: IEEE

ISBN (Electronic): 9781538639207

ASJC Scopus subject areas: Computer Networks and Communications, Computer Science Applications, Hardware and Architecture, Safety, Risk, Reliability and Quality

DOIs:

10.1109/GLOCOMW.2017.8269183

Source: Scopus

Source ID: 85050472068

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

#### **Detailed Interference Analysis in Dense mmWave Systems Employing Dual-Polarized Antennas**

The use of extremely high frequency (EHF) bands, known as millimeter-wave (mmWave) frequencies, requires densification of cells to maintain system performance at required levels. This may lead to potential increase of interference in practical mmWave networks, thus making it the limiting factor. On the other hand, attractive utilization of dual-polarized

antennas may improve over this situation by mitigating some of the interfering components, which can be employed as part of interference control techniques. In this paper, an accurate two-stage ray-based characterization is conducted that models interference-related metrics while taking into account a detailed dual-polarized antenna model. In particular, we confirm that narrower pencil-beam antennas (HPBW = 13) have significant advantages as compared to antennas with relatively narrow beams (HPBW = 20 and HPBW = 50) in the environments with high levels of interference. Additionally, we demonstrate that in the Manhattan grid deployment a transition from interference- to noise-limited regime and back occurs at the cell inter-site distances of under 90 m and over 180 m, respectively.

#### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Electronics and Communications Engineering, Intel Corporation

Contributors: Solomitckii, D., Petrov, V., Nikopour, H., Akdeniz, M., Orhan, O., Himayat, N., Talwar, S., Andreev, S., Koucheryavy, Y.

Number of pages: 6

Pages: 1-6

Publication date: 24 Jan 2018

#### Host publication information

Title of host publication: 2017 IEEE Globecom Workshops

Publisher: IEEE

ISBN (Electronic): 9781538639207

ASJC Scopus subject areas: Computer Networks and Communications, Computer Science Applications, Hardware and Architecture, Safety, Risk, Reliability and Quality

DOIs:

10.1109/GLOCOMW.2017.8269040

Source: Scopus

Source ID: 85050464132

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

#### Dual Structured Convolutional Neural Network with Feature Augmentation for Quantitative Characterization of Tissue Histology

We present a dual convolutional neural network (dCNN) architecture for extracting multi-scale features from histological tissue images for the purpose of automated characterization of tissue in digital pathology. The dual structure consists of two identical convolutional neural networks applied to input images with different scales, that are merged together and stacked with two fully connected layers. It has been acknowledged that deep networks can be used to extract higher-order features, and therefore, the network output at final fully connected layer was used as a deep dCNN feature vector. Further, engineered features, shown in previous studies to capture important characteristics of tissue structure and morphology, were integrated to the feature extractor module. The acquired quantitative feature representation can be further utilized to train a discriminative model for classifying tissue types. Machine learning based methods for detection of regions of interest, or tissue type classification will advance the transition to decision support systems and computer aided diagnosis in digital pathology. Here we apply the proposed feature-augmented dCNN method with supervised learning in detecting cancerous tissue from whole slide images. The extracted quantitative representation of tissue histology was used to train a logistic regression model with elastic net regularization. The model was able to accurately discriminate cancerous tissue from normal tissue, resulting in blockwise AUC=0.97, where the total number of analyzed tissue blocks was approximately 8.3 million that constitute the test set of 75 whole slide images.

#### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Faculty of Biomedical Sciences and Engineering, Signal Processing

Contributors: Valkonen, M., Kartasalo, K., Liimatainen, K., Nykter, M., Latonen, L., Ruusuvoori, P.

Number of pages: 9

Pages: 27-35

Publication date: 19 Jan 2018

#### Host publication information

Title of host publication: 2017 IEEE International Conference on Computer Vision Workshops, ICCVW 2017

Publisher: IEEE

ISBN (Electronic): 9781538610343

ASJC Scopus subject areas: Computer Science Applications, Computer Vision and Pattern Recognition

DOIs:

10.1109/ICCVW.2017.10

#### Bibliographical note

EXT="Nykter, Matti"

Source: Scopus

Source ID: 85046258201

Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

### **Image-Based Localization Using Hourglass Networks**

In this paper, we propose an encoder-decoder convolutional neural network (CNN) architecture for estimating camera pose (orientation and location) from a single RGB-image. The architecture has a hourglass shape consisting of a chain of convolution and up-convolution layers followed by a regression part. The up-convolution layers are introduced to preserve the fine-grained information of the input image. Following the common practice, we train our model in end-to-end manner utilizing transfer learning from large scale classification data. The experiments demonstrate the performance of the approach on data exhibiting different lighting conditions, reflections, and motion blur. The results indicate a clear improvement over the previous state-of-the-art even when compared to methods that utilize sequence of test frames instead of a single frame.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Signal Processing, Aalto University

Contributors: Melekhov, I., Ylioinas, J., Kannala, J., Rahtu, E.

Number of pages: 8

Pages: 870-877

Publication date: 19 Jan 2018

#### **Host publication information**

Title of host publication: 2017 IEEE International Conference on Computer Vision Workshops, ICCVW 2017

Publisher: IEEE

ISBN (Electronic): 9781538610343

ASJC Scopus subject areas: Computer Science Applications, Computer Vision and Pattern Recognition

DOIs:

10.1109/ICCVW.2017.107

Source: Scopus

Source ID: 85046300625

Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

### **Multiwavelength surface contouring from phase-coded diffraction patterns**

We propose a new algorithm for absolute phase retrieval from multiwavelength noisy phase coded diffraction patterns in the task of surface contouring. A lensless optical setup is considered with a set of successive single wavelength experiments. The phase masks are applied for modulation of the multiwavelength object wavefronts. The algorithm uses the forward and backward propagation for coherent light beams and sparsely encoding wavefronts which leads to the complex-domain block-matching 3D filtering. The key-element of the algorithm is an original aggregation of the multiwavelength object wavefronts for high-dynamic-range profile measurement. Numerical experiments demonstrate that the developed approach leads to the effective solutions explicitly using the sparsity for noise suppression and high-accuracy object profile reconstruction.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Signal Processing, Research group: Computational Imaging-CI, ITMO University

Contributors: Katkovnik, V., Shevkunov, I., Petrov, N. V., Eguiazarian, K.

Publication date: 1 Jan 2018

#### **Host publication information**

Title of host publication: Unconventional Optical Imaging 2018. Strasbourg, France

Volume: 10677

Publisher: SPIE

Article number: 106771B

ISBN (Print): 978-1-5106-1880-0

#### **Publication series**

Name: Proceedings of SPIE - The International Society for Optical Engineering

Volume: 10677

ISSN (Electronic): 0277-786X

ASJC Scopus subject areas: Electronic, Optical and Magnetic Materials, Condensed Matter Physics, Computer Science Applications, Applied Mathematics, Electrical and Electronic Engineering

Keywords: absolute phase retrieval, discrete optical signal processing, Multiwavelength phase retrieval, phase imaging, surface contouring

DOIs:

10.1117/12.2306127

Source: Scopus

Source ID: 85052446644

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

### **Technologies for Efficient Amateur Drone Detection in 5G Millimeter-Wave Cellular Infrastructure**

Unmanned aerial vehicles, also called drones, are recently gaining increased research attention across various fields due to their flexibility and application potential. The steady increase in the number of amateur drones demands more stringent regulations on their allowed route, mass, and load. However, these regulations may be violated accidentally or deliberately. In these cases, spying with drones, transfer of dangerous payloads, or losing reliable drone control can represent a new hazard for people, governments, and business sector. The technologies to detect, track, and disarm possible aerial threats are therefore in prompt demand. To this end, ubiquitous cellular networks, and especially 5G infrastructures based on the use of millimeter-wave radio modules, may be efficiently leveraged to offer the much needed drone detection capabilities. In this work, we propose to exploit 5G millimeter-wave deployments to detect violating amateur drones. We argue that the prospective 5G infrastructure may provide all the necessary technology elements to support efficient detection of small-sized drones. We therefore outline a novel technology and system design perspective, including such considerations as the density of base stations, their directional antennas, and the available bandwidth, among others, as well as characterize their impact with our ray-based modeling methods.

#### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Electronics and Communications Engineering, Aalto University

Contributors: Solomitckii, D., Gapeyenko, M., Semkin, V., Andreev, S., Koucheryavy, Y.

Number of pages: 8

Pages: 43-50

Publication date: 1 Jan 2018

Peer-reviewed: Yes

#### **Publication information**

Journal: IEEE Communications Magazine

Volume: 56

Issue number: 1

ISSN (Print): 0163-6804

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Scopus rating (2018): CiteScore 11.27 SJR 2.373 SNIP 4.681

Original language: English

ASJC Scopus subject areas: Computer Science Applications, Computer Networks and Communications, Electrical and Electronic Engineering

DOIs:

10.1109/MCOM.2017.1700450

Source: Scopus

Source ID: 85040720734

Research output: Contribution to journal > Article > Scientific > peer-review

### **Ultra-large mode area single frequency anisotropic MOPA with double clad Yb-doped tapered fiber**

We demonstrate all-fiber master oscillator - power amplifier delivered 70W output power at 1033.33nm with 8 kHz FWHM linewidth without any problems with SBS. The anisotropic ytterbium doped tapered double clad amplifier with 50  $\mu$ m MFD and polarization extinction ratio about 30 dB is developed as a burst stage. The output radiation demonstrated perfect beam quality ( $M^2=1.03/1.08$ ).

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Ampliconix Ltd, Institute of Radio Engineering and Electronics of the Russian Academy of Sciences, St. Petersburg State Polytechnical University

Contributors: Noronen, T., Fedotov, A., Rissanen, J., Gumenyuk, R., Butov, O., Chamorovskii, Y., Golant, K., Odnoblyudov, M., Filippov, V.

Number of pages: 6

Publication date: 1 Jan 2018

### Host publication information

Title of host publication: Fiber Lasers XV : Technology and Systems

Publisher: SPIE, IEEE

Article number: 105121T

ISBN (Electronic): 9781510615090

### Publication series

Name: Proceedings of SPIE

Publisher: SPIE

Volume: 10512

ISSN (Print): 0277-786X

ISSN (Electronic): 1996-756X

ASJC Scopus subject areas: Electronic, Optical and Magnetic Materials, Condensed Matter Physics, Computer Science Applications, Applied Mathematics, Electrical and Electronic Engineering

Keywords: active fiber, fiber amplifier, Fiber laser

Electronic versions:

Noronen T. Ultra-large mode area single frequency anisotropic MOPA with double clad Yb-doped tapered fiber

DOIs:

10.1117/12.2288942

URLs:

<http://urn.fi/URN:NBN:fi:tty-201908211995>

### Bibliographical note

EXT="Noronen, Teppo"

EXT="Fedotov, Andrei"

INT=fot, "Rissanen, Joonas"

EXT="Gumenyuk, Regina"

EXT="Filippov, Valery"

Source: Scopus

Source ID: 85045656071

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

### Action recognition using the 3D dense microblock difference

This paper describes a framework for action recognition which aims to recognize the goals and activities of one or more human from a series of observations. We propose an approach for the human action recognition based on the 3D dense micro-block difference. The proposed algorithm is a two-stage procedure: (a) image preprocessing using a 3D Gabor filter and (b) a descriptor calculation using 3D dense micro-block difference with SVM classifier. At the first step, an efficient spatial computational scheme designed for the convolution with a bank of 3D Gabor filters is present. This filter intensifies motion using a convolution for a set of 3D patches and arbitrarily-oriented anisotropic Gaussian. For preprocessed frames, we calculate the local features such as 3D dense micro-block difference (3D DMD), which capture the local structure from the image patches at high scales. This approach is processing the small 3D blocks with different scales from frames which capture the microstructure from it. The proposed image representation is combined with fisher vector method and linear SVM classifier. We evaluate the proposed approach on the UCF50, HMDB51 and UCF101 databases. Experimental results demonstrate the effectiveness of the proposed approach on video with a stochastic textures background with comparisons of the state-of-The-Art methods.

### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Signal Processing, Don State Technical University, Moscow State University of Technology 'Stankin', Beijing Jiaotong University

Contributors: Voronin, V., Pismenskova, M., Zelensky, A., Cen, Y., Nadykto, A., Egiazarian, K.

Publication date: 2018

### Host publication information

Title of host publication: Counterterrorism, Crime Fighting, Forensics, and Surveillance Technologies II

Publisher: SPIE

Article number: 1080200

ISBN (Electronic): 9781510621879

### Publication series

Name: Proceedings of SPIE

Volume: 10802

ISSN (Electronic): 1996-756X

ASJC Scopus subject areas: Electronic, Optical and Magnetic Materials, Condensed Matter Physics, Computer Science Applications, Applied Mathematics, Electrical and Electronic Engineering

Keywords: 3D Gabor filter., Action recognition, Micro-block difference, Texture

DOIs:

10.1117/12.2326801

### **Bibliographical note**

jufoid=71479

Source: Scopus

Source ID: 85057423236

Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

### **A Primal Neural Network for Online Equality-Constrained Quadratic Programming**

This paper aims at solving online equality-constrained quadratic programming problem, which is widely encountered in science and engineering, e.g., computer vision and pattern recognition, digital signal processing, and robotics. Recurrent neural networks such as conventional GradientNet and ZhangNet are considered as powerful solvers for such a problem in light of its high computational efficiency and capability of circuit realisation. In this paper, an improved primal recurrent neural network and its electronic implementation are proposed and analysed. Compared to the existing recurrent networks, i.e. GradientNet and ZhangNet, our network can theoretically guarantee superior global exponential convergence. Robustness performance of our such neural model is also analysed under a large model implementation error, with the upper bound of steady-state solution error estimated. Simulation results demonstrate theoretical analysis on the proposed model, which also verify the effectiveness of the proposed model for online equality-constrained quadratic programming.

### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Signal Processing, Research group: Vision, Shanghai Institute of Ceramics Chinese Academy of Sciences, Institute of Automation Chinese Academy of Sciences

Contributors: Chen, K., Zhang, Z.

Number of pages: 8

Pages: 381–388

Publication date: 2018

Peer-reviewed: Yes

### **Publication information**

Journal: Cognitive Computation

Volume: 10

Issue number: 2

ISSN (Print): 1866-9956

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Scopus rating (2018): CiteScore 5.05 SJR 1.06 SNIP 1.898

Original language: English

ASJC Scopus subject areas: Computer Vision and Pattern Recognition, Computer Science Applications, Cognitive Neuroscience

Keywords: Global exponential convergence, Online equality-constrained quadratic programming, Recurrent neural networks, Robustness analysis

DOIs:

10.1007/s12559-017-9510-4

Source: Scopus

Source ID: 85030320446

Research output: Contribution to journal › Article › Scientific › peer-review

### **Architectural patterns for microservices: A systematic mapping study**

Microservices is an architectural style increasing in popularity. However, there is still a lack of understanding how to adopt a microservice-based architectural style. We aim at characterizing different microservice architectural style patterns and the principles that guide their definition. We conducted a systematic mapping study in order to identify reported usage of microservices and based on these use cases extract common patterns and principles. We present two key contributions. Firstly, we identified several agreed microservice architecture patterns that seem widely adopted and reported in the case studies identified. Secondly, we presented these as a catalogue in a common template format including a summary of the advantages, disadvantages, and lessons learned for each pattern from the case studies. We can conclude that different architecture patterns emerge for different migration, orchestration, storage and deployment settings for a set of agreed principles.

### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication  
Organisations: Pervasive Computing, Free University of Bolzano-Bozen  
Contributors: Taibi, D., Lenarduzzi, V., Pahl, C.  
Number of pages: 12  
Pages: 221-232  
Publication date: 2018

#### Host publication information

Title of host publication: CLOSER 2018 - Proceedings of the 8th International Conference on Cloud Computing and Services Science  
Publisher: SCITEPRESS  
ISBN (Electronic): 9789897582950  
ASJC Scopus subject areas: Computer Science (miscellaneous), Software, Computer Science Applications  
Keywords: Architectural style, Architecture pattern, Cloud migration, Cloud native, DevOps, Microservices  
DOIs:  
10.5220/0006798302210232  
Source: Scopus  
Source ID: 85046716130  
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

#### Blind estimation of white Gaussian noise variance in highly textured images

In the paper, a new method of blind estimation of noise variance in a single highly textured image is proposed. An input image is divided into 8x8 blocks and discrete cosine transform (DCT) is performed for each block. A part of 64 DCT coefficients with lowest energy calculated through all blocks is selected for further analysis. For the DCT coefficients, a robust estimate of noise variance is calculated. Corresponding to the obtained estimate, a part of blocks having very large values of local variance calculated only for the selected DCT coefficients are excluded from the further analysis. These two steps (estimation of noise variance and exclusion of blocks) are iteratively repeated three times. For the verification of the proposed method, a new noise-free test image database TAMPERE17 consisting of many highly textured images is designed. It is shown for this database and different values of noise variance from the set {25, 49, 100, 225}, that the proposed method provides approximately two times lower estimation root mean square error than other methods.

#### General information

Publication status: Published  
MoE publication type: A4 Article in a conference publication  
Organisations: Signal Processing, Don State Technical University  
Contributors: Ponomarenko, M., Gapon, N., Voronin, V., Egiazarian, K.  
Publication date: 2018

#### Host publication information

Title of host publication: Electronic Imaging : Image Processing: Algorithms and Systems XVI  
Publisher: Society for Imaging Science and Technology  
ASJC Scopus subject areas: Computer Graphics and Computer-Aided Design, Computer Science Applications, Human-Computer Interaction, Software, Electrical and Electronic Engineering, Atomic and Molecular Physics, and Optics  
Keywords: Blind estimation of noise characteristics, Discrete cosine transform (DCT), Noise free test image database  
DOIs:  
10.2352/ISSN.2470-1173.2018.13.IPAS-382

#### Bibliographical note

jufoid=84313  
Source: Scopus  
Source ID: 85052856410  
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

#### Combined local and global image enhancement algorithm

We present a new image enhancement algorithm based on combined local and global image processing. The basic idea is to apply  $\alpha$ -rooting image enhancement approach for different image blocks. For this purpose, we split image in moving windows on disjoint blocks with different size (8 by 8, 16 by 16, 32 by 32 and, i.e.). The parameter  $\alpha$  for every block driven through optimization of measure of enhancement (EME). The resulting image is a weighted mean of all processing blocks. This strategy for image enhancement allows getting more contrast image with the following properties: irregular lighting and brightness gradient. Some experimental results are presented to illustrate the performance of the proposed algorithm.

#### General information

Publication status: Published  
MoE publication type: A4 Article in a conference publication

Organisations: Signal Processing, Don State Technical University, College of Staten Island  
Contributors: Voronin, V., Semenishchev, E., Ponomarenko, M., Agaian, S.  
Publication date: 2018

#### Host publication information

Title of host publication: Electronic Imaging : Image Processing: Algorithms and Systems XVI  
Publisher: Society for Imaging Science and Technology  
ASJC Scopus subject areas: Computer Graphics and Computer-Aided Design, Computer Science Applications, Human-Computer Interaction, Software, Electrical and Electronic Engineering, Atomic and Molecular Physics, and Optics  
DOIs:  
10.2352/ISSN.2470-1173.2018.13.IPAS-220

#### Bibliographical note

jufoid=84313  
Source: Scopus  
Source ID: 85052861928  
Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

#### Compression of signs of DCT coefficients for additional lossless compression of JPEG images

One of the main approaches to additional lossless compression of JPEG images is decoding of quantized values of discrete cosine transform (DCT) coefficients and further more effective recompression of the coefficients. Values of amplitudes of DCT coefficients are highly correlated and it is possible to effectively compress them. At the same time, signs of DCT coefficients, which occupy up to 20% of compressed image, are often considered unpredictable. In the paper, a new and effective method for compression of signs of quantized DCT coefficients is proposed. The proposed method takes into account both correlation between DCT coefficients of the same block and correlation between DCT coefficients of neighbor blocks. For each of 64 DCT coefficients, positions of 3 reference coefficients inside the block are determined and stored in the compressed file. Four reference coefficients with fixed positions are used from the neighbor blocks. For all reference coefficients, 15 frequency models to predict signs of a given coefficient are used. All 7 probabilities (that the sign is negative) are mixed by logistic mixing. For test set of JPEG images, we show that the proposed method allows compressing signs of DCT coefficients by 1.1 ... 1.3 times, significantly outperforming nearest analogues.

#### General information

Publication status: Published  
MoE publication type: A4 Article in a conference publication  
Organisations: Signal Processing, Kharkiv National Aerospace University  
Contributors: Miroshnichenko, O., Ponomarenko, M., Lukin, V., Egiazarian, K.  
Publication date: 2018

#### Host publication information

Title of host publication: Electronic Imaging : Image Processing: Algorithms and Systems XVI  
Publisher: Society for Imaging Science and Technology  
ASJC Scopus subject areas: Computer Graphics and Computer-Aided Design, Computer Science Applications, Human-Computer Interaction, Software, Electrical and Electronic Engineering, Atomic and Molecular Physics, and Optics  
Keywords: Discrete cosine transform, JPEG, JPEG additional compression, Sign compression  
DOIs:  
10.2352/ISSN.2470-1173.2018.13.IPAS-385

#### Bibliographical note

jufoid=84313  
EXT="Lukin, Vladimir"  
Source: Scopus  
Source ID: 85052859716  
Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

#### Conversion of sparsely-captured light field into alias-free fullparallax multiview content

We propose shearlet decomposition based light field (LF) reconstruction and filtering techniques for mitigating artifacts in the visualized contents of 3D multiview displays. Using the LF reconstruction capability, we first obtain the densely sampled light field (DSLRF) of the scene from a sparse set of view images. We design the filter via tiling the Fourier domain of epipolar image by shearlet atoms that are directionally and spatially localized versions of the desired display passband. In this way, it becomes possible to process the DSLRF in a depth-dependent manner. That is, the problematic areas in the 3D scene that are outside of the display depth of field (DoF) can be selectively filtered without sacrificing high details in the areas near the display, i.e. inside the DoF. The proposed approach is tested on a synthetic scene and the improvements achieved by means of the quality of the visualized content are verified, where the visualization process is simulated using a geometrical optics model of the human eye.

### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Signal Processing, Electronics and Telecommunication Research Institute (ETRI)

Contributors: Sahin, E., Vagharchakyan, S., Bregovic, R., Lee, G., Gotchev, A.

Number of pages: 5

Pages: 1441-1445

Publication date: 2018

### Host publication information

Title of host publication: Electronic Imaging : Stereoscopic Displays and Applications XXIX

Publisher: Society for Imaging Science and Technology

ASJC Scopus subject areas: Computer Graphics and Computer-Aided Design, Computer Science Applications, Human-Computer Interaction, Software, Electrical and Electronic Engineering, Atomic and Molecular Physics, and Optics

DOIs:

10.2352/ISSN.2470-1173.2018.04.SDA-144

### Bibliographical note

jufoid=84313

Source: Scopus

Source ID: 85052854954

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

### Deep p-Fibonacci scattering networks

Recently, the use of neural networks for image classification has become widely spread. Thanks to the availability of increased computational power, better performing architectures have been designed, such as the Deep Neural networks. In this work, we propose a novel image representation framework exploiting the Deep p- Fibonacci scattering network. The architecture is based on the structured p-Fibonacci scattering over graph data. This approach allows to provide good accuracy in classification while reducing the computational complexity. Experimental results demonstrate that the performance of the proposed method is comparable to state-of-the-art unsupervised methods while being computationally more efficient.

### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Signal Processing, University "Roma Tre"

Contributors: Battisti, F., Carli, M., De Paola, E., Egiazarian, K.

Publication date: 2018

### Host publication information

Title of host publication: Electronic Imaging : Image Processing: Algorithms and Systems XVI

Publisher: Society for Imaging Science and Technology

ASJC Scopus subject areas: Computer Graphics and Computer-Aided Design, Computer Science Applications, Human-Computer Interaction, Software, Electrical and Electronic Engineering, Atomic and Molecular Physics, and Optics

DOIs:

10.2352/ISSN.2470-1173.2018.13.IPAS-193

### Bibliographical note

jufoid=84313

EXT="Battisti, F."

EXT="Carli, M."

Source: Scopus

Source ID: 85052873638

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

### Effect of paint baking treatment on the properties of press hardened boron steels

This study comprehends the effect of a typical paint baking process on the properties of press hardened boron steels. Bake hardening response of four 22MnB5 steels with different production histories and two other boron steels of 30MnB5 and 34MnB5 type were analyzed. In particular, the effect of steel carbon content and prior austenite grain size on the strength of the bake hardening treated steels was investigated. Press hardened steels showed a relatively strong bake hardening effect, 80–160 MPa, in terms of yield strength. In addition, a clear decrease in ultimate tensile strength, 30–150 MPa, was observed due to baking. The changes in tensile strength showed a dependency on the carbon content of the steel: higher carbon content led to a larger decrease in tensile strength in general. Smaller prior austenite grain size resulted in a higher increase in yield strength despite the micro-alloyed 34MnB5. Transmission electron microscopy analysis carried out for the 34MnB5 revealed niobium rich mixture carbides of (Nb, Ti)C, which have most likely influenced the different bake hardening response. The present results indicate that the bake hardening response of press hardened

steels depends on both prior austenite grain size and carbon content, but is also affected by other alloying elements. The observed correlation between prior austenite grain size and bake hardening response can be used to optimize the production of the standard grades of 22MnB5 and 30MnB5. In addition, our study suggests that baking process improves the post-uniform elongation and ductile fracture behavior of 34MnB5, but do not significantly influence the ductile fracture mechanisms of 22MnB5 and 30MnB5 representing lower strength levels.

#### General information

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Materials Science, Research group: Metals Technology, SSAB

Contributors: Järvinen, H., Honkanen, M., Järvenpää, M., Peura, P.

Number of pages: 15

Pages: 90-104

Publication date: 2018

Peer-reviewed: Yes

Early online date: 11 Sep 2017

#### Publication information

Journal: Journal of Materials Processing Technology

Volume: 252

ISSN (Print): 0924-0136

Ratings:

Scopus rating (2018): CiteScore 5.08 SJR 1.719 SNIP 2.773

Original language: English

ASJC Scopus subject areas: Ceramics and Composites, Modelling and Simulation, Computer Science Applications,

Metals and Alloys, Industrial and Manufacturing Engineering

Keywords: Bake hardening, EBSD, Martensite, Paint baking, Press hardening, Prior austenite grain size

DOIs:

10.1016/j.jmatprotec.2017.08.027

Source: Scopus

Source ID: 85029389667

Research output: Contribution to journal › Article › Scientific › peer-review

#### Elementary math to close the digital skills gap

All-encompassing digitalization and the digital skills gap pressure the current school system to change. Accordingly, to 'digi-jump', the Finnish National Curriculum 2014 (FNC-2014) adds programming to K-12 math. However, we claim that the anticipated addition remains too vague and subtle. Instead, we should take into account education recommendations set by computer science organizations, such as ACM, and define clear learning targets for programming. Correspondingly, the whole math syllabus should be critically viewed in the light of these changes and the feedback collected from SW professionals and educators. These findings reveal an imbalance between supply and demand, i.e., what is over-taught versus under-taught, from the point of view of professional requirements. Critics claim an unnecessary surplus of calculus and differential equations, i.e., continuous mathematics. In contrast, the emphasis should shift more towards algorithms and data structures, flexibility in handling multiple data representations, logic; in summary - discrete mathematics.

#### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Pervasive Computing, Jyväskylän yliopisto

Contributors: Niemelä, P., Valmari, A.

Number of pages: 12

Pages: 154-165

Publication date: 2018

#### Host publication information

Title of host publication: CSEDU 2018 - Proceedings of the 10th International Conference on Computer Supported Education

Volume: 2

Publisher: SCITEPRESS

ISBN (Electronic): 9789897582912

ASJC Scopus subject areas: Computer Science Applications, Information Systems, Education

Keywords: Computing in math syllabus, Continuous vs. discrete math, Digital skills gap, Effectiveness of education, K-12 computer science education, Professional development of software professionals

DOIs:

10.5220/0006800201540165

## Bibliographical note

EXT="Valmari, Antti"

Source: Scopus

Source ID: 85047771637

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

## Gamification, quantified-self or social networking? Matching users' goals with motivational technology

Systems and services we employ in our daily life have increasingly been augmented with motivational designs which fall under the classes of (1) gamification, (2) quantified-self and (3) social networking features that aim to help users reach their goals via motivational enforcement. However, users differ in terms of their orientation and focus toward goals and in terms of the attributes of their goals. Therefore, different classes of motivational design may have a differential fit for users. Being able to distinguish the goal profiles of users, motivational design could be better tailored. Therefore, in this study we investigate how different goal foci (outcome and focus), goals orientation (mastery, proving, and avoiding), and goal attributes (specificity and difficulty) are associated with perceived importance of gamification, social networking and quantified-self features. We employ survey data ((Formula presented.)) from users of HeiaHeia; a popular exercise encouragement app. Results indicate that goal-setting related factors of users and attributes of goals are connected with users' preference over motivational design classes. In particular, the results reveal that being outcome-focused is associated with positive evaluations of gamification and quantified-self design classes. Users with higher proving-orientation perceived gamification and social networking design classes as more important, users with lower goal avoidance-orientation perceived social networking design as more important, whereas users with higher mastery-orientation perceived quantified-self design more important. Users with difficult goals were less likely to perceive gamification and social networking design important, whereas for users with high goal specificity quantified-self features were important. The findings provide insights for the automatic adaptation of motivational designs to users' goals. However, more research is naturally needed to further investigate generalizability of the results.

## General information

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Pervasive Computing, Swedish School of Economics and Business Administration, Aalto University

Contributors: Hamari, J., Hassan, L., Dias, A.

Number of pages: 40

Pages: 35–74

Publication date: 2018

Peer-reviewed: Yes

Early online date: 24 Jan 2018

## Publication information

Journal: User Modeling and User-Adapted Interaction

Volume: 28

Issue number: 1

ISSN (Print): 0924-1868

Ratings:

Scopus rating (2018): CiteScore 5.45 SJR 0.907 SNIP 3.137

Original language: English

ASJC Scopus subject areas: Education, Human-Computer Interaction, Computer Science Applications

Keywords: Gamification, Goal orientation, Goal-setting, Motivational information system, Quantified-self, Social networking  
DOIs:

10.1007/s11257-018-9200-2

Source: Scopus

Source ID: 85040920827

Research output: Contribution to journal > Article > Scientific > peer-review

## Highly-efficient Ho:KY(WO<sub>4</sub>)<sub>2</sub> thin-disk lasers at 2.06 μm

The recent advances in the development of Holmium monoclinic double tungstate thin-disk lasers are reviewed. The thin-disk is based on a 250-μm-thick 3 at. % Ho:KY(WO<sub>4</sub>)<sub>2</sub> active layer grown on a (010)-oriented KY(WO<sub>4</sub>)<sub>2</sub> substrate. When pumped by a Tm-fiber laser at 1960 nm with a single-bounce pump geometry, the continuous-wave Ho:KY(WO<sub>4</sub>)<sub>2</sub> thin-disk laser generates an output power of 1.01 W at 2057 nm corresponding to a slope efficiency  $\eta$  of 60% and a laser threshold of only 0.15 W. The thin-disk laser is passively Q-switched with a GaSb-based quantum-well semiconductor saturable absorber mirror. In this regime, it generates an average output power of 0.551 W at ~2056 nm with  $\eta = 44\%$ . The best pulse characteristics are 4.1 μJ/201 ns at a repetition rate of 135 kHz. The laser performance, beam quality and thermo-optic aberrations of such lasers are strongly affected by the Ho<sup>3+</sup> doping concentration. For the 3 at.% Ho<sup>3+</sup>-doped thin-disk, the thermal lens is negative (the sensitivity factors for the two principal meridional planes are -1.7 and -0.6 m<sup>-1</sup>/W) and astigmatic. The Ho:KY(WO<sub>4</sub>)<sub>2</sub> epitaxial structures are promising as active elements in mode-locked thin-disk lasers at ~2060 nm.

### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Photonics, Research group: ORC, Max Born Institute, Universitat Rovira i Virgili, LISA Laser Products OHG, ITMO University, Institute of Laser Physics of the Siberian Branch of the RAS

Contributors: Mateos, X., Loiko, P., Lamrini, S., Scholle, K., Fuhrberg, P., Suomalainen, S., Härkönen, A., Guina, M., Vatnik, S., Vedin, I., Aguiló, M., Díaz, F., Wang, Y., Griebner, U., Petrov, V.

Publication date: 2018

### Host publication information

Title of host publication: Pacific-Rim Laser Damage 2018 : Optical Materials for High-Power Lasers

Publisher: SPIE, IEEE

Article number: 107130J

ISBN (Electronic): 9781510619920

### Publication series

Name: Proceedings of SPIE

Volume: 10713

ISSN (Print): 0277-786X

ASJC Scopus subject areas: Electronic, Optical and Magnetic Materials, Condensed Matter Physics, Computer Science Applications, Applied Mathematics, Electrical and Electronic Engineering

Keywords: 2-micron lasers, Ho-lasers, monoclinic double tungstates, Q-switched lasers, thin-disk lasers

DOIs:

10.1117/12.2316822

### Bibliographical note

jufoid=71479

Source: Scopus

Source ID: 85051249536

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

### How to design gamification? A method for engineering gamified software

Context: Since its inception around 2010, gamification has become one of the top technology and software trends. However, gamification has also been regarded as one of the most challenging areas of software engineering. Beyond traditional software design requirements, designing gamification requires the command of disciplines such as (motivational/behavioral) psychology, game design, and narratology, making the development of gamified software a challenge for traditional software developers. Gamification software inhabits a finely tuned niche of software engineering that seeks for both high functionality and engagement; beyond technical flawlessness, gamification has to motivate and affect users. Consequently, it has also been projected that most gamified software is doomed to fail. Objective: This paper seeks to advance the understanding of designing gamification and to provide a comprehensive method for developing gamified software. Method: We approach the research problem via a design science research approach; firstly, by synthesizing the current body of literature on gamification design methods and by interviewing 25 gamification experts, producing a comprehensive list of design principles for developing gamified software. Secondly, and more importantly, we develop a detailed method for engineering of gamified software based on the gathered knowledge and design principles. Finally, we conduct an evaluation of the artifacts via interviews of ten gamification experts and implementation of the engineering method in a gamification project. Results: As results of the study, we present the method and key design principles for engineering gamified software. Based on the empirical and expert evaluation, the developed method was deemed as comprehensive, implementable, complete, and useful. We deliver a comprehensive overview of gamification guidelines and shed novel insights into the nature of gamification development and design discourse. Conclusion: This paper takes first steps towards a comprehensive method for gamified software engineering.

### General information

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Research group: TUT Game Lab, Pervasive Computing, University of Duisburg-Essen

Contributors: Morschheuser, B., Hassan, L., Werder, K., Hamari, J.

Pages: 219-237

Publication date: 2018

Peer-reviewed: Yes

Early online date: 2017

### Publication information

Journal: Information and Software Technology

Volume: 95

ISSN (Print): 0950-5849

Ratings:

Scopus rating (2018): CiteScore 5.07 SJR 0.615 SNIP 2.837

Original language: English

ASJC Scopus subject areas: Software, Information Systems, Computer Science Applications

Keywords: Design science research, Game design, Gameful design, Gamification, Persuasive technology, Playfulness, Software engineering

DOIs:

10.1016/j.infsof.2017.10.015

Source: Scopus

Source ID: 85035150495

Research output: Contribution to journal › Article › Scientific › peer-review

### **Integrated multi-wavelength mid-IR light source for gas sensing**

Cost effective multi-wavelength light sources are key enablers for spectroscopic applications at Mid-IR wavelength range. Utilizing a novel Mid-IR Si-based photonic integrated circuit filter and wide-band Mid-IR SLEDs, we show the concept of a light source that covers 2.7-3.5  $\mu\text{m}$  wavelength range with a resolution  $<1\text{nm}$ . The spectral bands are switchable and tunable and they can be modulated. The source allows for the fabrication of an affordable multi-band gas sensor with good selectivity and sensitivity. The unit price can be lowered in high volumes by utilizing tailored molded IR lens technology and automated packaging and assembling technologies. The status of the development of the key components of the light source are reported. The Mid-IR PIC is based on the use of thick-SOI technology, SLED is based on AlGaInAsSb materials and the lenses are tailored single crystal, nonoxide glass and heavy metal oxide glasses fabricated by the use of hot-embossing. The packaging concept utilizing automated assembly tools are depicted. In safety and security applications, the Mid-IR wavelength range covered by the source allows for the detection of several harmful gas components with a single sensor. At the moment, affordable sources are not available. The market impact is expected to be disruptive, since the devices currently in the market are either complicated, expensive and heavy instruments, or the applied measurement principles are inadequate in terms of stability and selectivity.

### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Photonics, Research group: ORC, VTT Technical Research Centre of Finland, Institute of Electronic Materials Technology, Vaisala Oyj, Airoptic Sp. z o.o., GasSecure, VIGO System S.A.

Contributors: Karioja, P., Alajoki, T., Cherchi, M., Ollila, J., Harjanne, M., Heinilehto, N., Suomalainen, S., Zia, N., Tuorila, H., Viheriälä, J., Guina, M., Buczynski, R., Kasztelaniec, R., Salo, T., Virtanen, S., Kluczynski, P., Borgen, L., Ratajczyk, M., Kalinowski, P.

Publication date: 2018

### **Host publication information**

Title of host publication: Next-Generation Spectroscopic Technologies XI

Publisher: SPIE, IEEE

Article number: 106570A

ISBN (Electronic): 9781510618251

### **Publication series**

Name: SPIE Conference Proceedings

Volume: 10657

ISSN (Print): 0277-786X

ASJC Scopus subject areas: Electronic, Optical and Magnetic Materials, Condensed Matter Physics, Computer Science Applications, Applied Mathematics, Electrical and Electronic Engineering

Keywords: gas sensing, Mid-IR integrated optics, Mid-IR lens, photonics packaging, PIC, Si photonics, SLED

DOIs:

10.1117/12.2305712

### **Bibliographical note**

jufoid=71479

Source: Scopus

Source ID: 85050701514

Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

### **Knowledge-based artificial neural network (KB-ANN) in engineering: Associating functional architecture modeling, dimensional analysis and causal graphs to produce optimized topologies for KB-ANNs**

This article documents a study on artificial neural networks (ANNs) applied to the field of engineering and more specifically a study taking advantage of prior domain knowledge of engineering systems to improve the learning capabilities of ANNs by reducing the dimensionality of the ANNs. The proposed approach ultimately leads to training a smaller ANN, offering advantage in training performances such as lower Mean Squared Error, lower cost and faster convergence. The article proposes to associate functional architecture, Pi numbers, and causal graphs and presents a design process to generate

optimized knowledge-based ANN (KB-ANN) topologies. The article starts with a literature survey related to ANN and their topologies. Then, an important distinction is made between system behavior centered topologies and ANN centered topologies. The Dimensional Analysis Conceptual Modeling (DACM) framework is introduced as a way of implementing the system behavior centered topology. One case study is analyzed with the goal of defining an optimized KB-ANN topology. The study shows that the KB-ANN topology performed significantly better in term of the size of the required training set than a conventional fully-connected ANN topology. Future work will investigate the application of KB-ANNs to additive manufacturing.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Mechanical Engineering and Industrial Systems, Research area: Manufacturing and Automation, Simon Fraser University

Contributors: Coatanéa, E., Wu, D., Tsarkov, V., Gary Wang, G., Modi, S., Jafarian, H.

Number of pages: 12

Publication date: 2018

#### **Host publication information**

Title of host publication: 38th Computers and Information in Engineering Conference

Volume: 1B-2018

Publisher: The American Society of Mechanical Engineers ASME

ISBN (Electronic): 9780791851739

ASJC Scopus subject areas: Mechanical Engineering, Computer Graphics and Computer-Aided Design, Computer Science Applications, Modelling and Simulation

Keywords: Additive Manufacturing, Artificial Neural Networks, Classifiers, Dimensional Analysis, Empirical learning, Knowledge Based Artificial Neural Network

DOIs:

10.1115/DETC201885895

#### **Bibliographical note**

INT=mei,"Jafarian, Hesam"

Source: Scopus

Source ID: 85056903740

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

#### **Making the cloud work for software producers: Linking architecture, operating cost and revenue**

Cloud migration is concerned with moving an on-premise software system into the cloud. In this paper, we focus on software producers adopting the cloud to provide their solutions to enterprise customers. Their challenge is to migrate a software product, developed in-house and traditionally delivered on-premise, to an Infrastructure-as-a-Service or Platform-as-a-Service solution, while also mapping an existing traditional licensing model on to a cloud monetization model. The analysis of relevant cost types and factors of cloud computing generate relevant information for the software producers when deciding to adopt cloud computing, and defining software pricing. We present an integrated framework for informing cloud monetization based on operational cost factors for migrating to the cloud and test it in a real-life case study. Differences between basic virtualization of the software product and using fully cloud-native platform services for re-architecting the product in question are discussed.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Pervasive Computing, Dublin City University, Free University of Bolzano-Bozen, Human-Centered Technology (IHTE)

Contributors: Rosati, P., Fowley, F., Pahl, C., Taibi, D., Lynn, T.

Number of pages: 12

Pages: 364-375

Publication date: 2018

#### **Host publication information**

Title of host publication: CLOSER 2018 - Proceedings of the 8th International Conference on Cloud Computing and Services Science

Publisher: SCITEPRESS

ISBN (Electronic): 9789897582950

ASJC Scopus subject areas: Computer Science (miscellaneous), Software, Computer Science Applications

Keywords: Architecture migration, Cloud migration, Monetization, Software producer, Total cost of ownership

DOIs:

10.5220/0006679303640375

Source: Scopus

Source ID: 85048894202

Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

### **Methods and tools for denoising of complex-valued images based on block-matching and high order singular value decomposition**

Noise suppression in complex-valued data is an important task for a wide class of applications, in particular concerning the phase retrieval in coherent imaging. The approaches based on BM3D techniques are ones of the most successful in the field. In this paper, we propose and develop a new class of BM3Dstyle algorithms, which use high order (3D and 4D) singular value decomposition (HOSVD) for transform design in complex domain. This set of the novel algorithms is implemented as a toolbox In Matlab. This development is produced for various types of the complex-domain sparsity: directly in complex domain, real/imaginary and phase/ amplitude parts of complexvalued variables. The group-wise transform design is combined with the different kinds of thresholding including multivariable Wiener filtering. The toolbox includes iterative and non-iterative novel complex-domain algorithms (filters). The efficiency of the developed algorithms is demonstrated on denoising problems with an additive Gaussian complex-valued noise. A special set of the complex-valued test-images was developed with spatially varying correlated phase and amplitudes imitating data typical for optical interferometry and holography. It is shown that for this class of the test-images the developed algorithms demonstrate the stateof- the-art performance.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Signal Processing

Contributors: Ponomarenko, M., Katkovnik, V., Egiazarian, K.

Publication date: 2018

#### **Host publication information**

Title of host publication: Electronic Imaging : Image Processing: Algorithms and Systems XVI

Publisher: Society for Imaging Science and Technology

ASJC Scopus subject areas: Computer Graphics and Computer-Aided Design, Computer Science Applications, Human-Computer Interaction, Software, Electrical and Electronic Engineering, Atomic and Molecular Physics, and Optics

Keywords: Block matching, Complex domain, Higher-order singular value decomposition, Image denoising, Phase imaging, Sparsity

DOIs:

10.2352/ISSN.2470-1173.2018.13.IPAS-306

#### **Bibliographical note**

jufoid=84313

Source: Scopus

Source ID: 85052877244

Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

### **Mixed-integer linear programming approach for global discrete sizing optimization of frame structures**

This paper focuses on discrete sizing optimization of frame structures using commercial profile catalogs. The optimization problem is formulated as a mixed-integer linear programming (MILP) problem by including the equations of structural analysis as constraints. The internal forces of the members are taken as continuous state variables. Binary variables are used for choosing the member profiles from a catalog. Both the displacement and stress constraints are formulated such that for each member limit values can be imposed at predefined locations along the member. A valuable feature of the formulation, lacking in most contemporary approaches, is that global optimality of the solution is guaranteed by solving the MILP using branch-and-bound techniques. The method is applied to three design problems: a portal frame, a two-story frame with three load cases and a multiple-bay multiple-story frame. Performance profiles are determined to compare the MILP reformulation method with a genetic algorithm.

#### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Civil Engineering, KU Leuven

Contributors: van Mellaert, R., Mela, K., Tiainen, T., Heinisuo, M., Lombaert, G., Schevenels, M.

Number of pages: 15

Pages: 579–593

Publication date: 2018

Peer-reviewed: Yes

#### **Publication information**

Journal: Structural and Multidisciplinary Optimization

Volume: 57  
Issue number: 2  
ISSN (Print): 1615-147X  
Ratings:

Scopus rating (2018): CiteScore 4.28 SJR 1.835 SNIP 1.862

Original language: English

ASJC Scopus subject areas: Control and Systems Engineering, Software, Computer Science Applications, Computer Graphics and Computer-Aided Design, Control and Optimization

Keywords: Discrete optimization, Frame structures, Global optimization, Mixed-integer linear programming, Sizing optimization

DOIs:

10.1007/s00158-017-1770-9

Source: Scopus

Source ID: 85026724545

Research output: Contribution to journal › Article › Scientific › peer-review

### **On the degeneracy of the Randić entropy and related graph measures**

Numerous quantitative graph measures have been defined and applied in various disciplines. Such measures may be differentiated according to whether they are information-theoretic or non-information-theoretic. In this paper, we examine an important property of Randić entropy, an information-theoretic measure, and examine some related graph measures based on random roots. In particular, we investigate the degeneracy of these structural graph measures and discuss numerical results. Finally, we draw some conclusions about the measures' applicability to deterministic and non-deterministic networks.

#### **General information**

Publication status: E-pub ahead of print

MoE publication type: A1 Journal article-refereed

Organisations: Faculty of Biomedical Sciences and Engineering, Research group: Computational Medicine and Statistical Learning Laboratory (CMSL), Research group: Predictive Society and Data Analytics (PSDA), University of Applied Sciences Upper Austria, School of Management, Nankai University, Hall in Tyrol, The City College of New York (CUNY), Production and Operations Management, Tianjin University of Technology

Contributors: Dehmer, M., Chen, Z., Mowshowitz, A., Jodlbauer, H., Emmert-Streib, F., Shi, Y., Tripathi, S., Xia, C.

Publication date: 2018

Peer-reviewed: Yes

#### **Publication information**

Journal: Information Sciences

ISSN (Print): 0020-0255

Ratings:

Scopus rating (2018): CiteScore 6.9 SJR 1.62 SNIP 2.636

Original language: English

ASJC Scopus subject areas: Software, Control and Systems Engineering, Theoretical Computer Science, Computer Science Applications, Information Systems and Management, Artificial Intelligence

Keywords: Data science, Graphs, Networks, Quantitative graph theory, Structural graph measures, Structural network analysis

DOIs:

10.1016/j.ins.2018.11.011

#### **Bibliographical note**

EXT="Tripathi, Shailesh"

Source: Scopus

Source ID: 85057760552

Research output: Contribution to journal › Article › Scientific › peer-review

### **Reduced Order Internal Models in the Frequency Domain**

The internal model principle states that all robustly regulating controllers must contain a suitably reduplicated internal model of the signal to be regulated. Using frequency domain methods, we show that the number of the copies may be reduced if the class of perturbations in the problem is restricted. We present a two stage design procedure for a simple controller containing a reduced order internal model achieving robust regulation. The results are illustrated with an example of a five tank laboratory process where a restricted class of perturbations arises naturally.

#### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Mathematics, Research group: Computer Science and Applied Logics  
Contributors: Laakkonen, P., Paunonen, L.  
Pages: 1806-1812  
Publication date: 2018  
Peer-reviewed: Yes

#### Publication information

Journal: IEEE Transactions on Automatic Control

Volume: 63

Issue number: 6

ISSN (Print): 0018-9286

Ratings:

Scopus rating (2018): CiteScore 6.72 SJR 3.233 SNIP 2.626

Original language: English

ASJC Scopus subject areas: Control and Systems Engineering, Computer Science Applications, Electrical and Electronic Engineering

Keywords: Adaptive control, Aerospace electronics, Frequency control, Frequency-domain analysis, Linear systems, Mathematical model, model/controller reduction, output tracking, robust control, Robustness, Uncertainty

Electronic versions:

LaaPau17

DOIs:

10.1109/TAC.2017.2751520

URLs:

<http://urn.fi/URN:NBN:fi:tuni-201910023648>

Source: Scopus

Source ID: 85030308353

Research output: Contribution to journal > Article > Scientific > peer-review

#### Robust linearized combined metrics of image visual quality

Existing full-reference metrics still do not provide a desirable degree of adequacy to a human visual perception, for evaluation of images with different types and levels of distortions. One reason for this is that it is difficult to incorporate the peculiarities of human visual system in the metrics design. In this paper, a robust approach to full-reference metrics' design is proposed, based on a combination of several existing full-reference metrics. A preliminary linearization (fitting) of the dependence of MOS with respect to the components metrics is performed in order to compensate shortcomings of each component. The proposed method is tested on several known databases, and demonstrate better performance than existing metrics.

#### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Signal Processing, Kharkiv National Aerospace University

Contributors: Ieremeiev, O., Lukin, V., Ponomarenko, N., Egiazarian, K.

Publication date: 2018

#### Host publication information

Title of host publication: Electronic Imaging : Image Processing: Algorithms and Systems XVI

Publisher: Society for Imaging Science and Technology

ASJC Scopus subject areas: Computer Graphics and Computer-Aided Design, Computer Science Applications, Human-Computer Interaction, Software, Electrical and Electronic Engineering, Atomic and Molecular Physics, and Optics

Keywords: Combined metrics, Full-reference metrics, Image visual quality assessment, Robust metrics

DOIs:

10.2352/ISSN.2470-1173.2018.13.IPAS-260

#### Bibliographical note

jufoid=84313

EXT="Ponomarenko, Nikolay"

EXT="Lukin, Vladimir"

Source: Scopus

Source ID: 85052901571

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

#### Robust Regulation of Infinite-Dimensional Port-Hamiltonian Systems

We will give general sufficient conditions under which a controller achieves robust regulation for a boundary control and observation system. Utilizing these conditions we construct a minimal order robust controller for an arbitrary order impedance passive linear port-Hamiltonian system. The theoretical results are illustrated with a numerical example where

we implement a controller for a one-dimensional Euler-Bernoulli beam with boundary controls and boundary observations.

#### General information

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Mathematics, Research group: Computer Science and Applied Logics

Contributors: Humaloja, J., Paunonen, L.

Publication date: 2018

Peer-reviewed: Yes

Early online date: 31 Aug 2017

#### Publication information

Journal: IEEE Transactions on Automatic Control

Volume: 63

Issue number: 5

ISSN (Print): 0018-9286

Ratings:

Scopus rating (2018): CiteScore 6.72 SJR 3.233 SNIP 2.626

Original language: English

ASJC Scopus subject areas: Control and Systems Engineering, Computer Science Applications, Electrical and Electronic Engineering

Keywords: Aerospace electronics, Closed loop systems, distributed parameter systems, Generators, Impedance, linear systems, port-Hamiltonian systems, robust control, Robustness, Transfer functions

Electronic versions:

08023782

DOIs:

10.1109/TAC.2017.2748055

URLs:

<http://urn.fi/URN:NBN:fi:ty-201710162011>

Source: Scopus

Source ID: 85029173308

Research output: Contribution to journal › Article › Scientific › peer-review

#### System-level analysis of IEEE 802.11ah technology for unsaturated MTC traffic

Enabling the Internet of Things, machine-type communications (MTC) is a next big thing in wireless innovation. In this work, we concentrate on the attractive benefits offered by the emerging IEEE 802.11ah technology to support a large number of MTC devices with extended communication ranges. We begin with a comprehensive overview of the novel features introduced by the latest IEEE 802.11ah specifications followed by the development of a powerful mathematical framework capturing the essential properties of a massive MTC deployment with unsaturated traffic patterns. Further, we compare our analytical findings for a characteristic MTC scenario against respective system-level simulations across a number of important performance indicators. Our analytical results provide adequate performance predictions even when simulations are challenged by the excessive computational complexity. In addition, we study the novel IEEE 802.11ah mechanisms offering improved support for massive device populations and conclude on their expected performance.

#### General information

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Electronics and Communications Engineering, Ericsson Research

Contributors: Ometov, A., Daneshfar, N., Hazmi, A., Andreev, S., Del Carpio, L. F., Amin, P., Torsner, J., Koucheryavy, Y., Valkama, M.

Number of pages: 14

Pages: 269-282

Publication date: 2018

Peer-reviewed: Yes

#### Publication information

Journal: International Journal of Sensor Networks

Volume: 26

Issue number: 4

ISSN (Print): 1748-1279

Ratings:

Scopus rating (2018): CiteScore 1.26 SJR 0.269 SNIP 0.532

Original language: English

ASJC Scopus subject areas: Control and Systems Engineering, Computer Science Applications, Computer Networks and Communications, Electrical and Electronic Engineering

Keywords: Analytical modelling, Delay, IEEE 802.11ah, MTC/M2M, Power consumption, Simulations, Throughput, Unsaturated traffic

DOIs:

10.1504/IJSNET.2018.090480

#### **Bibliographical note**

INT=elt"Daneshfar, Nader"

Source: Scopus

Source ID: 8504427791

Research output: Contribution to journal › Article › Scientific › peer-review

#### **Transmit Power Optimization and Feasibility Analysis of Self-backhauling Full-Duplex Radio Access Systems**

We analyze an inband full-duplex access node that is serving mobile users while simultaneously connecting to a core network over a wireless backhaul link, utilizing the same frequency band for all communication tasks. Such wireless self-backhauling is an intriguing option for the next generation wireless systems since a wired backhaul connection might not be economically viable if the access nodes are deployed densely. In particular, we derive the optimal transmit power allocation for such a system in closed form under Quality-of-Service (QoS) requirements, which are defined in terms of the minimum data rates for each mobile user. For comparison, the optimal transmit power allocation is solved also for two reference scenarios: a purely half-duplex access node, and a relay-type full-duplex access node. Based on the obtained expressions for the optimal transmit powers, we then show that the systems utilizing a full-duplex capable access node have a fundamental feasibility boundary, meaning that there are circumstances under which the QoS requirements cannot be fulfilled using finite transmit powers. This fundamental feasibility boundary is also derived in closed form. The feasibility boundaries and optimal transmit powers are then numerically evaluated in order to compare the different communication schemes. In general, utilizing the purely full-duplex access node results in the lowest transmit powers for all the communicating parties, although there are some network geometries under which such a system is not capable of reaching the required minimum data rates. In addition, the numerical results indicate that a full-duplex capable access node is best suited for relatively small cells.

#### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Electronics and Communications Engineering, Rice University

Contributors: Korpi, D., Riihonen, T., Sabharwal, A., Valkama, M.

Pages: 4219-4236

Publication date: 2018

Peer-reviewed: Yes

Early online date: 7 Apr 2018

#### **Publication information**

Journal: IEEE Transactions on Wireless Communications

Volume: 17

Issue number: 6

ISSN (Print): 1536-1276

Ratings:

Scopus rating (2018): CiteScore 7.79 SJR 1.692 SNIP 2.5

Original language: English

ASJC Scopus subject areas: Computer Science Applications, Electrical and Electronic Engineering, Applied Mathematics

Keywords: full-duplex wireless, massive MIMO, Self-backhauling, transmit power optimization

Electronic versions:

Author's pre-print version

DOIs:

10.1109/TWC.2018.2821682

URLs:

<http://urn.fi/URN:NBN:fi:tyy-201806051921>

Source: Scopus

Source ID: 85045199222

Research output: Contribution to journal › Article › Scientific › peer-review

#### **Fast Water Simulation Methods for Games**

Easy-To-use physics engines have created a whole new source of emergence and fun for digital games. Water simulation could add another similar emergent interaction element in 3D games. Several barriers that prevent this step for games with large playing areas are analysed. One of the most important problems is how to couple the water and physics simulations. Our implementation of the extremely fast virtual pipe method is compared with more sophisticated solvers. Also, two different implementations of physics coupling are compared.

### General information

Publication status: Published  
MoE publication type: A1 Journal article-refereed  
Organisations: Pervasive Computing  
Contributors: Kellomäki, T.  
Publication date: 1 Dec 2017  
Peer-reviewed: Yes

### Publication information

Journal: Computers in Entertainment  
Volume: 16  
Issue number: 1  
Article number: 2  
ISSN (Print): 1544-3574  
Ratings:  
Scopus rating (2017): CiteScore 0.5 SJR 0.133 SNIP 0.541  
Original language: English  
ASJC Scopus subject areas: Computer Science Applications  
Keywords: Fluid simulation, Games, Pipe method, Realtime, Rigid body coupling, Water simulation  
DOIs:  
10.1145/2700533  
Source: Scopus  
Source ID: 85040027871  
Research output: Contribution to journal › Article › Scientific › peer-review

### How developers perceive smells in source code: A replicated study

Context. In recent years, smells, also referred to as bad smells, have gained popularity among developers. However, it is still not clear how harmful they are perceived from the developers' point of view. Many developers talk about them, but only few know what they really are, and even fewer really take care of them in their source code. Objective. The goal of this work is to understand the perceived criticality of code smells both in theory, when reading their description, and in practice. Method. We executed an empirical study as a differentiated external replication of two previous studies. The studies were conducted as surveys involving only highly experienced developers (63 in the first study and 41 in the second one). First the perceived criticality was analyzed by proposing the description of the smells, then different pieces of code infected by the smells were proposed, and finally their ability to identify the smells in the analyzed code was tested. Results. According to our knowledge, this is the largest study so far investigating the perception of code smells with professional software developers. The results show that developers are very concerned about code smells in theory, nearly always considering them as harmful or very harmful (17 out of 23 smells). However, when they were asked to analyze an infected piece of code, only few infected classes were considered harmful and even fewer were considered harmful because of the smell. Conclusions. The results confirm our initial hypotheses that code smells are perceived as more critical in theory but not as critical in practice.

### General information

Publication status: Published  
MoE publication type: A1 Journal article-refereed  
Organisations: Free University of Bolzano-Bozen, Free University of Bozen-Bolzano  
Contributors: Taibi, D., Janes, A., Lenarduzzi, V.  
Number of pages: 13  
Pages: 223-235  
Publication date: 1 Dec 2017  
Peer-reviewed: Yes

### Publication information

Journal: Information and Software Technology  
Volume: 92  
ISSN (Print): 0950-5849  
Ratings:  
Scopus rating (2017): CiteScore 4.04 SJR 0.581 SNIP 2.615  
Original language: English  
ASJC Scopus subject areas: Software, Information Systems, Computer Science Applications  
Keywords: Antipatterns, Bad smells, Code smells, Refactoring, Software maintenance  
DOIs:  
10.1016/j.infsof.2017.08.008  
Source: Scopus  
Source ID: 85028762206  
Research output: Contribution to journal › Article › Scientific › peer-review

### **Quantitative Graph Theory: A new branch of graph theory and network science**

In this paper, we describe some highlights of the new branch QUANTITATIVE GRAPH THEORY and explain its significant different features compared to classical graph theory. The main goal of quantitative graph theory is the structural quantification of information contained in complex networks by employing a measurement approach based on numerical invariants and comparisons. Furthermore, the methods as well as the networks do not need to be deterministic but can be statistic. As such this complements the field of classical graph theory, which is descriptive and deterministic in nature. We provide examples of how quantitative graph theory can be used for novel applications in the context of the overarching concept network science.

#### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Research group: Computational Medicine and Statistical Learning Laboratory (CMSL), Faculty of Biomedical Sciences and Engineering, BioMediTech, Research group: Predictive Society and Data Analytics (PSDA), Nankai University

Contributors: Dehmer, M., Emmert-Streib, F., Shi, Y.

Number of pages: 6

Pages: 575-580

Publication date: 1 Dec 2017

Peer-reviewed: Yes

#### **Publication information**

Journal: Information Sciences

Volume: 418-419

ISSN (Print): 0020-0255

Ratings:

Scopus rating (2017): CiteScore 5.25 SJR 1.635 SNIP 2.257

Original language: English

ASJC Scopus subject areas: Control and Systems Engineering, Theoretical Computer Science, Software, Computer Science Applications, Information Systems and Management, Artificial Intelligence

Keywords: Data Science, Graphs, Networks, Quantitative Graph Theory, Statistics

DOIs:

10.1016/j.ins.2017.08.009

URLs:

<https://arxiv.org/abs/1710.05660>

Source: Scopus

Source ID: 85027400753

Research output: Contribution to journal > Article > Scientific > peer-review

### **DoGlycans-Tools for Preparing Carbohydrate Structures for Atomistic Simulations of Glycoproteins, Glycolipids, and Carbohydrate Polymers for GROMACS**

Carbohydrates constitute a structurally and functionally diverse group of biological molecules and macromolecules. In cells they are involved in, e.g., energy storage, signaling, and cell-cell recognition. All of these phenomena take place in atomistic scales, thus atomistic simulation would be the method of choice to explore how carbohydrates function.

However, the progress in the field is limited by the lack of appropriate tools for preparing carbohydrate structures and related topology files for the simulation models. Here we present tools that fill this gap. Applications where the tools discussed in this paper are particularly useful include, among others, the preparation of structures for glycolipids, nanocellulose, and glycans linked to glycoproteins. The molecular structures and simulation files generated by the tools are compatible with GROMACS.

#### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Physics, Research group: Biological Physics and Soft Matter, University of Helsinki, Institute of Organic Chemistry and Biochemistry, Academy of Sciences of the Czech Republic, MEMPHYS - Centre for Biomembrane Physics, University of Southern Denmark, Laboratory of Physics

Contributors: Danne, R., Poojari, C., Martinez-Seara, H., Rissanen, S., Lolicato, F., Róg, T., Vattulainen, I.

Number of pages: 6

Pages: 2401-2406

Publication date: 23 Oct 2017

Peer-reviewed: Yes

#### **Publication information**

Journal: Journal of Chemical Information and Modeling

Volume: 57

Issue number: 10

ISSN (Print): 1549-9596

Ratings:

Scopus rating (2017): CiteScore 3.9 SJR 1.349 SNIP 1.216

Original language: English

ASJC Scopus subject areas: Chemistry(all), Chemical Engineering(all), Computer Science Applications, Library and Information Sciences

DOIs:

10.1021/acs.jcim.7b00237

Source: Scopus

Source ID: 85031999962

Research output: Contribution to journal › Article › Scientific › peer-review

### **Adaptive and nonlinear control of discharge pressure for variable displacement axial piston pumps**

This paper proposes, for the first time without using any linearization or order reduction, an adaptive and model-based discharge pressure control design for the variable displacement axial piston pumps (VDAPPs), whose dynamical behaviors are highly nonlinear and can be described by a fourth-order differential equation. The rigorous stability proof, with an asymptotic convergence, is given for the entire system. In the proposed novel controller design method, the specifically designed stabilizing terms constitute an essential core to cancel out all the stability-preventing terms. The experimental results reveal that rapid parameter adaptation significantly improves the feedback signal tracking precision compared to a known-parameter controller design. In the comparative experiments, the adaptive controller design demonstrates the state-of-the-art discharge pressure control performance, enabling a possibility for energy consumption reductions in hydraulic systems driven with VDAPP.

### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Automation and Hydraulic Engineering, Research group: Mobile manipulation

Contributors: Koivumäki, J., Mattila, J.

Publication date: 1 Oct 2017

Peer-reviewed: Yes

### **Publication information**

Journal: Journal of Dynamic Systems, Measurement and Control: Transactions of the ASME

Volume: 139

Issue number: 10

Article number: 101008

ISSN (Print): 0022-0434

Ratings:

Scopus rating (2017): CiteScore 1.74 SJR 0.618 SNIP 1.024

Original language: English

ASJC Scopus subject areas: Control and Systems Engineering, Information Systems, Instrumentation, Mechanical Engineering, Computer Science Applications

DOIs:

10.1115/1.4036537

Source: Scopus

Source ID: 85021623538

Research output: Contribution to journal › Article › Scientific › peer-review

### **An ensemble of visual features for Gaussians of local descriptors and non-binary coding for texture descriptors**

This paper presents an improved version of a recent state-of-the-art texture descriptor called Gaussians of Local Descriptors (GOLD), which is based on a multivariate Gaussian that models the local feature distribution that describes the original image. The full rank covariance matrix, which lies on a Riemannian manifold, is projected on the tangent Euclidean space and concatenated to the mean vector for representing a given image. In this paper, we test the following features for describing the original image: scale-invariant feature transform (SIFT), histogram of gradients (HOG), and weber's law descriptor (WLD). To improve the baseline version of GOLD, we describe the covariance matrix using a set of visual features that are fed into a set of Support Vector Machines (SVMs). The SVMs are combined by sum rule. The scores obtained by an SVM trained using the original GOLD approach and the SVMs trained with visual features are then combined by sum rule. Experiments show that our proposed variant outperforms the original GOLD approach. The superior performance of the proposed system is validated across a large set of datasets. Particularly interesting is the performance obtained in two widely used person re-identification datasets, CAVIAR4REID and IAS, where the proposed GOLD variant is coupled with a state-of-the-art ensemble to obtain an improvement of performance on these two datasets. Moreover, we performed further tests that combine GOLD with non-binary features (local ternary/quinary patterns) and

deep transfer learning. The fusion among SVMs trained with deep features and the SVMs trained using the ternary/quinary coding ensemble is demonstrated to obtain a very high performance across datasets. The MATLAB code for the ensemble of classifiers and for the extraction of the features will be publicly available<sup>1</sup> to other researchers for future comparisons.

#### General information

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Faculty of Biomedical Sciences and Engineering, Research group: Computational Biophysics and Imaging Group, BioMediTech, Università degli Studi di Padova, Italy, BioMediTech Institute and Faculty of Biomedical Sciences and Engineering, Missouri State University

Contributors: Nanni, L., Paci, M., Brahnam, S., Ghidoni, S.

Number of pages: 13

Pages: 27-39

Publication date: 1 Oct 2017

Peer-reviewed: Yes

#### Publication information

Journal: Expert Systems with Applications

Volume: 82

ISSN (Print): 0957-4174

Ratings:

Scopus rating (2017): CiteScore 5.22 SJR 1.271 SNIP 2.44

Original language: English

ASJC Scopus subject areas: Engineering(all), Computer Science Applications, Artificial Intelligence

Keywords: Ensemble of descriptors, Image classification, Image processing, Person re-identification, Texture  
DOIs:

10.1016/j.eswa.2017.03.065

Source: Scopus

Source ID: 85017166137

Research output: [Contribution to journal](#) > [Article](#) > [Scientific](#) > [peer-review](#)

#### Highly unique network descriptors based on the roots of the permanental polynomial

In this paper, we examine the zeros of permanental polynomials as highly unique network descriptors. We employ exhaustively generated networks and demonstrate that our defined graph measures based on the moduli of the zeros of permanental polynomials are quite efficient when distinguishing graphs structurally. In this work, we continue with a line of research that relates to the search of almost complete graph invariants. These highly unique network measures may serve as a powerful tool for tackling graph isomorphism.

#### General information

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Faculty of Biomedical Sciences and Engineering, Research group: Computational Medicine and Statistical Learning Laboratory (CMSL), BioMediTech, Research group: Predictive Society and Data Analytics (PSDA), Institute for Bioinformatics and Translational Research, Laboratory of Biosystem Dynamics, BioMediTech Institute and Faculty of Biomedical Sciences and Engineering, Universität der Bundeswehr München, Nankai University, Babes-Bolyai University  
Contributors: Dehmer, M., Emmert-Streib, F., Hu, B., Shi, Y., Stefu, M., Tripathi, S.

Number of pages: 6

Pages: 176-181

Publication date: 1 Oct 2017

Peer-reviewed: Yes

#### Publication information

Journal: Information Sciences

Volume: 408

ISSN (Print): 0020-0255

Ratings:

Scopus rating (2017): CiteScore 5.25 SJR 1.635 SNIP 2.257

Original language: English

ASJC Scopus subject areas: Control and Systems Engineering, Theoretical Computer Science, Software, Computer Science Applications, Information Systems and Management, Artificial Intelligence

Keywords: Data science, Graphs, Networks, Quantitative graph theory, Statistics

DOIs:

10.1016/j.ins.2017.04.041

Source: Scopus

Source ID: 85018769218

Research output: Contribution to journal › Article › Scientific › peer-review

### **On the Performance of Visible Light Communication Systems with Non-Orthogonal Multiple Access**

Visible light communication (VLC) has been proposed as a promising and efficient solution to indoor ubiquitous broadband connectivity. In this paper, non-orthogonal multiple access, which has been recently introduced as an effective scheme for fifth generation (5G) wireless networks, is considered in the context of VLC systems under different channel uncertainty models. To this end, we first derive a novel closed-form expression for the bit-error-rate (BER) under perfect channel state information (CSI). Capitalizing on this, we then quantify the effect of noisy and outdated CSI by deriving a simple and accurate approximation for the former and a tight upper bound for the latter. The offered results are corroborated by respective results from extensive Monte Carlo simulations and assist in developing useful insights on the effect of imperfect CSI knowledge on the overall system performance. Furthermore, it was shown that while noisy CSI leads to slight degradation in the BER performance, outdated CSI can cause considerable performance degradation, if the order of the users' channel gains change due to the involved mobility.

#### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Electronics and Communications Engineering, Research group: Wireless Communications and Positioning, Khalifa University, Department of Electrical and Computer Engineering, University of Surrey, Aristotle University of Thessaloniki

Contributors: Marshoud, H., Sofotasios, P. C., Muhaidat, S., Karagiannidis, G. K., Sharif, B. S.

Number of pages: 15

Pages: 6350-6364

Publication date: 1 Oct 2017

Peer-reviewed: Yes

#### **Publication information**

Journal: IEEE Transactions on Wireless Communications

Volume: 16

Issue number: 10

ISSN (Print): 1536-1276

Ratings:

Scopus rating (2017): CiteScore 6.43 SJR 1.246 SNIP 2.451

Original language: English

ASJC Scopus subject areas: Computer Science Applications, Electrical and Electronic Engineering, Applied Mathematics

Keywords: bit-error-rate, dimming control, imperfect channel state information, non-orthogonal multiple access, Visible light communications

DOIs:

10.1109/TWC.2017.2722441

Source: Scopus

Source ID: 85023196523

Research output: Contribution to journal › Article › Scientific › peer-review

### **Predicting academic success based on learning material usage**

In this work, we explore students' usage of online learning material as a predictor of academic success. In the context of an introductory programming course, we recorded the amount of time that each element such as a text paragraph or an image was visible on the students' screen. Then, we applied machine learning methods to study to what extent material usage predicts course outcomes. Our results show that the time spent with each paragraph of the online learning material is a moderate predictor of student success even when corrected for student time-on-task, and that the information can be used to identify at-risk students. The predictive performance of the models is dependent on the quantity of data, and the predictions become more accurate as the course progresses. In a broader context, our results indicate that course material usage can be used to predict academic success, and that such data can be collected in-situ with minimal interference to the students' learning process.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Pervasive Computing, Research area: Software engineering, University of Helsinki

Contributors: Leppänen, L., Leinonen, J., Ihanntola, P., Hellas, A.

Number of pages: 6

Pages: 13-18

Publication date: 27 Sep 2017

### Host publication information

Title of host publication: SIGITE 2017 - Proceedings of the 18th Annual Conference on Information Technology Education  
Publisher: ACM  
ISBN (Electronic): 9781450351003  
ASJC Scopus subject areas: Computational Theory and Mathematics, Artificial Intelligence, Computer Science Applications, Software  
Keywords: Academic success prediction, Educational data mining, Element-level web logs, Online learning materials, Web log mining  
DOIs:  
10.1145/3125659.3125695  
Source: Scopus  
Source ID: 85037111531  
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

### The effect of lake bottom sediment layers on radionuclide transport from bedrock to biosphere and doses to humans

#### General information

Publication status: Published  
Organisations: Pori, Research group: Data-analytics and Optimization  
Contributors: Pohjola, J., Turunen, J., Lipping, T.  
Number of pages: 2  
Pages: 439-440  
Publication date: 3 Sep 2017  
Peer-reviewed: Unknown  
Event: Paper presented at 4th International Conference on Radioecology & Environmental Radioactivity, Berlin, Germany.  
ASJC Scopus subject areas: Computer Science Applications

#### Bibliographical note

Abstracts Book ISBN: 978-2-9545237-7-4  
Research output: Other conference contribution › Paper, poster or abstract › Scientific

### Energy Efficiency Maximization of Full-Duplex Two-Way Relay with Non-Ideal Power Amplifiers and Non-Negligible Circuit Power

In this paper, we maximize the energy efficiency (EE) of full-duplex (FD) two-way relay (TWR) systems under non-ideal power amplifiers (PAs) and non-negligible transmission-dependent circuit power. We start with the case where only the relay operates full duplex and two timeslots are required for TWR. Then, we extend to the advanced case, where the relay and the two nodes all operate full duplex, and accomplish TWR in a single timeslot. In both cases, we establish the intrinsic connections between the optimal transmit powers and durations, based on which the original non-convex EE maximization can be convexified and optimally solved. Simulations show the superiority of FD-TWR in terms of EE, especially when traffic demand is high. The simulations also reveal that the maximum EE of FD-TWR is more sensitive to the PA efficiency, than it is to self-cancellation. The full FD design of FD-TWR is susceptible to traffic imbalance, while the design with only the relay operating in the FD mode exhibits strong tolerance.

#### General information

Publication status: Published  
MoE publication type: A1 Journal article-refereed  
Organisations: Electronics and Communications Engineering, Research group: Wireless Communications and Positioning, Beijing University of Posts and Telecommunications, CSIRO Energy Centre, Aalto University  
Contributors: Cui, Q., Zhang, Y., Ni, W., Valkama, M., Jantti, R.  
Number of pages: 15  
Pages: 6264-6278  
Publication date: 1 Sep 2017  
Peer-reviewed: Yes

#### Publication information

Journal: IEEE Transactions on Wireless Communications  
Volume: 16  
Issue number: 9  
ISSN (Print): 1536-1276  
Ratings:  
Scopus rating (2017): CiteScore 6.43 SJR 1.246 SNIP 2.451  
Original language: English  
ASJC Scopus subject areas: Computer Science Applications, Applied Mathematics, Electrical and Electronic Engineering  
Keywords: Energy efficiency, full-duplex, non-ideal power amplifier, non-negligible circuit power, two-way relay

DOIs:

10.1109/TWC.2017.2721372

Source: Scopus

Source ID: 85023192668

Research output: Contribution to journal › Article › Scientific › peer-review

### **Robust Output Regulation for Continuous-Time Periodic Systems**

We consider controller design for robust output tracking and disturbance rejection for continuous-time periodic linear systems with periodic reference and disturbance signals. As our main results, we present four different controllers: a feedforward control law and a discrete-time dynamic error feedback controller for output tracking and disturbance rejection, a robust discrete-time feedback controller, and finally a discrete-time feedback controller that achieves approximate robust output tracking and disturbance rejection. The presented constructions are also new for time-invariant finite and infinite-dimensional systems. The results are illustrated with two examples: a periodically time-dependent system of harmonic oscillators and a nonautonomous two-dimensional heat equation with boundary disturbance.

#### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Mathematics, Research group: Computer Science and Applied Logics

Contributors: Paunonen, L.

Number of pages: 13

Pages: 4363-4375

Publication date: 1 Sep 2017

Peer-reviewed: Yes

#### **Publication information**

Journal: IEEE Transactions on Automatic Control

Volume: 62

Issue number: 9

ISSN (Print): 0018-9286

Ratings:

Scopus rating (2017): CiteScore 5.9 SJR 3.433 SNIP 3.046

Original language: English

ASJC Scopus subject areas: Control and Systems Engineering, Computer Science Applications, Electrical and Electronic Engineering

Keywords: Controller design, feedback, periodic system, robust output regulation

Electronic versions:

Pau17a

DOIs:

10.1109/TAC.2017.2654968

URLs:

<http://urn.fi/URN:NBN:fi:tuni-201910023646>

Source: Scopus

Source ID: 85029869750

Research output: Contribution to journal › Article › Scientific › peer-review

### **The Effect of Ultrasonic Dispersion on the Surface Chemistry of Carbon Nanotubes in the Jeffamine D-230 Polyetheramine Medium**

This paper studies changes in the surface chemistry of carbon nanotubes (CNTs) where they are under ultrasonication process in Jeffamine D-230 polyetheramine medium. Jeffamine is used as a curing agent in the nanocomposite manufacturing process. In the nanocomposite technology, ultrasonication process is employed as a method for dispersion of CNTs in a suspension. This research tries to investigate the effect of ultrasonic dispersion with different time and energy on the surface chemistry of CNTs by Fourier transform infrared spectroscopy. The results show ultrasonication of CNTs in the Jeffamine medium leads to significant oxidation and hydration along creating new chemical bonds on the CNTs surface.

#### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Materials Science, Research group: Plastics and Elastomer Technology

Contributors: Shahshahan, M., Keinänen, P., Vuorinen, J.

Number of pages: 4

Pages: 741-744

Publication date: 1 Sep 2017

Peer-reviewed: Yes

### Publication information

Journal: IEEE Transactions on Nanotechnology

Volume: 16

Issue number: 5

ISSN (Print): 1536-125X

Ratings:

Scopus rating (2017): CiteScore 2.86 SJR 0.572 SNIP 1.111

Original language: English

ASJC Scopus subject areas: Computer Science Applications, Electrical and Electronic Engineering

Keywords: Carbon nanotubes, characterization of functional groups, dispersion of carbon nanotubes, Fourier transform infrared (FTIR) spectroscopy, functionalization, optical spectroscopy, sonicated carbon nanotubes, sonochemistry, surface chemistry of carbon nanotubes, ultrasonication

DOIs:

10.1109/TNANO.2017.2691904

### Bibliographical note

EXT="Shahshahan, Mohsen"

Source: Scopus

Source ID: 85029628879

Research output: Contribution to journal > Article > Scientific > peer-review

### Comparison of time metrics in programming

Research on the indicators of student performance in introductory programming courses has traditionally focused on individual metrics and specific behaviors. These metrics include the amount of time and the quantity of steps such as code compilations, the number of completed assignments, and metrics that one cannot acquire from a programming environment. However, the differences in the predictive powers of different metrics and the cross-metric correlations are unclear, and thus there is no generally preferred metric of choice for examining time on task or effort in programming. In this work, we contribute to the stream of research on student time on task indicators through the analysis of a multi-source dataset that contains information about students' use of a programming environment, their use of the learning material as well as self-reported data on the amount of time that the students invested in the course and per-Assignment perceptions on workload, educational value and difficulty. We compare and contrast metrics from the dataset with course performance. Our results indicate that traditionally used metrics from the same data source tend to form clusters that are highly correlated with each other, but correlate poorly with metrics from other data sources. Thus, researchers should utilize multiple data sources to gain a more accurate picture of students' learning.

### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Pervasive Computing, Research area: Software engineering, University of Helsinki

Contributors: Leinonen, J., Leppänen, L., Ihantola, P., Hellas, A.

Number of pages: 9

Pages: 200-208

Publication date: 14 Aug 2017

### Host publication information

Title of host publication: ICER 2017 - Proceedings of the 2017 ACM Conference on International Computing Education Research

Publisher: ACM

ISBN (Electronic): 9781450349680

ASJC Scopus subject areas: Computational Theory and Mathematics, Computer Science Applications, Software, Education

DOIs:

10.1145/3105726.3106181

Source: Scopus

Source ID: 85030162903

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

### Indirect NO<sub>x</sub> emission monitoring in natural gas fired boilers

New emission regulations will increase the need for inexpensive NO<sub>x</sub> emission monitoring solutions also in smaller power plants. The objective in this study is to find easily maintainable and transparent but still valid models to predict NO<sub>x</sub> emissions in natural gas fired hot water boilers utilizing existing process instrumentation. With a focus on long-term applicability in practical installations, the performance of linear regression is compared in two municipal 43 MW boilers with three widely used nonlinear methods: multilayer perceptron, support vector regression, and fuzzy inference system.

The linear models were the most applicable providing the best estimation results (relative error of 1 applications in practise. However, each boiler model should be identified individually.

#### General information

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Automation and Hydraulic Engineering, Research area: Measurement Technology and Process Control, Helen Ltd.

Contributors: Korpela, T., Kumpulainen, P., Majanne, Y., Häyrinen, A., Lautala, P.

Number of pages: 15

Pages: 11-25

Publication date: 1 Aug 2017

Peer-reviewed: Yes

#### Publication information

Journal: Control Engineering Practice

Volume: 65

ISSN (Print): 0967-0661

Ratings:

Scopus rating (2017): CiteScore 3.42 SJR 1.069 SNIP 1.905

Original language: English

ASJC Scopus subject areas: Control and Systems Engineering, Computer Science Applications, Applied Mathematics, Electrical and Electronic Engineering

Keywords: Combustion, Estimation, Modelling, Monitoring, Natural gas, NO, Soft sensor

Electronic versions:

Indirect NOx Emission Monitoring in Natural Gas Fired Boilers. Embargo ended: 29/05/19

DOIs:

10.1016/j.conengprac.2017.04.013

URLs:

<http://urn.fi/URN:NBN:fi:tty-201708021643>. Embargo ended: 29/05/19

Source: Scopus

Source ID: 85019718306

Research output: Contribution to journal > Article > Scientific > peer-review

#### Mobility aware eMBMS management in urban 5G-oriented systems

The demand for video services in mobile networks is rapidly increasing. In fact, is expected that video transmissions will account for more than 69% of mobile data traffic by 2018[1]. Along these lines, the challenging requirements of such multimedia applications and, at the same time, the centralized organization typical of current cellular technologies motivate the investigation of enhanced advanced driver assistance systems (ADAS) for supporting the driver experience in terms of safety driving comfort. In this context, in this paper we focus our attention of a new realistic scenario, in which all users share video contents from the surrounding environment with the aim to create a global 3D video content useful for ADAS systems. Once that such video content is created, we assume that the LTE eNodeB may come in help for making it available through streaming transmissions towards all vehicles in that area with the use of Multimedia Broadcast Multicast Services (MBMS). Obtained results, show that multicast transmissions based on subgrouping techniques are able to overcome the legacy solutions where conservative and opportunistic schemes are used.

#### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Electronics and Communications Engineering, Dept. of Electrical and Electronic Engineering, Università degli Studi di Reggio Calabria, Peoples' Friendship University of Russia

Contributors: Desogus, C., Fadda, M., Murrioni, M., Araniti, G., Orsino, A.

Publication date: 19 Jul 2017

#### Host publication information

Title of host publication: 2017 IEEE International Symposium on Broadband Multimedia Systems and Broadcasting, BMSB 2017

Publisher: IEEE

ISBN (Electronic): 9781509049370

ASJC Scopus subject areas: Computer Graphics and Computer-Aided Design, Computer Networks and Communications, Computer Science Applications, Human-Computer Interaction, Electrical and Electronic Engineering, Media Technology, Communication

Keywords: LTE, MBMS, Multicast Grouping, V2X, Video Streaming

DOIs:

10.1109/BMSB.2017.7986140

### Bibliographical note

jufoid=72046

INT=ELT, "Orsino, A."

Source: Scopus

Source ID: 85027268444

Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

### Monitoring pH, temperature and humidity in long-term stem cell culture in CO<sub>2</sub> incubator

Cell culture in stem cell research is on the rise, not only for basic research but also for its potential medical and therapeutic applications. Monitoring culture process using sensors throughout the culture helps to optimize culture conditions for optimal growth and maximize yield from the cells. Further, the sensor data gives insight into developing better cell culture systems. Typical stem cell culture platforms, e.g. well plates or flasks, cannot be easily equipped with sensors and impose many challenges in periodic process measurements in a CO<sub>2</sub> incubator. We present an incubator compatible modular measurement system with three sensors, to monitor pH, temperature and humidity continuously throughout the culture. Sensors are assembled around a flow through cuvette for highly sterile non-contact measurements. No sample preparation or sample extraction from the incubator is needed and the measurements are carried out in a closed flow loop without wasting any medium. The modular assembly is novel, reusable and feasible for humid incubator environments. The system has been tested, validated and used in mesenchymal stem cell expansion and differentiation, for periods ranging from two to three weeks. Once the measurement has commenced at the beginning of culture, continuous measurements without sensor recalibration or special manual attention are carried out till the end of the culture. Measurement data clearly show the interplay between measured parameters, indicating a few stress sources present all through the culture. Additionally, it gives an overall picture of behavior of critical control parameters in an incubator and points out the need for bioprocess systems with automatic process monitoring and smart control for maximum yield, optimal growth and maintenance of the cells.

### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: BioMediTech, Faculty of Biomedical Sciences and Engineering, Research area: Microsystems, Research group: Sensor Technology and Biomeasurements (STB)

Contributors: Rajan, D. K., Verho, J., Kreutzer, J., Valimaki, H., Ihalainen, H., Lekkala, J., Patrikoski, M., Miettinen, S.

Number of pages: 5

Pages: 470-474

Publication date: 19 Jul 2017

### Host publication information

Title of host publication: 2017 IEEE International Symposium on Medical Measurements and Applications (MeMeA)

Publisher: IEEE

ISBN (Electronic): 9781509029839

ASJC Scopus subject areas: Instrumentation, Computer Science Applications, Medicine (miscellaneous)

Keywords: cell culture incubator environmental monitoring, incubator compatible sensors, long-term cell culture measurements, long-term optical cell culture pH measurements, non-contact cell culture measurements

DOIs:

10.1109/MeMeA.2017.7985922

Source: Scopus

Source ID: 85027990253

Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

### Novel D2D-based relaying method for multicast services over 3GPP LTE-A systems

The fast proliferation of 'smart' devices with enhanced capabilities and, at the same time, new multimedia streaming services (i.e., providing high-resolution video and audio content) push the network operator to handle a tremendous increase in the traffic load that is difficult to cope with the current wireless/cellular infrastructures. For that reason, in this paper we consider a novel method based on multi-hop Device-to-Device (D2D) communications, where direct links are established among User Equipments (UEs) in proximity within a Long Term Evolution-Advanced (LTE-A)-based network. The aim of the proposed mechanism is to improve the multimedia multicast sessions and transmissions in terms of throughput and mean download time per user by delivering ubiquitous and reliable connectivity to the larger number of UEs. Our system-level analysis highlights that via proximity-based transmissions among the users, it is possible to provide multimedia content with higher data rates and lower delays w.r.t. The legacy cellular solutions.

### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Electronics and Communications Engineering, University Mediterranea of Reggio

Contributors: Araniti, G., Orsino, A., Militano, L., Putrino, G., Andreev, S., Koucheryavy, Y., Iera, A.

Publication date: 19 Jul 2017

#### Host publication information

Title of host publication: 2017 IEEE International Symposium on Broadband Multimedia Systems and Broadcasting, BMSB 2017

Publisher: IEEE

ISBN (Electronic): 9781509049370

ASJC Scopus subject areas: Computer Graphics and Computer-Aided Design, Computer Networks and Communications, Computer Science Applications, Human-Computer Interaction, Electrical and Electronic Engineering, Media Technology, Communication

Keywords: 5G, D2D, LTE, MBMS, Multicast services, Networking and QoS, Performance evaluation

DOIs:

10.1109/BMSB.2017.7986137

#### Bibliographical note

jufoid=72046

INT=elt,"Orsino, A."

Source: Scopus

Source ID: 85027253110

Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

#### Optimal subgroup configuration for multicast services over 5G-satellite systems

The fast spreading of new multimedia services and applications is pushing telco operator to identify candidate technologies for handling the increasing traffic load expected in the coming years. Along this line, satellite communications integrated with terrestrial systems is gaining momentum as a possible solution to overcome the aforementioned challenges. In this paper, we analyze a multicast subgroup configuration problem for providing multimedia services over 5G satellite systems. In particular, an optimization problem is considered in order to maximize the aggregate data rate (ADR) with an execution time that is sensibly smaller compared to other solutions available in literature. Obtained results, demonstrated as the proposed approach, hereafter named as Optimal Multicast Subgroup Configuration (OMSC), is able to overcome the limitation of sub-optimal subgrouping solutions by providing higher performance and, at the same time, low complexity operations.

#### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Electronics and Communications Engineering, Universita degli Studi di Reggio Calabria, Peoples' Friendship University of Russia

Contributors: Orsino, A., Araniti, G., Scopelliti, P., Gudkova, I. A., Samouylov, K. E., Iera, A.

Publication date: 19 Jul 2017

#### Host publication information

Title of host publication: 2017 IEEE International Symposium on Broadband Multimedia Systems and Broadcasting, BMSB 2017

Publisher: IEEE

ISBN (Electronic): 9781509049370

ASJC Scopus subject areas: Computer Graphics and Computer-Aided Design, Computer Networks and Communications, Computer Science Applications, Human-Computer Interaction, Electrical and Electronic Engineering, Media Technology, Communication

Keywords: 5G-Satellite, Multicast, Networking and QoS, Performance Evaluation, Satellite-LTE

DOIs:

10.1109/BMSB.2017.7986134

#### Bibliographical note

jufoid=72046

INT=elt,"Orsino, A."

Source: Scopus

Source ID: 85027270587

Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

#### sgnesR: An R package for simulating gene expression data from an underlying real gene network structure considering delay parameters

Background: sgnesR (Stochastic Gene Network Expression Simulator in R) is an R package that provides an interface to simulate gene expression data from a given gene network using the stochastic simulation algorithm (SSA). The package allows various options for delay parameters and can easily included in reactions for promoter delay, RNA delay and Protein delay. A user can tune these parameters to model various types of reactions within a cell. As examples, we present two network models to generate expression profiles. We also demonstrated the inference of networks and the

evaluation of association measure of edge and non-edge components from the generated expression profiles. Results: The purpose of sgenesR is to enable an easy to use and a quick implementation for generating realistic gene expression data from biologically relevant networks that can be user selected. Conclusions: sgenesR is freely available for academic use. The R package has been tested for R 3.2.0 under Linux, Windows and Mac OS X.

#### General information

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: BioMediTech, Faculty of Biomedical Sciences and Engineering, Signal Processing, Research group: Laboratory of Biosystem Dynamics-LBD, Research group: Computational Systems Biology, Research group: Computational Medicine and Statistical Learning Laboratory (CMSL), Research group: Predictive Society and Data Analytics (PSDA), Harvard T.H. Chan School of Public Health, Harvard School of Public Health, Mathematics and Operations Research

Contributors: Tripathi, S., Lloyd-Price, J., Ribeiro, A., Yli-Harja, O., Dehmer, M., Emmert-Streib, F.

Publication date: 4 Jul 2017

Peer-reviewed: Yes

#### Publication information

Journal: BMC Bioinformatics

Volume: 18

Issue number: 1

Article number: 325

ISSN (Print): 1471-2105

Ratings:

Scopus rating (2017): CiteScore 2.49 SJR 1.479 SNIP 0.896

Original language: English

ASJC Scopus subject areas: Structural Biology, Biochemistry, Molecular Biology, Computer Science Applications, Applied Mathematics

Keywords: Gene expression data, Gene network, Simulation

Electronic versions:

sgnesR

DOIs:

10.1186/s12859-017-1731-8

URLs:

<http://urn.fi/URN:NBN:fi:tty-201708041653>

Source: Scopus

Source ID: 85021637056

Research output: Contribution to journal > Article > Scientific > peer-review

#### A Proxy-Based Solution for Asynchronous Telemedical Systems

Asynchronous telemedicine systems face many challenges related to information security as the patient's sensitive information and data on medicine dosage is transmitted over a network when monitoring patients and controlling asynchronous telemedical IoT devices. This information may be modified or spied on by a malicious adversary. To make asynchronous telemedicine systems more secure, the authors present a proxy-based solution against data modification and spying attacks in web-based telemedical applications. By obfuscating the executable code of a web application and by continuously dynamically changing obfuscation, the authors' solution makes it more difficult for a piece of malware to attack its target. They use a constructive research approach. They characterize the threat and present an outline of a proposed solution. The benefits and limitations of the proposed solution are discussed. Cyber-Attacks targeted at the information related to patient's care are a serious threat in today's telemedicine. If disregarded, these attacks have negative implications on patient safety and quality of care.

#### General information

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Research group: Software Engineering and Intelligent Systems, Pervasive Computing

Contributors: Rauti, S., Lahtiranta, J., Parisod, H., Hyrynsalmi, S., Salanterä, S., Aromaa, M. E., Smed, J., Leppänen, V.

Number of pages: 14

Pages: 70-83

Publication date: 1 Jul 2017

Peer-reviewed: Yes

#### Publication information

Journal: International Journal of E-health and Medical Communication

Volume: 8

Issue number: 3

Article number: 5  
ISSN (Print): 1947-315X  
Ratings:

Scopus rating (2017): CiteScore 0.62 SJR 0.129 SNIP 0.276

Original language: English

ASJC Scopus subject areas: Computer Science Applications, Health Informatics

Keywords: Asynchronous Telemedicine, Man-in-The-Middle Attacks, Obfuscation, Telemedical IoT Devices, Web Application Security

DOIs:

10.4018/IJEHMC.2017070105

Source: Scopus

Source ID: 85020175149

Research output: [Contribution to journal](#) › [Article](#) › [Scientific](#) › [peer-review](#)

### **The Fisher-Snedecor F Distribution: A Simple and Accurate Composite Fading Model**

We consider the use of the Fisher-Snedecor F distribution, which is defined as the ratio of two chi-squared variates, to model composite fading channels. In this context, the root-mean-square power of a Nakagami- $m$  signal is assumed to be subject to variations induced by an inverse Nakagami- $m$  random variable. Comparisons with physical channel data demonstrate that the proposed composite fading model provides as good, and in most cases better, fit to the data compared to the generalized- $K$  composite fading model. Motivated by this result, simple novel expressions are derived for the key statistical metrics and performance measures of interest.

#### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Electronics and Communications Engineering, Research group: Wireless Communications and Positioning, Queen's University, Belfast, Northern Ireland, Aristotle University of Thessaloniki

Contributors: Yoo, S. K., Cotton, S. L., Sofotasios, P. C., Matthaiou, M., Valkama, M., Karagiannidis, G. K.

Number of pages: 4

Pages: 1661-1664

Publication date: 1 Jul 2017

Peer-reviewed: Yes

#### **Publication information**

Journal: IEEE Communications Letters

Volume: 21

Issue number: 7

ISSN (Print): 1089-7798

Ratings:

Scopus rating (2017): CiteScore 3.01 SJR 0.589 SNIP 1.386

Original language: English

ASJC Scopus subject areas: Modelling and Simulation, Computer Science Applications, Electrical and Electronic Engineering

Keywords: Composite fading, inverse Nakagami- $m$  distribution, Nakagami- $m$  fading, shadowing.

DOIs:

10.1109/LCOMM.2017.2687438

Source: Scopus

Source ID: 85029841155

Research output: [Contribution to journal](#) › [Article](#) › [Scientific](#) › [peer-review](#)

### **Using and collecting fine-grained usage data to improve online learning materials**

As educators seek to create better learning materials, knowledge about how students actually use the materials is priceless. The advent of online learning materials has allowed tracking of student movement on levels not previously possible with on-paper materials: Server logs can be parsed for details on when students opened certain pages. But such data is extremely coarse and only allows for rudimentary usage analysis. How do students move within the course pages? What do they read in detail and what do they glance over? Traditionally, answering such questions has required complex setups with eye tracking labs. In this paper we investigate how fine-grained data about student movement within an online learning material can be used to improve said material in an informed fashion. Our data is collected by a JavaScript-component that tracks which elements of the online learning material are visible on the student's browser window as they study. The data is collected in situ, and no software needs to be installed on the student's computer. We further investigate how such data can be combined with data from a separate learning environment in which students work on course assignments and if the types of movements made by the students are correlated with student self-regulation metrics or course outcomes. Our results indicate that the use of rather simple and non-invasive tracking of students' movements in course materials allows material creators to quickly see major problem-areas in their materials and to highlight sections that students keep returning to. In addition, when the tracking data is combined with student course

assignment data, inferring meaningful assignment-specific areas within the course material becomes possible. Finally, we determine that high-level statistics of user movements are not correlated with course outcomes or certain self-regulation related metrics.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Pervasive Computing, Research area: Software engineering, University of Helsinki

Contributors: Leppänen, L., Leinonen, J., Ihantola, P., Hellas, A.

Number of pages: 9

Pages: 4-12

Publication date: 29 Jun 2017

#### **Host publication information**

Title of host publication: Proceedings - 2017 IEEE/ACM 39th International Conference on Software Engineering: Software Engineering and Education Track, ICSE-SEET 2017

Publisher: IEEE

ISBN (Electronic): 9781538626719

ASJC Scopus subject areas: Computer Science Applications, Software, Education

Keywords: course material usage, e-learning, heat map, learning material evaluation, student behavior, visualization

DOIs:

10.1109/ICSE-SEET.2017.12

Source: Scopus

Source ID: 85026769227

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

#### **CNN-based edge filtering for object proposals**

Recent advances in image-based object recognition have exploited object proposals to speed up the detection process by reducing the search space. In this paper, we present a novel idea that utilizes true objectness and semantic image filtering (retrieved within the convolutional layers of a Convolutional Neural Network) to propose effective region proposals. Information learned in fully convolutional layers is used to reduce the number of proposals and enhance their localization by producing highly accurate bounding boxes. The greatest benefit of our method is that it can be integrated into any existing approach exploiting edge-based objectness to achieve consistently high recall across various intersection over union thresholds. Experiments on PASCAL VOC 2007 and ImageNet datasets demonstrate that our approach improves two existing state-of-the-art models with significantly high margins and pushes the boundaries of object proposal generation.

#### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Signal Processing, Research group: Multimedia Research Group - MRG, Aarhus Universitet

Contributors: Waris, M. A., Iosifidis, A., Gabbouj, M.

Pages: 631-640

Publication date: 2 Jun 2017

Peer-reviewed: Yes

#### **Publication information**

Journal: Neurocomputing

Volume: 266

ISSN (Print): 0925-2312

Ratings:

Scopus rating (2017): CiteScore 3.74 SJR 1.073 SNIP 1.516

Original language: English

ASJC Scopus subject areas: Computer Science Applications, Cognitive Neuroscience, Artificial Intelligence

Keywords: Deep learning, Neural networks, Object detection, Object proposals, Region of interest

DOIs:

10.1016/j.neucom.2017.05.071

Source: Scopus

Source ID: 85020766935

Research output: Contribution to journal > Article > Scientific > peer-review

#### **Towards the Utilization of Crowdsourcing in Traffic Condition Reporting**

The use of traffic information in map applications designed for stand-alone navigation devices as well as in mobile devices has become a common trend. This information is often governed by the various service providers with little or non-existent feedback from the users. Using a wide user base it is possible to collect information on traffic conditions faster and more

efficiently. Additionally, many of the events faced on the road can be challenging to detect by automatic means, but are easily noticed by the road users – animals on the road and broken or missing road signs are only a few examples. To better facilitate the utilization of information gathered from road users, simple and easy-to-use software solutions are required. This paper presents a prototype mobile application, which the road users can take advantage of for both following the on-going traffic conditions while driving and for collectively reporting traffic events other users might be interested in. The high-level architecture, application and data utilized in the reports are presented in addition to the preliminary findings of the on-going research. This paper will also discuss the challenges identified while developing the application.

### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Research group: Software Engineering and Intelligent Systems, Pervasive Computing

Contributors: Rantanen, P., Sillberg, P., Soini, J.

Number of pages: 6

Pages: 985-990

Publication date: May 2017

### Host publication information

Title of host publication: 2017 40th International Convention on Information and Communication Technology, Electronics and Microelectronics, MIPRO 2017 - Proceedings

Publisher: IEEE

ISBN (Print): 978-1-5090-4969-1

ISBN (Electronic): 978-953-233-090-8

ASJC Scopus subject areas: Computer Networks and Communications, Computer Science Applications, Information Systems

Electronic versions:

towards

DOIs:

10.23919/MIPRO.2017.7973567

URLs:

<http://urn.fi/URN:NBN:fi:tty-201806212017>

Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

### Preventing keystroke based identification in open data sets

Large-scale courses such as Massive Online Open Courses (MOOCs) can be a great data source for researchers. Ideally, the data gathered on such courses should be openly available to all researchers. Studies could be easily replicated and novel studies on existing data could be conducted. However, very fine-grained data such as source code snapshots can contain hidden identifiers. For example, distinct typing patterns that identify individuals can be extracted from such data. Hence, simply removing explicit identifiers such as names and student numbers is not sufficient to protect the privacy of the users who have supplied the data. At the same time, removing all keystroke information would decrease the value of the shared data significantly. In this work, we study how keystroke data from a programming context could be modified to prevent keystroke latency based identification whilst still retaining information that can be used to e.g. infer programming experience. We investigate the degree of anonymization required to render identification of students based on their typing patterns unreliable. Then, we study whether the modified keystroke data can still be used to infer the programming experience of the students as a case study of whether the anonymized typing patterns have retained at least some informative value. We show that it is possible to modify data so that keystroke latency based identification is no longer accurate, but the programming experience of the students can still be inferred, i.e. the data still has value to researchers. In a broader context, our results indicate that information and anonymity are not necessarily mutually exclusive.

### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Pervasive Computing, Research area: Software engineering, University of Helsinki

Contributors: Leinonen, J., Ihantola, P., Hellas, A.

Number of pages: 9

Pages: 101-109

Publication date: 12 Apr 2017

### Host publication information

Title of host publication: L@S 2017 - Proceedings of the 4th (2017) ACM Conference on Learning at Scale

Publisher: ACM

ISBN (Electronic): 9781450344500

ASJC Scopus subject areas: Computer Networks and Communications, Education, Software, Computer Science Applications

Keywords: Data anonymization, Data privacy, Keystroke dynamics, Programming experience inference, Source code snapshots

DOIs:

10.1145/3051457.3051458

Source: Scopus

Source ID: 85018432742

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

### **A Mixed Finite Element Method to Solve the EEG Forward Problem**

Finite element methods have been shown to achieve high accuracies in numerically solving the EEG forward problem and they enable the realistic modeling of complex geometries and important conductive features such as anisotropic conductivities. To date, most of the presented approaches rely on the same underlying formulation, the continuous Galerkin (CG)-FEM. In this article, a novel approach to solve the EEG forward problem based on a mixed finite element method (Mixed-FEM) is introduced. To obtain the Mixed-FEM formulation, the electric current is introduced as an additional unknown besides the electric potential. As a consequence of this derivation, the Mixed-FEM is, by construction, current preserving, in contrast to the CG-FEM. Consequently, a higher simulation accuracy can be achieved in certain scenarios, e.g., when the diameter of thin insulating structures, such as the skull, is in the range of the mesh resolution. A theoretical derivation of the Mixed-FEM approach for EEG forward simulations is presented, and the algorithms implemented for solving the resulting equation systems are described. Subsequently, first evaluations in both sphere and realistic head models are presented, and the results are compared to previously introduced CG-FEM approaches. Additional visualizations are shown to illustrate the current preserving property of the Mixed-FEM. Based on these results, it is concluded that the newly presented Mixed-FEM can at least complement and in some scenarios even outperform the established CG-FEM approaches, which motivates a further evaluation of the Mixed-FEM for applications in bioelectromagnetism.

#### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Mathematics, Research group: Inverse Problems, University of Utah, Cluster of Excellence EXC, University of Münster

Contributors: Vorwerk, J., Engwer, C., Pursiainen, S., Wolters, C. H.

Number of pages: 12

Pages: 930-941

Publication date: 1 Apr 2017

Peer-reviewed: Yes

#### **Publication information**

Journal: IEEE Transactions on Medical Imaging

Volume: 36

Issue number: 4

Article number: 7731161

ISSN (Print): 0278-0062

Ratings:

Scopus rating (2017): CiteScore 6.6 SJR 1.895 SNIP 2.86

Original language: English

ASJC Scopus subject areas: Software, Radiological and Ultrasound Technology, Computer Science Applications, Electrical and Electronic Engineering

Keywords: EEG, forward problem, mixed finite element method, realistic head modeling, source analysis

DOIs:

10.1109/TMI.2016.2624634

Source: Scopus

Source ID: 85017598893

Research output: Contribution to journal > Article > Scientific > peer-review

### **A survey on control of hydraulic robotic manipulators with projection to future trends**

This paper presents the recent advancements in the control of multiple-degree-of-freedom hydraulic robotic manipulators. A literature review is performed on their control, covering both free-space and constrained motions of serial and parallel manipulators. Stability-guaranteed control system design is the primary requirement for all control systems. Thus, this paper pays special attention to such systems. An objective evaluation of the effectiveness of different methods and the state of the art in a given field is one of the cornerstones of scientific research and progress. For this purpose, the maximum position tracking error  $|e|_{\max}$  and a performance indicator  $\rho$  (the ratio of  $|e|_{\max}$  with respect to the maximum velocity) are used to evaluate and benchmark different free-space control methods in the literature. These indicators showed that stability-guaranteed nonlinear model based control designs have resulted in the most advanced control performance. In addition to stable closed-loop control, lack of energy efficiency is another significant challenge in hydraulic robotic systems. This paper pays special attention to these challenges in hydraulic robotic systems and discusses their

reciprocal contradiction. Potential solutions to improve the system energy efficiency without control performance deterioration are discussed. Finally, for hydraulic robotic systems, open problems are defined and future trends are projected.

#### General information

Publication status: Published  
MoE publication type: A2 Review article in a scientific journal  
Organisations: Automation and Hydraulic Engineering, Italian Institute of Technology  
Contributors: Mattila, J., Koivumäki, J., Caldwell, D. G., Semini, C.  
Number of pages: 12  
Pages: 669-680  
Publication date: 1 Apr 2017  
Peer-reviewed: Yes

#### Publication information

Journal: IEEE - ASME Transactions on Mechatronics  
Volume: 22  
Issue number: 2  
ISSN (Print): 1083-4435  
Ratings:  
Scopus rating (2017): CiteScore 5.03 SJR 1.537 SNIP 2.429  
Original language: English  
ASJC Scopus subject areas: Control and Systems Engineering, Computer Science Applications, Electrical and Electronic Engineering  
Keywords: Force control, hydraulic manipulators, motion control, performance evaluation, robotics  
Electronic versions:  
tmech\_manipulator\_survey\_accepted  
DOIs:  
10.1109/TMECH.2017.2668604  
URLs:  
<http://urn.fi/URN:NBN:fi:itty-201709011863>  
Source: Scopus  
Source ID: 85018476348  
Research output: Contribution to journal › Review Article › Scientific › peer-review

#### Guest editorial introduction to the focused section on design and control of hydraulic robots

The papers in this special section focus on the design and control of hydraulic robots. Since the 1980s hydraulic robots have been a key technology allowing to push the state of the art in robotics by demonstrating new levels of performance in terms of rough terrain locomotion, balance, speed, dexterity, and robustness. Inspired by these results, an increasing number of academic groups are (re-)discovering hydraulic actuation for applications where high power density, robustness, and high control bandwidth are crucial requirements. The ultimate goal for legged robots is agility comparable to bi-/quadrupedal animals (walking, running, jumping), which requires high-performance control of the hydraulic actuators and sufficient power-to-weight ratio provided by the actuators. In addition to these advanced high-tech hydraulic robots, hydraulic actuation has been used for decades in a variety of mobile (off-highway) heavy-duty machines (e.g., construction, forestry, mining, and agricultural machines) due to their higher robustness and significantly larger power-to-weight ratio compared with electric actuators. It is highly expected that the development in robotics will revolutionize this heavy-duty machine industry just as is currently happening in the car industry.

#### General information

Publication status: Published  
MoE publication type: B1 Article in a scientific magazine  
Organisations: Automation and Hydraulic Engineering, Research group: Mobile manipulation, Italian Institute of Technology, Sungkyunkwan University, HCI e 486.1, Ritsumeikan University, Biwako-Kusatsu, University of Minnesota Twin Cities, Purdue University  
Contributors: Mattila, J., Semini, C., Moon, H., Buchli, J., Hyon, S., Li, P. Y., Yao, B.  
Number of pages: 4  
Pages: 585-588  
Publication date: 1 Apr 2017  
Peer-reviewed: No

#### Publication information

Journal: IEEE - ASME Transactions on Mechatronics  
Volume: 22  
Issue number: 2  
ISSN (Print): 1083-4435

Ratings:

Scopus rating (2017): CiteScore 5.03 SJR 1.537 SNIP 2.429

Original language: English

ASJC Scopus subject areas: Control and Systems Engineering, Computer Science Applications, Electrical and Electronic Engineering

DOIs:

10.1109/TMECH.2017.2668611

Source: Scopus

Source ID: 85018508508

Research output: Contribution to journal › Editorial › Scientific

### **Interference and SINR in Millimeter Wave and Terahertz Communication Systems With Blocking and Directional Antennas**

The fifth generation wireless systems are expected to rely on a large number of small cells to massively offload traffic from the cellular and even from the wireless local area networks. To enable this functionality, mm-wave (EHF) and Terahertz (THF) bands are being actively explored. These bands are characterized by unique propagation properties compared with microwave systems. As a result, the interference structure in these systems could be principally different to what we observed so far at lower frequencies. In this paper, using the tools of stochastic geometry, we study the systems operating in the EHF/THF bands by explicitly capturing three phenomena inherent for these frequencies: 1) high directivity of the transmit and receive antennas; 2) molecular absorption; and 3) blocking of high-frequency radiation. We also define and compare two different antenna radiation pattern models. The metrics of interest are the mean interference and the signal-to-interference-plus-noise (SINR) ratio at the receiver. Our results reveal that: 1) for the same total emitted energy by a Poisson field of interferers, both the interference and SINR significantly increase when simultaneously both transmit and receive antennas are directive and 2) blocking has a profound impact on the interference and SINR creating much more favorable conditions for communications compared with no blocking case.

#### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Electronics and Communications Engineering, Research group: Emerging Technologies for Nano-Bio-Info-Cogno, State University of New York

Contributors: Petrov, V., Komarov, M., Moltchanov, D., Jornet, J. M., Koucheryavy, Y.

Number of pages: 18

Pages: 1791-1808

Publication date: 1 Mar 2017

Peer-reviewed: Yes

#### **Publication information**

Journal: IEEE Transactions on Wireless Communications

Volume: 16

Issue number: 3

ISSN (Print): 1536-1276

Ratings:

Scopus rating (2017): CiteScore 6.43 SJR 1.246 SNIP 2.451

Original language: English

ASJC Scopus subject areas: Computer Science Applications, Applied Mathematics, Electrical and Electronic Engineering

Keywords: 5G systems, blocking, directional antennas, Interference, millimeter waves, terahertz band

DOIs:

10.1109/TWC.2017.2654351

Source: Scopus

Source ID: 85015301037

Research output: Contribution to journal › Article › Scientific › peer-review

### **Neighborhood Matching for Image Retrieval**

In the last few years, large-scale image retrieval has attracted a lot of attention from the multimedia community. Usual approaches addressing this task first generate an initial ranking of the reference images using fast approximations that do not take into consideration the spatial arrangement of local features in the image (e.g., the bag-of-words paradigm). The top positions of the rankings are then re-estimated with verification methods that deal with more complex information, such as the geometric layout of the image. This verification step allows pruning of many false positives at the expense of an increase in the computational complexity, which may prevent its application to large-scale retrieval problems. This paper describes a geometric method known as neighborhood matching (NM), which revisits the keypoint matching process by considering a neighborhood around each keypoint and improves the efficiency of a geometric verification step in the image search system. Multiple strategies are proposed and compared to incorporate NM into a large-scale image retrieval framework. A detailed analysis and comparison of these strategies and baseline methods have been investigated. The experiments show that the proposed method not only improves the computational efficiency, but also increases the retrieval performance and outperforms state-of-the-art methods in standard datasets, such as the Oxford 5 k and 105 k

datasets, for which the spatial verification step has a significant impact on the system performance.

#### General information

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Signal Processing, Universidad Carlos III de Madrid, Purdue University

Contributors: González-Díaz, I., Birinci, M., Díaz-De-María, F., Delp, E. J.

Number of pages: 15

Pages: 544-558

Publication date: 1 Mar 2017

Peer-reviewed: Yes

#### Publication information

Journal: IEEE Transactions on Multimedia

Volume: 19

Issue number: 3

ISSN (Print): 1520-9210

Ratings:

Scopus rating (2017): CiteScore 5.24 SJR 0.954 SNIP 2.283

Original language: English

ASJC Scopus subject areas: Signal Processing, Media Technology, Computer Science Applications, Electrical and Electronic Engineering

Keywords: Geometric verification, image retrieval, neighborhood matching (NM), robust estimation

DOIs:

10.1109/TMM.2016.2616298

Source: Scopus

Source ID: 85013466531

Research output: Contribution to journal › Article › Scientific › peer-review

#### Towards a conceptual framework for privacy protection in the use of interactive 360° video surveillance

Interactive 360° video technology has not been embraced for surveillance purposes despite its ability to eliminate blind spots, which is an important attribute of video surveillance. Further, privacy invasion due to video surveillance has a negative impact, and this urges for attention. Hence, the paper authors considered these two aspects and proposed a conceptual design framework with its rationale for privacy protection in use within the infrastructure of the interactive 360° video surveillance system. This conceptual integration framework takes into account the next essential factors: i) the utilization of the positive characteristics of 360° video to improve surveillance; ii) the protection of people's privacy; iii) the assistance needed in crime investigation and forensics; and iv) the ease and cost-effectiveness for deployment. These are factors of paramount significance for public safety and social order and they can be guaranteed with proactive approaches of design, based on the latest developments of Internet of Things technology and digital watermarking advancements.

#### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Pervasive Computing, Research area: Information security, University of Tampere, Monash University

Contributors: Chaudhary, S., Berki, E., Nykänen, P., Zolotavkin, Y., Helenius, M., Kela, J.

Publication date: 23 Feb 2017

#### Host publication information

Title of host publication: 2016 22nd International Conference on Virtual System & Multimedia (VSMM)

Publisher: IEEE

ISBN (Electronic): 9781467389938

ASJC Scopus subject areas: Computer Science Applications, Human-Computer Interaction, Media Technology, Radiology Nuclear Medicine and imaging

Keywords: conceptual framework, Interactive 360° video surveillance, Internet of Things, literature review, privacy and safety, security, steganography and digital watermarking

DOIs:

10.1109/VSMM.2016.7863179

#### Bibliographical note

EXT="Chaudhary, Sunil"

Source: Scopus

Source ID: 85016023783

Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

### **Benchmarking DFT methods with small basis sets for the calculation of halogen-bond strengths**

In recent years, halogen bonding has become an important design tool in crystal engineering, supramolecular chemistry and biosciences. The fundamentals of halogen bonding have been studied extensively with high-accuracy computational methods. Due to its non-covalency, the use of triple-zeta (or larger) basis sets is often recommended when studying halogen bonding. However, in the large systems often encountered in supramolecular chemistry and biosciences, large basis sets can make the calculations far too slow. Therefore, small basis sets, which would combine high computational speed and high accuracy, are in great demand. This study focuses on comparing how well density functional theory (DFT) methods employing small, double-zeta basis sets can estimate halogen-bond strengths. Several methods with triple-zeta basis sets are included for comparison. Altogether, 46 DFT methods were tested using two data sets of 18 and 33 halogen-bonded complexes for which the complexation energies have been previously calculated with the high-accuracy CCSD(T)/CBS method. The DGDZVP basis set performed far better than other double-zeta basis sets, and it even outperformed the triple-zeta basis sets. Due to its small size, it is well-suited to studying halogen bonding in large systems.

#### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Chemistry and Bioengineering, Research group: Supramolecular photochemistry

Contributors: Siiskonen, A., Priimägi, A.

Publication date: 1 Feb 2017

Peer-reviewed: Yes

#### **Publication information**

Journal: Journal of Molecular Modeling

Volume: 23

Issue number: 2

Article number: 50

ISSN (Print): 1610-2940

Ratings:

Scopus rating (2017): CiteScore 1.17 SJR 0.36 SNIP 0.515

Original language: English

ASJC Scopus subject areas: Catalysis, Computer Science Applications, Physical and Theoretical Chemistry, Organic Chemistry, Computational Theory and Mathematics, Inorganic Chemistry

Keywords: Basis set, Benchmarking, Density functional theory, Halogen bonding

DOIs:

10.1007/s00894-017-3212-4

Source: Scopus

Source ID: 85011684872

Research output: Contribution to journal › Article › Scientific › peer-review

### **Effects of Heterogeneous Mobility on D2D-and Drone-Assisted Mission-Critical MTC in 5G**

mcMTC is starting to play a central role in the industrial Internet of Things ecosystem and have the potential to create high-revenue businesses, including intelligent transportation systems, energy/ smart grid control, public safety services, and high-end wearable applications. Consequently, in the 5G of wireless networks, mcMTC have imposed a wide range of requirements on the enabling technology, such as low power, high reliability, and low latency connectivity. Recognizing these challenges, the recent and ongoing releases of LTE systems incorporate support for lowcost and enhanced coverage, reduced latency, and high reliability for devices at varying levels of mobility. In this article, we examine the effects of heterogeneous user and device mobility-produced by a mixture of various mobility patterns-on the performance of mcMTC across three representative scenarios within a multi-connectivity 5G network. We establish that the availability of alternative connectivity options, such as D2D links and drone-Assisted access, helps meet the requirements of mcMTC applications in a wide range of scenarios, including industrial automation, vehicular connectivity, and urban communications. In particular, we confirm improvements of up to 40 percent in link availability and reliability with the use of proximate connections on top of the cellular-only baseline.

#### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Electronics and Communications Engineering, Research group: Emerging Technologies for Nano-Bio-Info-Cogno, Department of Chemistry and Bioengineering, Ericsson Research and Wireless KTH, Ericsson Research, King's College London, Antonio Iera Are with University Mediterranea of Reggio Calabria

Contributors: Orsino, A., Ometov, A., Fodor, G., Moltchanov, D., Militano, L., Andreev, S., Yilmaz, O. N. C., Tirronen, T., Torsner, J., Arani, G., Iera, A., Dohler, M., Koucheryav, Y.

Number of pages: 9

Pages: 79-87

Publication date: 1 Feb 2017

Peer-reviewed: Yes

### Publication information

Journal: IEEE Communications Magazine

Volume: 55

Issue number: 2

ISSN (Print): 0163-6804

Ratings:

Scopus rating (2017): CiteScore 11.06 SJR 2.297 SNIP 5.734

Original language: English

ASJC Scopus subject areas: Computer Science Applications, Computer Networks and Communications, Electrical and Electronic Engineering

Electronic versions:

Effects of Heterogeneous Mobility on D2D- and Drone-Assisted Mission-Critical MTC in 5G

DOIs:

10.1109/MCOM.2017.1600443CM

URLs:

<http://urn.fi/URN:NBN:fi:ty-201802141226>

Source: Scopus

Source ID: 85012979681

Research output: Contribution to journal > Article > Scientific > peer-review

### GSAR: Bioconductor package for Gene Set analysis in R

Background: Gene set analysis (in a form of functionally related genes or pathways) has become the method of choice for analyzing omics data in general and gene expression data in particular. There are many statistical methods that either summarize gene-level statistics for a gene set or apply a multivariate statistic that accounts for intergene correlations. Most available methods detect complex departures from the null hypothesis but lack the ability to identify the specific alternative hypothesis that rejects the null. Results: GSAR (Gene Set Analysis in R) is an open-source R/Bioconductor software package for gene set analysis (GSA). It implements self-contained multivariate non-parametric statistical methods testing a complex null hypothesis against specific alternatives, such as differences in mean (shift), variance (scale), or net correlation structure. The package also provides a graphical visualization tool, based on the union of two minimum spanning trees, for correlation networks to examine the change in the correlation structures of a gene set between two conditions and highlight influential genes (hubs). Conclusions: Package GSAR provides a set of multivariate non-parametric statistical methods that test a complex null hypothesis against specific alternatives. The methods in package GSAR are applicable to any type of omics data that can be represented in a matrix format. The package, with detailed instructions and examples, is freely available under the GPL (> = 2) license from the Bioconductor web site.

### General information

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Faculty of Biomedical Sciences and Engineering, Research group: Predictive Society and Data Analytics (PSDA), University of Arkansas for Medical Sciences, Computational Medicine and Statistical Learning Laboratory

Contributors: Rahmatallah, Y., Zybailov, B., Emmert-Streib, F., Glazko, G.

Publication date: 24 Jan 2017

Peer-reviewed: Yes

### Publication information

Journal: BMC Bioinformatics

Volume: 18

Issue number: 1

Article number: 61

ISSN (Print): 1471-2105

Ratings:

Scopus rating (2017): CiteScore 2.49 SJR 1.479 SNIP 0.896

Original language: English

ASJC Scopus subject areas: Structural Biology, Biochemistry, Molecular Biology, Computer Science Applications, Applied Mathematics

Keywords: Gene set analysis, Kolmogorov-Smirnov, Minimum spanning tree, Non-parametric, Pathways, Wald Wolfowitz

Electronic versions:

GSAR - Bioconductor package for Gene Set analysis in R

DOIs:

10.1186/s12859-017-1482-6

URLs:

<http://urn.fi/URN:NBN:fi:ty-201703151179>

Source: Scopus

Source ID: 85010460642

### **Efficient coding of 360-degree pseudo-cylindrical panoramic video for virtual reality applications**

Pseudo-cylindrical panoramas represent the data distribution of spherical coordinates closely in two-dimensional domain due to the equidistant sampling of 360-degree scene. Therefore, unlike the cylindrical projections, they do not suffer from the over stretching in the polar areas. However, due to the non-rectangular format in effective picture area and sharp edges at its borders, the compression performance is inefficient. In this paper, we propose two methods which improve the compression performance of both intra-frame and inter-frame coding of pseudo-cylindrical panoramic content and meanwhile reduce the coding artifacts. In the intra-frame coding method, border edges are smoothed by modifying the content of the image in the non-effective picture area, which are cropped at the receiver side. In the inter-frame coding method, gaining the benefit of 360-degree property of the content, non-effective picture area of reference frames at border is filled with the content of the effective picture area from the opposite border to enhance the performance of motion compensation.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Signal Processing, Research group: Video, Nokia

Contributors: Youvalari, R. G., Aminlou, A., Hannuksela, M. M., Gabbouj, M.

Number of pages: 4

Pages: 525-528

Publication date: 18 Jan 2017

#### **Host publication information**

Title of host publication: 2016 IEEE International Symposium on Multimedia (ISM)

Publisher: IEEE

ISBN (Electronic): 9781509045709

ASJC Scopus subject areas: Artificial Intelligence, Computer Networks and Communications, Media Technology, Computer Science Applications

Keywords: Pseudo-cylindrical panorama, Video coding, Virtual reality

DOIs:

10.1109/ISM.2016.74

Source: Scopus

Source ID: 85015196525

Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

### **Standard-compliant multiview video coding and streaming for virtual reality applications**

Virtual reality (VR) systems employ multiview cameras or camera rigs to capture a scene from the entire 360-degree perspective. Due to computational or latency constraints, it might not be possible to stitch multiview videos into a single video sequence prior to encoding. In this paper we investigate the coding and streaming of multiview VR video content. We present a standard-compliant method where we first divide the camera views into two types: Primary views represent a subset of camera views with lower resolution and non-overlapping (minimally overlapping) content which cover the entire 360-degree field-of-view to guarantee immediate monoscopic viewing during very rapid head movements. Auxiliary views consist of remaining camera views with higher resolution which produce overlapping content with the primary views and are additionally used for stereoscopic viewing. Based on this categorization, we propose a coding arrangement in which, the primary views are independently coded in the base layer and the additional auxiliary views are coded as an enhancement layer, using inter-layer prediction from primary views. The proposed system not only meets the low latency requirements of VR systems, but also conforms to the existing multilayer extensions of the High Efficiency Video Coding standard. Simulation results show that the coding and streaming performance of the proposed scheme is significantly improved compared to earlier methods.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Signal Processing, Nokia Technologies Oy

Contributors: Kammachi-Sreedhar, K., Aminlou, A., Hannuksela, M. M., Gabbouj, M.

Number of pages: 6

Pages: 295-300

Publication date: 18 Jan 2017

#### **Host publication information**

Title of host publication: 2016 IEEE International Symposium on Multimedia (ISM)

Publisher: IEEE

ISBN (Electronic): 9781509045709

ASJC Scopus subject areas: Artificial Intelligence, Computer Networks and Communications, Media Technology, Computer Science Applications

Keywords: Multiview video coding, Selective streaming, Virtual reality

DOIs:

10.1109/ISM.2016.0065

#### **Bibliographical note**

EXT="Aminlou, Alireza"

Source: Scopus

Source ID: 85015245476

Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

#### **Viewport-adaptive encoding and streaming of 360-degree video for virtual reality applications**

Virtual reality applications use 360-degree videos and head mount displays (HMDs) with stereoscopic capabilities to provide full immersion experience. In these applications it is also common to use 4K resolution or higher per view for 360-degree videos. Consequently, this leads to technical challenges in handling the bandwidth requirements while keeping the system latency to the minimal. When the content is viewed with a HMD, a subset of the entire 360-degree video is displayed at a single point of time. To improve the resolution and picture quality of the displayed content, viewport based coding is desirable. In this regard, we investigated various viewport dependent projection schemes including the existing variants of Pyramidal projection. In this regard we propose the multi-resolution versions of Equirectangular and Cubemap projections. Additionally, we developed a methodology for comparing the rate-distortion performance of these projections. Based on the simulation results, it was observed that multi-resolution projections of Equirectangle and Cubemap outperform other projection schemes, significantly.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Research group: Computational Imaging-CI, Signal Processing, Research group: Video, Nokia, Nokia Technologies Oy

Contributors: Kammachi-Sreedhar, K., Aminlou, A., Hannuksela, M. M., Gabbouj, M.

Number of pages: 4

Pages: 583-586

Publication date: 18 Jan 2017

#### **Host publication information**

Title of host publication: 2016 IEEE International Symposium on Multimedia (ISM)

Publisher: IEEE

ISBN (Electronic): 9781509045709

ASJC Scopus subject areas: Artificial Intelligence, Computer Networks and Communications, Media Technology, Computer Science Applications

Keywords: Environmental mapping, View-adaptive coding

DOIs:

10.1109/ISM.2016.0126

#### **Bibliographical note**

EXT="Aminlou, Alireza"

Source: Scopus

Source ID: 85015244649

Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

#### **Color-distribution similarity by information theoretic divergence for color images**

The divergence similarity between two color images is presented based on the Jensen-Shannon divergence to measure the color-distribution similarity. Subjective assessment experiments were developed to obtain mean opinion scores (MOS) of test images. It was found that the divergence similarity and MOS values showed statistically significant correlations.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Signal Processing, Research group: Vision, University of Niigata, KLab, Japan, K-JIST, Dongguk University, Seoul

Contributors: Murayama, M., Oguro, D., Kikuchi, H., Huttunen, H., Ho, Y. S., Shin, J.

Publication date: 17 Jan 2017

#### **Host publication information**

Title of host publication: 2016 Asia-Pacific Signal and Information Processing Association Annual Summit and Conference, APSIPA 2016

Publisher: IEEE

ISBN (Electronic): 9789881476821

ASJC Scopus subject areas: Artificial Intelligence, Computer Science Applications, Information Systems, Signal Processing

DOIs:

10.1109/APSIPA.2016.7820681

### **Bibliographical note**

JUFOID=72850

Source: Scopus

Source ID: 85013813769

Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

### **Architectures and codecs for real-time light field streaming**

Light field 3D displays represent a major step forward in visual realism, providing glasses-free spatial vision of real or virtual scenes. Applications that capture and process live imagery have to process data captured by potentially tens to hundreds of cameras and control tens to hundreds of projection engines making up the human perceivable 3D light field using a distributed processing system. The associated massive data processing is difficult to scale beyond a specific number and resolution of images, limited by the capabilities of the individual computing nodes. The authors therefore analyze the bottlenecks and data flow of the light field conversion process and identify possibilities to introduce better scalability. Based on this analysis they propose two different architectures for distributed light field processing. To avoid using uncompressed video data all along the processing chain, the authors also analyze how the operation of the proposed architectures can be supported by existing image/video codecs.

### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Signal Processing, Research group: 3D MEDIA, Holografika, Nokia

Contributors: Kovács, P. T., Zare, A., Balogh, T., Bregovic, R., Gotchev, A.

Publication date: 1 Jan 2017

Peer-reviewed: Yes

### **Publication information**

Journal: Journal of Imaging Science and Technology

Volume: 61

Issue number: 1

Article number: 010403

ISSN (Print): 1062-3701

Ratings:

Scopus rating (2017): CiteScore 0.59 SJR 0.237 SNIP 0.712

Original language: English

ASJC Scopus subject areas: Electronic, Optical and Magnetic Materials, Chemistry(all), Atomic and Molecular Physics, and Optics, Computer Science Applications

DOIs:

10.2352/J.ImagingSci.Technol.2017.61.1.010403

Source: Scopus

Source ID: 85016298177

Research output: Contribution to journal › Article › Scientific › peer-review

### **Advanced boundary electrode modeling for tES and parallel tES/EEG**

This paper explores advanced electrode modeling in the context of separate and parallel transcranial electrical stimulation (tES) and electroencephalography (EEG) measurements. We focus on boundary condition based approaches that do not necessitate adding auxiliary elements, e.g. sponges, to the computational domain. In particular, we investigate the complete electrode model (CEM) which incorporates a detailed description of the skin-electrode interface including its contact surface, impedance and normal current distribution. The CEM can be applied for both tES and EEG electrodes which is advantageous when a parallel system is used. In comparison to the CEM, we test two important reduced approaches: the gap model (GAP) and the point electrode model (PEM). We aim to find out the differences of these approaches for a realistic numerical setting based on the stimulation of the auditory cortex. The results obtained suggest, among other things, that GAP and GAP/PEM are sufficiently accurate for the practical application of tES and parallel tES/EEG, respectively. Differences between CEM and GAP were observed mainly in the skin compartment, where only CEM explains the heating effects characteristic to tES.

### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Mathematics, Research group: Inverse Problems, University of Münster  
Contributors: Pursiainen, S., Agsten, B., Wagner, S., Wolters, C. H.  
Pages: 37-44  
Publication date: 2017  
Peer-reviewed: Yes

### Publication information

Journal: IEEE Transactions on Neural Systems and Rehabilitation Engineering

Volume: 26

Issue number: 1

ISSN (Print): 1534-4320

Ratings:

Scopus rating (2017): CiteScore 5.14 SJR 1.152 SNIP 2.092

Original language: English

ASJC Scopus subject areas: Neuroscience(all), Biomedical Engineering, Computer Science Applications

Keywords: Boundary conditions, Brain modeling, Complete electrode model (CEM), Computational modeling, Electric potential, Electrodes, Electroencephalography, Electroencephalography (EEG) electrode modeling, Finite element method (FEM), Skin, Transcranial electrical stimulation (tES)

DOIs:

10.1109/TNSRE.2017.2748930

Source: Scopus

Source ID: 85030762392

Research output: Contribution to journal > Article > Scientific > peer-review

### A dynamical quality model to continuously monitor software maintenance

Context: several companies, particularly Small and Medium Sized Enterprises (SMEs), often face software maintenance issues due to the lack of Software Quality Assurance (SQA). SQA is a complex task that requires a lot of effort and expertise, often not available in SMEs. Several SQA models, including maintenance prediction models, have been defined in research papers. However, these models are commonly defined as "one-size-fits-All" and are mainly targeted at the big industry, which can afford software quality experts who undertake the data interpretation tasks. Objective: in this work, we propose an approach to continuously monitor the software operated by end users, automatically collecting issues and recommending possible fixes to developers. The continuous exception monitoring system will also serve as knowledge base to suggest a set of quality practices to avoid (re)introducing bugs into the code. Method: first, we identify a set of SQA practices applicable to SMEs, based on the main constraints of these. Then, we identify a set of prediction techniques, including regressions and machine learning, keeping track of bugs and exceptions raised by the released software. Finally, we provide each company with a tailored SQA model, automatically obtained from companies' bug/issue history. Developers are then provided with the quality models through a set of plug-ins for integrated development environments. These suggest a set of SQA actions that should be undertaken, in order to maintain a certain quality level and allowing to remove the most severe issues with the lowest possible effort. Conclusion: The collected measures will be made available as public dataset, so that researchers can also benefit of the project's results. This work is developed in collaboration with local SMEs and existing Open Source projects and communities.

### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Free University of Bolzano-Bozen, Università degli Studi Dell'Insubria, Former organisation of the author

Contributors: Lenarduzzi, V., Stan, A. C., Taibi, D., Tosi, D., Venters, G.

Number of pages: 11

Pages: 168-178

Publication date: 2017

### Host publication information

Title of host publication: Proceedings of the 11th European Conference on Information Systems Management, ECISM 2017

Publisher: Academic Conferences and Publishing International Limited

ISBN (Electronic): 9781911218524

ASJC Scopus subject areas: Computer Science Applications, Information Systems, Management Information Systems

Keywords: Dynamic Software Measurement, Software Maintenance, Software Quality

URLs:

<http://www.scopus.com/inward/record.url?scp=85029853227&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 85029853227

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

### **Bayes Forest: A data-intensive generator of morphological tree clones**

Detailed and realistic tree form generators have numerous applications in ecology and forestry. For example, the varying morphology of trees contributes differently to formation of landscapes, natural habitats of species, and eco-physiological characteristics of the biosphere. Here, we present an algorithm for generating morphological tree "clones" based on the detailed reconstruction of the laser scanning data, statistical measure of similarity, and a plant growth model with simple stochastic rules. The algorithm is designed to produce tree forms, i.e., morphological clones, similar (and not identical) in respect to tree-level structure, but varying in fine-scale structural detail. Although we opted for certain choices in our algorithm, individual parts may vary depending on the application, making it a general adaptable pipeline. Namely, we showed that a specific multipurpose procedural stochastic growth model can be algorithmically adjusted to produce the morphological clones replicated from the target experimentally measured tree. For this, we developed a statistical measure of similarity (structural distance) between any given pair of trees, which allows for the comprehensive comparing of the tree morphologies by means of empirical distributions describing the geometrical and topological features of a tree. Finally, we developed a programmable interface to manipulate data required by the algorithm. Our algorithm can be used in a variety of applications for exploration of the morphological potential of the growth models (both theoretical and experimental), arising in all sectors of plant science research.

#### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Mathematics, Research group: Inverse Problems, Department of Computer Science, Aalto University

Contributors: Potapov, I., Järvenpää, M., Åkerblom, M., Raunonen, P., Kaasalainen, M.

Publication date: 2017

Peer-reviewed: Yes

#### **Publication information**

Journal: GigaScience

Volume: 6

Issue number: 10

Article number: gix079

ISSN (Print): 2047-217X

Ratings:

Scopus rating (2017): CiteScore 6.81 SJR 5.022 SNIP 1.836

Original language: English

ASJC Scopus subject areas: Health Informatics, Computer Science Applications

Keywords: Empirical distributions, Large scale data, Morphological clone, Quantitative structure tree model, Stochastic data driven model, Terrestrial laser scanning

Electronic versions:

gix079

DOIs:

10.1093/gigascience/gix079

URLs:

<http://urn.fi/URN:NBN:fi:tty-201711212191>

#### **Bibliographical note**

EXT="Järvenpää, Marko"

Source: Scopus

Source ID: 85032857287

Research output: Contribution to journal › Article › Scientific › peer-review

### **BM3D-HVS: Content-Adaptive denoising for improved visual quality**

We introduce a content-Adaptive approach to image denoising where the filter design is based on mean opinion scores (MOSs) from preliminary experiments with volunteers who evaluated the quality of denoised image fragments. This allows to tune the filter parameters so to improve the perceptual quality of the output image, implicitly accounting for the peculiarities of the human visual system (HVS). A modification of the BM3D image denoising filter (Dabov et al., IEEE TIP, 2007), namely BM3DHVS, is proposed based on this framework. We show that it yields a higher visual quality than the conventional BM3D. Further, we have also analyzed the MOSs against popular full-reference visual quality metrics such as SSIM (Wang et al., IEEE TIP, 2004), its extension FSIM (Zhang et al., IEEE TIP, 2011), and the no-reference IL-NIQE (Zhang et al., IEEE TIP, 2015) over each image fragment. Both the Spearman and the Kendall rank order correlation show that these metrics do not correspond well to the human perception. This calls for new visual quality metrics tailored for the benchmarking and optimization of image denoising methods.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Signal Processing, Kharkiv National Aerospace University, Noiseless Imaging Ltd

Contributors: Egiazarian, K., Danielyan, A., Ponomarenkoa, N., Foia, A., Ieremeiev, O., Lukin, V.  
Number of pages: 8  
Pages: 48-55  
Publication date: 2017

#### Host publication information

Title of host publication: Image Processing: Algorithms and Systems XV

#### Publication series

Name: Electronic Imaging  
ISSN (Print): 2470-1173  
ASJC Scopus subject areas: Computer Graphics and Computer-Aided Design, Computer Science Applications, Human-Computer Interaction, Software, Electrical and Electronic Engineering, Atomic and Molecular Physics, and Optics  
DOIs:  
10.2352/ISSN.2470-1173.2017.13.DPMI-083

#### Bibliographical note

EXT="Danielyan, Aram"  
EXT="Lukin, Vladimir"  
jufoid=84313  
Source: Scopus  
Source ID: 85040604686  
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

#### Complex elevator system DSM-case for a DSM design sprint

In this paper we present a complex elevator system design structure matrix (DSM). The DSM is created with system experts to enable solving of complex system development problems via a product DSM. This data is created to be used as a case study in a DSM design sprint. It was created to show the diversity of findings that can be ascertained from a single DSM matrix. In the spirit of open science, we present both the DSM and the design sprint to enable other researchers to replicate, reproduce or otherwise build on the same source of data.

#### General information

Publication status: Published  
MoE publication type: A4 Article in a conference publication  
Organisations: Research area: Design, Development and LCM, Mechanical Engineering and Industrial Systems, Aalto University, Kone Oyj, Department of P5DC, University of Vaasa (UVA)  
Contributors: Niutanen, V., Hölttä-Otto, K., Rahardjo, A., Stowe, H. M., Helo, P., Pulkkinen, A.  
Number of pages: 6  
Pages: 259-264  
Publication date: 2017

#### Host publication information

Title of host publication: Understand, Innovate, and Manage your Complex System! - Proceedings of the 19th International DSM Conference  
Publisher: The Design Society  
ISBN (Electronic): 9783000574795  
ASJC Scopus subject areas: Computer Science Applications, Information Systems  
Keywords: Complex product, Design structure matrix, Product architecture  
Source: Scopus  
Source ID: 85040109179  
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

#### Computational wavelength resolution for in-line lensless holography: Phase-coded diffraction patterns and wavefront group-sparsity

In-line lensless holography is considered with a random phase modulation at the object plane. The forward wavefront propagation is modelled using the Fourier transform with the angular spectrum transfer function. The multiple intensities (holograms) recorded by the sensor are random due to the random phase modulation and noisy with Poissonian noise distribution. It is shown by computational experiments that high-accuracy reconstructions can be achieved with resolution going up to the two thirds of the wavelength. With respect to the sensor pixel size it is a super-resolution with a factor of 32. The algorithm designed for optimal superresolution phase/amplitude reconstruction from Poissonian data is based on the general methodology developed for phase retrieval with a pixel-wise resolution in V. Katkovnik, "Phase retrieval from noisy data based on sparse approximation of object phase and amplitude", <http://www.cs.tut.fi/~lasip/DDT/index3.html>.

#### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication  
Organisations: Signal Processing, Department of Photonics and Optical Information Technology, ITMO University  
Contributors: Katkovnik, V., Shevkunov, I., Petrov, N. V., Egiazarian, K.  
Publication date: 2017

#### Host publication information

Title of host publication: Digital Optical Technologies 2017  
Publisher: SPIE  
Article number: 1033509  
ISBN (Electronic): 9781510611153

#### Publication series

Name: Proceedings of SPIE  
Volume: 10335  
ISSN (Print): 0277-786X  
ASJC Scopus subject areas: Electronic, Optical and Magnetic Materials, Condensed Matter Physics, Computer Science Applications, Applied Mathematics, Electrical and Electronic Engineering  
Keywords: Discrete optical signal processing, Image processing, Noise in imaging systems, Phase retrieval, Superresolution  
DOIs:  
10.1117/12.2269327

#### Bibliographical note

jufoid=71479  
Source: Scopus  
Source ID: 85030715279  
Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

#### Dimension reduction and decomposition using causal graph and qualitative analysis for aircraft concept design optimization

With the increasing design dimensionality, it is more difficult to solve Multidisciplinary design optimization (MDO) problems. To reduce the dimensionality of MDO problems, many MDO decomposition strategies have been developed. However, those strategies consider the design problem as a black-box function. In practice, the designers usually have certain knowledge of their problem. In this paper, a method leveraging causal graph and qualitative analysis is developed to reduce the dimensionality of the MDO problem by systematically modeling and incorporating knowledge of the design problem. Causal graph is employed to show the input-output relationships between variables. Qualitative analysis using design structure matrix (DSM) is carried out to automatically find the variables that can be determined without optimization. According to the weight of variables, the MDO problem is divided into two sub-problems, the optimization problem with respect to important variables, and the one with less important variables. The novel method is performed to solve an aircraft concept design problem and the results show that the new dimension reduction and decomposition method can significantly improve optimization efficiency.

#### General information

Publication status: Published  
MoE publication type: A4 Article in a conference publication  
Organisations: Mechanical Engineering and Industrial Systems, Simon Fraser University  
Contributors: Wu, D., Coatanea, E., Wang, G. G.  
Publication date: 2017

#### Host publication information

Title of host publication: 43rd Design Automation Conference  
Publisher: The American Society of Mechanical Engineers ASME  
ISBN (Electronic): 9780791858134  
ASJC Scopus subject areas: Mechanical Engineering, Computer Graphics and Computer-Aided Design, Computer Science Applications, Modelling and Simulation  
Keywords: Aircraft concept design, Causal graph, Dimension reduction, Dimensional analysis, Multidisciplinary design optimization  
DOIs:  
10.1115/DETC201767601  
Source: Scopus  
Source ID: 85034658662  
Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

### **Dynamic laser speckle metrology with binarization of speckle patterns**

Dynamic laser speckle analysis is non-destructive detection of physical or biological activity through statistical processing of speckle patterns on the surface of diffusely reflecting objects. This method is sensitive to microscopic changes of the surface over time and needs simple optical means. Advances in computers and 2D optical sensors forced development of pointwise algorithms. They rely on acquisition of a temporal sequence of correlated speckle images and generate activity data as a 2D spatial contour map of the estimate of a given statistical parameter. The most widely used pointwise estimates are the intensity-based estimates which compose each map entry from a time sequence of intensity values taken at one and the same pixel in the acquired speckle images. Accuracy of the pointwise approach is strongly affected by the signal-dependent nature of the speckle data when the spread of intensity fluctuations depends on the intensity itself. The latter leads to erroneous activity determination at non-uniform distribution of intensity in the laser beam for the non-normalized estimates. Normalization of the estimates, introduces errors. We propose to apply binarization to the acquired speckle images by comparing the intensity values in the temporal sequence for a given spatial point to the mean intensity value estimated for this point and to evaluate a polar correlation function. Efficiency of this new processing algorithm is checked both by simulation and experiment.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Signal Processing, Research group: 3D MEDIA, Bulgarian Academy of Sciences

Contributors: Stoykova, E., Nazarova, D., Berberova, N., Gotchev, A., Ivanov, B., Mateev, G.

Publication date: 2017

#### **Host publication information**

Title of host publication: 19th International Conference and School on Quantum Electronics: Laser Physics and Applications

Publisher: SPIE

Article number: 102260R

ISBN (Electronic): 9781510609532

#### **Publication series**

Name: Proceedings of SPIE

Volume: 10226

ISSN (Print): 0277-786X

ASJC Scopus subject areas: Electronic, Optical and Magnetic Materials, Condensed Matter Physics, Computer Science Applications, Applied Mathematics, Electrical and Electronic Engineering

Keywords: Binary patterns, Dynamic speckle, Intensity-based algorithms, Optical metrology, Pointwise processing

DOIs:

10.1117/12.2262330

#### **Bibliographical note**

JUF0ID=71479

Source: Scopus

Source ID: 85017345812

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

### **Dynamic response to process disturbances—A comparison between TMB/SMB models in transient regime**

The modelling and design of Simulated moving bed (SMB) processes is normally done using the True moving bed (TMB) approximation. Several studies show that average values obtained at cyclic steady state for SMB units approach the TMB unit at steady state and that this approach is better as the number of columns in the SMB increases. However, studies that evaluate this equivalence under dynamic conditions are scarce. The objective of this work is to perform an analysis of the transient behaviour of two SMB units, with four and eight columns, and compare the results with the ones obtained for a TMB unit. An analysis of the impact of operating variables on the processes performance parameters is performed. The results show that TMB/SMB equivalence is valid only for conditions that do not violate the regeneration/separation regions and that the transient behaviour of the four columns SMB can resemble more the TMB.

#### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Univ Porto, Universidade do Porto, Fac Med, Dept Med Imaging

Contributors: Nogueira, I. B., Ribeiro, A. M., Rodrigues, A. E., Loureiro, J. M.

Number of pages: 15

Pages: 230-244

Publication date: 2017

Peer-reviewed: Yes

#### **Publication information**

Journal: Computers and Chemical Engineering

Volume: 99

ISSN (Print): 0098-1354

Ratings:

Scopus rating (2017): CiteScore 3.65 SJR 1.024 SNIP 1.621

Original language: English

ASJC Scopus subject areas: Chemical Engineering(all), Computer Science Applications

Keywords: Dynamic behaviour, Enantiomers separation, Simulated moving bed, True moving bed

DOIs:

10.1016/j.compchemeng.2017.01.026

URLs:

<http://www.scopus.com/inward/record.url?scp=85012284107&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 85012284107

Research output: Contribution to journal › Article › Scientific › peer-review

### **Experimenting traditional and modern reliability models in a 3-years european software project**

Reliability is a very important non-functional aspect for software systems and artefacts. In literature, several definitions of software reliability exist and several methods and approaches exist to measure reliability of a software project. However, in the literature no works focus on the applicability of these methods in all the development phases of real software projects. In this paper, we describe the methodology we adopted during the S-CASE FP7 European Project to predict reliability for both the S-CASE platform as well as for the software artefacts automatically generated by using the S-CASE platform. Two approaches have been adopted to compute reliability: The first one is the Rome Lab Model, a well adopted traditional approach in industry; the second one is an empirical approach defined by the authors in a previous work. An extensive dataset of results has been collected during all the phases of the project. The two approaches can complement each other, to support to prediction of reliability during all the development phases of a software system in order to facilitate the project management from a non-functional point-of-view.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Università degli Studi Dell'Insubria, Former organisation of the author

Contributors: Tosi, D., Lenarduzzi, V., Morasca, S., Taibi, D.

Number of pages: 11

Pages: 304-314

Publication date: 2017

#### **Host publication information**

Title of host publication: Proceedings of the 11th European Conference on Information Systems Management, ECISM 2017

Publisher: Academic Conferences and Publishing International Limited

ISBN (Electronic): 9781911218524

ASJC Scopus subject areas: Computer Science Applications, Information Systems, Management Information Systems

Keywords: Early Reliability, Perceived Reliability, Predictive Models, Reliability by design, Rome Lab Model, Static Analysis

URLs:

<http://www.scopus.com/inward/record.url?scp=85039850001&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 85039850001

Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

### **Full-reference metrics multidistortional analysis**

This paper is devoted to analysis and further improvement of full-reference metrics of image visual quality. The effectiveness of a metric is characterized by the rank correlation factors between the obtained array of mean opinion scores (MOS) and the corresponding array of given metric values. This allows to determine the correspondence of a considered metric to a human visual system (HVS). Results obtained on the database TID2013 show that Spearman correlation for the best existing metrics (PSNRHMA, FSIM, SFF, etc.) does not exceed 0.85. In this paper, extended verification tools that allow to detect the shortcomings of the metrics taking into account combined distortions is proposed. An example for further improvement of the PSNRHMA metric is presented.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Signal Processing, Kharkiv National Aerospace University

Contributors: Ieremeiev, O., Lukin, V., Ponomarenko, N., Egiazarian, K.  
Number of pages: 9  
Pages: 27-35  
Publication date: 2017

#### Host publication information

Title of host publication: Image Processing: Algorithms and Systems XV

#### Publication series

Name: Electronic Imaging

ISSN (Print): 2470-1173

ASJC Scopus subject areas: Computer Graphics and Computer-Aided Design, Computer Science Applications, Human-Computer Interaction, Software, Electrical and Electronic Engineering, Atomic and Molecular Physics, and Optics

Keywords: Full-reference metrics, Image visual quality assessment, Metrics analysis, Metrics verification, Multiple distortions

DOIs:

10.2352/ISSN.2470-1173.2017.13.IPAS-202

#### Bibliographical note

jufoid=84313

EXT="Ponomarenko, Nikolay"

EXT="Lukin, Vladimir"

Source: Scopus

Source ID: 85040625876

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

#### Internet of Things: Opportunities for vocational education and training: Presentation of the pilot project

In the Internet of Things (IoT), machines and devices are equipped with sensors and Internet connections that makes it possible to collect data and store this data to cloud services. In vocational education and training, the stored data can be used to improve decision-making processes. With the help of this data, a teacher can also get a more accurate picture of the current state of the education environment than before. IoT should be integrated into vocational education and training because IoT will help to achieve important educational objectives. IoT is able to promote students' preparation for working life, the safety of education environment, self-directed learning, and effective learning. It can also improve the efficient use of educational resources. In additional, IoT based solutions should be introduced so that students would have a vision of new types of IoT skill requirements before they enter the labour market. In this paper, we presents IoT related aspects that enable to meet the above-mentioned educational objectives. By implementing a pilot project, we aim to concretise IoT's possibilities in the education sector.

#### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Research group: Software Engineering and Intelligent Systems, Pervasive Computing, Facilities and Infrastructure

Contributors: Vihervaara, J., Alapaholuoma, T.

Number of pages: 5

Pages: 476-480

Publication date: 2017

#### Host publication information

Title of host publication: CSEDU 2017 - Proceedings of the 9th International Conference on Computer Supported Education

Publisher: SCITEPRESS

ISBN (Electronic): 9789897582394

ASJC Scopus subject areas: Education, Computer Science Applications, Information Systems

Keywords: Internet of Things, Pilot, Vocational education

DOIs:

10.5220/0006353204760480

Source: Scopus

Source ID: 85023781608

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

#### Method for Simulating Dose Reduction in Digital Breast Tomosynthesis

This work proposes a new method of simulating dose reduction in digital breast tomosynthesis (DBT), starting from a clinical image acquired with a standard radiation dose. It considers both signal-dependent quantum and signal-independent electronic noise. Furthermore, the method accounts for pixel crosstalk, which causes the noise to be frequency-dependent, thus increasing the simulation accuracy. For an objective assessment, simulated and real images

were compared in terms of noise standard deviation, signal-to-noise ratio (SNR) and normalized noise power spectrum (NNPS). A two-alternative forced-choice (2-AFC) study investigated the similarity between the noise strength of low-dose simulated and real images. Six experienced medical physics specialists participated on the study, with a total of 2,160 readings. Objective assessment showed no relevant trends with the simulated noise. The relative error in the standard deviation of the simulated noise was less than 2%; for every projection angle. The relative error of the SNR was less than 1.5%, and the NNPS of the simulated images had errors less than 2.5%. The 2-AFC human observer experiment yielded no statistically significant difference ( $p=0.84$ ) in the perceived noise strength between simulated and real images. Furthermore, the observer study also allowed the estimation of a dose difference at which the observer perceived a just-noticeable difference (JND) in noise levels. The estimated JND value indicated that a change of 17% in the current-time product was sufficient to cause a noticeable difference in noise levels. The observed high accuracy, along with the flexible calibration, make this method an attractive tool for clinical image-based simulations of dose reduction.

#### General information

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Signal Processing, Research group: Signal and Image Restoration-RST

Contributors: Borges, L. R., Guerrero, I., Bakic, P. R., Foi, A., Maidment, A. D., Vieira, M. A.

Pages: 2331-2342

Publication date: 2017

Peer-reviewed: Yes

#### Publication information

Journal: IEEE Transactions on Medical Imaging

Volume: 36

Issue number: 11

ISSN (Print): 0278-0062

Ratings:

Scopus rating (2017): CiteScore 6.6 SJR 1.895 SNIP 2.86

Original language: English

ASJC Scopus subject areas: Software, Radiological and Ultrasound Technology, Computer Science Applications, Electrical and Electronic Engineering

Keywords: Biomedical imaging, Breast, Calibration, digital breast tomosynthesis, dose reduction, Electronic noise, Estimation, Image reconstruction, quantum noise, Signal to noise ratio, Standards

Electronic versions:

Borges-DBT\_Sim-TMI2017

DOIs:

10.1109/TMI.2017.2715826

URLs:

<http://urn.fi/URN:NBN:fi:itty-201708071662>

Source: Scopus

Source ID: 85023177059

Research output: Contribution to journal > Article > Scientific > peer-review

#### Nanodevice Arrays for Peripheral Nerve Fascicle Activation Using Ultrasound Energy-harvesting

We propose the use of wireless, energy-harvesting, implanted nanodevice arrays with electrodes for selective stimulation of peripheral nerves in the human body. We calculate the input ultrasound energy and harvested power for single fixed-size nanowire-based nanodevices at different tissue depths and compare these with the current and voltage levels required for peripheral neural stimulation. We model the dimensioning of arrays of nanodevices, embedded in biocompatible tissue patches, to meet these neural stimulation requirements. Selectivity of activation of particular nerve bundles requires that the output voltage and current of the array can be varied to increase or decrease penetration into the neural tissue. This variation can be achieved by changing the energised area of the array and/or by decreasing the incident ultrasound power. However, the array must be implanted horizontally relative to the incident ultrasound as any tilting of the nanodevices will reduce the harvested energy. The proposed approach provides a long-term implant solution for nerve stimulation that allows the patient greater freedom of movement than with embedded tethered electrodes.

#### General information

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Electronics and Communications Engineering, Research group: Emerging Technologies for Nano-Bio-Info-Cogno

Contributors: Donohoe, M., Jennings, B., Jornet, J. M., Balasubramaniam, S.

Pages: 919-930

Publication date: 2017

Peer-reviewed: Yes

### Publication information

Journal: IEEE Transactions on Nanotechnology

Volume: 16

Issue number: 6

ISSN (Print): 1536-125X

Ratings:

Scopus rating (2017): CiteScore 2.86 SJR 0.572 SNIP 1.111

Original language: English

ASJC Scopus subject areas: Computer Science Applications, Electrical and Electronic Engineering

Keywords: Crystals, Electrodes, Energy harvesting, Energy Harvesting, Nanoscale devices, Nanowires, Nerve stimulation, Resonant frequency, Substrates, Ultrasonic imaging, Ultrasound

Electronic versions:

TNANO2723658corrected

DOIs:

10.1109/TNANO.2017.2723658

URLs:

<http://urn.fi/URN:NBN:fi:tty-201712212450>

Source: Scopus

Source ID: 85023197296

Research output: Contribution to journal > Article > Scientific > peer-review

### Picosecond MOPA with ytterbium doped tapered double clad fiber

The powerful picosecond master oscillator - power amplifier (MOPA) with double clad ytterbium doped tapered fiber as a buster amplifier has been demonstrated in the presented paper. The developed MOPA has 60ps pulses with 0.3mJ pulse energy and 5MW peak power.

### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Research group: Ultrafast and intense lasers, Photonics, Research group: Nanophotonics, Ampliconix Ltd, Institute of Radio Engineering and Electronics of the Russian Academy of Sciences

Contributors: Filippov, V., Vorotynskii, A., Noronen, T., Gumenyuk, R., Chamorovskii, Y., Golant, K.

Number of pages: 6

Publication date: 2017

### Host publication information

Title of host publication: Fiber Lasers XIV : Technology and Systems

Volume: 10083

Publisher: SPIE

Article number: 100831H

ISBN (Electronic): 9781510606074

### Publication series

Name: Proceedings of SPIE

Publisher: SPIE

No.: 10083

ISSN (Print): 0277-786X

ISSN (Electronic): 1996-756X

ASJC Scopus subject areas: Electronic, Optical and Magnetic Materials, Condensed Matter Physics, Computer Science Applications, Applied Mathematics, Electrical and Electronic Engineering

Keywords: Fiber laser, Picosecond laser, Ultrafast laser

DOIs:

10.1117/12.2252006

Source: Scopus

Source ID: 85019465842

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

### Time-Dependent Energy and Resource Management in Mobility-Aware D2D-Empowered 5G Systems

The 5G mobile networks are expected to offer higher degrees of radio access heterogeneity across a wide range of technologies (LTE, WiFi, mmWave, etc.), which operate in both licensed and unlicensed spectrum providing dissimilar data rates and coverage. In light of the stringent requirements in terms of resource and energy efficiency, the performance optimization of such heterogeneous 5G systems becomes an involved task that demands abundant information on the states of users to solve a complex, large-scale optimization problem. However, the unpredictable mobility of communicating entities, including dual mobility of D2D partners, may lead to a rapid deviation from the initial, optimized system state and thus requires frequent re-optimizations of the entire network. In this article, we aim to deliver a

comprehensive tutorial on the implications of system-wide energy and resource management with the emphasis on its time-dependent behavior. Proposing a novel network-centric 5G optimization framework, we employ insights from the random walk and Markov chain theories, and also confirm our findings with an extensive system-level simulation campaign. These results reveal an exponential performance degradation rate that primarily depends on the average user speeds. Together with reporting the divergence exponents for different 5G system configurations, we also provide practical insights into how to exploit them in order to non-incrementally improve the throughput and energy performance of the network.

#### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Electronics and Communications Engineering, University of Russia, University Mediterranea of Reggio, RUDN University

Contributors: Orsino, A., Samuylov, A., Moltchanov, D., Andreev, S., Militano, L., Araniti, G., Koucheryavy, Y.

Number of pages: 9

Pages: 14-22

Publication date: 2017

Peer-reviewed: Yes

#### **Publication information**

Journal: IEEE Wireless Communications

Volume: 24

Issue number: 4

ISSN (Print): 1536-1284

Ratings:

Scopus rating (2017): CiteScore 9.3 SJR 1.878 SNIP 3.636

Original language: English

ASJC Scopus subject areas: Computer Science Applications, Electrical and Electronic Engineering

DOIs:

10.1109/MWC.2017.1600393

Source: Scopus

Source ID: 85028851100

Research output: Contribution to journal › Article › Scientific › peer-review

#### **Urban 3D segmentation and modelling from street view images and LiDAR point clouds**

3D urban maps with semantic labels and metric information are not only essential for the next generation robots such as autonomous vehicles and city drones, but also help to visualize and augment local environment in mobile user applications. The machine vision challenge is to generate accurate urban maps from existing data with minimal manual annotation. In this work, we propose a novel methodology that takes GPS registered LiDAR (Light Detection And Ranging) point clouds and street view images as inputs and creates semantic labels for the 3D points clouds using a hybrid of rule-based parsing and learning-based labelling that combine point cloud and photometric features. The rule-based parsing boosts segmentation of simple and large structures such as street surfaces and building facades that span almost 75% of the point cloud data. For more complex structures, such as cars, trees and pedestrians, we adopt boosted decision trees that exploit both structure (LiDAR) and photometric (street view) features. We provide qualitative examples of our methodology in 3D visualization where we construct parametric graphical models from labelled data and in 2D image segmentation where 3D labels are back projected to the street view images. In quantitative evaluation we report classification accuracy and computing times and compare results to competing methods with three popular databases: NAVTEQ True, Paris-Rue-Madame and TLS (terrestrial laser scanned) Velodyne.

#### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Signal Processing, Research group: Vision, Nokia

Contributors: Babahajani, P., Fan, L., Kämäräinen, J., Gabbouj, M.

Number of pages: 16

Pages: 679-694

Publication date: 2017

Peer-reviewed: Yes

#### **Publication information**

Journal: Machine Vision and Applications

Volume: 28

Issue number: 7

ISSN (Print): 0932-8092

Ratings:

Scopus rating (2017): CiteScore 2.62 SJR 0.485 SNIP 1.601

Original language: English

ASJC Scopus subject areas: Software, Hardware and Architecture, Computer Vision and Pattern Recognition, Computer Science Applications

Keywords: LiDAR, Point cloud, Robotics, Semantic segmentation, Street view, Urban 3D

Electronic versions:

Urban 3D segmentation and modelling from street view images and LiDAR point clouds

DOIs:

10.1007/s00138-017-0845-3

URLs:

<http://urn.fi/URN:NBN:fi:tty-201706121590>

#### **Bibliographical note**

EXT="Babahajiani, Pouria"

Source: Scopus

Source ID: 85019692066

Research output: Contribution to journal > Article > Scientific > peer-review

#### **Using enterprise architecture artefacts in an organisation**

As a tool for management and planning, Enterprise Architecture (EA) can potentially align organisations' business processes, information, information systems and technology towards a common goal, and supply the information required within this journey. However, an explicit view on why, how, when and by whom EA artefacts are used in order to realise its full potential is not defined. Utilising the features of information systems use studies and data from a case study with 14 EA stakeholder interviews, we identify and describe 15 EA artefact use situations that are then reflected in the related literature. Their analysis enriches understanding of what are EA artefacts, how and why they are used and when are they used, and results in a theoretical framework for understanding their use in general.

#### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Department of Information Management and Logistics, Research group: Novi, Managing digital industrial transformation (mDIT)

Contributors: Niemi, E., Pekkola, S.

Pages: 313-338

Publication date: 2017

Peer-reviewed: Yes

#### **Publication information**

Journal: Enterprise Information Systems

Volume: 11

Issue number: 3

ISSN (Print): 1751-7575

Ratings:

Scopus rating (2017): CiteScore 2.87 SJR 0.717 SNIP 1.751

Original language: English

ASJC Scopus subject areas: Computer Science Applications, Information Systems and Management

Keywords: artefact, case study, enterprise architecture, use situation, utilisation

DOIs:

10.1080/17517575.2015.1048831

#### **Bibliographical note**

EXT="Niemi, Eetu"

Source: Scopus

Source ID: 84929593903

Research output: Contribution to journal > Article > Scientific > peer-review

#### **Describing mobile devices as RESTful services for the end-users**

This paper presents an end-user oriented approach of describing mobile devices as RESTful services. The mobile services are provided to the end-users through a centralized server. To enable plugging of devices, they provide a machine-processable device description with detailed specification of their RESTful API. The device description is used to generate required user interface as well as generating the RESTful invocations. We provide general guidelines on how to design a REST API for a mobile device and a device description for machine-to-machine interactions. The approach is demonstrated by building a centralized marketplace to promote and use available mobile services. The central marketplace acts as a broker for the dynamic mobile services. In addition, we use two case study applications to

demonstrate the service registration, provisioning, and usage.

#### **General information**

Publication status: Published  
MoE publication type: A4 Article in a conference publication  
Organisations: Pervasive Computing, City University of Hong Kong  
Contributors: Ruokonen, A., Wu, Z., Lu, R.  
Number of pages: 8  
Pages: 127-134  
Publication date: 16 Dec 2016

#### **Host publication information**

Title of host publication: 2016 IEEE International Conference on Mobile Services (MS)  
Publisher: IEEE  
ISBN (Electronic): 9781509026258  
ASJC Scopus subject areas: Computer Science Applications, Computer Networks and Communications  
Keywords: End-Users, Internet of Things, Machine-to-Machine, Mobile Service  
DOIs:  
10.1109/MobServ.2016.27  
Source: Scopus  
Source ID: 85010420468  
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

#### **Dynamic social trust associations over d2d communications: An implementation perspective**

Network-assisted device-to-device (D2D) connectivity is a next-generation wireless technology that facilitates direct user contacts in physical proximity while taking advantage of the flexible and ubiquitous control coming from the cellular infrastructure. This novel type of user interactions creates challenges in constructing meaningful proximity-based applications and services that would enjoy high levels of user adoption. Accordingly, to enable such adoption a comprehensive understanding of user sociality and trust factors is required together with respective technology enablers for secure D2D communications, especially when cellular control is not available at all times. In this paper, we study an important aspect of secure communications over proximity-based direct links, with a primary emphasis on developing the corresponding proof-of-concept implementation. Our developed prototype offers rich functionality for dynamic management of security functions in proximate devices, whenever a new device joins the secure group of users or an existing one leaves it. To evaluate the behavior of our implemented application, we characterize its performance in terms of computation and transmission delays from the user perspective.

#### **General information**

Publication status: Published  
MoE publication type: A4 Article in a conference publication  
Organisations: Electronics and Communications Engineering, Pervasive Computing, Research area: User experience, Research group: Emerging Technologies for Nano-Bio-Info-Cogno, Research area: Software engineering, Brno University of Technology, Intel Corporation  
Contributors: Urama, J., Olshannikova, E., Ometov, A., Masek, P., Andreev, S., Olsson, T., Hosek, J., Niutanen, J., Koucheryavy, Y., Mikkonen, T.  
Number of pages: 4  
Pages: 186-189  
Publication date: 16 Dec 2016

#### **Host publication information**

Title of host publication: 2016 IEEE International Conference on Mobile Services (MS)  
Publisher: IEEE  
ISBN (Electronic): 9781509026258  
ASJC Scopus subject areas: Computer Science Applications, Computer Networks and Communications  
DOIs:  
10.1109/MobServ.2016.41

#### **Bibliographical note**

EXT="Niutanen, Jussi"  
Source: Scopus  
Source ID: 85010280710  
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

#### **Visual decision support for business ecosystem analysis**

This study comparatively evaluates the effectiveness of three visualization methods (list, matrix, network) and the influence of data complexity, task type, and user characteristics on decision performance in the context of business ecosystem analysis. We pursue this objective using an exploratory study with 14 prototypical users (e.g. executives,

analysts, investors, and policy makers). The results show that in low complexity contexts, decision performance between visual representations differ but not substantially. In high complexity contexts, however, decision performance suffers significantly if visual representations are not appropriately matched to task types. Our study makes several theoretical and practical contributions. Theoretically, we extend cognitive fit theory by investigating the impact of business ecosystem task type and complexity. Managerially, our study contributes to the relatively underexplored, but emerging area of the design of business ecosystem intelligence tools and presentation of business ecosystem data for the purpose of decision making. We conclude with future research opportunities.

### General information

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Department of Mathematics, Research group: MAT Intelligent Information Systems Laboratory, Tennenbaum Institute & School of Interactive Computing Georgia Institute of Technology 85 Fifth Street NW Atlanta, VTT Technical Research Centre of Finland, mediaX and H\*STAR Stanford University Stanford

Contributors: Basole, R. C., Huhtamäki, J., Still, K., Russell, M. G.

Number of pages: 12

Pages: 271-282

Publication date: 15 Dec 2016

Peer-reviewed: Yes

### Publication information

Journal: Expert Systems with Applications

Volume: 65

ISSN (Print): 0957-4174

Ratings:

Scopus rating (2016): CiteScore 4.7 SJR 1.343 SNIP 2.446

Original language: English

ASJC Scopus subject areas: Engineering(all), Computer Science Applications, Artificial Intelligence

Keywords: Business ecosystem, Cognitive fit theory, Data complexity, Decision support, Information visualization

DOIs:

10.1016/j.eswa.2016.08.041

Source: Scopus

Source ID: 84984633268

Research output: [Contribution to journal](#) > [Article](#) > [Scientific](#) > [peer-review](#)

### Improving the delivery cycle: A multiple-case study of the toolchains in Finnish software intensive enterprises

Context: Software companies seek to gain benefit from agile development approaches in order to meet evolving market needs without losing their innovative edge. Agile practices emphasize frequent releases with the help of an automated toolchain from code to delivery. Objective: We investigate, which tools are used in software delivery, what are the reasons omitting certain parts of the toolchain and what implications toolchains have on how rapidly software gets delivered to customers. Method: We present a multiple-case study of the toolchains currently in use in Finnish software-intensive organizations interested in improving their delivery frequency. We conducted qualitative semi-structured interviews in 18 case organizations from various software domains. The interviewees were key representatives of their organization, considering delivery activities. Results: Commodity tools, such as version control and continuous integration, were used in almost every organization. Modestly used tools, such as UI testing and performance testing, were more distinctly missing from some organizations. Uncommon tools, such as artifact repository and acceptance testing, were used only in a minority of the organizations. Tool usage is affected by the state of current workflows, manual work and relevancy of tools. Organizations whose toolchains were more automated and contained fewer manual steps were able to deploy software more rapidly. Conclusions: There is variety in the need for tool support in different development steps as there are domain-specific differences in the goals of the case organizations. Still, a well-founded toolchain supports speedy delivery of new software.

### General information

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Department of Pervasive Computing, Research area: Software engineering, University of Helsinki, Aalto University

Contributors: Mäkinen, S., Leppänen, M., Kilamo, T., Mattila, A., Laukkanen, E., Pagels, M., Männistö, T.

Number of pages: 13

Pages: 1339-1351

Publication date: 1 Dec 2016

Peer-reviewed: Yes

### Publication information

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Scopus rating (2016): CiteScore 3.61 SJR 0.801 SNIP 2.422

Original language: English

ASJC Scopus subject areas: Software, Information Systems, Computer Science Applications

Keywords: Agile software development, Continuous delivery, Continuous deployment, Deployment pipeline, Software development tools

DOIs:

10.1016/j.infsof.2016.09.001

Source: Scopus

Source ID: 84988001567

Research output: Contribution to journal > Article > Scientific > peer-review

### **SamExploreR: Exploring reproducibility and robustness of RNA-seq results based on SAM files**

Motivation: Data from RNA-seq experiments provide us with many new possibilities to gain insights into biological and disease mechanisms of cellular functioning. However, the reproducibility and robustness of RNA-seq data analysis results is often unclear. This is in part attributed to the two counter acting goals of (i) a cost efficient and (ii) an optimal experimental design leading to a compromise, e.g. in the sequencing depth of experiments. Results: We introduce an R package called samExploreR that allows the subsampling ( $m$  out of  $n$  bootstrapping) of short-reads based on SAM files facilitating the investigation of sequencing depth related questions for the experimental design. Overall, this provides a systematic way for exploring the reproducibility and robustness of general RNA-seq studies. We exemplify the usage of samExploreR by studying the influence of the sequencing depth and the annotation on the identification of differentially expressed genes.

#### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Department of Signal Processing, BioMediTech, Queen's University, Belfast, Northern Ireland, University of Arkansas for Medical Sciences, Nankai University

Contributors: Stupnikov, A., Tripathi, S., De Matos Simoes, R., McArt, D., Salto-Tellez, M., Glazko, G., Dehmer, M., Emmert-Streib, F.

Number of pages: 3

Pages: 3345-3347

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#### **Publication information**

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ISSN (Print): 1367-4803

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Scopus rating (2016): CiteScore 6.42 SJR 5.21 SNIP 2.329

Original language: English

ASJC Scopus subject areas: Statistics and Probability, Medicine(all), Biochemistry, Molecular Biology, Computer Science Applications, Computational Theory and Mathematics, Computational Mathematics

DOIs:

10.1093/bioinformatics/btw475

Source: Scopus

Source ID: 84994666672

Research output: Contribution to journal > Article > Scientific > peer-review

### **Casual immersive viewing with smartphones**

In this paper, we explore how to better integrate virtual reality viewing to a smartphone. We present novel designs for casual (short-term) immersive viewing of spatial and 3D content, such as augmented and virtual reality, with smartphones. Our goal is to create a simple and low-cost casual-viewing design which could be retrofitted and eventually be embedded into smartphones, instead of using larger spatial viewing accessories. We explore different designs and implemented several prototypes. One prototype uses thin and light near-to-eye optics with a smartphone display, thus providing the user with the functionality of a large, high-resolution virtual display. Our designs also enable 3D user interfaces. Easy interaction through various gestures and other modalities is possible by using the inertial and other sensors and camera of the smartphone. Our preliminary concepts are a starting point for exploring useful constructions and designs for such usage.

### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Department of Electronics and Communications Engineering, Research group: Personal Electronics Group, University of California, Santa Barbara

Contributors: Rakkolainen, I., Raisamo, R., Turk, M., Höllerer, T., Palovuori, K.

Number of pages: 4

Pages: 449-452

Publication date: 17 Oct 2016

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Publisher: ACM

ISBN (Electronic): 978-1-4503-4367-1

ASJC Scopus subject areas: Human-Computer Interaction, Software, Computer Science Applications

Keywords: 3D interaction, Augmented reality, Mobile computing, Near-to-eye display, Virtual reality

DOIs:

10.1145/2994310.2994314

### Bibliographical note

EXT="Rakkolainen, Ismo"

Source: Scopus

Source ID: 84994852921

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

### Focusing on user experience and business models in startups: Investigation of two-dimensional value creation

While good user experience (UX) can be seen to provide competitive advantage for the company and added value to users, resources for achieving UX may often be lacking in software startups. Furthermore, in different phases of business and product development process, concentrating on the focal things can be challenging. In this study, we investigated the factors affecting UX work in startups as well as UX goals startups set for their products. Furthermore, we reviewed the goals in terms of the Minimum Viable UX framework as well as value creation aspects. We present qualitative results of a survey study with 20 software startups as well as findings of a literature review. Our study suggests that while startups aim to provide products with good usability, the lack of a more comprehensive approach to UX can hinder their value creation; affecting both user satisfaction and business success. As a result, this may affect the successful implementation of startup's business model.

### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Research area: User experience, Department of Pervasive Computing, University of Oulu

Contributors: Hokkanen, L., Xu, Y., Väänänen, K.

Number of pages: 9

Pages: 59-67

Publication date: 17 Oct 2016

### Host publication information

Title of host publication: AcademicMindtrek 2016 - Proceedings of the 20th International Academic Mindtrek Conference

Publisher: ACM

ISBN (Electronic): 9781450343671

ASJC Scopus subject areas: Human-Computer Interaction, Software, Computer Science Applications

Keywords: Business model, Software, Startup, User experience, Value

Electronic versions:

Focusing on User Experience and Business Models in Startups\_HokkanenEtAl\_Mindtrek16

DOIs:

10.1145/2994310.2994371

Source: Scopus

Source ID: 84994831715

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

### Participatory development of user experience design guidelines for a B2B company

As business success is increasingly dependent on an organization's ability to provide a pleasant user experiences (UX) for its products, companies need to find ways to harness every employee to think about UX in their daily work. To support this goal, we present a participatory development process to create user experience design guidelines for a company developing materials-handling equipment for warehouses. The guidelines were developed to steer the work of all R&D designers and developers towards experience-driven design of the products in business-to-business context. The

participatory process includes six steps: Spreading awareness of UX within the company, providing information on UX, supporting understanding of UX, co-creation of guidelines, reviewing the outcome, and implementing the guidelines. This paper concentrates on describing the first five phases. The participatory approach is applicable by other organizations to support the change towards experience-driven design. The process and outcome aims to support employees' everyday work aiming for products with pleasant UX.

#### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Department of Pervasive Computing, Research area: User experience, Rocla Oy, Aalto University

Contributors: Hildén, E., Vääätäjä, H., Roto, V., Uusitalo, K.

Number of pages: 10

Pages: 49-58

Publication date: 17 Oct 2016

#### Host publication information

Title of host publication: AcademicMindtrek '16 Proceedings of the 20th International Academic Mindtrek Conference

Publisher: ACM

ISBN (Electronic): 978-1-4503-4367-1

ASJC Scopus subject areas: Human-Computer Interaction, Software, Computer Science Applications

Keywords: B2B, Design, Guideline, Mindset, Organizational change, Participatory Design, User experience

DOIs:

10.1145/2994310.2994355

#### Bibliographical note

EXT="Roto, Virpi"

Source: Scopus

Source ID: 84994834980

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

#### Software visualization today - Systematic literature review

Software visualization means visualizing various aspects and artifacts related to software. By this definition a wide range of different software engineering aspects from program comprehension to understanding software process and usage are covered. This paper presents the results of systematic literature review spanning six years of software visualization literature. The main result shows that the most studied topics in the past six years are related to software structure, behavior and evolution. Software process and usage are addressed only in few studies. In the future studying the adoption of software visualization tools in industry context would be beneficial.

#### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Department of Pervasive Computing, Research area: Software engineering, Research area: User experience

Contributors: Mattila, A., Ihantola, P., Kilamo, T., Luoto, A., Nurminen, M., Vääätäjä, H.

Number of pages: 10

Pages: 262-271

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Title of host publication: AcademicMindtrek 2016 - Proceedings of the 20th International Academic Mindtrek Conference

Publisher: ACM

ISBN (Electronic): 9781450343671

ASJC Scopus subject areas: Human-Computer Interaction, Software, Computer Science Applications

Keywords: Human-centered computing, Software visualization, Systematic literature review

DOIs:

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Source: Scopus

Source ID: 84994910745

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

#### Temporal dimensions of affect in user experience of digital news in the field

This paper examines temporal dimensions of affective experiences as part of user experience of digital news reading in field conditions in two case studies. The first study focused on user experience of novel browser optimized versions of news for tablet computers. The second study examined the experience of digital replicas. The participants were active readers of newspapers studied. The daily reporting of affect was done over the usage period of one week. The results of both studies showed that there are differences between positive and negative affect, in their dynamism over time and

individual differences they captured. The amount of negative emotions was very low with small individual differences and it reduced over time. In contrast, positive affect indicated slightly positive user experience with larger amount of individual differences. Its main dynamism was expressed at the beginning of study.

#### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Department of Pervasive Computing, Research area: User experience, Eindhoven University of Technology

Contributors: Jumisko-Pyykkö, S., Pesonen, E., Väättäjä, H.

Pages: 192-197

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Title of host publication: AcademicMindtrek 2016 - Proceedings of the 20th International Academic Mindtrek Conference

Publisher: ACM

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ASJC Scopus subject areas: Human-Computer Interaction, Software, Computer Science Applications

Keywords: Authentication, Browser, Digital news, Digital replica, Emotion, Reading, Tablet, User experience

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Source ID: 84994817765

Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

#### A coordination-based brokerage architecture for multi-cloud resource markets

With an increasing number of service providers in the cloud market, the competition between these is also increasing. Each provider attempts to attract customers by providing a high quality service with lowest possible cost and at the same time trying to make profit. Often, cloud resources are advertised and brokered in a spot market style, i.e., traded for immediate delivery. This paper proposes an architecture for a brokerage model specifically for multi-cloud resource spot markets that integrates the resource brokerage function across several cloud providers. We use a tuple space architecture to facilitate coordination. This architecture supports specifically multiple cloud providers selling unused resources in the spot market. To support the matching process by finding the best match between customer requirements and providers, offers are matched with regard the lowest possible cost available for the customer in the market at the time of the request. The key role of this architecture is to provide the coordination techniques built on a tuple space, adapted to the cloud spot market.

#### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Dublin City University, Free University of Bolzano-Bozen, School of Computing Edinburgh Napier University Edinburgh

Contributors: Aldawood, S., Fowley, F., Pahl, C., Taibi, D., Liu, X.

Number of pages: 8

Pages: 7-14

Publication date: 14 Oct 2016

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Publisher: Institute of Electrical and Electronics Engineers Inc.

ISBN (Electronic): 9781509039463

ASJC Scopus subject areas: Computer Networks and Communications, Computer Science Applications, Information Systems

Keywords: Cloud Brokerage Architecture, Cloud Resources Market, Resource Brokerage, Spot Market, Tuple Space

DOIs:

10.1109/W-FiCloud.2016.19

Source: Scopus

Source ID: 85009829349

Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

#### MVP Explained: A Systematic Mapping Study on the Definitions of Minimal Viable Product

Context: One of the most important steps of the Lean Startup methodology is the definition of Minimum Viable Product (MVP), needed to start the learning process by integrating the early adopters' feedbacks as soon as possible. Objective: This study aims at identifying the common definitions of MVP proposed and the key factors identified to help

entrepreneurs efficiently define their MVP, reducing errors due to unconsidered unknown factors. Method: We identified the MVP definitions and key factors by means of a systematic mapping study, defining the research questions and the protocol to be used. We selected the bibliographic sources, the keywords, and the selection criteria for searching the relevant papers. Results: We found 97 articles and, through inclusion and exclusion criteria, removed 75 articles, which reduced the total to 22 at the end of the process. The results are a classification schema for characterizing the definition of Minimum Viable Product in Lean Startups and a set of common key factors identified in the MVP definitions. Conclusion: The identified key factors are related to technical characteristics of the product as well as market and customer aspects. We found a positive improvement of the state of the art of MVP and the definition of Minimum.

#### **General information**

Publication status: Published  
MoE publication type: A4 Article in a conference publication  
Organisations: Free University of Bolzano-Bozen  
Contributors: Lenarduzzi, V., Taibi, D.  
Number of pages: 8  
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Publication date: 14 Oct 2016

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Publisher: IEEE  
ISBN (Electronic): 9781509028191  
ASJC Scopus subject areas: Computer Science Applications, Software  
Keywords: Entrepreneurship, Lean Startup, Minimum Viable Product, Startup  
DOIs:  
10.1109/SEAA.2016.56

#### **Bibliographical note**

EXT="Lenarduzzi, Valentina"  
Source: Scopus  
Source ID: 85018685711  
Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

#### **Challenges and capabilities of conductive polymeric materials for electromechanical stimulation of stem cells: A case study**

Cell cultivation devices that mimic the complex microenvironment of cells in the human body are of high importance for the future of stem cell research. This paper introduces a prototype of an electromechanical stimulation platform as a modular expansion of an earlier developed mechanical stimulation device for stem cell research. A solution processable ink from PEDOT:PSS and graphene is studied as a suitable material for fabrication of transparent stretchable electrodes. Challenges of electrode integration on a flexible membrane using this material are critically discussed.

#### **General information**

Publication status: Published  
MoE publication type: A4 Article in a conference publication  
Organisations: Department of Automation Science and Engineering  
Contributors: Viehrig, M., Tuukkanen, S., Kallio, P.  
Number of pages: 5  
Publication date: 6 Sep 2016

#### **Host publication information**

Title of host publication: 2016 International Conference on Manipulation, Automation and Robotics at Small Scales, MARSS 2016  
Publisher: Institute of Electrical and Electronics Engineers Inc.  
ISBN (Electronic): 9781509015108  
ASJC Scopus subject areas: Artificial Intelligence, Human-Computer Interaction, Computer Science Applications  
Keywords: Conductive Polymer, Electromechanical Stimulation, graphene/PEDOT:PSS ink, PEDOT: PSS, Stem Cells  
Electronic versions:  
Viehrig\_2016\_MASRSS\_Self-archive  
DOIs:  
10.1109/MARSS.2016.7561744  
URLs:  
<http://urn.fi/URN:NBN:fi:tty-201802021188>

#### **Bibliographical note**

INT=ase,"Viehrig, Marlitt"

Source: Scopus

Source ID: 84988946977

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

### Full-duplex mobile device: Pushing the limits

In this article, we address the challenges of transmitter-receiver isolation in mobile full-duplex devices, building on shared-antenna-based transceiver architecture. First, self-adaptive analog RF cancellation circuitry is required, since the ability to track time-varying self-interference coupling characteristics is of utmost importance in mobile devices. In addition, novel adaptive nonlinear DSP methods are also required for final self-interference suppression at digital baseband, since mobile-scale devices typically operate under highly nonlinear low-cost RF components. In addition to describing the above kind of advanced circuit and signal processing solutions, comprehensive RF measurement results from a complete demonstrator implementation are also provided, evidencing beyond 40 dB of active RF cancellation over an 80 MHz waveform bandwidth with a highly nonlinear transmitter power amplifier. Measured examples also demonstrate the good self-healing characteristics of the developed control loop against fast changes in the coupling channel. Furthermore, when complemented by nonlinear digital cancellation processing, the residual self-interference level is pushed down to the noise floor of the demonstration system, despite the harsh nonlinear nature of the self-interference. These findings indicate that deploying the full-duplex principle can indeed also be feasible in mobile devices, and thus be one potential technology in, for example, 5G and beyond radio systems.

### General information

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Department of Electronics and Communications Engineering, Research group: Wireless Communications and Positioning, Intel Corporation

Contributors: Korpi, D., Tamminen, J., Turunen, M., Huusari, T., Choi, Y. S., Anttila, L., Talwar, S., Valkama, M.

Number of pages: 8

Pages: 80-87

Publication date: 1 Sep 2016

Peer-reviewed: Yes

### Publication information

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Original language: English

ASJC Scopus subject areas: Computer Science Applications, Computer Networks and Communications, Electrical and Electronic Engineering

DOIs:

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Source: Scopus

Source ID: 84991056293

Research output: Contribution to journal > Article > Scientific > peer-review

### Image interpolation based on non-local geometric similarities and directional gradients

Image interpolation offers an efficient way to compose a high-resolution (HR) image from the observed low-resolution (LR) image. Advanced interpolation techniques design the interpolation weighting coefficients by solving a minimum mean-square-error (MMSE) problem in which the local geometric similarity is often considered. However, using local geometric similarities cannot usually make the MMSE-based interpolation as reliable as expected. To solve this problem, we propose a robust interpolation scheme by using the nonlocal geometric similarities to construct the HR image. In our proposed method, the MMSE-based interpolation weighting coefficients are generated by solving a regularized least squares problem that is built upon a number of dual-reference patches drawn from the given LR image and regularized by the directional gradients of these patches. Experimental results demonstrate that our proposed method offers a remarkable quality improvement as compared to some state-of-the-art methods, both objectively and subjectively.

### General information

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Department of Signal Processing, Research group: Video, University of Electronic Science and Technology of China

Contributors: Zhu, S., Zeng, B., Zeng, L., Gabbouj, M.

Number of pages: 13  
Pages: 1707-1719  
Publication date: 1 Sep 2016  
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#### **Publication information**

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Volume: 18

Issue number: 9

ISSN (Print): 1520-9210

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Scopus rating (2016): CiteScore 5.4 SJR 1.298 SNIP 2.47

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ASJC Scopus subject areas: Signal Processing, Media Technology, Computer Science Applications, Electrical and Electronic Engineering

Keywords: Directional gradient, geometric similarity, image interpolation, minimum mean square error (MMSE)

DOIs:

10.1109/TMM.2016.2593039

Source: Scopus

Source ID: 84983409176

Research output: Contribution to journal › Article › Scientific › peer-review

#### **Trading exploits online: A preliminary case study**

A software defect that exposes a software system to a cyber security attack is known as a software vulnerability. A software security exploit is an engineered software solution that successfully exploits the vulnerability. Exploits are used to break into computer systems, but exploits are currently used also for security testing, security analytics, intrusion detection, consultation, and other legitimate and legal purposes. A well-established market emerged in the 2000s for software vulnerabilities. The current market segments populated by small and medium-sized companies exhibit signals that may eventually lead to a similar industrialization of software exploits. To these ends and against these industry trends, this paper observes the first online market place for trading exploits between buyers and sellers. The paper adopts three different perspectives to study the case. The paper (a) portrays the studied exploit market place against the historical background in the software security industry. A qualitative assessment is made to (b) evaluate the case against the common characteristics of traditional online market places. The qualitative observations are used in the quantitative part (c) for predicting the price of exploits with partial least squares regression. The results show that (i) the case is unique from a historical perspective, although (ii) the online market place characteristics are familiar. The regression estimates also indicate that (iii) the pricing of exploits is only partially dependent on such factors as the targeted platform, the date of disclosure of the exploited vulnerability, and the quality assurance service provided by the market place provider. The results allow to contemplate (iv) practical means for enhancing the market place.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: University of Turku, Department of Information Technology

Contributors: Ruohonen, J., Hyrynsalmi, S., Leppänen, V.

Publication date: 23 Aug 2016

#### **Host publication information**

Title of host publication: IEEE RCIS 2016 - IEEE 10th International Conference on Research Challenges in Information Science

Publisher: IEEE COMPUTER SOCIETY PRESS

ISBN (Electronic): 9781479987092

ASJC Scopus subject areas: Computer Science Applications, Information Systems, Software

Keywords: attack code, cyber security, e-commerce, offensive security, penetration testing, software vulnerability

DOIs:

10.1109/RCIS.2016.7549301

Source: Scopus

Source ID: 84987653537

Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

#### **Asymmetric full-duplex with contiguous downlink carrier aggregation**

In this paper, a contiguous carrier aggregation scheme for the downlink transmissions in an inband full-duplex cellular network is analyzed. In particular, we consider a scenario where the base station transmits over a wider bandwidth than the mobiles, while both parties are still using the same center frequency. As a result, the mobiles must cancel their own self-interference over a wider bandwidth, when compared to a situation where the uplink and downlink frequency bands are symmetric. Furthermore, due to the inherent RF impairments in the mobile devices, nonlinear modeling of the self-

interference is required in the digital domain to fully cancel it over the whole reception bandwidth. The feasibility of the proposed scheme is demonstrated with real-life RF measurements, using two different bandwidths. In both of these cases, it is shown that the SI can be attenuated below the receiver noise floor over the whole reception bandwidth.

#### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Department of Electronics and Communications Engineering, Research group: Wireless Communications and Positioning

Contributors: Korpi, D., Anttila, L., Valkama, M.

Publication date: 9 Aug 2016

#### Host publication information

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Publisher: IEEE

ISBN (Electronic): 9781509017492

ASJC Scopus subject areas: Electrical and Electronic Engineering, Computer Science Applications, Information Systems  
DOIs:

10.1109/SPAWC.2016.7536807

Source: Scopus

Source ID: 84984647086

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

#### Exploring synergy between communications, caching, and computing in 5G-grade deployments

Decisive progress in 5G mobile technology, fueled by a rapid proliferation of computation-hungry and delay-sensitive services, puts economic pressure on the research community to rethink the fundamentals of underlying networking architectures. Along these lines, the first half of this article offers a first-hand tutorial on the most recent advances in content-centric networking, emerging user applications, as well as enabling system architectures. We establish that while significant progress has been made along the individual vectors of communications, caching, and computing, together with some promising steps in proposing hybrid functionalities, the ultimate synergy behind a fully integrated solution is not nearly well understood. Against this background, the second half of this work carefully brings into perspective additional important factors, such as user mobility patterns, aggressive application requirements, and associated operator deployment capabilities, to conduct comprehensive system-level analysis. Furthermore, supported by a full-fledged practical trial on a live cellular network, our systematic findings reveal the most dominant factors in converged 5G-grade communications, caching, and computing layouts, as well as indicate the natural optimization points for system operators to leverage the maximum available benefits.

#### General information

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Department of Electronics and Communications Engineering, Research group: Emerging Technologies for Nano-Bio-Info-Cogno, Brno University of Technology, Carleton University

Contributors: Andreev, S., Galinina, O., Pyattaev, A., Hosek, J., Masek, P., Yanikomeroğlu, H., Koucheryavy, Y.

Number of pages: 10

Pages: 60-69

Publication date: 1 Aug 2016

Peer-reviewed: Yes

#### Publication information

Journal: IEEE Communications Magazine

Volume: 54

Issue number: 8

ISSN (Print): 0163-6804

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Original language: English

ASJC Scopus subject areas: Computer Science Applications, Computer Networks and Communications, Electrical and Electronic Engineering

DOIs:

10.1109/MCOM.2016.7537178

Source: Scopus

Source ID: 84982290651

Research output: Contribution to journal > Article > Scientific > peer-review

### **Toward trusted, social-aware D2D connectivity: Bridging across the technology and sociality realms**

Driven by the unprecedented increase of mobile data traffic, D2D communications technology is rapidly moving into the mainstream of the 5G networking landscape. While D2D connectivity originally emerged as a technology enabler for public safety services, it is likely to remain at the heart of the 5G ecosystem by spawning a wide diversity of proximate applications and services. In this work, we argue that the widespread adoption of the direct communications paradigm is unlikely without embracing the concepts of trust and social-aware cooperation between end users and network operators. However, such adoption remains conditional on identifying adequate incentives that engage humans and their connected devices in a plethora of collective activities. To this end, the mission of our research is to advance the vision of social-aware and trusted D2D connectivity, as well as to facilitate its further adoption. We begin by reviewing the various types of underlying incentives with the emphasis on sociality and trust, discuss these factors specifically for humans and for networked devices (machines), and also propose a novel framework allowing construction of much needed incentive-aware D2D applications. Our supportive system-level performance evaluations suggest that trusted and social-aware direct connectivity has the potential to decisively augment network performance. We conclude by outlining the future perspectives of its development across the research and standardization sectors.

#### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Department of Electronics and Communications Engineering, Department of Pervasive Computing, Research group: Emerging Technologies for Nano-Bio-Info-Cogno, Università degli Studi di Reggio Calabria, Ericsson Research and Wireless

Contributors: Ometov, A., Orsino, A., Militano, L., Moltchanov, D., Araniti, G., Olshannikova, E., Fodor, G., Andreev, S., Olsson, T., Iera, A., Torsner, J., Koucheryavy, Y., Mikkonen, T.

Number of pages: 9

Pages: 103-111

Publication date: 1 Aug 2016

Peer-reviewed: Yes

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ISSN (Print): 1536-1284

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Scopus rating (2016): CiteScore 9.15 SJR 2.082 SNIP 3.738

Original language: English

ASJC Scopus subject areas: Computer Science Applications, Electrical and Electronic Engineering

DOIs:

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Source: Scopus

Source ID: 84986197866

Research output: [Contribution to journal](#) > [Article](#) > [Scientific](#) > [peer-review](#)

### **Portable sensor system for reliable condition measurement**

Regarding sustainable development, there is a growing need to gather more and more various kinds of measurement, space, and consumption information about property. The necessity for property condition measurement is apparent and the appropriate circumstances, such as indoor air quality and suitable temperature, have an essential influence on comfort and welfare at work and, at the same time, have significance in terms of energy efficiency. This paper presents a portable prototype system for property condition measurement. The objective was to generate a reliable system that improves the quality and also the visual presentation of the collected data. The paper presents the components of the system and the technology utilized to implement the system. The results of piloting in a real-life environment, where particular focus was placed on both controlling energy efficiency and well-being at work, are also presented.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Pori Department, Research group: Software Engineering and Intelligent Systems, Riffid Oy

Contributors: Soini, J., Sillberg, P., Rantanen, P., Nummela, J.

Number of pages: 6

Pages: 1190-1195

Publication date: 25 Jul 2016

#### **Host publication information**

Title of host publication: 2016 39th International Convention on Information and Communication Technology, Electronics and Microelectronics, MIPRO 2016 - Proceedings

ISBN (Electronic): 9789532330885

ASJC Scopus subject areas: Biomedical Engineering, Computer Networks and Communications, Computer Science Applications, Information Systems, Electrical and Electronic Engineering

DOIs:

10.1109/MIPRO.2016.7522320

Source: Scopus

Source ID: 84983609917

Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

### Utilizing MOOCs in the development of education and training programs

Open education and distance learning are not new pedagogical innovations. However, through the introduction of Massive Open Online Courses (MOOC), they have recently attracted a great deal of attention among educational establishments. MOOCs can be considered a threat to small universities, but, on the other hand, they can also be a means of providing opportunities to develop their core activities. The challenge is how universities will perceive this phenomenon and take advantage of the new chances it brings. This paper examines the utilization of MOOCs from several points of view. The focus is on degree courses and continuing education offered by universities, but in-house personnel training in companies is also discussed. The issue is how to find proper ways to utilize third-party MOOCs in these three domains. Based on our investigations, the paper introduces a preliminary model for exploiting MOOCs in the development of education and training programs.

#### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Pori Department, Research group: Software Engineering and Intelligent Systems

Contributors: Linna, P., Mäkinen, T., Keto, H.

Number of pages: 4

Pages: 861-864

Publication date: 25 Jul 2016

#### Host publication information

Title of host publication: 2016 39th International Convention on Information and Communication Technology, Electronics and Microelectronics, MIPRO 2016 - Proceedings

ISBN (Electronic): 9789532330885

ASJC Scopus subject areas: Biomedical Engineering, Computer Networks and Communications, Computer Science Applications, Information Systems, Electrical and Electronic Engineering

DOIs:

10.1109/MIPRO.2016.7522260

Source: Scopus

Source ID: 84983684751

Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

### Robust data reconciliation of combustion variables in multi-fuel fired industrial boilers

This paper introduces an application of simultaneous nonlinear data reconciliation and gross error detection for power plants utilizing a complex but computationally light first principle combustion model. Element and energy balances and robust techniques introduce nonlinearity and the consequent optimization problem is solved using nonlinear optimization. Data reconciliation improves estimation of process variables and enables improved sensor quality control and identification of process anomalies. The approach was applied to an industrial 200 MW<sub>th</sub> fluidized bed boiler combusting wood, peat, bark, and slurry. The results indicate that the approach is valid and is able to perform in various process conditions. As the combustion model is generic, the method is applicable in any boiler environment.

#### General information

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Department of Automation Science and Engineering, Research area: Dynamic Systems, Research area: Measurement Technology and Process Control, Indmeas Ltd.

Contributors: Korpela, T., Suominen, O., Majanne, Y., Laukkanen, V., Lautala, P.

Number of pages: 15

Pages: 101-115

Publication date: 21 Jul 2016

Peer-reviewed: Yes

#### Publication information

Journal: Control Engineering Practice

Volume: 55

ISSN (Print): 0967-0661

Ratings:

Scopus rating (2016): CiteScore 3.42 SJR 1.076 SNIP 2.087

Original language: English

ASJC Scopus subject areas: Control and Systems Engineering, Electrical and Electronic Engineering, Applied Mathematics, Computer Science Applications

Keywords: Data reconciliation, Diagnostics, Estimation, Gross error detection, Monitoring, Power plant

DOIs:

10.1016/j.conengprac.2016.07.002

Source: Scopus

Source ID: 84978710819

Research output: Contribution to journal > Article > Scientific > peer-review

### **A novel stochastic channel modeling approach for mmWave systems with beamforming**

The stochastic channel models typically abstract away the details of the paths that carry energy in the radio channel. While these have been universally acceptable for decades due to their ease of use and reasonable accuracy in most practical cases, the appearance of steerable, narrow-beam antennas in mmWave bands makes the exact path information very valuable, primarily for beam tracking algorithms. Currently, only deterministic channel modeling (e.g. ray tracing) provides the required level of details, but at prohibitive computing cost. This limits the study and design environments for such algorithms to the confines of existing ray tracing data, which is bulky and rarely available for free. In this paper, we consider an approach to stochastic channel modeling that allows to achieve the level of details equivalent to ray tracing, but at a fraction of the computing costs. The proposed approach may be immediately applied to any system operating at 20-100 GHz. It allows the researchers and engineers to perform quick testing of elaborate mmWave MAC and PHY algorithms with a system-level simulation, without having to obtain exhaustive measurement or ray tracing data.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Department of Electronics and Communications Engineering, Research group: Emerging Technologies for Nano-Bio-Info-Cogno, Intel Corporation

Contributors: Pyattaev, A., Johnsson, K., Andreev, S., Koucheryavy, Y.

Publication date: 5 Jul 2016

#### **Host publication information**

Title of host publication: 2016 IEEE 83rd Vehicular Technology Conference (VTC Spring)

Publisher: IEEE

ISBN (Electronic): 9781509016983

ASJC Scopus subject areas: Electrical and Electronic Engineering, Computer Science Applications, Applied Mathematics

Keywords: Beamforming, EHF, MIMO, MmWave, Multipath, Stochastic channel model

DOIs:

10.1109/VTCSpring.2016.7504091

Source: Scopus

Source ID: 84979729800

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

### **Multi-carrier CDMA for network assisted device-to-device communications for an integrated OFDMA cellular system**

Device-to-Device communication (D2D) has been a hot research topic in recent years, especially concerning the integration of D2D and conventional cellular networks. In general, the integration improves the efficiency and flexibility of the overall system. Furthermore, D2D can provide partial solutions for some inherent problems of cellular systems, such as cell edge related problems. Currently, most of the D2D integration studies assume that D2D UEs and cellular UEs use identical multiple access (MA) technology for the convenience of integration and backward compatibility. In this paper, besides the conventional OFDMA based D2D, we investigate the use of multicarrier code division multiple access (MC-CDMA) as the MA scheme for D2D UEs. The idea is to use processing gains obtained by spreading against critical interference, especially from cellular UEs. The study is emphasized on interference related issues, including interference analysis of the integrated system, and overall performance enhancement, mainly for D2D UEs, by utilizing frequency domain spreading. Network simulations show the gain against critical interference from cellular UEs. Meanwhile, it is shown that intra-cell cross mode interference control/elimination is the key scheme to guarantee performance of the integrated system. Furthermore, we discuss the potential benefits and procedures of MC-CDMA D2D based cluster integration.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Department of Electronics and Communications Engineering, Research group: Wireless Communications and Positioning

Contributors: Xing, H., Renfors, M.

Publication date: 5 Jul 2016

#### Host publication information

Title of host publication: 2016 IEEE 83rd Vehicular Technology Conference (VTC Spring)

ISBN (Electronic): 9781509016983

ASJC Scopus subject areas: Electrical and Electronic Engineering, Computer Science Applications, Applied Mathematics

Keywords: D2D, MC-CDMA, OFDMA

DOIs:

10.1109/VTCSpring.2016.7504354

Source: Scopus

Source ID: 84979740932

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

#### Novel frequency domain cyclic prefix autocorrelation based compressive spectrum sensing for cognitive radio

Cognitive radio (CR) has received increasing attention and is considered an important solution to the spectral crowding problem. The main idea behind CR technology is to utilize the unused spectral resources which are determined to be available for secondary user by effective spectrum sensing techniques. However, CR technology significantly depends on the spectrum sensing techniques which are applied to detect the presence of primary user (PU) signals. This paper focuses on detecting OFDM primaries using novel frequency-domain cyclic prefix (CP) autocorrelation based compressive spectrum sensing algorithms. To counteract the practical wireless channel effects, frequency domain approaches for PU signal detection are developed. The proposed spectrum sensing method eliminates the effects of both noise uncertainty and frequency selective channels. Using the frequency domain autocorrelation approach results in highly increased flexibility, facilitating robust wideband multi-mode, multi-channel sensing with low complexity. It also allows to sense weak PU signals which are partly overlapped by other strong PU or CR transmissions.

#### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Department of Electronics and Communications Engineering, Research group: Wireless Communications and Positioning

Contributors: Dikmese, S., Ilyas, Z., Sofotasios, P., Renfors, M., Valkama, M.

Publication date: 5 Jul 2016

#### Host publication information

Title of host publication: 2016 IEEE 83rd Vehicular Technology Conference (VTC Spring)

Publisher: IEEE

ISBN (Electronic): 9781509016983

ASJC Scopus subject areas: Electrical and Electronic Engineering, Computer Science Applications, Applied Mathematics

Keywords: Cognitive radio, Energy detector, Frequency selective channel and noise uncertainty, OFDMVCP, Time and/or frequency domain CP autocorrelation based compressive spectrum sensing

DOIs:

10.1109/VTCSpring.2016.7504368

#### Bibliographical note

INT=elt,"Ilyas, Zobia"

Source: Scopus

Source ID: 84979752384

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

#### Framework for optimization and scheduling of a copper production plant

This work presents a nonlinear optimization and scheduling approach applied to a copper production plant. The solution maximizes smelting furnace production and provides valid converting schedules by simulating the evolution of the process over the optimization horizon. The production process is briefly described and the main models used to predict and calculate furnace and converter parameters are detailed. Though the solution is concentrated on the main elements, copper and iron, the optimization framework enables easy future augmentation with more complex models. A schedule optimization case is presented.

#### General information

Publication status: Published

MoE publication type: A3 Part of a book or another research book

Organisations: Department of Automation Science and Engineering, Research area: Dynamic Systems, Research area: Measurement Technology and Process Control

Contributors: Suominen, O., Mörsky, V., Ritala, R., Vilkkö, M.  
Number of pages: 6  
Pages: 1243-1248  
Publication date: 25 Jun 2016

#### Host publication information

Title of host publication: 26th European Symposium on Computer Aided Process Engineering, 2016  
Volume: 38  
Publisher: Elsevier Science B.V.  
ISBN (Print): 9780444634283

#### Publication series

Name: Computer Aided Chemical Engineering  
ISSN (Print): 1570-7946

ASJC Scopus subject areas: Chemical Engineering(all), Computer Science Applications

Keywords: copper smelting, modelling, nonlinear optimization, Scheduling

DOIs:

10.1016/B978-0-444-63428-3.50212-5

URLs:

<http://www.scopus.com/inward/record.url?scp=84994385954&partnerID=8YFLogxK> (Link to publication in Scopus)

#### Bibliographical note

JUFOID=70254

Source: Scopus

Source ID: 84994385954

Research output: Chapter in Book/Report/Conference proceeding > Chapter > Scientific > peer-review

#### Investigating mid-air gestures and handhelds in motion tracked environments

Smart spaces with multiple interactive devices and motion tracking capabilities are becoming more common. However, there is little research on how interaction with one device affects the usage of other devices in the space. We investigate the effects of mobile devices and physical interactive devices on gestural interaction in motion-tracked environments. For our user study, we built a smart space consisting of a gesture-controlled large display, an NFC reader and a mobile device, to simulate a system in which users can transfer information between the space and personal devices. The study with 13 participants revealed that (1) the mobile device affects gesturing as well as passive stance; (2) users may stop moving completely when they intend to stop interacting with a display; (3) interactive devices with overlapping interaction space make unintentional interaction significantly more frequent. Our findings give implications for gestural interaction design as well as design of motion-tracked smart spaces.

#### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Department of Pervasive Computing, Research area: User experience

Contributors: Mäkelä, V., Korhonen, H., Ojala, J., Järvi, A., Väänänen, K., Raisamo, R., Turunen, M.

Number of pages: 7

Pages: 45-51

Publication date: 20 Jun 2016

#### Host publication information

Title of host publication: PerDis 2016 - Proceedings of the 5th ACM International Symposium on Pervasive Displays

Publisher: ACM

ISBN (Electronic): 9781450343664

ASJC Scopus subject areas: Computer Networks and Communications, Hardware and Architecture, Computer Graphics and Computer-Aided Design, Computer Science Applications

Keywords: Handhelds, Large displays, Mid-air gestures, Mobile devices, Motion-tracked environments, Smart spaces, Ubiquitous computing

Electronic versions:

Investigating\_Mid\_Air\_Gestures\_M\_kel\_EtAl\_PerDis16

DOIs:

10.1145/2914920.2915015

URLs:

<http://urn.fi/URN:NBN:fi:ty-201903291363>

#### Bibliographical note

INT=tie,"Järvi, Antti"

Source: Scopus

Source ID: 84979742748

Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

### **Fifty years of graph matching, network alignment and network comparison**

In this paper we survey methods for performing a comparative graph analysis and explain the history, foundations and differences of such techniques of the last 50 years. While surveying these methods, we introduce a novel classification scheme by distinguishing between methods for deterministic and random graphs. We believe that this scheme is useful for a better understanding of the methods, their challenges and, finally, for applying the methods efficiently in an interdisciplinary setting of data science to solve a particular problem involving comparative network analysis.

#### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Department of Signal Processing

Contributors: Emmert-Streib, F., Dehmer, M., Shi, Y.

Number of pages: 18

Pages: 180-197

Publication date: 10 Jun 2016

Peer-reviewed: Yes

#### **Publication information**

Journal: Information Sciences

Volume: 346-347

ISSN (Print): 0020-0255

Ratings:

Scopus rating (2016): CiteScore 5.37 SJR 1.781 SNIP 2.487

Original language: English

ASJC Scopus subject areas: Artificial Intelligence, Software, Control and Systems Engineering, Theoretical Computer Science, Computer Science Applications, Information Systems and Management

Keywords: Biological networks, Computational graph theory, Graph matching, Network comparison, Network similarity, Quantitative graph theory

DOIs:

10.1016/j.ins.2016.01.074

Source: Scopus

Source ID: 84964349574

Research output: Contribution to journal › Article › Scientific › peer-review

### **Linear accelerometers and rate gyros for rotary joint angle estimation of heavy-duty mobile manipulators using forward kinematic modeling**

A gravity-referenced joint angle estimation approach is proposed for multiple-degree-of-freedom hydraulic manipulators. The approach is built solely upon easy-to-install linear accelerometers and angular rate gyroscopes to avoid physical contact to rotary joint mechanisms and the use of in-axis sensors. As a significant novelty, a comprehensive kinematics model for linear accelerations acting on the accelerometers during motion is associated with the well-known principles of complementary sensor fusion for the first time, which provides a practical solution for using the force of gravity as an angular reference while in fast motion. In experiments with a serial-link manipulator of a multiton off-road forestry vehicle, gyro-aided sensor fusion employing the kinematics model achieved a joint angle sensing error of less than  $\pm 1^\circ$ , which translated to a centimeter end-effector positioning accuracy. This can be considered a significant result in view of the vibrations oscillating through the manipulator structure, coupled linear accelerations of linkage motion, and nonstatic interaction between the vehicle base and the terrain.

#### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Department of Signal Processing, Research group: MMDM, Department of Intelligent Hydraulics and Automation, Research group: Mobile manipulation, Research area: Information Technology for Biology and Health, Research area: Intelligence in Machines, Research area: Signal and Information Processing

Contributors: Vihonen, J., Honkakorpi, J., Tuominen, J., Mattila, J., Visa, A.

Number of pages: 10

Pages: 1765-1774

Publication date: 1 Jun 2016

Peer-reviewed: Yes

#### **Publication information**

Journal: IEEE - ASME Transactions on Mechatronics

Volume: 21  
Issue number: 3  
ISSN (Print): 1083-4435  
Ratings:

Scopus rating (2016): CiteScore 5.22 SJR 1.511 SNIP 2.536

Original language: English

ASJC Scopus subject areas: Electrical and Electronic Engineering, Control and Systems Engineering, Computer Science Applications

Keywords: Kinematics, Manipulators, Microelectromechanical devices

DOIs:

10.1109/TMECH.2016.2544352

Source: Scopus

Source ID: 84970024956

Research output: Contribution to journal > Article > Scientific > peer-review

### **Visual Voice Activity Detection in the Wild**

The visual voice activity detection (V-VAD) problem in unconstrained environments is investigated in this paper. A novel method for V-VAD in the wild, exploiting local shape and motion information appearing at spatiotemporal locations of interest for facial video segment description and the bag of words model for facial video segment representation, is proposed. Facial video segment classification is subsequently performed using the state-of-The-Art classification algorithms. Experimental results on one publicly available V-VAD dataset denote the effectiveness of the proposed method, since it achieves better generalization performance in unseen users, when compared to the recently proposed state-of-The-Art methods. Additional results on a new unconstrained dataset provide evidence that the proposed method can be effective even in such cases in which any other existing method fails.

### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Department of Signal Processing, Aristotle University of Thessaloniki

Contributors: Patrona, F., Iosifidis, A., Tefas, A., Nikolaidis, N., Pitas, I.

Number of pages: 11

Pages: 967-977

Publication date: 1 Jun 2016

Peer-reviewed: Yes

### **Publication information**

Journal: IEEE Transactions on Multimedia

Volume: 18

Issue number: 6

ISSN (Print): 1520-9210

Ratings:

Scopus rating (2016): CiteScore 5.4 SJR 1.298 SNIP 2.47

Original language: English

ASJC Scopus subject areas: Electrical and Electronic Engineering, Signal Processing, Media Technology, Computer Science Applications

Keywords: Action Recognition, Bag of Words model, Voice Activity Detection in the wild

DOIs:

10.1109/TMM.2016.2535357

Source: Scopus

Source ID: 84971281783

Research output: Contribution to journal > Article > Scientific > peer-review

### **Towards semantic self-description of industrial devices and control system interfaces**

Information systems in production environments control and gather data in operations integrating multiple devices and systems with various communication interfaces. With the development of smart industrial environments, needing to connect heterogeneous components into systems communicating over the Internet, integration and interoperability challenges emerge. Self-description is regarded as the capability of devices and systems to include descriptions expressing the offered services and information exchange. Further by semantic descriptions they can provide interpretable, meaningful information how to use the service interface but also how to interpret the capabilities and data. The paper presents a Semantic Web technology based approach to harmonize access and utilization of devices and control systems in distributed and dynamic environments. For this two standards based ontologies are developed: an industrial plant model for hierarchical structure and a state model for operational information of system components. To demonstrate the architecture and developed models the approach is applied to the components of a small-scale example industrial process.

### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Department of Automation Science and Engineering, Research area: Information Systems in Automation, Fortiss GmbH

Contributors: Hästbacka, D., Zoitl, A.

Number of pages: 6

Pages: 879-884

Publication date: 19 May 2016

### Host publication information

Title of host publication: 2016 IEEE International Conference on Industrial Technology (ICIT)

Publisher: Institute of Electrical and Electronics Engineers IEEE

ISBN (Print): 9781467380751

ASJC Scopus subject areas: Electrical and Electronic Engineering, Computer Science Applications

DOIs:

10.1109/ICIT.2016.7474867

Source: Scopus

Source ID: 84974588366

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

### Coordinating proactive social devices in a mobile cloud: Lessons learned and a way forward

Recent device shipment trends strongly indicate that the number of Web-enabled devices other than PCs and smart phones are growing rapidly. Marking the end of the dominant era of these two traditional device categories, people will soon commonly use various types of Internet-connected devices in their daily lives, where no single device will dominate. Since today's devices are mostly standalone and only stay in sync in limited ways, new approaches are needed for mastering the complexity arising from the world of many types of devices, created by different manufacturers and implementing competing standards. Today, the most common denominator for dealing with the differences is using clouds. Unfortunately, however, while the cloud is well suited for numerous activities, there are also serious limitations, especially when considering systems that consist of numerous, battery-powered computing devices that have limited connectivity. In this paper, we provide an insight to our research where totally cloud-based orchestration of cooperating devices is partitioned into more local actions, where constant communication with the cloud backend can be at least partially omitted.

### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Department of Pervasive Computing, Research area: Software engineering

Contributors: Mäkitalo, N., Aaltonen, T., Mikkonen, T.

Number of pages: 10

Pages: 179-188

Publication date: 14 May 2016

### Host publication information

Title of host publication: MOBILESoft '16 Proceedings of the International Conference on Mobile Software Engineering and Systems

Publisher: ACM

ISBN (Electronic): 9781450341783

ASJC Scopus subject areas: Control and Systems Engineering, Software, Computer Science Applications, Signal Processing

Keywords: Cloud computing, Cyber-physical systems, Internet of things, Mobile cloud, Multi-device ownership, Multi-device programming

DOIs:

10.1145/2897073.2897079

Source: Scopus

Source ID: 84983554842

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

### Characterizing rate limiting steps in transcription from RNA production times in live cells

Motivation: Single-molecule measurements of live Escherichia coli transcription dynamics suggest that this process ranges from sub- to super-Poissonian, depending on the conditions and on the promoter. For its accurate quantification, we propose a model that accommodates all these settings, and statistical methods to estimate the model parameters and to select the relevant components. Results: The new methodology has improved accuracy and avoids overestimating the transcription rate due to finite measurement time, by exploiting unobserved data and by accounting for the effects of discrete sampling. First, we use Monte Carlo simulations of models based on measurements to show that the methods are reliable and offer substantial improvements over previous methods. Next, we apply the methods on measurements of

transcription intervals of different promoters in live *E. coli*, and show that they produce significantly different results, both in low- and high-noise settings, and that, in the latter case, they even lead to qualitatively different results. Finally, we demonstrate that the methods can be generalized for other similar purposes, such as for estimating gene activation kinetics. In this case, the new methods allow quantifying the inducer uptake dynamics as opposed to just comparing them between cases, which was not previously possible. We expect this new methodology to be a valuable tool for functional analysis of cellular processes using single-molecule or single-event microscopy measurements in live cells.

#### General information

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Research group: Laboratory of Biosystem Dynamics-LBD, Department of Signal Processing

Contributors: Häkkinen, A., Ribeiro, A. S.

Number of pages: 7

Pages: 1346-1352

Publication date: 1 May 2016

Peer-reviewed: Yes

#### Publication information

Journal: Bioinformatics

Volume: 32

Issue number: 9

ISSN (Print): 1367-4803

Ratings:

Scopus rating (2016): CiteScore 6.42 SJR 5.21 SNIP 2.329

Original language: English

ASJC Scopus subject areas: Biochemistry, Molecular Biology, Computational Theory and Mathematics, Computer Science Applications, Computational Mathematics, Statistics and Probability

DOIs:

10.1093/bioinformatics/btv744

Source: Scopus

Source ID: 84966359423

Research output: Contribution to journal › Article › Scientific › peer-review

#### Feasibility characterization of cryptographic primitives for constrained (wearable) IoT devices

The Internet of Things (IoT) employs smart devices as its building blocks for developing a ubiquitous communication framework. It thus supports a wide variety of application domains, including public safety, healthcare, education, and public transportation. While offering a novel communication paradigm, IoT finds its requirements closely connected to the security issues. The role of security following the fact that a new type of devices known as wearables constitute an emerging area. This paper delivers an applicability study of the state-of-the-art cryptographic primitives for wearable IoT devices, including the pairing-based cryptography. Pairing-based schemes are well-recognized as fundamental enablers for many advanced cryptographic applications, such as privacy protection and identity-based encryption. To deliver a comprehensive view on the computational power of modern wearable devices (smart phones, watches, and embedded devices), we perform an evaluation of a variety of them utilizing bilinear pairing for real-time communication. In order to deliver a complete picture, the obtained bilinear pairing results are complemented with performance figures for classical cryptography (such as block ciphers, digital signatures, and hash functions). Our findings show that wearable devices of today have the needed potential to efficiently operate with cryptographic primitives in real time. Therefore, we believe that the data provided during this research would shed light on what devices are more suitable for certain cryptographic operations.

#### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Department of Electronics and Communications Engineering, Research group: Emerging Technologies for Nano-Bio-Info-Cogno

Contributors: Ometov, A., Masek, P., Malina, L., Florea, R., Hosek, J., Andreev, S., Hajny, J., Niutananen, J., Koucheryavy, Y.

Publication date: 19 Apr 2016

#### Host publication information

Title of host publication: 2016 IEEE International Conference on Pervasive Computing and Communication Workshops, PerCom Workshops 2016

Publisher: IEEE

ISBN (Print): 9781509019410

ASJC Scopus subject areas: Computer Science Applications, Computer Networks and Communications, Human-Computer Interaction

Keywords: Bilinear Pairing, Cryptography, Group Signatures, IoT, Performance evaluation, Wearables

DOIs:

10.1109/PERCOMW.2016.7457161

#### **Bibliographical note**

INT=elt,"Florea, Roman"

EXT="Niutanen, Jussi"

Source: Scopus

Source ID: 84966546696

Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

#### **A unifying perspective on proximity-based cellular-assisted mobile social networking**

Today, the rapid adoption of mobile social networking is changing how and where humans communicate. As a result, in recent years we have been increasingly moving from physical (e.g., face-to-face) to virtual interaction. However, there is also a new emerging category of social applications that take advantage of both worlds, that is, using virtual interaction to enhance physical interaction. This novel form of networking is enabled by D2D communication between/among the laptops, smartphones, and wearables of persons in proximity of each other. Unfortunately, it has remained limited by the fact that most people are simply not aware of the many potential virtual opportunities in their proximity at any given time. This is a result of the very real digital privacy and security concerns surrounding direct communication between stranger devices. Fortunately, these concerns can be mitigated with the help of a centralized trusted entity, such as a cellular service provider, which can not only authenticate and protect the privacy of devices involved into D2D communication, but also facilitate the discovery of device capabilities and their available content. This article offers an extensive research summary behind this type of cellular-assisted D2D communication, detailing the enabling technology and its implementation, relevant usage scenarios, security challenges, and user experience observations from large-scale deployments.

#### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Department of Electronics and Communications Engineering, Research group: Emerging Technologies for Nano-Bio-Info-Cogno, Department of Pervasive Computing, Research area: Software engineering

Contributors: Andreev, S., Hosek, J., Olsson, T., Johnsson, K., Pyattaev, A., Ometov, A., Olshannikova, E., Gerasimenko, M., Masek, P., Koucheryavy, Y., Mikkonen, T.

Number of pages: 9

Pages: 108-116

Publication date: 1 Apr 2016

Peer-reviewed: Yes

#### **Publication information**

Journal: IEEE Communications Magazine

Volume: 54

Issue number: 4

ISSN (Print): 0163-6804

Ratings:

Scopus rating (2016): CiteScore 10.66 SJR 2.298 SNIP 4.768

Original language: English

ASJC Scopus subject areas: Electrical and Electronic Engineering, Computer Science Applications, Computer Networks and Communications

DOIs:

10.1109/MCOM.2016.7452274

Source: Scopus

Source ID: 84964277259

Research output: Contribution to journal › Article › Scientific › peer-review

#### **On feasibility of 5G-grade dedicated RF charging technology for wireless-powered wearables**

For decades, wireless energy transfer and harvesting received focused attention in the research community, but with limited practical applications. Recently, with the development of fifth-generation (5G) mobile technology, the concept of dedicated radio-frequency (RF) charging promises to support the growing market of wearable devices. In this work we shed light on the potential of wireless RF power transfer by elaborating upon feasible system parameters and architecture, emphasizing the basic tradeoffs behind omni-directional and directional out-of-band energy transmission, providing system-level performance evaluation, and discussing open challenges on the way to sustainable wireless-powered wearables. The key aspects highlighted in this article include system operation choices, user mobility effects, impact of network and user densities, and regulatory issues. Ultimately, our research aims to facilitate the integration of wireless RF charging technology into the emerging 5G ecosystem.

### General information

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Department of Electronics and Communications Engineering, Research group: Emerging Technologies for Nano-Bio-Info-Cogno, University of Manitoba, Univ of Oulu

Contributors: Galinina, O., Tabassum, H., Mikhaylov, K., Andreev, S., Hossain, E., Koucheryavy, Y.

Number of pages: 10

Pages: 28-37

Publication date: 1 Apr 2016

Peer-reviewed: Yes

### Publication information

Journal: IEEE Wireless Communications

Volume: 23

Issue number: 2

ISSN (Print): 1536-1284

Ratings:

Scopus rating (2016): CiteScore 9.15 SJR 2.082 SNIP 3.738

Original language: English

ASJC Scopus subject areas: Computer Science Applications, Electrical and Electronic Engineering

DOIs:

10.1109/MWC.2016.7462482

Source: Scopus

Source ID: 84968750633

Research output: Contribution to journal > Article > Scientific > peer-review

### Detection of bubbles as concentric circular arrangements

The paper proposes a method for the detection of bubble-like transparent objects in a liquid. The detection problem is non-trivial since bubble appearance varies considerably due to different lighting conditions causing contrast reversal and multiple interreflections. We formulate the problem as the detection of concentric circular arrangements (CCA). The CCAs are recovered in a hypothesize-optimize-verify framework. The hypothesis generation is based on sampling from the partially linked components of the non-maximum suppressed responses of oriented ridge filters, and is followed by the CCA parameter estimation. Parameter optimization is carried out by minimizing a novel cost-function. The performance was tested on gas dispersion images of pulp suspension and oil dispersion images. The mean error of gas/oil volume estimation was used as a performance criterion due to the fact that the main goal of the applications driving the research was the bubble volume estimation. The method achieved 28 and 13 % of gas and oil volume estimation errors correspondingly outperforming the OpenCV Circular Hough Transform in both cases and the WaldBoost detector in gas volume estimation.

### General information

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Department of Signal Processing, Research group: Vision, Research Community on Data-to-Decision (D2D), Machine Vision and Pattern Recognition Laboratory, Lappeenranta University of Technology, Computer Vision Group, Czech Technical University in Prague, Monash University Malaysia

Contributors: Strokina, N., Matas, J., Eerola, T., Lensu, L., Kälviäinen, H.

Number of pages: 10

Pages: 387-396

Publication date: Apr 2016

Peer-reviewed: Yes

Early online date: 10 Feb 2016

### Publication information

Journal: Machine Vision and Applications

Volume: 27

Issue number: 3

ISSN (Print): 0932-8092

Ratings:

Scopus rating (2016): CiteScore 2.46 SJR 0.741 SNIP 1.398

Original language: English

ASJC Scopus subject areas: Hardware and Architecture, Computer Vision and Pattern Recognition, Software, Computer Science Applications

Keywords: Bubble detection, Circular arrangements, Image processing, Machine vision, Object segmentation

DOIs:

10.1007/s00138-016-0749-7

Source: Scopus

Source ID: 84957656160

Research output: Contribution to journal › Article › Scientific › peer-review

### **Digital predistortion for mitigating spurious emissions in spectrally agile radios**

Spectrally non-contiguous transmissions pose serious transceiver design challenges due to the nonlinear PA. When two or more non-contiguous carriers with close proximity are amplified by the same PA, spurious emissions inside or in the vicinity of the transmitter RF band are created. These spurious emissions may violate emission limits or otherwise compromise network coverage and reliability. Lowering the transmit power is a straightforward remedy, but it will reduce throughput, coverage, and power efficiency of the device. To improve linearity without sacrificing performance, several DPD techniques have recently been proposed to target the spurious emissions explicitly. These techniques are designed to minimize the computational and hardware complexity of DPD, thus making them better suited for mobile terminals and other lowcost devices. In this article, these recent advances in DPD for non-contiguous transmission scenarios are discussed, with a focus on mitigating the spurious emissions in the concrete example case of non-contiguous dual-carrier transmission. The techniques are compared to more traditional DPD approaches in terms of their computational and hardware complexities, as well as linearization performance.

#### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Department of Electronics and Communications Engineering, Research group: Wireless Communications and Positioning, Qualcomm Inc., Wireless Innovation Laboratory at Worcester Polytechnic Institute

Contributors: Abdelaziz, M., Fu, Z., Anttila, L., Wyglinski, A. M., Valkama, M.

Number of pages: 10

Pages: 60-69

Publication date: 1 Mar 2016

Peer-reviewed: Yes

#### **Publication information**

Journal: IEEE Communications Magazine

Volume: 54

Issue number: 3

ISSN (Print): 0163-6804

Ratings:

Scopus rating (2016): CiteScore 10.66 SJR 2.298 SNIP 4.768

Original language: English

ASJC Scopus subject areas: Electrical and Electronic Engineering, Computer Science Applications, Computer Networks and Communications

DOIs:

10.1109/MCOM.2016.7432149

Source: Scopus

Source ID: 84963776001

Research output: Contribution to journal › Article › Scientific › peer-review

### **Highly dynamic spectrum management within licensed shared access regulatory framework**

Historical fragmentation in spectrum access models accentuates the need for novel concepts that allow for efficient sharing of already available but underutilized spectrum. The emerging LSA regulatory framework is expected to enable more advanced spectrum sharing between a limited number of users while guaranteeing their much needed interference protection. However, the ultimate benefits of LSA may in practice be constrained by space-time availability of the LSA bands. Hence, more dynamic LSA spectrum management is required to leverage such realtime variability and sustain reliability when, for example, the original spectrum user suddenly revokes the previously granted frequency bands as they are required again. In this article, we maintain the vision of highly dynamic LSA architecture and rigorously study its future potential, from reviewing market opportunities and discussing available technology implementations to conducting performance evaluation of LSA dynamics and outlining the standardization landscape. Our investigations are based on a comprehensive system-level evaluation framework, which has been specifically designed to assess highly dynamic LSA deployments.

#### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Department of Electronics and Communications Engineering, Research group: Emerging Technologies for Nano-Bio-Info-Cogno

Contributors: Ponomarenko-Timofeev, A., Pyattaev, A., Andreev, S., Koucheryavy, Y., Mueck, M., Karls, I.

Number of pages: 10

Pages: 100-109  
Publication date: 1 Mar 2016  
Peer-reviewed: Yes

#### Publication information

Journal: IEEE Communications Magazine  
Volume: 54  
Issue number: 3  
ISSN (Print): 0163-6804  
Ratings:

Scopus rating (2016): CiteScore 10.66 SJR 2.298 SNIP 4.768

Original language: English

ASJC Scopus subject areas: Electrical and Electronic Engineering, Computer Science Applications, Computer Networks and Communications

DOIs:

10.1109/MCOM.2016.7432155

#### Bibliographical note

INT=elt,"Ponomarenko-Timofeev, Aleksei"

Source: Scopus

Source ID: 84963721319

Research output: Contribution to journal > Article > Scientific > peer-review

#### Random Value Impulse Noise Removal Based on Most Similar Neighbors

A novel filter based on four most similar neighbors (MSN) is proposed in this paper which considers all the pixels of the sliding window except the central pixel after taking the first order absolute differences from the central pixel. The proposed filter is composed of two steps: noise detection followed by filtering. In noise detection, first order absolute differences are calculated and sorted in ascending order. Clusters of equal sizes are formed based on most similar pixels and then fuzzy rules are applied to detect the noise present in the current pixel. Threshold parameters are set adaptively. In filtering phase, median based fuzzy filter is used to restore the corrupted pixels. Experimental results show that the proposed filter outperforms several state-of-the-art filters for random value impulse noise removal in an image.

#### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Department of Electronics and Communications Engineering, International Islamic University Islamabad

Contributors: Habib, M., Rasheed, S., Hussain, A., Ali, M.

Number of pages: 5

Pages: 329-333

Publication date: 26 Feb 2016

#### Host publication information

Title of host publication: 2015 13th International Conference on Frontiers of Information Technology (FIT)

Publisher: IEEE

ISBN (Print): 9781467396660

ASJC Scopus subject areas: Health Informatics, Computer Science Applications, Signal Processing

Keywords: fuzzy logic, Image processing, impulse noise, noise removal

DOIs:

10.1109/FIT.2015.64

#### Bibliographical note

INT=elt,"Ali, Mubashir"

Source: Scopus

Source ID: 84964689604

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

#### Quantitative + qualitative information for heritage conservation: An open science research for paving 'collaboratively' the way to historical-BIM

Insofar as our cultural heritage (CH) has become not only an economic resource but a key element in defining our identity, its accurate and flexible documentation has emerged as an essential task. The generation of 3D information with physical and functional characteristics is now possible through the connection of survey data with Historical Building Information Modeling (HBIM). However, few studies have focused on the semantic enrichment process of models based on point clouds, especially on the field of cultural heritage. These singularities make the conversion of point cloud to 'as-built' HBIM an expensive process from the mathematical and computational viewpoint. At present, there is no software that guarantees automatic and efficient data conversion in architectural or urban contexts. The ongoing research 'Documenting

and Visualizing Industrial Heritage' is conducted by the School of Architecture, Tampere University of Technology, Finland based on an Open Notebook Research Model. It is focused on advance the knowledge of digital operating environments for the representation and management of historical buildings and sites. On the one hand, the research is advancing in three-dimensional 'as-built' modeling based on remote sensing data, while on the other hand is aiming to incorporate more qualitative information based on concepts of production and management in the lifecycle of the built environment. The purpose of this presentation is to discuss the different approaches to date on the HBIM generation chain: from 3D point cloud data collection to semantically enriched parametric models.

### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: School of Architecture, Research group: EDGE, Michigan Technological University, University of Valladolid

Contributors: Garcia-Fernandez, J., Joutsiniemi, A., Ahn, Y., Fernandez, J. J.

Number of pages: 2

Pages: 207-208

Publication date: 24 Feb 2016

### Host publication information

Title of host publication: 2015 Digital Heritage International Congress, Digital Heritage 2015

Publisher: IEEE

ISBN (Print): 9781509000487

ASJC Scopus subject areas: Computer Graphics and Computer-Aided Design, Computer Science Applications, Information Systems, Archaeology, Cultural Studies

Keywords: BIM, Conservation, HBIM, Heritage, Open Science, Remote Sensing

DOIs:

10.1109/DigitalHeritage.2015.7419495

Source: Scopus

Source ID: 84965156312

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

### First-principles data set of 45,892 isolated and cation-coordinated conformers of 20 proteinogenic amino acids

We present a structural data set of the 20 proteinogenic amino acids and their amino-methylated and acetylated (capped) dipeptides. Different protonation states of the backbone (uncharged and zwitterionic) were considered for the amino acids as well as varied side chain protonation states. Furthermore, we studied amino acids and dipeptides in complex with divalent cations ( $\text{Ca}^{2+}$ ,  $\text{Ba}^{2+}$ ,  $\text{Sr}^{2+}$ ,  $\text{Cd}^{2+}$ ,  $\text{Pb}^{2+}$ , and  $\text{Hg}^{2+}$ ). The database covers the conformational hierarchies of 280 systems in a wide relative energy range of up to 4 eV (390 kJ/mol), summing up to a total of 45,892 stationary points on the respective potential-energy surfaces. All systems were calculated on equal first-principles footing, applying density-functional theory in the generalized gradient approximation corrected for long-range van der Waals interactions. We show good agreement to available experimental data for gas-phase ion affinities. Our curated data can be utilized, for example, for a wide comparison across chemical space of the building blocks of life, for the parametrization of protein force fields, and for the calculation of reference spectra for biophysical applications.

### General information

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Department of Physics, Fritz Haber Institute of the Max Planck Society, COMP Centre of Excellence, Department of Applied Physics, Aalto University, Aalto University, Duke University

Contributors: Ropo, M., Schneider, M., Baldauf, C., Blum, V.

Publication date: 16 Feb 2016

Peer-reviewed: Yes

### Publication information

Journal: Scientific Data

Volume: 3

Article number: 160009

ISSN (Print): 2052-4463

Ratings:

Scopus rating (2016): CiteScore 4.8 SJR 3.261 SNIP 2.124

Original language: English

ASJC Scopus subject areas: Education, Library and Information Sciences, Computer Science Applications, Information Systems, Statistics, Probability and Uncertainty, Statistics and Probability

Electronic versions:

ropo et al - First-principles data set

DOIs:

10.1038/sdata.2016.9

URLs:

<http://urn.fi/URN:NBN:fi:tty-201607294339>

Source: Scopus

Source ID: 84961184519

Research output: Contribution to journal › Article › Scientific › peer-review

### **Lean manufacturing methods in simulation literature: Review and association analysis**

The lean manufacturing philosophy includes several methods that aim to remove waste from production. This paper studies lean manufacturing methods and how simulation is used to consider them. In order to do this, it reviews papers that study simulation together with lean methods. The papers that are reviewed are categorized according to the lean methods used and result types obtained. Analysis is performed in order to gain knowledge about the volumes of occurrence of different methods and result types. Typical methods in the papers are different types of value stream mapping and work-in-process models. An exploratory analysis is performed to reveal the relationships between the methods and result types. This is done using association analysis. It reveals the methods that are commonly studied together in the literature. The paper also lists research areas that are not considered in the literature. These areas are often related to the analysis of variation.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Department of Mechanical Engineering and Industrial Systems, Research area: Manufacturing and Automation, Aalto University, Department of Engineering Design and Production

Contributors: Tokola, H., Niemi, E., Väistö, V.

Number of pages: 10

Pages: 2239-2248

Publication date: 16 Feb 2016

#### **Host publication information**

Title of host publication: 2015 Winter Simulation Conference (WSC)

ISBN (Print): 978-1-4673-9743-8

ASJC Scopus subject areas: Software, Modelling and Simulation, Computer Science Applications

DOIs:

10.1109/WSC.2015.7408336

#### **Bibliographical note**

EXT="Niemi, Esko"

Source: Scopus

Source ID: 85032069323

Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

### **Guest editorial special issue on the internet of nano things**

The six papers in this special section focus on the Internet of nanotechnology things. While researchers are currently investigating these challenges to develop fully functional nano communication systems, a question remains as to whether they can represent an extended communication network that is part of the broader Internet. These papers address new solutions for the Internet of Nano Things. The Internet of Things paradigm has transformed the way we operate our personal and professional lives, it is driving our economy and will continue to enable many new opportunities in broad research areas. As this pervasive and ubiquitous interconnection of our everyday life appliances continues into the future, new types of devices enabled by nano and biotechnology promise to push engineering to previously unexplored application domains, where the exchange of information and access from/to the broader Internet for their monitoring and control are even more essential. The research on nanoscale communication and networks aims to develop systems for interconnecting these novel devices at the nanoscale, i.e., the Internet of Nano Things.

#### **General information**

Publication status: Published

MoE publication type: B1 Article in a scientific magazine

Organisations: Department of Electronics and Communications Engineering, Research group: Emerging Technologies for Nano-Bio-Info-Cogno, Nano Communication Centre, State University of New York, University of Nebraska - Lincoln

Contributors: Balasubramaniam, S., Jornet, J. M., Pierobon, M., Koucheryavy, Y.

Number of pages: 3

Pages: 1-3

Publication date: 1 Feb 2016

Peer-reviewed: No

#### **Publication information**

Journal: IEEE Internet of Things Journal

Volume: 3  
Issue number: 1  
ISSN (Print): 2327-4662  
Ratings:

Scopus rating (2016): CiteScore 9.9 SJR 1.447 SNIP 5.896

Original language: English

ASJC Scopus subject areas: Computer Networks and Communications, Computer Science Applications, Hardware and Architecture, Information Systems, Signal Processing, Information Systems and Management

DOIs:

10.1109/JIOT.2016.2516838

Source: Scopus

Source ID: 84959329564

Research output: Contribution to journal › Article › Scientific

### **An image generator platform to improve cell tracking algorithms simulation of objects of various morphologies, kinetics and clustering**

Several major advances in Cell and Molecular Biology have been made possible by recent advances in livecell microscopy imaging. To support these efforts, automated image analysis methods such as cell segmentation and tracking during a time-series analysis are needed. To this aim, one important step is the validation of such image processing methods. Ideally, the "ground truth" should be known, which is possible only by manually labelling images or in artificially produced images. To simulate artificial images, we have developed a platform for simulating biologically inspired objects, which generates bodies with various morphologies and kinetics and, that can aggregate to form clusters. Using this platform, we tested and compared four tracking algorithms: Simple Nearest-Neighbour (NN), NN with Morphology and two DBSCAN-based methods. We show that Simple NN works well for small object velocities, while the others perform better on higher velocities and when clustering occurs. Our new platform for generating new benchmark images to test image analysis algorithms is openly available at (<http://griduni.uninova.pt/ClusterGen/ClusterGen-v1.0.zip>).

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Department of Signal Processing, Research group: Laboratory of Biosystem Dynamics-LBD, Campus FCT-UNL

Contributors: Canelas, P., Martins, L., Mora, A., S. Ribeiro, A., Fonseca, J.

Number of pages: 12

Pages: 44-55

Publication date: 2016

#### **Host publication information**

Title of host publication: SIMULTECH 2016 - Proceedings of the 6th International Conference on Simulation and Modeling Methodologies, Technologies and Applications

Publisher: SCITEPRESS

ISBN (Electronic): 9789897581991

ASJC Scopus subject areas: Modelling and Simulation, Computational Theory and Mathematics, Computer Science Applications, Information Systems

Keywords: Cell Tracking, Cluster Tracking, Microscopy, Synthetic Time-lapse Image Simulation

Source: Scopus

Source ID: 84991211006

Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

### **Brownfield Process: A method for modular product family development aiming for product configuration**

Modularisation, product platforms, product families and product configuration are efficient product structuring tactics in mass customisation. Industry needs descriptions of how the engineering should be done in this context. We suggest that key engineering concepts in this field are partitioning logic, set of modules, interfaces, architecture and configuration knowledge. A literature review reveals that methods consider these concepts partly or with different combinations, but considering all of them is rare. Therefore, a design method known as the Brownfield Process is presented. The method is applied to an industrial case in which the aim was rationalisation of existing product variety towards a modular product family that enables product configuration. We suggest that the method is valuable in cases with similar goals.

#### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Research area: Design, Development and LCM, Department of Mechanical Engineering and Industrial Systems

Contributors: Pakkanen, J., Juuti, T., Lehtonen, T.

Number of pages: 32  
Pages: 210-241  
Publication date: 2016  
Peer-reviewed: Yes

#### **Publication information**

Journal: DESIGN STUDIES  
Volume: 45B  
ISSN (Print): 0142-694X  
Ratings:

Scopus rating (2016): CiteScore 3.3 SJR 1.32 SNIP 2.483

Original language: English

ASJC Scopus subject areas: Engineering(all), Architecture , Computer Science Applications, Artificial Intelligence, Social Sciences(all), Arts and Humanities (miscellaneous)

Keywords: Design method, Design process, Engineering design, Product design, Product development

Electronic versions:

bfp\_desstud

DOIs:

10.1016/j.destud.2016.04.004

URLs:

<http://urn.fi/URN:NBN:fi:tty-201608194419>

Source: Scopus

Source ID: 84967235654

Research output: Contribution to journal › Article › Scientific › peer-review

#### **Digital storytelling promoting twenty-first century skills and student engagement**

This article presents results on how students became engaged and motivated when using digital storytelling in knowledge creation in Finland, Greece and California. The theoretical framework is based on sociocultural theories. Learning is seen as a result of dialogical interactions between people, substances and artefacts. This approach has been used in the creation of the Global Sharing Pedagogy (GSP) model for the empirical study of student levels of engagement in learning twenty-first century skills. This model presents a set of conceptual mediators for student-driven knowledge creation, collaboration, networking and digital literacy. Data from 319 students were collected using follow-up questionnaires after the digital storytelling project. Descriptive statistical methods, correlations, analysis of variance and regression analysis were used. The mediators of the GSP model strongly predicted student motivation and enthusiasm as well as their learning outcomes. The digital storytelling project, using the technological platform Mobile Video Experience (MoViE), was very successful in teaching twenty-first century skills.

#### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Pori Department, University of Helsinki

Contributors: Niemi, H., Multisilta, J.

Pages: 451-468

Publication date: 2016

Peer-reviewed: Yes

#### **Publication information**

Journal: Technology, Pedagogy and Education

Volume: 25

Issue number: 4

ISSN (Print): 1475-939X

Ratings:

Scopus rating (2016): CiteScore 1.4 SJR 0.906 SNIP 1.554

Original language: English

ASJC Scopus subject areas: Education, Communication, Computer Science Applications, Information Systems

Keywords: engagement, learning, motivation, twenty-first century skills

DOIs:

10.1080/1475939X.2015.1074610

URLs:

<http://www.scopus.com/inward/record.url?scp=84939476760&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84939476760

Research output: Contribution to journal › Article › Scientific › peer-review

### **Dots-on-the-fly electron beam lithography**

We demonstrate a novel approach for electron-beam lithography (EBL) of periodic nanostructures. This technique can rapidly produce arrays of various metallic and etched nanostructures with line and pitch dimensions approaching the beam spot size. Our approach is based on often neglected functionality which is inherent in most modern EBL systems. The raster/vector beam exposure system of the EBL software is exploited to produce arrays of pixel-like spots without the need to define coordinates for each spot in the array. Producing large arrays with traditional EBL techniques is cumbersome during pattern design, usually leads to large data files and easily results in system memory overload during patterning. In Dots-on-The-fly (DOTF) patterning, instead of specifying the locations of individual spots, a boundary for the array is given and the spacing between spots within the boundary is specified by the beam step size. A designed pattern element thus becomes a container object, with beam spacing acting as a parameterized location list for an array of spots confined by that container. With the DOTF method, a single pattern element, such as a square, rectangle or circle, can be used to produce a large array containing thousands of spots. In addition to simple arrays of nano-dots, we expand the technique to produce more complex, highly tunable arrays and structures on substrates of silicon, ITO/ FTO coated glass, as well as uncoated fused silica, quartz and sapphire.

### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Department of Electronics and Communications Engineering, Research group: Wireless Communications and Positioning, Optoelectronics Research Centre, Research group: Nanophotonics

Contributors: Isotalo, T. J., Niemi, T.

Number of pages: 7

Publication date: 2016

### **Host publication information**

Title of host publication: SPIE Proceedings : Alternative Lithographic Technologies VIII

Volume: 9777

Publisher: SPIE

Editor: Bencher, C.

Article number: 97771E

ISBN (Electronic): 9781510600126

### **Publication series**

Name: Proceedings of SPIE

Publisher: SPIE

ISSN (Print): 0277-786X

ISSN (Electronic): 1996-756X

ASJC Scopus subject areas: Electronic, Optical and Magnetic Materials, Condensed Matter Physics, Computer Science Applications, Electrical and Electronic Engineering, Applied Mathematics

Keywords: electron beam lithography, nano-fabrication, nano-particle arrays, optoelectronics, periodic nano-structures, plasmonics

DOIs:

10.1117/12.2219136

Source: Scopus

Source ID: 84981516864

Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

### **Fabrication and characterization of broadband superluminescent diodes for 2 $\mu\text{m}$ wavelength**

Single-mode superluminescent diodes operating at 2  $\mu\text{m}$  wavelength are reported. The structures are based on GaSb material systems and were fabricated by molecular beam epitaxy. Several waveguide designs have been implemented. A continuous-wave output power higher than 35 mW is demonstrated for a spectrum centered at around 1.92  $\mu\text{m}$ . We show that the maximum output power of the devices is strongly linked to spectrum width. Device having low output power exhibit a wide spectrum with a full-width half-maximum (FWHM) as large as 209 nm, while devices with highest output power exhibit a narrower spectrum with about 61 nm FWHM.

### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Optoelectronics Research Centre, Research group: Semiconductor Technology and Applications

Contributors: Zia, N., Viheriälä, J., Koskinen, R., Koskinen, M., Suomalainen, S., Guina, M.

Publication date: 2016

### **Host publication information**

Title of host publication: Light-Emitting Diodes: Materials, Devices, and Applications for Solid State Lighting XX

Publisher: SPIE  
Article number: 97680Q  
ISBN (Electronic): 9781510600034

#### Publication series

Name: Proceedings of SPIE  
Volume: 9768  
ISSN (Print): 0277-786X  
ISSN (Electronic): 1996-756X  
ASJC Scopus subject areas: Applied Mathematics, Computer Science Applications, Electrical and Electronic Engineering, Electronic, Optical and Magnetic Materials, Condensed Matter Physics  
Keywords: Gallium antimonide, SLD design, Superluminescent diodes, Tilt waveguide  
Electronic versions:  
Proc\_SPIE\_9768\_97680Q\_N.\_Zia\_et\_al\_author\_prepared\_version  
DOIs:  
10.1117/12.2209720  
URLs:  
<http://urn.fi/URN:NBN:fi:tty-201706201608>

#### Bibliographical note

INT=orc,"Koskinen, Mervi"  
Source: Scopus  
Source ID: 84978727362  
Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

#### Graph Embedded Extreme Learning Machine

In this paper, we propose a novel extension of the extreme learning machine (ELM) algorithm for single-hidden layer feedforward neural network training that is able to incorporate subspace learning (SL) criteria on the optimization process followed for the calculation of the network's output weights. The proposed graph embedded ELM (GEELM) algorithm is able to naturally exploit both intrinsic and penalty SL criteria that have been (or will be) designed under the graph embedding framework. In addition, we extend the proposed GEELM algorithm in order to be able to exploit SL criteria in arbitrary (even infinite) dimensional ELM spaces. We evaluate the proposed approach on eight standard classification problems and nine publicly available datasets designed for three problems related to human behavior analysis, i.e., the recognition of human face, facial expression, and activity. Experimental results denote the effectiveness of the proposed approach, since it outperforms other ELM-based classification schemes in all the cases.

#### General information

Publication status: Published  
MoE publication type: A1 Journal article-refereed  
Organisations: Aristotle University of Thessaloniki, Department of Informatics  
Contributors: Iosifidis, A., Tefas, A., Pitas, I.  
Pages: 311 - 324  
Publication date: 2016  
Peer-reviewed: Yes

#### Publication information

Journal: IEEE Transactions on Cybernetics  
Volume: 46  
Issue number: 1  
ISSN (Print): 2168-2267  
Ratings:  
Scopus rating (2016): CiteScore 7.14 SJR 2.927 SNIP 3.282  
Original language: English  
ASJC Scopus subject areas: Computer Science Applications, Human-Computer Interaction, Information Systems, Software, Control and Systems Engineering, Electrical and Electronic Engineering  
DOIs:  
10.1109/TCYB.2015.2401973  
Research output: Contribution to journal > Article > Scientific > peer-review

#### High-power 1550 nm tapered DBR lasers fabricated using soft UV-nanoimprint lithography

Paper reports the DBR-RWG surface grating design, the fabrication process, and the output characteristics of tapered DBR laser diodes for the applications, like for example LIDAR and range finding, that require eye-safe high-power single-mode coherent light sources. The fabricated regrowth-free DBR AlGaInAs/InP lasers exhibited a CW output power as high as 560 mW in single-mode operation at room temperature. At maximum output power the SMSR was 38 dB, proving the excellent behavior of the surface gratings. The tapered section enabled scaling the maximum CW power at room

temperature from 125 mW to 560 mW, by increasing its length from 0.5 mm to 4.0 mm. The paper discusses the limitations and performance variation associated to the power scaling by using the tapered section length as a scaling parameter.

#### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Optoelectronics Research Centre, Research group: Nanophotonics, Research group: Semiconductor Technology and Applications, Materials Research Laboratory, Turun Yliopisto/Turun Biomateriaalikeskus

Contributors: Viheriälä, J., Aho, A. T., Mäkelä, J., Salmi, J., Virtanen, H., Leinonen, T., Dumitrescu, M., Guina, M.

Number of pages: 7

Publication date: 2016

#### Host publication information

Title of host publication: High-Power Diode Laser Technology and Applications XIV

Publisher: SPIE

Article number: 97330Q

ISBN (Electronic): 9781628419689

#### Publication series

Name: SPIE Conference Proceedings

Publisher: SPIE

Volume: 9733

ISSN (Print): 0277-786X

ASJC Scopus subject areas: Applied Mathematics, Computer Science Applications, Electrical and Electronic Engineering, Electronic, Optical and Magnetic Materials, Condensed Matter Physics

Keywords: 1550 nm laser diode, DBR, Power scaling, Tapered laser diode

DOIs:

10.1117/12.2207423

#### Bibliographical note

INT=orc,"Aho, Antti T."

JUFOID=71479

Source: Scopus

Source ID: 84978785955

Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

#### Hot pen and laser writable photonic polymer films

An orange-reflecting photonic polymer film has been fabricated based on a hydrogen-bonded cholesteric liquid crystalline (CLC) polymer consisting of non-reactive (R)-(+)-3-methyladipic acid as the chiral dopant. This polymer film can be patterned easily by evaporating the chiral dopant at specific locations with a hot pen or a laser beam. Removal of chiral dopant leads to a decrease in the helical pitch at the heat treated areas leading to a change in color from orange to green revealing a high contrast pattern. The photonic patterns are irreversible and stable at ambient conditions. This makes such a CLC polymer film interesting as writable photonic paper.

#### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Eindhoven University of Technology

Contributors: Moirangthem, M., Stumpel, J. E., Alp, B., Teunissen, P., Bastiaansen, C. W. M., Schenning, A. P. H. J.

Publication date: 2016

#### Host publication information

Title of host publication: Emerging Liquid Crystal Technologies XI

Volume: 9769

Publisher: SPIE

Article number: 97690Y

ISBN (Electronic): 9781510600041

ASJC Scopus subject areas: Electronic, Optical and Magnetic Materials, Condensed Matter Physics, Computer Science Applications, Electrical and Electronic Engineering, Applied Mathematics

Keywords: Cholesteric liquid crystals, laser writing, patterned surface, photonic paper, thermal writing

DOIs:

10.1117/12.2209065

URLs:

<http://www.scopus.com/inward/record.url?scp=84982292427&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84982292427

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

### **HTML5-based mobile agents for Web-of-Things**

Systems and services utilizing Internet-of-Things can benefit from dynamically updated software in a significant way. In this paper we show how the most advanced variant of moving code, mobile agents, can be used for operating and managing Internet-connected systems composed of gadgets, sensors and actuators. We believe that the use of mobile agents brings several benefits, for example, mobile agents help to reduce the network load, overcome network latency, and encapsulate protocols. In addition, they can perform autonomous tasks that would otherwise require extensive configuration. The need for moving agents is even more significant if the applications and other factors of the over experience should follow the user to new contexts. When multiple agents are used to provide the user with services, some mechanisms to manage the agents are needed. In the context of Internet-of-Things such management should reflect the physical spaces and other relevant contexts. In this paper we describe the technical solutions used in implementation of the mobile agents, describe two proof concepts and we also compare our solution to related work. We also describe our visions of the future work.

#### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Department of Pervasive Computing, Research area: Software engineering

Contributors: Voutilainen, J. P., Mattila, A. L., Systä, K., Mikkonen, T.

Number of pages: 9

Pages: 43-51

Publication date: 2016

Peer-reviewed: Yes

#### **Publication information**

Journal: Informatica

Volume: 40

Issue number: 1

ISSN (Print): 0350-5596

Ratings:

Scopus rating (2016): CiteScore 0.54 SJR 0.136 SNIP 0.449

Original language: English

ASJC Scopus subject areas: Computer Science Applications, Software, Artificial Intelligence, Theoretical Computer Science

Keywords: Html5, Internet-of-things, Javascript, Mobile agents, Web applications, Web-of-things

Electronic versions:

HTML5-based mobile agents for Web-of-Things

URLs:

<http://urn.fi/URN:NBN:fi:ty-201605033936>

Source: Scopus

Source ID: 84963719558

Research output: Contribution to journal > Article > Scientific > peer-review

### **Integrating III-V, Si, and polymer waveguides for optical interconnects: RAPIDO**

We present a vision for the hybrid integration of advanced transceivers at 1.3  $\mu\text{m}$  wavelength, and the progress done towards this vision in the EU-funded RAPIDO project. The final goal of the project is to make five demonstrators that show the feasibility of the proposed concepts to make optical interconnects and packet-switched optical networks that are scalable to Pb/s systems in data centers and high performance computing. Simplest transceivers are to be made by combining directly modulated InP VCSELs with 12  $\mu\text{m}$  SOI multiplexers to launch, for example, 200 Gbps data into a single polymer waveguide with 4 channels to connect processors on a single line card. For more advanced transceivers we develop novel dilute nitride amplifiers and modulators that are expected to be more power-efficient and temperatureinsensitive than InP devices. These edge-emitting III-V chips are flip-chip bonded on 3  $\mu\text{m}$  SOI chips that also have polarization and temperature independent multiplexers and low-loss coupling to the 12  $\mu\text{m}$  SOI interposers, enabling to launch up to 640 Gbps data into a standard single mode (SM) fiber. In this paper we present a number of experimental results, including low-loss multiplexers on SOI, zero-birefringence Si waveguides, micron-scale mirrors and bends with 0.1 dB loss, direct modulation of VCSELs up to 40 Gbps,  $\pm 0.25\mu\text{m}$  length control for dilute nitride SOA, strong band edge shifts in dilute nitride EAMs and SM polymer waveguides with 0.4 dB/cm loss.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Optoelectronics Research Centre, Research group: Semiconductor Technology and Applications, VTT Technical Research Centre of Finland, IBM Research, Vertilas GmbH, Scuola Superiore sant'Anna, Tyndall National Institute at National University of Ireland, Cork, Modulight Inc.

Contributors: Aalto, T., Harjanne, M., Offrein, B. J., Caër, C., Neumeyr, C., Malacarne, A., Guina, M., Sheehan, R. N., Peters, F. H., Melanen, P.

Publication date: 2016

#### Host publication information

Title of host publication: Optical Interconnects XVI

Publisher: SPIE

Article number: 97530D

ISBN (Print): 9781628419887

#### Publication series

Name: Proceedings of SPIE

Volume: 9753

ISSN (Print): 0277-786X

ISSN (Electronic): 1996-756X

ASJC Scopus subject areas: Applied Mathematics, Computer Science Applications, Electrical and Electronic Engineering, Electronic, Optical and Magnetic Materials, Condensed Matter Physics

Keywords: electro absorption modulator, hybrid integration, optical interconnect, optical interposer, optoelectronics, polymer photonics, semiconductor optical amplifier, Silicon photonics, VCSEL, wavelength multiplexers

DOIs:

10.1117/12.2214786

#### Bibliographical note

EXT="Melanen, Petri"

Source: Scopus

Source ID: 84975114015

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

#### Methodology to obtain the security controls in multi-cloud applications

What controls should be used to ensure adequate security level during operation is a non-trivial subject in complex software systems and applications. The problem becomes even more challenging when the application uses multiple cloud services which security measures are beyond the control of the application provider. In this paper, a methodology that enables the identification of the best security controls for multicloud applications whose components are deployed in heterogeneous clouds is presented. The methodology is based on application decomposition and modelling of threats over the components, followed by the analysis of the risks together with the capture of cloud business and security requirements. The methodology has been applied in the MUSA EU H2020 project use cases as the first step for building up the multi-cloud applications' security-aware Service Level Agreements (SLA). The identified security controls will be included in the applications' SLAs for their monitoring and fulfilment assurance at operation.

#### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Department of Automation Science and Engineering, Research group: Factory automation systems technology, Faculty of Engineering Sciences, Factory Automation Systems and Technologies Lab (FAST-Lab), Second University of Naples, ENEA/CREATE/Università Degli Studi Napoli Federico II, TECNALIA. ICT-European Software Institute. Parque Tecnológico de Bizkaia

Contributors: Afolaranmi, S. O., Gonzalez Moctezuma, L. E., Rak, M., Casola, V., Rios, E., Martinez Lastra, J. L.

Number of pages: 6

Pages: 327-332

Publication date: 2016

#### Host publication information

Title of host publication: CLOSER 2016 - Proceedings of the 6th International Conference on Cloud Computing and Services Science

Volume: 1

Publisher: SCITEPRESS

ISBN (Electronic): 9789897581823

ASJC Scopus subject areas: Computer Science (miscellaneous), Computer Science Applications, Software

Keywords: Cyber-security Methodologies, Multi-cloud, Security-by-design, Threat Modelling

DOIs:

10.5220/0005912603270332

URLs:

<http://www.scopus.com/inward/record.url?scp=84979747685&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84979747685

Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

### **Metrics for polyphonic sound event detection**

This paper presents and discusses various metrics proposed for evaluation of polyphonic sound event detection systems used in realistic situations where there are typically multiple sound sources active simultaneously. The system output in this case contains overlapping events, marked as multiple sounds detected as being active at the same time. The polyphonic system output requires a suitable procedure for evaluation against a reference. Metrics from neighboring fields such as speech recognition and speaker diarization can be used, but they need to be partially redefined to deal with the overlapping events. We present a review of the most common metrics in the field and the way they are adapted and interpreted in the polyphonic case. We discuss segment-based and event-based definitions of each metric and explain the consequences of instance-based and class-based averaging using a case study. In parallel, we provide a toolbox containing implementations of presented metrics.

### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Department of Signal Processing, Research group: Audio research group

Contributors: Mesaros, A., Heittola, T., Virtanen, T.

Publication date: 2016

Peer-reviewed: Yes

### **Publication information**

Journal: Applied Sciences

Volume: 6

Issue number: 6

Article number: 162

ISSN (Print): 2076-3417

Ratings:

Scopus rating (2016): SJR 0.315 SNIP 0.799

Original language: English

ASJC Scopus subject areas: Fluid Flow and Transfer Processes, Process Chemistry and Technology, Computer Science Applications, Engineering(all), Materials Science(all), Instrumentation

Keywords: Audio content analysis, Audio signal processing, Computational auditory scene analysis, Evaluation of sound event detection, Everyday sounds, Pattern recognition, Polyphonic sound event detection, Sound events

Electronic versions:

Metrics for Polyphonic Sound Event Detection

DOIs:

10.3390/app6060162

URLs:

<http://urn.fi/URN:NBN:fi:tty-201607294341>

Source: Scopus

Source ID: 84973574836

Research output: Contribution to journal › Article › Scientific › peer-review

### **Optical fiber amplifier with spectral compression elements for high-power laser pulse generation**

We report main features of spectral compression of parabolic pulses in nonlinear optical fibers. It is shown that the variational analysis correctly describes evolution of pulse parameters during spectral compression. The model of cascade amplifier system employing spectral compression is developed to achieve superior spectral densities. The proposed configuration is promising as optical pulse preamplifier for operation in the high-energy pulse laser systems.

### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Optoelectronics Research Centre, University de Mons, Ulyanovsk State University, Optoelectronic Research Center

Contributors: Fotiadi, A. A., Korobko, D. A., Okhotnikov, O. G., Zolotovskii, I. O.

Publication date: 2016

### **Host publication information**

Title of host publication: Nonlinear Optics and its Applications IV

Volume: 9894

Publisher: SPIE  
Article number: 989411  
ISBN (Electronic): 9781510601390

#### **Publication series**

Name: Proceedings of SPIE

Volume: 9894

ISSN (Print): 0277-786X

ASJC Scopus subject areas: Electronic, Optical and Magnetic Materials, Condensed Matter Physics, Computer Science Applications, Electrical and Electronic Engineering, Applied Mathematics

Keywords: Fiber optics amplifiers, high-power laser pulses, nonlinear spectral compression, phase self-modulation

DOIs:

10.1117/12.2223637

Source: Scopus

Source ID: 84985911601

Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

#### **Simultaneous binary hash and features learning for image retrieval**

Content-based image retrieval systems have plenty of applications in modern world. The most important one is the image search by query image or by semantic description. Approaches to this problem are employed in personal photo-collection management systems, web-scale image search engines, medical systems, etc. Automatic analysis of large unlabeled image datasets is virtually impossible without satisfactory image-retrieval technique. It's the main reason why this kind of automatic image processing has attracted so much attention during recent years. Despite rather huge progress in the field, semantically meaningful image retrieval still remains a challenging task. The main issue here is the demand to provide reliable results in short amount of time. This paper addresses the problem by novel technique for simultaneous learning of global image features and binary hash codes. Our approach provide mapping of pixel-based image representation to hash-value space simultaneously trying to save as much of semantic image content as possible. We use deep learning methodology to generate image description with properties of similarity preservation and statistical independence. The main advantage of our approach in contrast to existing is ability to fine-tune retrieval procedure for very specific application which allow us to provide better results in comparison to general techniques. Presented in the paper framework for data-dependent image hashing is based on use two different kinds of neural networks: convolutional neural networks for image description and autoencoder for feature to hash space mapping. Experimental results confirmed that our approach has shown promising results in compare to other state-of-the-art methods.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Department of Signal Processing, Research group: Computational Imaging-CI, Don State Technical University, Univ of Texas at San Antonio

Contributors: Frantc, V. A., Makov, S. V., Voronin, V. V., Marchuk, V. I., Semenishchev, E. A., Egiazarian, K. O., Agaian, S.

Publication date: 2016

#### **Host publication information**

Title of host publication: Mobile Multimedia/Image Processing, Security, and Applications 2016

Publisher: SPIE

Article number: 986902

ISBN (Electronic): 9781510601109

#### **Publication series**

Name: SPIE Conference Proceedings

Volume: 9869

ISSN (Print): 0277-786X

ASJC Scopus subject areas: Electronic, Optical and Magnetic Materials, Condensed Matter Physics, Computer Science Applications, Applied Mathematics, Electrical and Electronic Engineering

Keywords: autoencoder, content-based image retrieval, deep convolutional neural network, semantic hashing

DOIs:

10.1117/12.2223605

Source: Scopus

Source ID: 84991480411

Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

#### **Still image/video frame lossy compression providing a desired visual quality**

The problem of how to automatically provide a desired (required) visual quality in lossy compression of still images and video frames is considered in this paper. The quality can be measured based on different conventional and visual quality

metrics. In this paper, we mainly employ human visual system (HVS) based metrics PSNR-HVS-M and MSSIM since both of them take into account several important peculiarities of HVS. To provide a desired visual quality with high accuracy, iterative image compression procedures are proposed and analyzed. An experimental study is performed for a large number of grayscale test images. We demonstrate that there exist several coders for which the number of iterations can be essentially decreased using a reasonable selection of the starting value and the variation interval for the parameter controlling compression (PCC). PCC values attained at the end of the iterative procedure may heavily depend upon the coder used and the complexity of the image. Similarly, the compression ratio also considerably depends on the above factors. We show that for some modern coders that take HVS into consideration it is possible to give practical recommendations on setting a fixed PCC to provide a desired visual quality in a non-iterative manner. The case when original images are corrupted by visible noise is also briefly studied.

#### General information

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Department of Signal Processing, Research group: Computational Imaging-CI, National Aerospace University

Contributors: Zemliachenko, A., Lukin, V., Ponomarenko, N., Egiazarian, K., Astola, J.

Pages: 697-718

Publication date: 2016

Peer-reviewed: Yes

#### Publication information

Journal: Multidimensional Systems and Signal Processing

Volume: 27

Issue number: 3

ISSN (Print): 0923-6082

Ratings:

Scopus rating (2016): CiteScore 1.47 SJR 0.424 SNIP 1.123

Original language: English

ASJC Scopus subject areas: Computer Science Applications, Information Systems, Signal Processing, Software, Artificial Intelligence, Hardware and Architecture, Applied Mathematics

Keywords: Compression ratio, Lossy compression, Required quality, Visual quality metrics

DOIs:

10.1007/s11045-015-0333-8

URLs:

<http://www.scopus.com/inward/record.url?scp=84930357751&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84930357751

Research output: Contribution to journal › Article › Scientific › peer-review

#### Technoeconomical Analysis of Macrocell and Femtocell Based HetNet under Different Deployment Constraints

Ultradense deployment of small cells is being considered as one of the key flavors of the emerging 5G cellular networks to address the future data capacity challenges. A large share of these deployments will be indoor, as this is the arena where the majority of the data traffic is believed to originate from in the future. Indoor small cell solutions (e.g., femtocell or WiFi) are well positioned for delivering superior indoor coverage and capacity. However, due to relatively smaller coverage footprint compared to traditional macrocells, a very dense deployment of small cells will be needed in order to have a ubiquitous indoor coverage. Such dense deployment triggers cost and energy efficiency concerns for mobile operators. In this paper, we analyze and compare the technoeconomic performance of two deployment strategies: homogeneous macrocellular densification and heterogeneous macro-femto deployment strategy, from an indoor service provisioning perspective. Particularly, we analyze and contrast the performance of macro-femto based deployment, with varying femtocell market penetration rate and under different femtocell backhaul connectivity constraints, with that of homogeneous macrocellular densification. The results indicate superior performance of indoor femtocell based deployment as compared to macrocellular-only densification, due to better indoor coverage, radio channel conditions, and high degree of spatial reuse.

#### General information

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Department of Electronics and Communications Engineering, Research group: Wireless Communications and Positioning

Contributors: Yunas, S. F., Ansari, W. H., Valkama, M.

Publication date: 2016

Peer-reviewed: Yes

#### Publication information

Journal: Mobile Information Systems

Volume: 2016

Article number: 6927678

ISSN (Print): 1574-017X

Ratings:

Scopus rating (2016): CiteScore 1.03 SJR 0.208 SNIP 0.619

Original language: English

ASJC Scopus subject areas: Computer Networks and Communications, Computer Science Applications

Electronic versions:

Technoeconomical Analysis of Macrocell and Femtocell Based HetNet under Different Deployment Constraints

DOIs:

10.1155/2016/6927678

URLs:

<http://urn.fi/URN:NBN:fi:ty-201609274557>

### Bibliographical note

INT=elt,"Ansari, Waqas H."

Source: Scopus

Source ID: 84985945396

Research output: Contribution to journal › Article › Scientific › peer-review

### Two models for hydraulic cylinders in flexible multibody simulations

In modelling hydraulic cylinders interaction between the structural response and the hydraulic system needs to be taken into account. In this chapter two approaches for modelling flexible multibody systems coupled with hydraulic actuators i.e. cylinders are presented and compared. These models are the truss-elementlike cylinder and bending flexible cylinder models. The bending flexible cylinder element is a super-element combining the geometrically exact Reissner-beam element, the  $C^1$ -continuous slide-spring element needed for the telescopic movement and the hydraulic fluid field. Both models are embedded with a friction model based on a bristle approach. The models are implemented in a finite element environment. In time the coupled stiff differential equation system is integrated using the L-stable Rosenbrock method.

### General information

Publication status: Published

MoE publication type: A3 Part of a book or another research book

Organisations: Department of Civil Engineering, Research group: Structural Mechanics, Department of Mechanical Engineering and Industrial Systems, Research area: Applied Mechanics, FS Dynamics Finland Oy Ab

Contributors: Ylinen, A., Mäkinen, J., Kouhia, R.

Number of pages: 31

Pages: 463-493

Publication date: 2016

### Host publication information

Title of host publication: Computational Methods for Solids and Fluids : Multiscale Analysis, Probability Aspects and Model Reduction

Publisher: Springer

ISBN (Print): 978-3-319-27994-7

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### Publication series

Name: Computational Methods in Applied Sciences

Volume: 41

ISSN (Print): 1871-3033

ASJC Scopus subject areas: Computational Mathematics, Modelling and Simulation, Fluid Flow and Transfer Processes, Computer Science Applications, Civil and Structural Engineering, Electrical and Electronic Engineering, Biomedical Engineering

DOIs:

10.1007/978-3-319-27996-1\_17

### Bibliographical note

JUF0ID=79940

EXT="Ylinen, Antti"

Source: Scopus

Source ID: 84964233721

Research output: Chapter in Book/Report/Conference proceeding › Chapter › Scientific › peer-review

### **Energy cooperation for throughput optimization based on save-then-transmit protocol in wireless communication system**

Green communication and energy saving have been a critical issue in modern wireless communication systems. The concepts of energy harvesting and energy transfer are recently receiving much attention in academic research field. In this paper, we study energy cooperation problems based on save-then-transmit protocol and propose two energy cooperation schemes for different system models: two-node communication model and three-node relay communication model. In both models, all of the nodes transmitting information have no fixed energy supplies and gain energy only via wireless energy harvesting from nature. Besides, these nodes also follow a save-then-transmit protocol. Namely, for each timeslot, a fraction (referred to as save-ratio) of time is devoted exclusively to energy harvesting while the remaining fraction is used for data transmission. In order to maximize the system throughput, energy transfer mechanism is introduced in our schemes, i.e., some nodes are permitted to share their harvested energy with other nodes by means of wireless energy transfer. Simulation results demonstrate that our proposed schemes can outperform both the schemes with half-allocate save-ratio and the schemes without energy transfer in terms of throughput performance, and also characterize the dependencies of system throughput, transferred energy, and save-ratio on energy harvesting rate.

#### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Department of Electronics and Communications Engineering, Research group: Wireless Communications and Positioning, Wireless Communications and Positioning (WICO), Chongqing Key Lab of Mobile Communication Technology, Chongqing University of Posts and Telecommunications

Contributors: Dai, C., Li, F., Renfors, M.

Publication date: 26 Dec 2015

Peer-reviewed: Yes

#### **Publication information**

Journal: Eurasip Journal on Wireless Communications and Networking

Volume: 2015

Issue number: 1

Article number: 119

ISSN (Print): 1687-1472

Ratings:

Scopus rating (2015): CiteScore 0.96 SJR 0.362 SNIP 1.138

Original language: English

ASJC Scopus subject areas: Computer Networks and Communications, Signal Processing, Computer Science Applications

Keywords: Energy harvesting, Energy transfer, Save-then-transmit protocol, Throughput optimization

DOIs:

10.1186/s13638-015-0364-8

URLs:

<http://www.scopus.com/inward/record.url?scp=84930207810&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84930207810

Research output: Contribution to journal > Article > Scientific > peer-review

### **Bispectrum-based demodulation technique using triple-channel heterodyning of triplet-signal**

Paper is dedicated to novel bispectrum-based demodulation technique by using triple-channel heterodyning of triplet-signals. Test statistics used for triplet-signals detection and discrimination are evaluated in the form of the bimagnitude peak values. Experimental study of noise immunity in bispectrum-based digital communication system is performed for suggested triple-channel heterodyning technique. Bit error rate (BER) values are computed under additive Gaussian noise influence in radio communication link for wide variations of input signal-to-noise ratio (SNR).

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Department of Signal Processing, Research group: Algebraic and Algorithmic Methods in Signal Processing AAMSP, Signal Processing Research Community (SPRC), National Aerospace University

Contributors: Naumenko, V., Solodovnik, V., Totsky, A., Zelensky, A., Astola, J.

Number of pages: 3

Pages: 224-226

Publication date: 14 Dec 2015

#### **Host publication information**

Title of host publication: 2015 Second International Scientific-Practical Conference Problems of Infocommunications Science and Technology (PIC S&T)

Publisher: IEEE

ISBN (Print): 9789669751928

ASJC Scopus subject areas: Computer Science (miscellaneous), Computer Science Applications

Keywords: bispectrum, digital communication system, noise immunity, three-channel heterodyning, triplet-signal

DOIs:

10.1109/INFOCOMMST.2015.7357319

Source: Scopus

Source ID: 84962840376

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

### **HVS-based local analysis of denoising efficiency for DCT-based filters**

Images acquired and processed in communication and multimedia systems are often noisy. Thus, pre-filtering is a typical stage to remove noise. At this stage, a special attention has to be paid to image visual quality. This paper analyzes denoising efficiency from the viewpoint of visual quality improvement using metrics that take into account human vision system (HVS). Specific features of the paper consist in, first, considering filters based on discrete cosine transform (DCT) and, second, analyzing the filter performance locally. Such an analysis is possible due to the structure and peculiarities of the metric PSNR-HVS-M. It is shown that a more advanced DCT-based filter BM3D outperforms a simpler (and faster) conventional DCT-based filter in locally active regions, i.e., neighborhoods of edges and small-sized objects. This conclusion allows accelerating BM3D filter and can be used in further improvement of the analyzed denoising techniques.

### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Department of Signal Processing, Research group: Algebraic and Algorithmic Methods in Signal Processing AAMSP, Research group: Computational Imaging-CI, Signal Processing Research Community (SPRC)

Contributors: Rubel, O., Ponomarenko, N., Lukin, V., Astola, J., Egiazarian, K.

Number of pages: 4

Pages: 189-192

Publication date: 14 Dec 2015

### **Host publication information**

Title of host publication: 2015 2nd International Scientific-Practical Conference Problems of Infocommunications Science and Technology, PIC S and T 2015 - Conference Proceedings

Publisher: IEEE

ISBN (Print): 9789669751928

ASJC Scopus subject areas: Computer Science (miscellaneous), Computer Science Applications

Keywords: DCT-based filters, HVS-metrics, image denoising, local analysis

DOIs:

10.1109/INFOCOMMST.2015.7357309

Source: Scopus

Source ID: 84962840358

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

### **Method of data compression for traffic monitoring**

In this paper a problem of compressing data containing information on basic parameters of network traffic is considered. Six test sets with different types of network traffic for known monitoring tool Wireshark are formed. Analysis of compression efficiency for these datasets by widely used archivers is carried out. It is shown that the main part of memory in compressed data relates to timestamps. A method for compressing timestamps that consists in delta calculation, Burrows-Wheeler transform (BWT), distance coding (DC) and recursive group coding (RGC) at the final stage is proposed. It is demonstrated that the use of RGC at the final stage provides more efficient coding compared to known methods. It is also shown that the proposed method of timestamps coding produces about twice larger compression ratio than WinRar.

### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Department of Signal Processing, Research group: Algebraic and Algorithmic Methods in Signal Processing AAMSP, Research group: Computational Imaging-CI, Signal Processing Research Community (SPRC)

Contributors: Kozhemiakina, N., Lukin, V., Ponomarenko, N., Akulyinichev, A., Astola, J., Egiazarian, K.

Number of pages: 4

Pages: 153-156

Publication date: 14 Dec 2015

### **Host publication information**

Title of host publication: 2015 2nd International Scientific-Practical Conference Problems of Infocommunications Science and Technology, PIC S and T 2015 - Conference Proceedings

Publisher: IEEE

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ASJC Scopus subject areas: Computer Science (miscellaneous), Computer Science Applications

Keywords: Burrows-Wheeler transform, data compression, distance coding, traffic monitoring and analysis tools

DOIs:

10.1109/INFOCOMMST.2015.7357299

Source: Scopus

Source ID: 84962870220

Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

### **Texture detection in noisy images by combining several local parameters**

A problem of detecting textural areas in images corrupted by noise is considered. Detection is based on joint use of several local parameters calculated in scanning windows (blocks) of different size. Trained support vector machine (SVM) classifier is used for combining local parameters. Factors that influence detector performance are analyzed. It is shown that detector performance can be improved by taking into account information from classifier output for neighbor pixels.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Signal Processing Research Community (SPRC), Kharkiv National Aerospace University, Department of Transmitters

Contributors: Naumenko, A., Krivenko, S., Ponomarenko, N., Zelensky, A., Lukin, V.

Number of pages: 4

Pages: 230-233

Publication date: 14 Dec 2015

#### **Host publication information**

Title of host publication: 2015 2nd International Scientific-Practical Conference Problems of Infocommunications Science and Technology, PIC S and T 2015 - Conference Proceedings

Publisher: Institute of Electrical and Electronics Engineers Inc.

Article number: 7357321

ISBN (Electronic): 9789669751928

ASJC Scopus subject areas: Computer Science (miscellaneous), Computer Science Applications

Keywords: image, local parameters, noise, SVM, texture detection

DOIs:

10.1109/INFOCOMMST.2015.7357321

URLs:

<http://www.scopus.com/inward/record.url?scp=84962836336&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84962836336

Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

### **Urban sensing and smart home energy optimisations: A machine learning approach**

Energy efficiency for smart home applications is proposed using urban sensing data with machine learning techniques. We exploit Internet of Things (IoT) enabled environmental and energy panel sensor data, smart home sensing data and opportunistic crowd-sourced data for energy efficient applications in a smart urban home. We present some applications where data from the IoT enabled sensors can be utilised using machine learning techniques. Prediction of small scale renewable energy using solar photovoltaic panels and environmental sensor data is used in energy management such as water heating system. Smart meter data and motion sensor data are used in household appliance monitoring applications with machine learning techniques towards energy savings. Further event detection from environmental and traffic sensor data is proposed in planning and optimising energy usage of smart electric vehicles for a smart urban home. Initial experimental results show the applicability of developing energy efficient applications using machine learning techniques with IoT enabled sensor data.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Department of Electronics and Communications Engineering, CSIRO Digital Productivity Flagship

Contributors: Shahriar, M. S., Rahman, M. S.

Number of pages: 4

Pages: 19-22

Publication date: 1 Nov 2015

#### **Host publication information**

Title of host publication: IoT-App 2015 - Proceedings of the 2015 International Workshop on Internet of Things Towards Applications, co-located with SenSys 2015

Publisher: ACM

ISBN (Electronic): 9781450338387

ASJC Scopus subject areas: Computer Networks and Communications, Computer Science Applications

Keywords: Energy efficiency, Machine learning, Urban sensing

DOIs:

10.1145/2820975.2820979

### Bibliographical note

INT=elt,"Rahman, M. Sabbir"

Source: Scopus

Source ID: 84961161222

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

### Polynomial Input-Output Stability for Linear Systems

We introduce the concept of polynomial input-output stability for infinite-dimensional linear systems. We show that this stability type corresponds exactly to the recent notion of P-stability in the frequency domain. In addition, we show that on a Hilbert space a regular linear system whose system operator generates a polynomially stable semigroup is always polynomially input-output stable, and present additional conditions under which the system is input-output stable. The results are illustrated with an example of a polynomially input-output stable one-dimensional wave system.

### General information

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Department of Mathematics, Research group: MAT Mathematical and semantic modelling

Contributors: Paunonen, L., Laakkonen, P.

Number of pages: 6

Pages: 2797-2802

Publication date: 1 Oct 2015

Peer-reviewed: Yes

### Publication information

Journal: IEEE Transactions on Automatic Control

Volume: 60

Issue number: 10

ISSN (Print): 0018-9286

Ratings:

Scopus rating (2015): CiteScore 5.08 SJR 4.285 SNIP 3.218

Original language: English

ASJC Scopus subject areas: Electrical and Electronic Engineering, Control and Systems Engineering, Computer Science Applications

Keywords: Distributed parameter system, Stability

DOIs:

10.1109/TAC.2015.2398890

URLs:

<http://www.scopus.com/inward/record.url?scp=84942853446&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84942853446

Research output: Contribution to journal > Article > Scientific > peer-review

### Antroposeeni - A mixed reality game

In this paper, we describe Antroposeeni, a mixed reality game designed and developed for mobile devices. Antroposeeni utilizes location-based services, GPS for tracking users and augmented reality techniques for displaying captivating audiovisual content and creating rich experiences. Our demonstration will introduce a pilot version of the game, which encompasses narrative elements of the game mediated through developed media technologies. The goal for the demonstration is to give the conference visitors a chance to test the game in a specifically tailored route close to the conference site. After conducting the pilot we plan to organize a short review regarding the user experience.

### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Augmented Human Activities (AHA), Metaria Ry

Contributors: Luhtala, M., Karvonen, T., Pylväs, J., Ala-Kokko, A., Magica, R., Takeda, Y., Turunen, M.

Number of pages: 3  
Pages: 211-213  
Publication date: 22 Sep 2015

#### Host publication information

Title of host publication: ACADEMICMINDTREK 2015 - Proceedings of the 19th International Academic Mindtrek Conference  
Publisher: Association for Computing Machinery, Inc  
ISBN (Electronic): 9781450339483  
ASJC Scopus subject areas: Human-Computer Interaction, Software, Computer Science Applications  
Keywords: Aesthetics, Art, Augmented reality, Design, Games, Mixed reality, Software design, Theatre, User experience  
DOIs:  
10.1145/2818187.2818287  
URLs:  
<http://www.scopus.com/inward/record.url?scp=84962875980&partnerID=8YFLogxK> (Link to publication in Scopus)  
Source: Scopus  
Source ID: 84962875980  
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

#### OASIS deck of cards - House of colleagues: A playful

A research experiment to facilitate playful interaction and community learning within an academic organization of about 170 employees was conducted. A 2-player card game including 61 'staff character cards' and 39 question cards was implemented to be played by the relatively new community. The game period, including supporting events, ran for 5 weeks. After the experiment 59 staff members responded to an online survey on play experiences. The results showed that ways of participation and means of play are more diverse in a work community context than as they are specified in the game rules. More emphasis should be set on framing the game and supporting it as a continuous activity to become a playful practice in the work community. An academic community has inherent contextual prerequisites that need to be addressed in order for a playful practice to gain traction as a means for community building.

#### General information

Publication status: Published  
MoE publication type: A4 Article in a conference publication  
Organisations: Mathematical modelling with wide societal impact (MathImpact)  
Contributors: Nummenmaa, T., Kultima, A., Kankainen, V., Savolainen, S., Syvänen, A., Alha, K., Mäyrä, F.  
Number of pages: 8  
Pages: 2-9  
Publication date: 22 Sep 2015

#### Host publication information

Title of host publication: ACADEMICMINDTREK 2015 - Proceedings of the 19th International Academic Mindtrek Conference  
Publisher: Association for Computing Machinery, Inc  
ISBN (Electronic): 9781450339483  
ASJC Scopus subject areas: Human-Computer Interaction, Software, Computer Science Applications  
Keywords: Academia, Adult play, Attitudes towards play, Card game, Community, Design, Play at work, Playfulness, University  
DOIs:  
10.1145/2818187.2818296  
URLs:  
<http://www.scopus.com/inward/record.url?scp=84962803762&partnerID=8YFLogxK> (Link to publication in Scopus)  
Source: Scopus  
Source ID: 84962803762  
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

#### Analytical model for magnetic anisotropy of non-oriented steel sheets

Purpose - Recent investigations on magnetic properties of non-oriented (NO) steel sheets enhance the comprehension of the magnetic anisotropy behaviour of widely employed electrical sheets. The concept of energy/coenergy density can be employed to model these magnetic properties. However, it usually presents an implicit form which requires an iterative process. The purpose of this paper is to develop an analytical model to consider these magnetic properties with an explicit formulation in order to ease the computations. Design/methodology/approach - From rotational measurements, the anhysteretic curves are interpolated in order to extract the magnetic energy density for different directions and amplitudes of the magnetic flux density. Furthermore, the analytical representation of this energy is suggested based on statistical distribution which aims to minimize the intrinsic energy of the material. The model is finally validated by comparing measured and computed values of the magnetic field strength. Findings - The proposed model is based on an analytical formulation of the energy depending on the components of the magnetic flux density. This formulation is composed of

three Gumbel distributions. Every functional parameters of energy density is formulated with only four parameters which are calculated by fitting the energy extracted from measurements. Finally, the proposed model is validated by comparing the computation and the measurements of 9 H loci for NO steel sheets at 10 Hz. The proposed analytical model shows good agreements with an average relative error of 27 per cent. Originality/value - The paper presents an original analytical method to model magnetic anisotropy for NO electrical sheets. With this analytical formulation, the determination of H does not require any iterative process as it is usually the case with this energy method coupled with implicit function. This method can be easily incorporated in finite element method since it does not require any extra iterative process.

#### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Smart Energy Systems (SES), Aalto University

Contributors: Martin, F., Singh, D., Belahcen, A., Rasilo, P., Haavisto, A., Arkkio, A.

Number of pages: 14

Pages: 1475-1488

Publication date: 7 Sep 2015

Peer-reviewed: Yes

#### **Publication information**

Journal: COMPEL: The International Journal for Computation and Mathematics in Electrical and Electronic Engineering

Volume: 34

Issue number: 5

ISSN (Print): 0332-1649

Ratings:

Scopus rating (2015): CiteScore 0.68 SJR 0.231 SNIP 0.554

Original language: English

ASJC Scopus subject areas: Electrical and Electronic Engineering, Computer Science Applications, Computational Theory and Mathematics, Applied Mathematics

Keywords: FEM, Ferromagnetic materials, Magnetic anisotropy, Soft magnetic materials

DOIs:

10.1108/COMPEL-02-2015-0076

URLs:

<http://www.scopus.com/inward/record.url?scp=84941117731&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84941117731

Research output: Contribution to journal › Article › Scientific › peer-review

#### **Estimation of additional losses due to random contacts at the edges of stator of an electrical machine**

Purpose - Punching of the electrical sheets impair the insulation and make random galvanic contacts between the edges of the sheets. The purpose of this paper is to model the random galvanic contacts at the stator edges of 37 kW induction machine and estimate the additional losses due to these contacts. Design/methodology/approach - The presence of the surface current at the edges of sheets causes the discontinuity in the tangential component of the magnetic field. The surface boundary layer model which is based on this concept is implemented to model the galvanic contacts at the edges of the sheets. Finite element analysis based on magnetic vector potential was done and theoretical statistical study of the random conductivity at the stator edge was performed using brute force method. Findings - Finite element analysis validates the interlaminar current when galvanic contacts are present at the edges of electrical sheets. The case studies show that the rotor and stator losses increases with the thickness of the contacts. Statistical studies show that the mean value of total electromagnetic loss was increased by 7.7 percent due to random contacts at the edges of sheets. Originality/value - The novel approach for modeling the galvanic contacts at the stator edges of induction machine is discussed in this paper. The hypothesis of interlaminar current due to galvanic contacts is also validated using finite element simulation.

#### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Smart Energy Systems (SES), Aalto University

Contributors: Shah, S. B., Rasilo, P., Belahcen, A., Arkkio, A.

Number of pages: 10

Pages: 1501-1510

Publication date: 7 Sep 2015

Peer-reviewed: Yes

#### **Publication information**

Journal: COMPEL: The International Journal for Computation and Mathematics in Electrical and Electronic Engineering

Volume: 34

Issue number: 5  
ISSN (Print): 0332-1649  
Ratings:

Scopus rating (2015): CiteScore 0.68 SJR 0.231 SNIP 0.554

Original language: English

ASJC Scopus subject areas: Electrical and Electronic Engineering, Computer Science Applications, Computational Theory and Mathematics, Applied Mathematics

Keywords: Boundary conditions, Eddy current, Electrical conductivity, FEM, Magnetic vector potential

DOIs:

10.1108/COMPEL-02-2015-0083

URLs:

<http://www.scopus.com/inward/record.url?scp=84941111680&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84941111680

Research output: Contribution to journal › Article › Scientific › peer-review

### **DropELM: Fast neural network regularization with Dropout and DropConnect**

In this paper, we propose an extension of the Extreme Learning Machine algorithm for Single-hidden Layer Feedforward Neural network training that incorporates Dropout and DropConnect regularization in its optimization process. We show that both types of regularization lead to the same solution for the network output weights calculation, which is adopted by the proposed DropELM network. The proposed algorithm is able to exploit Dropout and DropConnect regularization, without computationally intensive iterative weight tuning. We show that the adoption of such a regularization approach can lead to better solutions for the network output weights. We incorporate the proposed regularization approach in several recently proposed ELM algorithms and show that their performance can be enhanced without requiring much additional computational cost.

#### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Research Community on Data-to-Decision (D2D), Aristotle University of Thessaloniki, Department of Informatics

Contributors: Iosifidis, A., Tefas, A., Pitas, I.

Number of pages: 10

Pages: 57-66

Publication date: 25 Aug 2015

Peer-reviewed: Yes

#### **Publication information**

Journal: Neurocomputing

Volume: 162

ISSN (Print): 0925-2312

Ratings:

Scopus rating (2015): CiteScore 3.18 SJR 0.981 SNIP 1.698

Original language: English

ASJC Scopus subject areas: Artificial Intelligence, Computer Science Applications, Cognitive Neuroscience

Keywords: DropConnect, Dropout, Extreme Learning Machine, Regularization, Single Hidden Layer Feedforward Networks

DOIs:

10.1016/j.neucom.2015.04.006

URLs:

<http://www.scopus.com/inward/record.url?scp=84929271496&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84929271496

Research output: Contribution to journal › Article › Scientific › peer-review

### **Evaluating a Future Remote Control Environment with an Experience-Driven Science Fiction Prototype**

The case study presented in this paper aimed at discovering opportunities for ambient intelligence and new interaction methods for a future remote crane-operating environment. The theoretical objective was to carry out an experience-driven research project in an industrial work context, and the practical objective was to create and evaluate a future oriented science fiction prototype. The work was carried out in close co-operation with an industrial partner who was a domain expert in the field of crane industry. The aim was to focus on clearly defined user experience goals to which the industrial partner committed. The consequent immediate objective was to focus on two explicit experiences relating to 'Feeling of being motivated' and to 'Sense of community' that were placed at the core of the design investigations. These experiences were deliberated into a science fiction prototype entitled 'Remote operator's day in a future control centre'. The science

fiction prototype was further introduced to users by twofold means: as a plain, simple short story and through an interactive experience path. The main contribution of the paper is to demonstrate how an emerging technology research of a new domain may employ science fiction prototyping method as a primary means of experience design investigations.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Augmented Human Activities (AHA), VTT Technical Research Centre of Finland, Jyväskylän yliopisto, Konecranes Ltd

Contributors: Kymalainen, T., Perala, P., Hakulinen, J., Heimonen, T., James, J., Pera, J.

Number of pages: 8

Pages: 81-88

Publication date: 12 Aug 2015

#### **Host publication information**

Title of host publication: Proceedings - 2015 International Conference on Intelligent Environments, IE 2015

Publisher: Institute of Electrical and Electronics Engineers Inc.

Article number: 7194274

ISBN (Electronic): 9781467366540

ASJC Scopus subject areas: Artificial Intelligence, Computer Science Applications, Engineering (miscellaneous), Social Sciences (miscellaneous)

Keywords: human-computer interaction (HCI), Intelligent environment (IE), remote crane operation, science fiction prototyping (SFP), user experience (UX)

DOIs:

10.1109/IE.2015.19

URLs:

<http://www.scopus.com/inward/record.url?scp=84955492937&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84955492937

Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

#### **Distance-based human action recognition using optimized class representations**

We study distance-based classification of human actions and introduce a new metric learning approach based on logistic discrimination for the determination of a low-dimensional feature space of increased discrimination power. We argue that for effective distance-based classification, both the optimal projection space and the optimal class representation should be determined. We qualitatively and quantitatively illustrate the superiority of the proposed approach to metric learning approaches employing the class mean for class representation. We also introduce extensions of the proposed metric learning approach to allow for richer class representations and to operate in arbitrary-dimensional Hilbert spaces for non-linear feature extraction and classification. Experimental results denote that the performance of the proposed distance-based classification schemes is comparable (or even better) to that of Support Vector Machine classifier (in both the linear and kernel cases) which is currently the standard choice for human action recognition.

#### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Research Community on Data-to-Decision (D2D), Aristotle University of Thessaloniki, Department of Informatics

Contributors: Iosifidis, A., Tefas, A., Pitas, I.

Number of pages: 9

Pages: 47-55

Publication date: 5 Aug 2015

Peer-reviewed: Yes

#### **Publication information**

Journal: Neurocomputing

Volume: 161

ISSN (Print): 0925-2312

Ratings:

Scopus rating (2015): CiteScore 3.18 SJR 0.981 SNIP 1.698

Original language: English

ASJC Scopus subject areas: Artificial Intelligence, Computer Science Applications, Cognitive Neuroscience

Keywords: Distance-based classification, Optimized class representations

DOIs:

10.1016/j.neucom.2014.10.088

URLs:

<http://www.scopus.com/inward/record.url?scp=84929045315&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84929045315

Research output: Contribution to journal > Article > Scientific > peer-review

### **Image interpolation based on non-local geometric similarities**

Image interpolation refers to constructing a high-resolution (HR) image from a low-resolution (LR) image. Traditionally, an HR image can be produced from an observed LR image via the polynomial-based interpolation (bi-linear or bi-cubic interpolations, involving a small number of neighbors around each interpolated position). The advanced interpolation makes use of the so-called 'geometric similarity' to design a set of optimal interpolation weighting coefficients. However, better geometric similarities can perhaps be found from a non-local area within the LR source image or even from other but similar images (possibly with higher resolutions). Based on this fact, we propose in this paper a non-local geometric similarity based interpolation scheme to construct HR images. In our proposed method, optimal weighting coefficients are determined by solving a regularized least squares problem which is built upon a number of dual reference patches drawn from the observed LR image and regularized by the variation of directional gradients of the image patch. Experimental results demonstrate that our proposed method offers a remarkable quality improvement, both objectively and subjectively.

### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Department of Signal Processing, Research group: Video, Research Community on Data-to-Decision (D2D), University of Electronic Science and Technology of China, University of Science and Technology of China

Contributors: Zhu, S., Zeng, B., Liu, G., Zeng, L., Fang, L., Gabbouj, M.

Publication date: 4 Aug 2015

### **Host publication information**

Title of host publication: 2015 IEEE International Conference on Multimedia and Expo (ICME)

Publisher: IEEE COMPUTER SOCIETY PRESS

ISBN (Print): 9781479970827

ASJC Scopus subject areas: Computer Networks and Communications, Computer Science Applications

Keywords: geometric similarity, Image interpolation, regularization, weighting coefficients

DOIs:

10.1109/ICME.2015.7177417

URLs:

<http://www.scopus.com/inward/record.url?scp=84946043968&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84946043968

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

### **Stability-Guaranteed Force-Sensorless Contact Force/Motion Control of Heavy-Duty Hydraulic Manipulators**

In this paper, a force-sensorless high-performance contact force/motion control approach is proposed for multiple-degree-of-freedom hydraulic manipulators. A rigorous stability proof for an entire hydraulic manipulator performing contact tasks is provided for the first time. The controller design for the manipulator is based on the recently introduced virtual decomposition control approach. As a significant novelty, the end-effector contact force is directly estimated from the manipulator's cylinder pressure data, which provides a practical solution for heavy-duty contact force control without engaging fragile force/torque sensors. In the experiments, the proposed controller achieved a force control accuracy of 4.1% at a desired contact force of 8000 N while in motion. This can be considered a significant result due to the hydraulic actuators' highly nonlinear behaviors, the coupled mechanical linkage dynamics, and the complex interaction dynamics between the manipulator and the environment.

### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Department of Intelligent Hydraulics and Automation, Research group: Mobile manipulation, Field robotics for efficient work sites (FIRE)

Contributors: Koivumäki, J., Mattila, J.

Number of pages: 18

Pages: 918-935

Publication date: 1 Aug 2015

Peer-reviewed: Yes

### **Publication information**

Journal: IEEE Transactions on Robotics

Volume: 31  
Issue number: 4  
ISSN (Print): 1552-3098  
Ratings:

Scopus rating (2015): CiteScore 4.86 SJR 2.271 SNIP 2.772

Original language: English

ASJC Scopus subject areas: Electrical and Electronic Engineering, Control and Systems Engineering, Computer Science Applications

Keywords: Contact force estimation, contact force/motion control, hydraulic manipulators, nonlinear model-based control, stability analysis, virtual decomposition control (VDC)

DOIs:

10.1109/TRO.2015.2441492

URLs:

<http://www.scopus.com/inward/record.url?scp=84939173864&partnerID=8YFLogxK> (Link to publication in Scopus)

Research output: Contribution to journal › Article › Scientific › peer-review

### **Gathering useful programming data; Analysis and insights from real-time collaborative editing**

Traditionally, collaborative coding has been practiced in open source communities where cooperation has mostly taken place on a coordination level. Nowadays, web technology is sufficiently advanced to enable collaborative coding in real-time as group work, which eases communication in software development. In this paper this phenomenon has been studied from a knowledge transfer and learning perspective. With the aid of two different example cases (code camps), we have examined the possibilities and challenges in learning during real-time group work. Additionally, we have evaluated the effect of the structure of log data created during software development. The research frame for this study is the utilization of log data visualization in evaluating group work and further improvement of the visualization in order to support software development.

### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Pori Department, Research group: Software Engineering and Intelligent Systems, Department of Pervasive Computing, Research area: Software engineering, Managing digital industrial transformation (mDIT)

Contributors: Rantala, M., Soini, J., Kilamo, T.

Number of pages: 6

Pages: 229-234

Publication date: 15 Jul 2015

### **Host publication information**

Title of host publication: 2015 38th International Convention on Information and Communication Technology, Electronics and Microelectronics, MIPRO 2015 - Proceedings

Publisher: The Institute of Electrical and Electronics Engineers, Inc.

Article number: 7160270

ISBN (Print): 9789532330854

ASJC Scopus subject areas: Computer Networks and Communications, Computer Science Applications, Hardware and Architecture, Electrical and Electronic Engineering

DOIs:

10.1109/MIPRO.2015.7160270

URLs:

<http://www.scopus.com/inward/record.url?scp=84946129499&partnerID=8YFLogxK> (Link to publication in Scopus)

### **Bibliographical note**

ORG=pla,0.7

ORG=tie,0.3

Source: Scopus

Source ID: 84946129499

Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

### **Effective variable switching point predictive current control for ac low-voltage drives**

This paper presents an effective model predictive current control scheme for induction machines driven by a three-level neutral point clamped inverter, called variable switching point predictive current control. Despite the fact that direct, enumeration-based model predictive control (MPC) strategies are very popular in the field of power electronics due to their numerous advantages such as design simplicity and straightforward implementation procedure, they carry two major drawbacks. These are the increased computational effort and the high ripples on the controlled variables, resulting in a limited applicability of such methods. The high ripples occur because in direct MPC algorithms the actuating variable can only be changed at the beginning of a sampling interval. A possible remedy for this would be to change the applied control input within the sampling interval, and thus to apply it for a shorter time than one sample. However, since such a solution

would lead to an additional overhead which is crucial especially for multilevel inverters, a heuristic preselection of the optimal control action is adopted to keep the computational complexity at bay. Experimental results are provided to verify the potential advantages of the proposed strategy.

#### General information

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Smart Energy Systems (SES), Technische Universitat Munchen, National Technical University of Athens, Technische Hochschule Ingolstadt

Contributors: Stolze, P., Karamanakos, P., Kennel, R., Manias, S., Endisch, C.

Number of pages: 13

Pages: 1366-1378

Publication date: 3 Jul 2015

Peer-reviewed: Yes

#### Publication information

Journal: International Journal of Control

Volume: 88

Issue number: 7

ISSN (Print): 0020-7179

Ratings:

Scopus rating (2015): CiteScore 2.56 SJR 1.397 SNIP 1.351

Original language: English

ASJC Scopus subject areas: Control and Systems Engineering, Computer Science Applications

Keywords: ac low-voltage drives, model predictive control (MPC), optimal control, three-level inverter, variable switching point

DOIs:

10.1080/00207179.2014.942699

Source: Scopus

Source ID: 84930755978

Research output: Contribution to journal › Article › Scientific › peer-review

#### A robust AMMI model for the analysis of genotype-by-environment data

Motivation: One of the most widely used models to analyse genotype-by-environment data is the additive main effects and multiplicative interaction (AMMI) model. Genotype-by-environment data resulting from multi-location trials are usually organized in two-way tables with genotypes in the rows and environments (location-year combinations) in the columns. The AMMI model applies singular value decomposition (SVD) to the residuals of a specific linear model, to decompose the genotype-by-environment interaction (GEI) into a sum of multiplicative terms. However, SVD, being a least squares method, is highly sensitive to contamination and the presence of even a single outlier, if extreme, may draw the leading principal component towards itself resulting in possible misinterpretations and in turn lead to bad practical decisions. Since, as in many other real-life studies the distribution of these data is usually not normal due to the presence of outlying observations, either resulting from measurement errors or sometimes from individual intrinsic characteristics, robust SVD methods have been suggested to help overcome this handicap. Results: We propose a robust generalization of the AMMI model (the R-AMMI model) that overcomes the fragility of its classical version when the data are contaminated. Here, robust statistical methods replace the classic ones to model, structure and analyse GEI. The performance of the robust extensions of the AMMI model is assessed through a Monte Carlo simulation study where several contamination schemes are considered. Applications to two real plant datasets are also presented to illustrate the benefits of the proposed methodology, which can be broadened to both animal and human genetics studies. Availability and implementation: Source code implemented in R is available in the supplementary material under the function `r-AMMI`.

#### General information

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Research Community on Data-to-Decision (D2D), Centro de Matemática e Aplicações (CMA, NOVA University of Lisbon

Contributors: Rodrigues, P. C., Monteiro, A., Lourenço, V. M.

Number of pages: 9

Pages: 58-66

Publication date: 1 Jul 2015

Peer-reviewed: Yes

#### Publication information

Journal: Bioinformatics

Volume: 32

Issue number: 1

ISSN (Print): 1367-4803

Ratings:

Scopus rating (2015): CiteScore 6.06 SJR 4.97 SNIP 2.151

Original language: English

ASJC Scopus subject areas: Biochemistry, Molecular Biology, Computational Theory and Mathematics, Computer Science Applications, Computational Mathematics, Statistics and Probability, Medicine(all)

DOIs:

10.1093/bioinformatics/btv533

URLs:

<http://www.scopus.com/inward/record.url?scp=84959872026&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84959872026

Research output: Contribution to journal › Article › Scientific › peer-review

### **Prioritized centrally-controlled resource allocation in integrated multi-RAT HetNets**

Given the importance of multi-radio heterogeneous networks (HetNets) in delivering more throughput and better connectivity experience to today's wireless users, we investigate the prioritized centrally-controlled resource allocation mechanisms in such systems. First, we theoretically formulate the problem of assisted rate allocation across multiple radio access technologies (RATs) as a special case of relative max-min fairness problem with bifurcated (splittable) traffic flows, which can then be solved by employing the standard linear optimization techniques. Our proposed solution delivers certain minimum guarantees to all the network users, while the rest of system resources are divided proportionally to the preset priority of the users. The priorities in our system may correspond to different subscription/pricing plans of a network operator. Finally, we demonstrate the practical benefits of the proposed resource allocation scheme with system-level simulations, as well as discuss its implementation within a testbed prototype based on the OpenFlow architecture.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Department of Electronics and Communications Engineering, Tampere University of Technology,

Research group: Emerging Technologies for Nano-Bio-Info-Cogno, Wireless Communications and Positioning (WICO), Intel Corporation

Contributors: Gerasimenko, M., Moltchanov, D., Florea, R., Himayat, N., Andreev, S., Koucheryavy, Y.

Number of pages: 7

Publication date: 1 Jul 2015

#### **Host publication information**

Title of host publication: IEEE Vehicular Technology Conference

Volume: 2015-July

Publisher: The Institute of Electrical and Electronics Engineers, Inc.

ISBN (Print): 9781479980888

ASJC Scopus subject areas: Electrical and Electronic Engineering, Computer Science Applications, Applied Mathematics

DOIs:

10.1109/VTCspring.2015.7146031

#### **Bibliographical note**

AUX=elt,"Florea, Roman"

Source: Scopus

Source ID: 84940398708

Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

### **Railway fastener inspection by real-time machine vision**

In this paper, a real-time railway fastener detection system using a high-speed laser range finder camera is presented. First, an extensive analysis of various methods based on pixel-wise and histogram similarities are conducted on a specific railway route. Then, a fusing stage is introduced which combines least correlated approaches also considering the performance upgrade after fusing. Then, the resulting method is tested on a larger database collected from a different railway route. After observing repeated successes, the method is implemented on NI LabVIEW and run real-time with a high-speed 3-D camera placed under a railway carriage designed for railway quality inspection.

#### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Department of Signal Processing, Research group: Video, Middle East Technical University, Electrical and Electronics Engineering Department

Contributors: Aytekin, C., Rezaeitabar, Y., Dogru, S., Ulusoy, I.

Number of pages: 7  
Pages: 1101-1107  
Publication date: 1 Jul 2015  
Peer-reviewed: Yes

#### Publication information

Journal: IEEE Transactions on Systems, Man, and Cybernetics: Systems  
Volume: 45

Issue number: 7  
ISSN (Print): 1083-4427

Ratings:

Scopus rating (2015): CiteScore 3.3 SJR 1.273 SNIP 2.189

Original language: English

ASJC Scopus subject areas: Computer Science Applications, Human-Computer Interaction, Software, Control and Systems Engineering, Electrical and Electronic Engineering

Keywords: High-speed laser range finder, railway fastener detection, railway inspection

DOIs:

10.1109/TSMC.2014.2388435

URLs:

<http://www.scopus.com/inward/record.url?scp=84932638036&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84932638036

Research output: Contribution to journal > Article > Scientific > peer-review

#### Wideband self-adaptive RF cancellation circuit for full-duplex radio: Operating principle and measurements

This paper presents a novel RF circuit architecture for self-interference cancellation in inband full-duplex radio transceivers. The developed canceller is able to provide wideband cancellation with waveform bandwidths in the order of 100 MHz or beyond and contains also self-adaptive or self-healing features enabling automatic tracking of time-varying self-interference channel characteristics. In addition to architecture and operating principle descriptions, we also provide actual RF measurements at 2.4 GHz ISM band demonstrating the achievable cancellation levels with different bandwidths and when operating in different antenna configurations and under low-cost highly nonlinear power amplifier. In a very challenging example with a 100 MHz waveform bandwidth, around 41 dB total cancellation is obtained while the corresponding cancellation figure is close to 60 dB with the more conventional 20 MHz carrier bandwidth. Also, efficient tracking in time-varying reflection scenarios is demonstrated.

#### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Department of Electronics and Communications Engineering, Tampere University of Technology,

Research group: Wireless Communications and Positioning, Wireless Communications and Positioning (WICO), Intel Corporation

Contributors: Huusari, T., Choi, Y. S., Liikkanen, P., Korpi, D., Talwar, S., Valkama, M.

Publication date: 1 Jul 2015

#### Host publication information

Title of host publication: 2015 IEEE 81st Vehicular Technology Conference (VTC Spring)

Publisher: The Institute of Electrical and Electronics Engineers, Inc.

ISBN (Print): 9781479980888

ASJC Scopus subject areas: Electrical and Electronic Engineering, Computer Science Applications, Applied Mathematics

Keywords: Full-duplex, RF cancellation, Self adaptive, Self interference, Tracking

DOIs:

10.1109/VTCspring.2015.7146163

#### Bibliographical note

AUX=elt,"Huusari, Timo"

AUX=elt,"Liikkanen, Petteri"

Source: Scopus

Source ID: 84940421784

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

#### AvanTomography: A compact module for positron emission mammography

In AvanTomography project, a compact, high performance module was developed for axial positron emission mammography, which can be integrated with X-ray mammography. With its axial crystal orientation, AvanTomography can achieve a uniform spatial resolution and eliminate the parallax error by unambiguously detecting the location of the positron annihilation. Compact design of the module enables a cost and space efficient system for breast screening.

Various configurations, plate or full ring, can be obtained by using multiple modules, allowing the screening of axillary and mammary regions with a single scanner position. In this project, a 6-module system was constructed and tested with a  $^{22}\text{Na}$  point source. Energy calibration was performed and initial measurements for energy resolution were conducted.

#### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Augmented Human Activities (AHA), Department of Signal Processing, Department of Electronics and Communications Engineering, Research group: Personal Electronics Group, Research group: M2oBSI, Ghent University, Zwijnaarde, Belgium

Contributors: Us, D., Moreno-Galera, A., Nazari-Farsani, S., Palovuori, K., Kosola, H., Zedda, T., Ruotsalainen, U.

Number of pages: 6

Pages: 52-57

Publication date: 30 Jun 2015

#### Host publication information

Title of host publication: 2015 IEEE International Symposium on Medical Measurements and Applications, MeMeA 2015 - Proceedings

Publisher: IEEE

ISBN (Print): 9781479964765

ASJC Scopus subject areas: Biomedical Engineering, Computer Science Applications

Keywords: Axial geometry, breast cancer, LYSO, Positron Emission Mammography (PEM), Positron Emission Tomography (PET), pulse width conversion

DOIs:

10.1109/MeMeA.2015.7145171

#### Bibliographical note

ORG=sgn,0.5

ORG=elt,0.5

INT=sgn,"Zedda, T."

Source: Scopus

Source ID: 84939483539

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

#### Collaborative cloud-based management of home networks

Future home networks are expected to become extremely sophisticated, yet only the most technically adept persons are equipped with skills to manage them. In this paper, we provide a novel solution as to how complex smart home networks can be collaboratively managed with the assistance of operators and third party experts. Our solution rests in separating the management and control functionalities of the home access points and routers, away from the actual connectivity, traffic forwarding and routing operations within the home network. By so doing, we present a novel REST-based architecture in which the management of the home network can be hosted in an entirely separate, external cloud-based infrastructure, which models the network within the home as a resource graph.

#### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Department of Pervasive Computing, Research area: Information security, Tampere University of Technology

Contributors: Silverajan, B., Luoma, J., Vajaranta, M., Itäpuro, R.

Number of pages: 4

Pages: 786-789

Publication date: 29 Jun 2015

#### Host publication information

Title of host publication: Proceedings of the 2015 IFIP/IEEE International Symposium on Integrated Network Management, IM 2015

Publisher: IEEE

ISBN (Print): 9783901882760

ASJC Scopus subject areas: Software, Computer Science Applications, Computer Networks and Communications

Keywords: Cloud, Homenet, IoT, Network Management

DOIs:

10.1109/INM.2015.7140376

Source: Scopus

Source ID: 84942601939

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

### **Blind estimation of speckle variance in synthetic aperture radar images**

A task of blind estimation of multiplicative noise (speckle) variance in multi-look images acquired by radars with synthesized aperture array is considered. It is shown that there are several factors affecting accuracy of such estimation. The main of them are spatial correlation of the speckle, complexity of an analyzed image and peculiarities of a method used. Spatial and spectral domain approaches are analyzed. It is shown that for both approaches spatial correlation of the speckle is to be estimated and taken into account. Results for real life TerraSAR-X data are presented as illustrations and for analyzing methods' accuracy.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Tampere University of Technology, Department of Signal Processing, Research group: Computational Imaging-CI, Signal Processing Research Community (SPRC), National Aerospace University

Contributors: Abramova, V. V., Kozhemiakin, R., Abramov, S. K., Lukin, V. V., Zelensky, A. A., Egiazarian, K.

Publication date: 25 Jun 2015

#### **Host publication information**

Title of host publication: 2015 International Conference on Antenna Theory and Techniques: Dedicated to 95 Year Jubilee of Prof. Yakov S. Shifrin, ICATT 2015 - Proceedings

Publisher: The Institute of Electrical and Electronics Engineers, Inc.

ISBN (Print): 9781479985579

ASJC Scopus subject areas: Electrical and Electronic Engineering, Computer Science Applications

Keywords: blind estimation, multi-look, SAR, speckle variance

DOIs:

10.1109/ICATT.2015.7136846

#### **Bibliographical note**

EXT="Lukin, V. V."

Source: Scopus

Source ID: 84939434768

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

### **Experimental study of bispectrum-based encoding in radio communication system**

This paper is devoted to a novel multi-frequency and bispectrum-based encoding technique designed for radio communication systems. An experimental study of an interference resistance in digital communication is performed using a novel bispectrum-based strategy. Test statistics evaluated in the form of peak values of magnitude bispectrum estimates are proposed for triplet-signals discrimination. Bit error rates assessed experimentally in a radio communication link contaminated by additive Gaussian noise and fading are studied within a wide range of input signal-to-noise ratio (SNR). Advantages of the proposed bispectral-based signal processing as compared with common phase and frequency shift keying are demonstrated and discussed.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Department of Signal Processing, Research group: Algebraic and Algorithmic Methods in Signal Processing AAMSP, Signal Processing Research Community (SPRC), National Aerospace University

Contributors: Naumenko, V. V., Solodovnik, V. F., Totsky, A. V., Zelensky, A. A., Astola, J. T.

Number of pages: 3

Publication date: 25 Jun 2015

#### **Host publication information**

Title of host publication: 2015 International Conference on Antenna Theory and Techniques: Dedicated to 95 Year Jubilee of Prof. Yakov S. Shifrin, ICATT 2015 - Proceedings

Publisher: The Institute of Electrical and Electronics Engineers, Inc.

ISBN (Print): 9781479985579

ASJC Scopus subject areas: Electrical and Electronic Engineering, Computer Science Applications

Keywords: bispectrum, digital communication system, fading, interference immunity, phase coupling, triplet-signal

DOIs:

10.1109/ICATT.2015.7136853

Source: Scopus

Source ID: 84939448255

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

### **Planar monopole antennas on substrates fabricated through an additive manufacturing process**

This paper introduces a new method for creating a flexible antenna using additive manufacturing for the construction of the substrate. Two substrates were created using a 3D multi-material polymer printer. These substrates were composed using different ratios of the two materials supported by the printer. Planar monopole antennas with a bevel were placed on top of these substrates to form flexible antennas. This paper demonstrates a quick way to create antennas that can be used on non-rigid structures.

#### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Sensing Systems for Wireless Medicine (MediSense), Georgia Institute of Technology, School of Electrical and Computer Engineering, George Woodruff School of Mechanical Engineering, Georgia Institute of Technology

Contributors: Saintsing, C. D., Yu, K., Qi, H. J., Tentzeris, M.

Number of pages: 3

Pages: 159-161

Publication date: 19 Jun 2015

Peer-reviewed: Yes

#### **Publication information**

Journal: IEEE Radio and Wireless Symposium, RWS

Volume: 2015-June

Issue number: June

Article number: 7129744

Original language: English

ASJC Scopus subject areas: Computer Networks and Communications, Computer Science Applications, Electrical and Electronic Engineering, Communication

Keywords: 3D Printing, Additive Manufacturing, Broadband Antennas, Flexible Antennas

DOIs:

10.1109/RWS.2015.7129744

URLs:

<http://www.scopus.com/inward/record.url?scp=84937963448&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84937963448

Research output: Contribution to journal > Article > Scientific > peer-review

### **Long-term epileptic EEG classification via 2D mapping and textural features**

Interpretation of long-term Electroencephalography (EEG) records is a tiresome task for clinicians. This paper presents an efficient, low cost and novel approach for patient-specific classification of long-term epileptic EEG records. We aim to achieve this with the minimum supervision from the neurologist. To accomplish this objective, first a novel feature extraction method is proposed based on the mapping of EEG signals into two dimensional space, resulting into a texture image. The texture image is constructed by mapping and scaling EEG signals and their associated frequency sub-bands into the gray-level image domain. Image texture analysis using gray level co-occurrence matrix (GLCM) is then applied in order to extract multivariate features which are able to differentiate between seizure and seizure-free events. To evaluate the discriminative power of the proposed feature extraction method, a comparative study is performed, against other dedicated feature extraction methods. The comparative performance evaluations show that the proposed feature extraction method can outperform other state-of-art feature extraction methods with a low computational cost. With a training rate of 25%, the overall sensitivity of 70.19% and specificity of 97.74% are achieved in the classification of over 163 h of EEG records using support vector machine (SVM) classifiers with linear kernels and trained by the stochastic gradient descent (SGD) algorithm.

#### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Department of Signal Processing, Research group: Video, Research group: Filterbanks, Research Community on Data-to-Decision (D2D), Qatar University

Contributors: Samiee, K., Kiranyaz, S., Gabbouj, M., Saramäki, T.

Number of pages: 11

Pages: 7175-7185

Publication date: 8 Jun 2015

Peer-reviewed: Yes

#### **Publication information**

Journal: Expert Systems with Applications

Volume: 42  
Issue number: 20  
ISSN (Print): 0957-4174  
Ratings:

Scopus rating (2015): CiteScore 4.11 SJR 1.473 SNIP 2.509

Original language: English

ASJC Scopus subject areas: Artificial Intelligence, Computer Science Applications, Engineering(all)

Keywords: CHB-MIT dataset, Electroencephalography, Epileptic seizure classification, Haralick, Stochastic gradient descent, Textural features

DOIs:

10.1016/j.eswa.2015.05.002

Source: Scopus

Source ID: 84930636361

Research output: Contribution to journal › Article › Scientific › peer-review

### **Urothelial cancer gene regulatory networks inferred from large-scale RNAseq, Bead and Oligo gene expression data**

**Background:** Urothelial pathogenesis is a complex process driven by an underlying network of interconnected genes. The identification of novel genomic target regions and gene targets that drive urothelial carcinogenesis is crucial in order to improve our current limited understanding of urothelial cancer (UC) on the molecular level. The inference of genome-wide gene regulatory networks (GRN) from large-scale gene expression data provides a promising approach for a detailed investigation of the underlying network structure associated to urothelial carcinogenesis. **Methods:** In our study we inferred and compared three GRNs by the application of the BC3Net inference algorithm to large-scale transitional cell carcinoma gene expression data sets from Illumina RNAseq (179 samples), Illumina Bead arrays (165 samples) and Affymetrix Oligo microarrays (188 samples). We investigated the structural and functional properties of GRNs for the identification of molecular targets associated to urothelial cancer. **Results:** We found that the urothelial cancer (UC) GRNs show a significant enrichment of subnetworks that are associated with known cancer hallmarks including cell cycle, immune response, signaling, differentiation and translation. Interestingly, the most prominent subnetworks of co-located genes were found on chromosome regions 5q31.3 (RNAseq), 8q24.3 (Oligo) and 1q23.3 (Bead), which all represent known genomic regions frequently deregulated or aberated in urothelial cancer and other cancer types. Furthermore, the identified hub genes of the individual GRNs, e.g., *HID1/DMC1* (tumor development), *RNF17/TDRD4* (cancer antigen) and *CYP4A11* (angiogenesis/ metastasis) are known cancer associated markers. The GRNs were highly dataset specific on the interaction level between individual genes, but showed large similarities on the biological function level represented by subnetworks. Remarkably, the RNAseq UC GRN showed twice the proportion of significant functional subnetworks. Based on our analysis of inferential and experimental networks the Bead UC GRN showed the lowest performance compared to the RNAseq and Oligo UC GRNs. **Conclusion:** To our knowledge, this is the first study investigating genome-scale UC GRNs. RNAseq based gene expression data is the data platform of choice for a GRN inference. Our study offers new avenues for the identification of novel putative diagnostic targets for subsequent studies in bladder tumors.

### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Department of Signal Processing, BioMediTech, Research Community on Data-to-Decision (D2D), BioMediTech - Institute of Biosciences and Medical Technology, Queen's University, Belfast, Northern Ireland

Contributors: Matos Simoes, R. D., Dalleau, S., Williamson, K. E., Emmert-Streib, F.

Publication date: 14 May 2015

Peer-reviewed: Yes

### **Publication information**

Journal: BMC Systems Biology

Volume: 9

Article number: 21

ISSN (Print): 1752-0509

Ratings:

Scopus rating (2015): CiteScore 2.54 SJR 1.549 SNIP 0.89

Original language: English

ASJC Scopus subject areas: Molecular Biology, Structural Biology, Applied Mathematics, Modelling and Simulation, Computer Science Applications

Keywords: BC3Net, Computational genomics, Gene regulatory network, Urothelial cancer

DOIs:

10.1186/s12918-015-0165-z

Source: Scopus

Source ID: 84931068065

Research output: Contribution to journal › Article › Scientific › peer-review

### **Multistep reactions of water with small Pd<sub>n</sub> clusters: A first principles study**

Multistep dissociative chemisorption reactions of water with Pd<sub>4</sub> and Pd<sub>7</sub> clusters were studied using density functional theory. The adsorption energies and referred adsorption sites from water molecule (H<sub>2</sub>O) to partially dissociative (H<sub>2</sub>+O and OH+H), then to fully dissociative (O+H+H) configurations are carefully determined. It is found that the adsorption energies of three dissociative reactions are 5-6 times larger than that of water molecule. Atop sites of Pd<sub>4</sub> and Pd<sub>7</sub> clusters are found to be the most stable sites for the adsorbed H<sub>2</sub>O molecule. For the coadsorption cases of partially and fully dissociated products, H<sub>2</sub> and OH molecules preferably tend to bind at the low coordination (atop or bridge) sites, and O and H atoms prefer to adsorb on the high coordination (hollow) sites. It is also found that the most favorable adsorption sites for the molecular adsorbates (H<sub>2</sub>O, H<sub>2</sub> and OH) are adjacent to the Pd atoms with the largest site-specific polarizabilities. Therefore, site-specific polarizability is a good predictor of the favorable adsorption sites for the weakly bound molecules. The different directions of charge transfer between the Pd clusters and the adsorbate(s) is observed. Furthermore, the processes of the adsorption, dissociation, and the dissociative products diffusion of H<sub>2</sub>O are analyzed.

#### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Computational Science X (CompX), Northwest University China, Nanjing University

Contributors: Liang, Y., Ma, L., Wang, J., Wang, G.

Publication date: 1 May 2015

Peer-reviewed: Yes

#### **Publication information**

Journal: Journal of Theoretical and Computational Chemistry

Volume: 14

Issue number: 3

Article number: 1550017

ISSN (Print): 0219-6336

Ratings:

Scopus rating (2015): CiteScore 0.57 SJR 0.249 SNIP 0.321

Original language: English

ASJC Scopus subject areas: Physical and Theoretical Chemistry, Computational Theory and Mathematics, Computer Science Applications

Keywords: Chemisorption, cluster, density functional theory, transition state

DOIs:

10.1142/S0219633615500170

URLs:

<http://www.scopus.com/inward/record.url?scp=84930178634&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84930178634

Research output: Contribution to journal > Article > Scientific > peer-review

### **Recent advances in antenna design and interference cancellation algorithms for in-band full duplex relays**

In-band full-duplex relays transmit and receive simultaneously at the same center frequency, hence offering enhanced spectral efficiency for relay deployment. In order to deploy such full-duplex relays, it is necessary to efficiently mitigate the inherent self-interference stemming from the strong transmit signal coupling to the sensitive receive chain. In this article, we present novel state-of-the-art antenna solutions as well as digital self-interference cancellation algorithms for compact MIMO full-duplex relays, specifically targeted for reduced-cost deployments in local area networks. The presented antenna design builds on resonant wavetraps and is shown to provide passive isolations on the order of 60-70 dB. We also discuss and present advanced digital cancellation solutions, beyond classical linear processing, specifically tailored against nonlinear distortion of the power amplifier when operating close to saturation. Measured results from a complete demonstrator system, integrating antennas, RF cancellation, and nonlinear digital cancellation, are also presented, evidencing close to 100 dB of overall self-interference suppression. The reported results indicate that building and deploying compact full-duplex MIMO relays is already technologically feasible.

#### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Department of Electronics and Communications Engineering, Research group: Wireless Communications and Positioning, Tampere University of Technology, Wireless Communications and Positioning (WICO), Aalto University

Contributors: Heino, M., Korpi, D., Huusari, T., Antonio-Rodríguez, E., Venkatasubramanian, S., Riihonen, T., Anttila, L., Icheln, C., Haneda, K., Wichman, R., Valkama, M.

Number of pages: 11

Pages: 91-101

Publication date: 1 May 2015

Peer-reviewed: Yes

### Publication information

Journal: IEEE Communications Magazine

Volume: 53

Issue number: 5

ISSN (Print): 0163-6804

Ratings:

Scopus rating (2015): CiteScore 8.15 SJR 2.225 SNIP 5.331

Original language: English

ASJC Scopus subject areas: Electrical and Electronic Engineering, Computer Science Applications, Computer Networks and Communications

DOIs:

10.1109/MCOM.2015.7105647

### Bibliographical note

AUX=elt,"Huusari, Timo"

Source: Scopus

Source ID: 84929335830

Research output: Contribution to journal › Article › Scientific › peer-review

### Variable switching point predictive torque control with extended prediction horizon

This paper introduces the extension of the prediction horizon in the one-step variable switching point predictive torque control (VSP<sup>2</sup>TC). Even though in the majority of power electronics applications using model predictive control (MPC) based schemes, a prediction horizon of one suffices, the use of longer prediction horizons offers substantial performance benefits. To highlight this, the proposed algorithm is applied to a low voltage (LV) drive system, which comprises a two-level inverter and an induction machine (IM). As it is shown, by extending the prediction horizon, important drive quality indices, such as the torque ripple, and the total harmonic distortion (THD) of the stator currents are reduced. However, the computational effort required for solving the formulated optimization problem in real time can be overwhelming. The implementation of a branch-and-bound technique is introduced to front this tricky matter. Simulation results verify the performance of the presented control strategy.

### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Smart Energy Systems (SES), National Technical University of Athens, Technische Universitat Munchen

Contributors: Alevras, I., Karamanakos, P., Manias, S., Kennel, R.

Number of pages: 6

Pages: 2352-2357

Publication date: 18 Mar 2015

### Host publication information

Title of host publication: 2015 IEEE International Conference on Industrial Technology, ICIT 2015

Publisher: Institute of Electrical and Electronics Engineers Inc.

Edition: June

ASJC Scopus subject areas: Electrical and Electronic Engineering, Computer Science Applications

DOIs:

10.1109/ICIT.2015.7125445

Source: Scopus

Source ID: 84937723977

Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

### Designing controllers with reduced order internal models

In this technical note we study robust output tracking for autonomous linear systems. We introduce a new approach to designing robust controllers using a recent observation that a full internal model is not always necessary for robustness. Especially this may be the case if the control law is only required to be robust with respect to a specific predetermined class of uncertainties in the parameters of the plant. The results are illustrated with an example on robust output tracking for coupled harmonic oscillators.

### General information

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Department of Mathematics, Research group: MAT Mathematical and semantic modelling

Contributors: Paunonen, L.  
Number of pages: 6  
Pages: 775-780  
Publication date: 1 Mar 2015  
Peer-reviewed: Yes

#### Publication information

Journal: IEEE Transactions on Automatic Control

Volume: 60

Issue number: 3

Article number: 6826480

ISSN (Print): 0018-9286

Ratings:

Scopus rating (2015): CiteScore 5.08 SJR 4.285 SNIP 3.218

Original language: English

ASJC Scopus subject areas: Electrical and Electronic Engineering, Control and Systems Engineering, Computer Science Applications

DOIs:

10.1109/TAC.2014.2329212

URLs:

<http://www.scopus.com/inward/record.url?scp=84923355671&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84923355671

Research output: Contribution to journal > Article > Scientific > peer-review

#### Task-based information interaction evaluation: The viewpoint of program theory

Evaluation is central in research and development of information retrieval (IR). In addition to designing and implementing new retrieval mechanisms, one must also show through rigorous evaluation that they are effective. A major focus in IR is IR mechanisms' capability of ranking relevant documents optimally for the users, given a query. Searching for information in practice involves searchers, however, and is highly interactive. When human searchers have been incorporated in evaluation studies, the results have often suggested that better ranking does not necessarily lead to better search task, or work task, performance. Therefore, it is not clear which system or interface features should be developed to improve the effectiveness of human task performance. In the present article, we focus on the evaluation of task-based information interaction (TBII). We give special emphasis to learning tasks to discuss TBII in more concrete terms. Information interaction is here understood as behavioral and cognitive activities related to task planning, searching information items, selecting between them, working with them, and synthesizing and reporting. These five generic activities contribute to task performance and outcome and can be supported by information systems. In an attempt toward task-based evaluation, we introduce program theory as the evaluation framework. Such evaluation can investigate whether a program consisting of TBII activities and tools works and how it works and, further, provides a causal description of program (in)effectiveness. Our goal in the present article is to structure TBII on the basis of the five generic activities and consider the evaluation of each activity using the program theory framework. Finally, we combine these activity-based program theories in an overall evaluation framework for TBII. Such an evaluation is complex due to the large number of factors affecting information interaction. Instead of presenting tested program theories, we illustrate how the evaluation of TBII should be accomplished using the program theory framework in the evaluation of systems and behaviors, and their interactions, comprehensively in context.

#### General information

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: University of Tampere

Contributors: Järvelin, K., Vakkari, P., Arvola, P., Baskaya, F., Järvelin, A., Kekäläinen, J., Keskustalo, H., Kumpulainen, S., Saastamoinen, M., Savolainen, R., Sormunen, E.

Publication date: 1 Mar 2015

Peer-reviewed: Yes

#### Publication information

Journal: ACM Transactions on Information Systems

Volume: 33

Issue number: 1

Article number: 3

ISSN (Print): 1046-8188

Ratings:

Scopus rating (2015): CiteScore 2.71 SJR 0.655 SNIP 2.007

Original language: English

ASJC Scopus subject areas: Information Systems, Business, Management and Accounting(all), Computer Science Applications

Keywords: Experimentation, Human factors, Theory

DOIs:

10.1145/2699660

Source: Scopus

Source ID: 84926320780

Research output: Contribution to journal › Article › Scientific › peer-review

### **The internet of Bio-Nano things**

The Internet of Things (IoT) has become an important research topic in the last decade, where things refer to interconnected machines and objects with embedded computing capabilities employed to extend the Internet to many application domains. While research and development continue for general IoT devices, there are many application domains where very tiny, concealable, and non-intrusive Things are needed. The properties of recently studied nanomaterials, such as graphene, have inspired the concept of Internet of NanoThings (IoNT), based on the interconnection of nanoscale devices. Despite being an enabler for many applications, the artificial nature of IoNT devices can be detrimental where the deployment of NanoThings could result in unwanted effects on health or pollution. The novel paradigm of the Internet of Bio-Nano Things (IoBNT) is introduced in this paper by stemming from synthetic biology and nanotechnology tools that allow the engineering of biological embedded computing devices. Based on biological cells, and their functionalities in the biochemical domain, Bio-NanoThings promise to enable applications such as intra-body sensing and actuation networks, and environmental control of toxic agents and pollution. The IoBNT stands as a paradigm-shifting concept for communication and network engineering, where novel challenges are faced to develop efficient and safe techniques for the exchange of information, interaction, and networking within the biochemical domain, while enabling an interface to the electrical domain of the Internet.

### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Department of Electronics and Communications Engineering, Research group: Emerging Technologies for Nano-Bio-Info-Cogno, Wireless Communications and Positioning (WICO), University of Nebraska, Georgia Institute of Technology

Contributors: Akyildiz, I. F., Pierobon, M., Balasubramaniam, S., Koucheryavy, Y.

Number of pages: 9

Pages: 32-40

Publication date: 1 Mar 2015

Peer-reviewed: Yes

### **Publication information**

Journal: IEEE Communications Magazine

Volume: 53

Issue number: 3

ISSN (Print): 0163-6804

Ratings:

Scopus rating (2015): CiteScore 8.15 SJR 2.225 SNIP 5.331

Original language: English

ASJC Scopus subject areas: Electrical and Electronic Engineering, Computer Science Applications, Computer Networks and Communications

DOIs:

10.1109/MCOM.2015.7060516

URLs:

<http://www.scopus.com/inward/record.url?scp=84925851587&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84925851587

Research output: Contribution to journal › Article › Scientific › peer-review

### **Semantic Labeling of Places based on Phone Usage Features using Supervised Learning**

Nowadays mobile applications demand higher context awareness. The applications aim to understand the user's context (e.g., home or at work) and provide services tailored to the users. The algorithms responsible for inferring the user's context are the so-called context inference algorithms, the place detection being a particular case. Our hypothesis is that people use mobile phones differently when they are located in different places (e.g. longer calls at home than at work). Therefore, the usage of the mobile phones could be an indicator of the users' current context. The objective of the work is to develop a system that can estimate the user's place label (home, work, etc.), based on phone usage. As training and validation set, we use a database containing phone usage information of 200 users over several months including phone call and SMS logs, multimedia usage, accelerometer, GPS, network information and system information. The data was split into visits, i.e., periods of uninterrupted time that the user has been in a certain place (Home, Work, Leisure, etc.). The data include information about the phone usage during the visits, and the semantic label of the place visited (Home, Work, etc.). We consider two approaches to represent this data: the first approach (so-called visits approach) saves each

visit separately; the second approach (so-called places approach) combines all visits of one user to a certain place and creates place-specific information. For place detection, we used five popular classification methods, Naïve Bayes, Decision Tree, Bagged Tree, Neural Network and K-Nearest Neighbors, in both representation approaches. We evaluated their classification rates and found that: 1) Bagged Tree outperforms the other methods; 2) the places data-representation gives better results than the visits data-representation.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Department of Mathematics, Research group: MAT Intelligent Information Systems Laboratory, Department of Automation Science and Engineering, Research area: Dynamic Systems, Research group: Positioning, Wireless Communications and Positioning (WICO)

Contributors: Rivero Rodriguez, A., Leppäkoski, H., Piché, R.

Number of pages: 6

Pages: 97-102

Publication date: 5 Feb 2015

#### **Host publication information**

Title of host publication: 2014 Ubiquitous Positioning Indoor Navigation and Location Based Service, UPINLBS 2014 - Conference Proceedings

Place of publication: Piscataway, NJ, USA

Publisher: IEEE

Article number: 7033715

ISBN (Print): 9781479960040

ASJC Scopus subject areas: Computer Networks and Communications, Computer Science Applications

Keywords: Context Inference, Location and positioning services, Place detection, Semantic positioning

Electronic versions:

Context-Inference

DOIs:

10.1109/UPINLBS.2014.7033715

URLs:

<http://urn.fi/URN:NBN:fi:tty-201603013584>

#### **Bibliographical note**

ORG=mat,0.6

ORG=ase,0.4

Portfolio EDEND: 2015-01-14 <br /> publication\_forum:72750

Source: researchoutputwizard

Source ID: 30

Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

#### **Communication challenges in high-density deployments of wearable wireless devices**

Wearable wireless devices are very likely to soon move into the mainstream of our society, led by the rapidly expanding multibillion dollar health and fitness markets. Should wearable technology sales follow the same pattern as those of smartphones and tablets, these new devices (a.k.a. wearables) will see explosive growth and high adoption rates over the next five years. It also means that wearables will need to become more sophisticated, capturing what the user sees, hears, or even feels. However, with an avalanche of new wearables, we will need to find ways to supply them with low-latency highspeed data connections to enable truly demanding use cases such as augmented reality. This is particularly true for high-density wearable computing scenarios, such as public transportation, where existing wireless technology may have difficulty supporting stringent application requirements. In this article, we summarize our recent progress in this area with a comprehensive review of current and emerging connectivity solutions for high-density wearable deployments, their relative performance, and open communication challenges.

#### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Department of Electronics and Communications Engineering, Research group: Emerging Technologies for Nano-Bio-Info-Cogno, Intelligent dexterity for secure networked infrastructure and applications (IDSNIA), Intel Corporation

Contributors: Pyattaev, A., Johnsson, K., Andreev, S., Koucheryav, Y.

Number of pages: 7

Pages: 12-18

Publication date: 1 Feb 2015

Peer-reviewed: Yes

### Publication information

Journal: IEEE Wireless Communications

Volume: 22

Issue number: 1

ISSN (Print): 1536-1284

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Scopus rating (2015): CiteScore 6.69 SJR 1.913 SNIP 3.92

Original language: English

ASJC Scopus subject areas: Electrical and Electronic Engineering, Computer Science Applications

DOIs:

10.1109/MWC.2015.7054714

URLs:

<http://www.scopus.com/inward/record.url?scp=84924943737&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84924943737

Research output: Contribution to journal > Article > Scientific > peer-review

### Fault tolerant control architecture design for mobile manipulation in scientific facilities

This paper describes one of the challenging issues implied by scientific infrastructures on a mobile robot cognition architecture. For a generally applicable cognition architecture, we study the dependencies and logical relations between several tasks and subsystems. The overall view of the software modules is described, including their relationship with a fault management module that monitors the consistency of the data flow among the modules. The fault management module is the solution of the deliberative architecture for the single point failures, and the safety anchor is the reactive solution for the faults by redundant equipment. In addition, a hardware architecture is proposed to ensure safe robot movement as a redundancy for the cognition of the robot. The method is designed for a four-wheel steerable (4WS) mobile manipulator (iMoro) as a case study.

### General information

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Department of Intelligent Hydraulics and Automation, Research group: Mobile manipulation, Research group: Field robotics and control, Field robotics for efficient work sites (FIRE)

Contributors: M. Aref, M., Oftadeh, R., Ghabcheloo, R., Mattila, J.

Publication date: 29 Jan 2015

Peer-reviewed: Yes

### Publication information

Journal: international Journal of Advanced Robotic Systems

Volume: 12

Issue number: 4

ISSN (Print): 1729-8806

Ratings:

Scopus rating (2015): CiteScore 1.02 SJR 0.346 SNIP 0.944

Original language: English

ASJC Scopus subject areas: Software, Artificial Intelligence, Computer Science Applications

Keywords: Architecture design, Autonomous vehicle drive, Cognition, Mobile robot, Remote handling

DOIs:

10.5772/60038

URLs:

<http://www.scopus.com/inward/record.url?scp=84923377541&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84923377541

Research output: Contribution to journal > Article > Scientific > peer-review

### Video summarization based on Subclass Support Vector Data Description

In this paper, we describe a method for video summarization that operates on a video segment level. We formulate this problem as the one of automatic video segment selection based on a learning process that employs salient video segment paradigms. We design an hierarchical learning scheme that consists of two steps. At the first step, an unsupervised process is performed in order to determine salient video segment types. The second step is a supervised learning process that is performed for each of the salient video segment type independently. For the latter case, since only salient training examples are available, the problem is stated as an one-class classification problem. In order to take into account subclass information that may appear in the video segment types, we introduce a novel formulation of the Support Vector Data Description method that exploits subclass information in its optimization process. We evaluate the proposed approach in three Hollywood movies, where the performance of the proposed Subclass SVDD (SSVDD) algorithm is

compared with that of related methods. Experimental results show that the adoption of both hierarchical learning and the proposed SSVDD method contribute to the final classification performance.

#### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Research Community on Data-to-Decision (D2D), Aristotle University of Thessaloniki, Department of Informatics

Contributors: Mygdalis, V., Iosifidis, A., Tefas, A., Pitas, I.

Number of pages: 5

Pages: 183-187

Publication date: 15 Jan 2015

#### Host publication information

Title of host publication: IEEE SSCI 2014 - 2014 IEEE Symposium Series on Computational Intelligence - CIES 2014: 2014 IEEE Symposium on Computational Intelligence for Engineering Solutions, Proceedings

Publisher: The Institute of Electrical and Electronics Engineers, Inc.

ISBN (Print): 9781479945108

ASJC Scopus subject areas: Computer Science Applications, Artificial Intelligence, Computational Theory and Mathematics

DOIs:

10.1109/CIES.2014.7011849

Source: Scopus

Source ID: 84922795880

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

#### Estimation of GFP-tagged RNA numbers from temporal fluorescence intensity data

Motivation: MS2-GFP-tagging of RNA is currently the only method to measure intervals between consecutive transcription events in live cells. For this, new transcripts must be accurately detected from intensity time traces. Results: We present a novel method for automatically estimating RNA numbers and production intervals from temporal data of cell fluorescence intensities that reduces uncertainty by exploiting temporal information. We also derive a robust variant, more resistant to outliers caused e.g. by RNAs moving out of focus. Using Monte Carlo simulations, we show that the quantification of RNA numbers and production intervals is generally improved compared with previous methods. Finally, we analyze data from live Escherichia coli and show statistically significant differences to previous methods. The new methods can be used to quantify numbers and production intervals of any fluorescent probes, which are present in low copy numbers, are brighter than the cell background and degrade slowly. Availability: Source code is available under Mozilla Public License at <http://www.cs.tut.fi/%7ehakkin22/jumpdet/>. Contact:

#### General information

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Department of Signal Processing, Research group: Laboratory of Biosystem Dynamics-LBD, Multi-scaled biodata analysis and modelling (MultiBAM)

Contributors: Häkkinen, A., Ribeiro, A. S.

Number of pages: 7

Pages: 69-75

Publication date: 1 Jan 2015

Peer-reviewed: Yes

#### Publication information

Journal: Bioinformatics

Volume: 31

Issue number: 1

ISSN (Print): 1367-4803

Ratings:

Scopus rating (2015): CiteScore 6.06 SJR 4.97 SNIP 2.151

Original language: English

ASJC Scopus subject areas: Biochemistry, Molecular Biology, Computational Theory and Mathematics, Computer Science Applications, Computational Mathematics, Statistics and Probability, Medicine(all)

DOIs:

10.1093/bioinformatics/btu592

URLs:

<http://www.scopus.com/inward/record.url?scp=84922352843&partnerID=8YFLogxK> (Link to publication in Scopus)

#### Bibliographical note

Contribution: organisation=sgn,FACT1=1<br/>Portfolio EDEND: 2014-09-15<br/>Publisher name: Oxford University Press  
Source: researchoutputwizard  
Source ID: 396  
Research output: Contribution to journal > Article > Scientific > peer-review

### **Spectral and energy efficiency of ultra-dense networks under different deployment strategies**

To tackle the 1000× mobile data challenge, the research towards the 5th generation of mobile cellular networks is currently ongoing. One clear enabler toward substantially improved network area capacities is the increasing level of network densification at different layers of the overall heterogeneous radio access system. Ultra-dense deployments, or DenseNets, seek to take network densification to a whole new level, where extreme spatial reuse is deployed. This article looks into DenseNets from the perspectives of different deployment strategies, covering the densification of the classical macro layer, extremely dense indoor femto layer, as well as outdoor distributed antenna system (DAS), which can be dynamically configured as a single microcell or multiple independent microcells. Also, the potential of a new indoor-to-outdoor service provisioning paradigm is examined. The different deployment solutions are analyzed from the network area spectral and network energy efficiency perspectives, with extreme densification levels, including both indoor and outdoor use scenarios. The obtained results indicate that dedicated indoor solutions with densely deployed femtocells are much more spectrum and energy-efficient approaches to address the enormous indoor capacity demands compared to densifying the outdoor macro layer, when the systems are pushed to their capacity limits. Furthermore, the dynamic outdoor DAS concept offers an efficient and capacity-adaptive solution to provide outdoor capacity, on demand, in urban areas.

#### **General information**

Publication status: Published  
MoE publication type: A1 Journal article-refereed  
Organisations: Department of Electronics and Communications Engineering, Research group: Wireless Communications and Positioning, Wireless Communications and Positioning (WICO)  
Contributors: Yunas, S., Valkama, M., Niemelä, J.  
Number of pages: 11  
Pages: 90-100  
Publication date: 1 Jan 2015  
Peer-reviewed: Yes

#### **Publication information**

Journal: IEEE Communications Magazine  
Volume: 53  
Issue number: 1  
ISSN (Print): 0163-6804  
Ratings:  
Scopus rating (2015): CiteScore 8.15 SJR 2.225 SNIP 5.331  
Original language: English  
ASJC Scopus subject areas: Electrical and Electronic Engineering, Computer Science Applications, Computer Networks and Communications  
DOIs:  
10.1109/MCOM.2015.7010521  
Source: Scopus  
Source ID: 84921459532  
Research output: Contribution to journal > Article > Scientific > peer-review

### **The assessment of constructability: BIM cases**

The constructability appraisal methods developed so far are based on evaluating and analysing the major design components and systems of an entire building, such as structural systems, materials and production techniques. At first, this paper discusses the current practice of constructability assessment used in Finland and next it introduces an experimental constructability assessment method (ECAM) using building information models (BIM) as a source of constructability information. Interviews of design and construction professionals were used to explore the current practice of constructability assessment. An experimental assessment methodology was developed and tested in case projects. According to the interviews, the main assessment method used was the inspection of drawings, and constructability was assessed occasionally during the design development stage and more systematically at the very end of the detailed design stage with varying professional participants in meetings. Using ECAM in the project level a constructability score of a building and building type can be analysed. When using ECAM on the level of structural elements a constructability score of elements can be measured. These scores incorporate information for the development of constructability. In Finland, the development of a systematic review process of constructability will be needed. The constructability assessment methodology suggested in the article is experimental and is to be developed and tested further before using it reliably in building projects. The assessment combining visual and analytical approach will change present methods for assessing constructability.

### General information

Publication status: Published  
MoE publication type: A1 Journal article-refereed  
Organisations: Life Cycle Effectiveness of the Built Environment (LCE@BE), Aalto University  
Contributors: Tauriainen, M. K., Puttonen, J. A., Saari, A. J.  
Number of pages: 17  
Pages: 51-67  
Publication date: 1 Jan 2015  
Peer-reviewed: Yes

### Publication information

Journal: Journal of Information Technology in Construction  
Volume: 20  
ISSN (Print): 1403-6835  
Ratings:  
Scopus rating (2015): CiteScore 1.18 SJR 0.398 SNIP 1.114  
Original language: English  
ASJC Scopus subject areas: Civil and Structural Engineering, Building and Construction, Computer Science Applications  
Keywords: Analyses, Assessment, BIM, Buildability, Constructability, Modelling, Quantitative  
URLs:  
<http://www.scopus.com/inward/record.url?scp=84921652278&partnerID=8YFLogxK> (Link to publication in Scopus)  
Source: Scopus  
Source ID: 84921652278  
Research output: Contribution to journal > Article > Scientific > peer-review

### 2.4 GHz inkjet-printed RF energy harvester on bulk cardboard substrate

An experimental investigation on the inkjetprinted power harvester for 2.4GHz and review of RF characterization of substrate and printed conductors are presented in this paper. A one stage discrete rectifier based on a voltage doubler structure and a planar monopole antenna are fabricated on cardboard using inkjet printing. The performance of the whole system is examined by measuring the output voltage of the RF power harvester. By the utilization of the proposed idea, the fabrication of low-cost environmentally-friendly battery-less wireless modules is conceivable.

### General information

Publication status: Published  
MoE publication type: A4 Article in a conference publication  
Organisations: Department of Electronics and Communications Engineering, Research group: Wireless Identification and Sensing Systems Research Group, Sensing Systems for Wireless Medicine (MediSense), Aristotle University of Thessaloniki, School of Electrical and Computer Engineering, Georgia Institute of Technology, School of Electrical and Computer Engineering  
Contributors: Khonsari, Z., Björninen, T., Tentzeris, M. M., Sydänheimo, L., Ukkonen, L.  
Number of pages: 3  
Pages: 153-155  
Publication date: Jan 2015

### Host publication information

Title of host publication: 2015 IEEE Radio and Wireless Symposium (RWS), 25-28 Jan. 2015, San Diego, CA  
Publisher: IEEE  
ISBN (Print): 978-1-4799-5507-7  
ASJC Scopus subject areas: Computer Networks and Communications, Computer Science Applications, Electrical and Electronic Engineering, Communication  
Keywords: additive manufacturing, cardboard substrate, energy harvester, Inkjet printing, planar monopole  
DOIs:  
10.1109/RWS.2015.7129721  
Source: Scopus  
Source ID: 84937875886  
Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

### 1180nm VECSEL with 50 W output power

We report on the development of a high-power vertical-external-cavity surface-emitting laser (VECSEL) emitting around 1180 nm. The laser emitted 50 W of output power when the mount of the gain chip was cooled to -15°C. The output power was measured using a 97% reflective cavity end-mirror. The VECSEL was arranged to form an I-shaped cavity with a length of ~100 mm; the gain chip and a curved dielectric mirror (RoC=150) acting as cavity end mirrors. The gain chip was grown by molecular beam epitaxy (MBE) and incorporated 10 GaInAs/GaAs quantum wells. For efficient heat extraction, the chip was capillary bonded to a diamond heat spreader which was attached to a TEC-cooled copper mount. The maximum optical-to-optical conversion efficiency of 28% was achieved for 42 W of output power and -15°C mount

temperature.

#### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Optoelectronics Research Centre, Research group: Semiconductor Technology and Applications, Frontier Photonics

Contributors: Kantola, E., Leinonen, T., Ranta, S., Tavast, M., Penttinen, J., Guina, M.

Publication date: 2015

#### Host publication information

Title of host publication: Proceedings of SPIE - The International Society for Optical Engineering

Volume: 9349

Publisher: SPIE

Article number: 93490U

ISBN (Print): 9781628414394

ASJC Scopus subject areas: Applied Mathematics, Computer Science Applications, Electrical and Electronic Engineering, Electronic, Optical and Magnetic Materials, Condensed Matter Physics

Keywords: continuous wave, frequency doubling, heat management, high power, infrared, power scaling, SDL, VECSEL

DOIs:

10.1117/12.2079480

Source: Scopus

Source ID: 84925666801

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

#### A method for predicting DCT-based denoising efficiency for grayscale images corrupted by AWGN and additive spatially correlated noise

Results of denoising based on discrete cosine transform for a wide class of images corrupted by additive noise are obtained. Three types of noise are analyzed: additive white Gaussian noise and additive spatially correlated Gaussian noise with middle and high correlation levels. TID2013 image database and some additional images are taken as test images. Conventional DCT filter and BM3D are used as denoising techniques. Denoising efficiency is described by PSNR and PSNR-HVS-M metrics. Within hard-thresholding denoising mechanism, DCT-spectrum coefficient statistics are used to characterize images and, subsequently, denoising efficiency for them. Results of denoising efficiency are fitted for such statistics and efficient approximations are obtained. It is shown that the obtained approximations provide high accuracy of prediction of denoising efficiency.

#### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Department of Signal Processing, Research group: Computational Imaging-CI, Signal Processing Research Community (SPRC), National Aerospace University

Contributors: Rubel, A. S., Lukin, V. V., Egiazarian, K.

Publication date: 2015

#### Host publication information

Title of host publication: Proceedings of SPIE - The International Society for Optical Engineering

Volume: 9399

Publisher: SPIE

Article number: 93990P

ISBN (Print): 9781628414899

ASJC Scopus subject areas: Applied Mathematics, Computer Science Applications, Electrical and Electronic Engineering, Electronic, Optical and Magnetic Materials, Condensed Matter Physics

Keywords: DCT and BM3D filter, Denoising, Fitting, Grayscale images, Prediction

DOIs:

10.1117/12.2082533

Source: Scopus

Source ID: 84928473717

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

#### A perceptual quality metric for high-definition stereoscopic 3D video

The use of 3D video is growing in several fields such as entertainment, military simulations, medical applications. However, the process of recording, transmitting, and processing 3D video is prone to errors thus producing artifacts that may affect the perceived quality. Nowadays a challenging task is the definition of a new metric able to predict the perceived quality with low computational complexity in order to be used in real-time applications. The research in this field is very active due to the complexity of the analysis of the influence of stereoscopic cues. In this paper we present a novel

stereoscopic metric based on the combination of relevant features able to predict the subjective quality rating in a more accurate way.

#### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Department of Signal Processing, Research group: 3D MEDIA, Signal Processing Research Community (SPRC), Universita' degli Studi Roma TRE

Contributors: Battisti, F., Carli, M., Stramacci, A., Boev, A., Gotchev, A.

Publication date: 2015

#### Host publication information

Title of host publication: Image Processing: Algorithms and Systems XIII

Publisher: SPIE

Article number: 939916

ISBN (Print): 9781628414899

#### Publication series

Name: SPIE Conference Proceedings

Volume: 9399

ASJC Scopus subject areas: Applied Mathematics, Computer Science Applications, Electrical and Electronic Engineering, Electronic, Optical and Magnetic Materials, Condensed Matter Physics

Keywords: Quality metric, Stereoscopic 3D video, Video transmission

Electronic versions:

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DOIs:

10.1117/12.2086901

URLs:

<http://urn.fi/URN:NBN:fi:tyy-201606134242>

Source: Scopus

Source ID: 84928485494

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

#### Busting myths of electronic word of mouth: The relationship between customer ratings and the sales of mobile applications

Business and academic research frequently highlights the power of electronic word of mouth, relying on the knowledge that online customer ratings and reviews influence consumer decision making. Numerous studies in different disciplines have been conducted to examine the effectiveness of electronic word of mouth communication. Previously, typically small sample studies suggest that positive electronic word of mouth increases sales and that the effects depend on the volume and valence of reviews and ratings. This study's contribution lies in testing the relationship between electronic word of mouth and the sales of applications in a mobile application ecosystem (Google Play) with an extensive dataset (over 260 million customer ratings; 18 months). The results show that higher values of valence of customer ratings correlate statistically significantly with higher sales. The volume of ratings correlates positively with sales in the long term but negatively in the short term. Furthermore, the relationship between electronic word of mouth and sales seems to be more important when the price of the application increases. The findings also underline the importance of the choice of a measurement period in studies.

#### General information

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Managing digital industrial transformation (mDIT), Pori Department, Research group: Business Ecosystems, Networks and Innovations, Turun Yliopisto/Turun Biomateriaalikeskus, University of Turku, Turku School of Economics, VTT Technical Research Centre of Finland, University of Turku

Contributors: Hyrynsalmi, S., Seppänen, M., Aarikka-Stenroos, L., Suominen, A., Järveläinen, J., Harkke, V.

Number of pages: 18

Pages: 1-18

Publication date: 2015

Peer-reviewed: Yes

#### Publication information

Journal: Journal of Theoretical and Applied Electronic Commerce Research

Volume: 10

Issue number: 2

ISSN (Print): 0718-1876

Ratings:

Scopus rating (2015): CiteScore 1.84 SJR 0.749 SNIP 1.398

Original language: English

ASJC Scopus subject areas: Business, Management and Accounting(all), Computer Science Applications

Keywords: App stores, Big data, Consumer ratings, Consumer reviews, Electronic word of mouth, Micro-pricing, Products ratings, Sales

Electronic versions:

Hyrnsalmi et al 2015 Busting Myths of E-WOM, The relationship btw Customer Ratings and the Sales of Mob Apps  
DOIs:

10.4067/S0718-18762015000200002

URLs:

<http://urn.fi/URN:NBN:fi:tty-201603013592>

### **Bibliographical note**

EXT="Aarikka-Stenroos, Leena"

EXT="Hyrnsalmi, Sami"

Versio ja lupa ok 12.1.2016, lupa annettu lomakkeella KK

Source: Scopus

Source ID: 84930678533

Research output: [Contribution to journal](#) › [Article](#) › [Scientific](#) › [peer-review](#)

### **Combining full-reference image visual quality metrics by neural network**

A task of assessing full-reference visual quality of images is considered. Correlation between the obtained array of mean opinion scores (MOS) and the corresponding array of given metric values allows characterizing correspondence of a considered metric to HVS. For the largest openly available database TID2013 intended for metric verification, a Spearman correlation is about 0.85 for the best existing HVS-metrics. One simple way to improve an efficiency of assessing visual quality of images is to combine several metrics. Our work addresses a possibility of using neural networks for the aforementioned purpose. As leaning data, we have used metric sets for images of the database TID2013 that are employed as the network inputs. Randomly selected half of 3000 images of the database TID2013 has been used at the learning stage whilst other half have been exploited for assessing quality of neural network based HVS-metric. Six metrics "cover" well all types of distortions: FSIMc, PSNR-HMA, PSNR-HVS, SFF, SR-SIM, and VIF, have been selected. As the result of NN learning, the Spearman correlation between the NN output and the MOS for the verification set of database TID2013 reaches 0.93 for the best configuration of NN. This is considerably better than for any particular metric employed as an input (FSIMc is the best among them). Analysis of the designed metric efficiency is carried out, its advantages and drawbacks are demonstrated.

### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Department of Signal Processing, Signal Processing Research Community (SPRC), National Aerospace University

Contributors: Lukin, V. V., Ponomarenko, N. N., Ieremeiev, O., Egiazarian, K., Astola, J.

Publication date: 2015

### **Host publication information**

Title of host publication: Proceedings of SPIE - The International Society for Optical Engineering

Volume: 9394

Publisher: SPIE

Article number: 93940K

ISBN (Print): 9781628414844

ASJC Scopus subject areas: Applied Mathematics, Computer Science Applications, Electrical and Electronic Engineering, Electronic, Optical and Magnetic Materials, Condensed Matter Physics

Keywords: Full-reference image visual quality assessment, Neural networks

DOIs:

10.1117/12.2085465

URLs:

<http://www.scopus.com/inward/record.url?scp=84928473490&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84928473490

Research output: [Chapter in Book/Report/Conference proceeding](#) › [Conference contribution](#) › [Scientific](#) › [peer-review](#)

### **Depth map occlusion filling and scene reconstruction using modified exemplar-based inpainting**

RGB-D sensors are relatively inexpensive and are commercially available off-the-shelf. However, owing to their low complexity, there are several artifacts that one encounters in the depth map like holes, mis-alignment between the depth and color image and lack of sharp object boundaries in the depth map. Depth map generated by Kinect cameras also contain a significant amount of missing pixels and strong noise, limiting their usability in many computer vision

applications. In this paper, we present an efficient hole filling and damaged region restoration method that improves the quality of the depth maps obtained with the Microsoft Kinect device. The proposed approach is based on a modified exemplar-based inpainting and LPA-ICI filtering by exploiting the correlation between color and depth values in local image neighborhoods. As a result, edges of the objects are sharpened and aligned with the objects in the color image. Several examples considered in this paper show the effectiveness of the proposed approach for large holes removal as well as recovery of small regions on several test images of depth maps. We perform a comparative study and show that statistically, the proposed algorithm delivers superior quality results compared to existing algorithms.

### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Department of Signal Processing, Research group: Computational Imaging-CI, Signal Processing Research Community (SPRC), Dept. of Radio-Electronics Systems, Don State Technical University

Contributors: Voronin, V. V., Marchuk, V. I., Fisunov, A. V., Tokareva, S. V., Egiazarian, K. O.

Publication date: 2015

### Host publication information

Title of host publication: Image Processing: Algorithms and Systems XIII

Publisher: SPIE

Article number: 93990S

ISBN (Print): 9781628414899

### Publication series

Name: SPIE Conference Proceedings

Volume: 9399

ASJC Scopus subject areas: Applied Mathematics, Computer Science Applications, Electrical and Electronic Engineering, Electronic, Optical and Magnetic Materials, Condensed Matter Physics

Keywords: Depth map, Filtering, Image processing, Inpainting, Kinect, Occlusion

DOIs:

10.1117/12.2076506

Source: Scopus

Source ID: 84928473063

Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

### Distant speech separation using predicted time-frequency masks from spatial features

Speech separation algorithms are faced with a difficult task of producing high degree of separation without containing unwanted artifacts. The time-frequency (T-F) masking technique applies a real-valued (or binary) mask on top of the signal's spectrum to filter out unwanted components. The practical difficulty lies in the mask estimation. Often, using efficient masks engineered for separation performance leads to presence of unwanted musical noise artifacts in the separated signal. This lowers the perceptual quality and intelligibility of the output. Microphone arrays have been long studied for processing of distant speech. This work uses a feed-forward neural network for mapping microphone array's spatial features into a T-F mask. Wiener filter is used as a desired mask for training the neural network using speech examples in simulated setting. The T-F masks predicted by the neural network are combined to obtain an enhanced separation mask that exploits the information regarding interference between all sources. The final mask is applied to the delay-and-sum beamformer (DSB) output. The algorithm's objective separation capability in conjunction with the separated speech intelligibility is tested with recorded speech from distant talkers in two rooms from two distances. The results show improvement in instrumental measure for intelligibility and frequency-weighted SNR over complex-valued non-negative matrix factorization (CNMF) source separation approach, spatial sound source separation, and conventional beamforming methods such as the DSB and minimum variance distortionless response (MVDR).

### General information

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Department of Signal Processing, Research group: Audio research group

Contributors: Pertilä, P., Nikunen, J.

Number of pages: 10

Pages: 97-106

Publication date: 2015

Peer-reviewed: Yes

### Publication information

Journal: Speech Communication

Volume: 68

ISSN (Print): 0167-6393

Ratings:

Scopus rating (2015): CiteScore 2.21 SJR 0.49 SNIP 1.612

Original language: English

ASJC Scopus subject areas: Modelling and Simulation, Computer Science Applications, Computer Vision and Pattern Recognition, Software, Communication, Linguistics and Language, Language and Linguistics

Keywords: Beamforming, Microphone arrays, Neural networks, Speech separation, Time-frequency masking

DOIs:

10.1016/j.specom.2015.01.006

Source: Scopus

Source ID: 84923277715

Research output: Contribution to journal › Article › Scientific › peer-review

### Extreme learning machine based supervised subspace learning

This paper proposes a novel method for supervised subspace learning based on Single-hidden Layer Feedforward Neural networks. The proposed method calculates appropriate network target vectors by formulating a Bayesian model exploiting both the labeling information available for the training data and geometric properties of the training data, when represented in the feature space determined by the network's hidden layer outputs. After the calculation of the network target vectors, Extreme Learning Machine-based neural network training is applied and classification is performed using a Nearest Neighbor classifier. Experimental results on publicly available data sets show that the proposed approach consistently outperforms the standard ELM approach, as well as other standard methods.

### General information

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Department of Signal Processing, Research Community on Data-to-Decision (D2D)

Contributors: Iosifidis, A.

Number of pages: 7

Pages: 158–164

Publication date: 2015

Peer-reviewed: Yes

### Publication information

Journal: Neurocomputing

Volume: 167

ISSN (Print): 0925-2312

Ratings:

Scopus rating (2015): CiteScore 3.18 SJR 0.981 SNIP 1.698

Original language: English

ASJC Scopus subject areas: Artificial Intelligence, Computer Science Applications, Cognitive Neuroscience

Keywords: Extreme Learning Machine, Network targets calculation, Supervised subspace learning

DOIs:

10.1016/j.neucom.2015.04.083

Research output: Contribution to journal › Article › Scientific › peer-review

### Green (In,Ga,Al)P-GaP light-emitting diodes grown on high-index GaAs surfaces

We report on green (550-560 nm) electroluminescence (EL) from

(Al<sub>0.5</sub>Ga<sub>0.5</sub>)<sub>0.5</sub>In<sub>0.5</sub>P-

(Al<sub>0.8</sub>Ga<sub>0.2</sub>)<sub>0.5</sub>In<sub>0.5</sub>P double p-i-n heterostructures with monolayer-scale

tensile strained GaP insertions in the cladding layers and light-emitting diodes (LEDs) based thereupon. The structures are grown side-by-side on high-index and (100) GaAs substrates by molecular beam epitaxy. Cross-sectional transmission electron microscopy studies indicate that GaP insertions are flat, thus the GaP-barrier substrate orientation-dependent heights should match the predictions of the flat model. At moderate current densities (~500 A/cm<sup>2</sup>) the EL intensity of the structures is comparable for all substrate orientations. Opposite to the (100)-grown structures, the EL spectra of (211) and (311)-grown devices are shifted towards shorter wavelengths (~550 nm at room temperature). At high current densities (>1 kA/cm<sup>2</sup>) a much higher EL intensity is achieved for the devices grown on high-index substrates. The integrated intensity of (311)-grown structures gradually saturates at current densities above 4 kA/cm<sup>2</sup>, whereas no saturation is revealed for (211)-grown structures up to the current densities above 14 kA/cm<sup>2</sup>. We attribute the effect to the surface orientation-dependent engineering of the GaP band structure which prevents the escape of the nonequilibrium electrons into the indirect conduction band minima of the p-doped (Al<sub>0.8</sub>Ga<sub>0.2</sub>)<sub>0.5</sub>In<sub>0.5</sub>P cladding layers.

### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Optoelectronics Research Centre, Research group: Ultrafast and intense lasers, Frontier Photonics,

Technische Universität Berlin, Fakultät VII-Wirtschaft und Management, 25.6.2012, VI Systems GmbH, CEMES-CNRS,

A. F. Ioffe Physical Technical Institute, Institut Für Festkörperphysik

Contributors: Ledentsov, N. N., Shchukin, V. A., Lyytikäinen, J., Okhotnikov, O., Cherkashin, N. A., Shernyakov, Y. M., Payusov, A. S., Gordeev, N. Y., Maximov, M. V., Schlichting, S., Nippert, F., Hoffmann, A.

Publication date: 2015

#### Host publication information

Title of host publication: Proceedings of SPIE : Light-Emitting Diodes: Materials, Devices, and Applications for Solid State Lighting XIX

Volume: 9383

Publisher: SPIE

Article number: 93830E

ISBN (Print): 9781628414738

ASJC Scopus subject areas: Applied Mathematics, Computer Science Applications, Electrical and Electronic Engineering, Electronic, Optical and Magnetic Materials, Condensed Matter Physics

Keywords: high-index surface, light-emitting diode, tensile strained barrier

DOIs:

10.1117/12.2083953

Source: Scopus

Source ID: 84930074847

Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

#### >8W GaInNAs VECSEL emitting at 615 nm

We report a high-power VECSEL emitting <8W around 615 nm. The gain chip of the laser was grown by plasma-assisted molecular beam epitaxy and it comprised 10 GaInNAs quantum wells. The VECSEL cavity had a V-shaped geometry and a 10-mm-long non-critically phase-matched LBO crystal for second harmonic generation. The cavity incorporated also an etalon and a birefringent filter for controlling the output wavelength. With the aid of the second-harmonic output and the infrared light leaking out from the laser cavity, the single-pass conversion efficiency of the crystal was estimated to have a value of 0.75%.

#### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Optoelectronics Research Centre, Research group: Semiconductor Technology and Applications, Frontier Photonics

Contributors: Leinonen, T., Penttinen, J. P., Korpijärvi, V. M., Kantola, E., Guina, M.

Publication date: 2015

#### Host publication information

Title of host publication: Proceedings of SPIE : Vertical External Cavity Surface Emitting Lasers (VECSELs) V

Volume: 9349

Publisher: SPIE

Article number: 934909

ISBN (Print): 9781628414394

ASJC Scopus subject areas: Applied Mathematics, Computer Science Applications, Electrical and Electronic Engineering, Electronic, Optical and Magnetic Materials, Condensed Matter Physics

Keywords: frequency doubling, high power visible laser, OPSL, orange-red VECSEL, SDL, SHG

DOIs:

10.1117/12.2079162

Source: Scopus

Source ID: 84925597620

Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

#### Idea-space: A use case of collaborative course development in higher education

#### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Managing digital industrial transformation (mDIT), ESCP Europe Berlin, Ruhr West University of Applied Sciences, Vytautas Magnus University, Duale Hochschule Baden Württemberg, NCSR, Jyväskylän yliopisto

Contributors: AbuJarour, S., Pawlowski, J., Bick, M., Bagucanskyte, M., Frankenberg, A., Hudak, R., Makropoulos, C., Pappa, D., Pitsilis, V., Pirkkalainen, H., Tannhauser, A. C., Trepule, E., Vidalis, A., Volungeviciene, A.

Number of pages: 8

Pages: 149-156

Publication date: 2015

### Host publication information

Title of host publication: Wissens-Gemeinschaften 2015

Publisher: TUDpress Verlag der Wissenschaften GmbH

ISBN (Electronic): 978-395908010-1

ASJC Scopus subject areas: Computer Science Applications, Information Systems

URLs:

<http://www.scopus.com/inward/record.url?scp=84959421920&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84959421920

Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

### Machine learning for adaptive bilateral filtering

We describe a supervised learning procedure for estimating the relation between a set of local image features and the local optimal parameters of an adaptive bilateral filter. A set of two entropy-based features is used to represent the properties of the image at a local scale. Experimental results show that our entropy-based adaptive bilateral filter outperforms other extensions of the bilateral filter where parameter tuning is based on empirical rules. Beyond bilateral filter, our learning procedure represents a general framework that can be used to develop a wide class of adaptive filters.

### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Department of Signal Processing, Research group: Computational Imaging-CI, Signal Processing

Research Community (SPRC), NVIDIA

Contributors: Frosio, I., Egiazarian, K., Pulli, K.

Publication date: 2015

### Host publication information

Title of host publication: Image Processing: Algorithms and Systems XIII

Volume: 9399

Publisher: SPIE

Article number: 939908

ISBN (Print): 9781628414899

### Publication series

Name: Proceedings of SPIE - The International Society for Optical Engineering

Publisher: The International Society for Optical Engineering

ISSN (Print): 0277-786X

ISSN (Electronic): 1996-756X

ASJC Scopus subject areas: Applied Mathematics, Computer Science Applications, Electrical and Electronic Engineering, Electronic, Optical and Magnetic Materials, Condensed Matter Physics

Keywords: Adaptive bilateral filter, Denoising, Machine learning, Optimization, Training

DOIs:

10.1117/12.2077733

Source: Scopus

Source ID: 84928485491

Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

### Measuring bend losses in large-mode-area fibers

We investigate the measurement of bend losses in few-mode large-mode-area (LMA) fibers. The influence of the light source spectral characteristics, modal power content and cladding light on the measurement accuracy and precision is studied experimentally. Monte-Carlo simulations are performed to understand the distribution of the variations. This study provides practical guidelines for bend loss measurements.

### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Frontier Photonics, nLIGHT Corporation

Contributors: Ye, C., Koponen, J., Aallos, V., Kokki, T., Petit, L., Kimmelma, O.

Publication date: 2015

### Host publication information

Title of host publication: Fiber Lasers XII: Technology, Systems, and Applications

Volume: 9344

Publisher: SPIE

Article number: 934425

ISBN (Electronic): 9781628414349

ASJC Scopus subject areas: Applied Mathematics, Computer Science Applications, Electrical and Electronic Engineering, Electronic, Optical and Magnetic Materials, Condensed Matter Physics

Keywords: Bend loss, Few-mode, Fiber amplifiers, Fiber lasers, Large-mode-area fiber, Silica optical fiber

DOIs:

10.1117/12.2076813

URLs:

<http://www.scopus.com/inward/record.url?scp=84931311791&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84931311791

Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

### Monolithic GaInNAsSb/GaAs VECSEL emitting at 1550 nm

We report the first monolithic GaAs-based vertical external-cavity surface-emitting laser (VECSEL) operating at 1550 nm. The VECSEL is based on a gain mirror which was grown by plasma-assisted molecular beam epitaxy and comprises 8 GaInNAsSb/GaAs quantum wells and an AlAs/GaAs distributed Bragg reflector. When pumped by an 808 nm diode laser, the laser exhibited an output power of 80 mW for a mount temperature of 16 °C.

### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Optoelectronics Research Centre, Research group: Semiconductor Technology and Applications, Frontier Photonics

Contributors: Korpijärvi, V., Kantola, E. L., Leinonen, T., Guina, M.

Publication date: 2015

### Host publication information

Title of host publication: SPIE conference proceedings

Volume: 9349

Publisher: SPIE

Article number: 93490D

ISBN (Print): 9781628414394

ASJC Scopus subject areas: Applied Mathematics, Computer Science Applications, Electrical and Electronic Engineering, Electronic, Optical and Magnetic Materials, Condensed Matter Physics

Keywords: dilute nitride, diode-pumped lasers, GaInNAsSb, semiconductor disk lasers, Semiconductor lasers, vertical external cavity surface emitting lasers

DOIs:

10.1117/12.2077517

Source: Scopus

Source ID: 84925652903

Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

### Multi-physics modeling and simulation of a frequency doubling antenna sensor for passive wireless strain sensing

This research studies multi-physics simulation of a frequency doubling antenna sensor for wireless strain measurement. The frequency doubling technology allows easy distinguishing of backscattered passive sensor signal (at the doubled frequency 2) from environmental reflection (at original reader interrogation frequency). Upon bonding to a base structure, because strain/deformation causes resonance frequency change of the antenna sensor, the passive wireless antenna sensor can be used to measure strain in the underlying base structure. To accurately model the mechanical and electromagnetic behaviors of the frequency doubling antenna sensor, a multiphysics coupled simulation approach is proposed. For simulating both the matching network performance and the antenna behavior under strain/deformation, two commercial software packages, COMSOL and ADS, are combined to leverage the strength of each package.

### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Sensing Systems for Wireless Medicine (MediSense), Georgia Institute of Technology, Georgia Institute of Technology, School of Electrical and Computer Engineering

Contributors: Cho, C., Yi, X., Wang, Y., Tentzeris, M. M.

Number of pages: 9

Pages: 864-872

Publication date: 2015

### Host publication information

Title of host publication: Structural Health Monitoring 2015: System Reliability for Verification and Implementation - Proceedings of the 10th International Workshop on Structural Health Monitoring, IWSHM 2015

Volume: 2

Publisher: DEStech Publications

ISBN (Electronic): 9781605951119

ASJC Scopus subject areas: Computer Science Applications, Health Information Management

URLs:

<http://www.scopus.com/inward/record.url?scp=84945541585&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84945541585

Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

### **No-reference visual quality assessment for image inpainting**

Inpainting has received a lot of attention in recent years and quality assessment is an important task to evaluate different image reconstruction approaches. In many cases inpainting methods introduce a blur in sharp transitions in image and image contours in the recovery of large areas with missing pixels and often fail to recover curvy boundary edges. Quantitative metrics of inpainting results currently do not exist and researchers use human comparisons to evaluate their methodologies and techniques. Most objective quality assessment methods rely on a reference image, which is often not available in inpainting applications. Usually researchers use subjective quality assessment by human observers. It is difficult and time consuming procedure. This paper focuses on a machine learning approach for no-reference visual quality assessment for image inpainting based on the human visual property. Our method is based on observation that Local Binary Patterns well describe local structural information of the image. We use a support vector regression learned on assessed by human images to predict perceived quality of inpainted images. We demonstrate how our predicted quality value correlates with qualitative opinion in a human observer study. Results are shown on a human-scored dataset for different inpainting methods.

### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Department of Signal Processing, Research group: Computational Imaging-CI, Signal Processing Research Community (SPRC), Dept. of Radio-Electronics Systems, Don State Technical University

Contributors: Voronin, V. V., Frantc, V. A., Marchuk, V. I., Sherstobitov, A. I., Egiazarian, K.

Publication date: 2015

### **Host publication information**

Title of host publication: Image Processing: Algorithms and Systems XIII

Publisher: SPIE

Article number: 93990U

ISBN (Print): 9781628414899

### **Publication series**

Name: SPIE Conference Proceedings

Volume: 9399

ASJC Scopus subject areas: Applied Mathematics, Computer Science Applications, Electrical and Electronic Engineering, Electronic, Optical and Magnetic Materials, Condensed Matter Physics

Keywords: Inpainting, Machine learning, Metric, Quality assessment, SVR, Visual salience

DOIs:

10.1117/12.2076507

Source: Scopus

Source ID: 84928473922

Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

### **Organisational knowledge flows and structural change the case of dispersed education organizations**

The paper studies the implications of structural change for organisational knowledge flows. A qualitative case study was carried out in two vocational education and training organisations in Finland in order to recognise how the system-level structural change has been perceived by the education managers. The paper aims to bridge a research gap in knowledge management in situations of changing organisation structures. The results reveal that the externally driven structural change has led to concurrent and somewhat conflicting organisation structures leading to distortion of knowledge flows. Administrative Bureaucracies, team adhocracies and professional autonomies favour different structures and knowledge flows. The results also show that the integration of smaller organisations into large administrative entities further complicates the flow of knowledge and amplifies management challenges relating to concurrent structures. The paper calls for better integration of knowledge management into the strategic management of knowledge-intensive education organisations. The findings provide practical support for the management of previously independent education institutes to confront the structural change towards regional and geographically dispersed actors. More generally, the discussion contributes to the discussion on managing growing knowledge-intensive organisations and knowledge work.

### General information

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Department of Information Management and Logistics, Research group: Novi, School of Management (JKK)

Contributors: Laihonon, H., Syysnummi, P.

Number of pages: 14

Pages: 247-260

Publication date: 2015

Peer-reviewed: Yes

### Publication information

Journal: International Journal of Knowledge Management Studies

Volume: 6

Issue number: 3

ISSN (Print): 1743-8268

Ratings:

Scopus rating (2015): CiteScore 0.56 SJR 0.182 SNIP 0.01

Original language: English

ASJC Scopus subject areas: Information Systems and Management, Computer Science Applications, Management Information Systems, Management of Technology and Innovation

Keywords: Education management, Knowledge flows, Knowledge management, VET

DOIs:

10.1504/IJKMS.2015.072711

URLs:

<http://www.scopus.com/inward/record.url?scp=84946750279&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84946750279

Research output: Contribution to journal › Article › Scientific › peer-review

### Power and wavelength scaling using semiconductor disk laser - bismuth fiber MOPA systems

We present a master oscillator power amplifier (MOPA) system that comprises a mode-locked semiconductor disk laser (SDL) emitting at 1.33  $\mu\text{m}$  and a bismuth-doped fiber amplifier. The mode-locked SDL was fabricated by wafer bonding an InP-based gain section with a GaAs-based distributed Bragg reflector (DBR) using (3-Mercaptopropyl)trimethoxysilane. The bismuth-doped fiber amplifier was pumped with a continuous wave SDL emitting at 1.18  $\mu\text{m}$ . The MOPA system produced pulses at a repetition rate of 827 MHz with a pulse energy of 0.62 nJ, which corresponds to an average output power of more than 0.5 W.

### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Frontier Photonics, Optoelectronics Research Centre, Research group: Ultrafast and intense lasers,

Research group: Semiconductor Technology and Applications, Ulyanovsk State University, Fiber Optics Research Center, Russian Academy of Sciences

Contributors: Heikkinen, J., Gumenyuk, R., Rantamäki, A., Lyytikäinen, J., Leinonen, T., Zolotovskii, I., Melkumov, M., Dianov, E. M., Okhotnikov, O. G.

Number of pages: 7

Publication date: 2015

### Host publication information

Title of host publication: Vertical External Cavity Surface Emitting Lasers (VECSELs) V

Place of publication: BELLINGHAM

Publisher: SPIE

Editor: Guina, M.

Article number: 93490E

ISBN (Print): 9781628414394

### Publication series

Name: Proceedings of SPIE

Publisher: SPIE-INT SOC OPTICAL ENGINEERING

Volume: 9349

ISSN (Print): 0277-786X

ASJC Scopus subject areas: Applied Mathematics, Computer Science Applications, Electrical and Electronic Engineering, Electronic, Optical and Magnetic Materials, Condensed Matter Physics

Keywords: Semiconductor disk laser (SDL), vertical-external-cavity surface-emitting laser (VECSEL), modelocking, wafer bonding, bismuth-doped fiber, master oscillator power amplifier (MOPA), SUPERCONTINUUM GENERATION, OUTPUT

POWER, PICOSECOND, VECSEL, PULSES, GHZ

DOIs:

10.1117/12.2076805

Source: WOS

Source ID: 000353134900011

Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

### **Preserving natural scene lighting by strobe-lit video**

Capturing images in low light intensity, and preserving ambient light in such conditions pose significant problems in terms of achievable image quality. Either the sensitivity of the sensor must be increased, filling the resulting image with noise, or the scene must be lit with artificial light, destroying the aesthetic quality of the image. While the issue has been previously tackled for still imagery using cross-bilateral filtering, the same problem exists in capturing video. We propose a method of illuminating the scene with a strobe light synchronized to every other frame captured by the camera, and merging the information from consecutive frames alternating between high gain and high intensity lighting. The motion between the frames is compensated using motion estimation based on block matching between strobe-illuminated frames. The uniform lighting conditions between every other frame make it possible to utilize conventional motion estimation methods, circumventing the image registration challenges faced in fusing flash/non-flash pairs from non-stationary images. The results of the proposed method are shown to closely resemble those computed using the same filter based on reference images captured at perfect camera alignment. The method can be applied starting from a simple set of three frames to video streams of arbitrary lengths with the only requirements being sufficiently accurate syncing between the imaging device and the lighting unit, and the capability to switch states (sensor gain high/low, illumination on/off) fast enough.

### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Department of Signal Processing, Research group: 3D MEDIA, Signal Processing Research Community (SPRC)

Contributors: Suominen, O., Gotchev, A.

Publication date: 2015

### **Host publication information**

Title of host publication: Image Processing: Algorithms and Systems XIII

Publisher: SPIE

Article number: 939919

ISBN (Print): 9781628414899

### **Publication series**

Name: SPIE Conference Proceedings

Volume: 9399

ASJC Scopus subject areas: Applied Mathematics, Computer Science Applications, Electrical and Electronic Engineering, Electronic, Optical and Magnetic Materials, Condensed Matter Physics

Keywords: Ambient light, Bilateral filter, Computational photography, Image denoising, Low-light, Motion compensation

Electronic versions:

EI2015\_suominen

DOIs:

10.1117/12.2185013

URLs:

<http://urn.fi/URN:NBN:fi:tty-201606064228>

Source: Scopus

Source ID: 84928473920

Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

### **Real-time depth image-based rendering with layered dis-occlusion compensation and aliasing-free composition**

Depth Image-based Rendering (DIBR) is a popular view synthesis technique which utilizes the RGB+D image format, also referred to as view-plus-depth scene representation. Classical DIBR is prone to dis-occlusion artefacts, caused by the lack of information in areas behind foreground objects, which appear visible in the synthesized images. A number of recently proposed compensation techniques have addressed the problem of hole filling. However, their computational complexity does not allow for real-time view synthesis and may require additional user input. In this work, we propose a hole-compensation technique, which works fully automatically and in a perceptually-correct manner. The proposed technique applies a two-layer model of the given RGB+D imagery, which is specifically tailored for rendering with free viewpoint selection. The main two components of the proposed technique are an adaptive layering of depth into relative 'foreground' and 'background' layers to be rendered separately and an additional blending filtering aimed at creating a blending function for aliasing cancellation during the process of view composition. The proposed real-time implementation turns ordinary view-plus-depth images to true 3D scene representations, which allow visualization in the fly-around manner.

### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Department of Signal Processing, Research group: 3D MEDIA, Signal Processing Research Community (SPRC)

Contributors: Smirnov, S., Gotchev, A.

Publication date: 2015

### Host publication information

Title of host publication: Proceedings of SPIE - The International Society for Optical Engineering

Publisher: SPIE

Article number: 93990T

ISBN (Print): 9781628414899

### Publication series

Name: SPIE Conference Proceedings

Volume: 9399

ASJC Scopus subject areas: Applied Mathematics, Computer Science Applications, Electrical and Electronic Engineering, Electronic, Optical and Magnetic Materials, Condensed Matter Physics

Electronic versions:

Smirnov 2015

DOIs:

10.1117/12.2086895

URLs:

<http://urn.fi/URN:NBN:fi:tty-201606154257>

Source: Scopus

Source ID: 84928501129

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

## Roadmap for organic and printed electronics

### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Research group: Laboratory for Future Electronics, Tampere University of Technology, Augmented Human Activities (AHA), OE-A (Organic and Printed Electronics Association), PolyIC GmbH and Co. KG

Contributors: Hecker, K., Clemens, W., Lupo, D., Breitung, S.

Number of pages: 2

Pages: 125-126

Publication date: 2015

### Host publication information

Title of host publication: Smart Systems Integration 2015 - 9th International Conference and Exhibition on Integration Issues of Miniaturized Systems: MEMS, NEMS, ICs and Electronic Components, SSI 2015

Publisher: Apprimus Verlag

ISBN (Electronic): 9783863592967

ASJC Scopus subject areas: Computer Science Applications, Computer Networks and Communications, Artificial Intelligence

URLs:

<http://www.scopus.com/inward/record.url?scp=84976314633&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84976314633

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

## Smart home gateway system over Bluetooth low energy with wireless energy transfer capability

As billions of sensors and smart meters connect to the Internet of Things (IoT), current wireless technologies are taking decisive steps to ensure their sustainable operation. One popular IoT scenario features a smart home service gateway, which becomes the central point of user's home environment facilitating a multitude of tasks. Given that most IoT devices connected to residential gateway are small-scale and battery-powered, the key challenge is to extend their lifetime without recharging/replacing batteries. To this end, a novel radio technology named Bluetooth low energy (BLE) has recently been completed to enable energy-efficient data transfer. Another inspiring innovation is the capability of sensors to harvest wireless energy in their local environment. In this work, we envision a scenario where many in-home sensors are communicating with a smart gateway over the BLE protocol, while at the same time harvesting RF energy transmitted from the gateway wirelessly via a dedicated radio interface. We thoroughly investigate performance limitations of such wireless energy transfer interface (WETI) with dynamic analytical model and with important practical considerations. Our

methodology delivers the upper bound on WETI operation coupled with BLE-based communication, which characterizes ultimate system performance over the class of practical radio and energy resource management algorithms.

### General information

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Department of Electronics and Communications Engineering, Research group: Emerging Technologies for Nano-Bio-Info-Cogno, Wireless Communications and Positioning (WICO), International Institute for Advanced Aerospace Technologies of St. Petersburg State University of Aerospace Instrumentation

Contributors: Galinina, O., Mikhaylov, K., Andreev, S., Turlikov, A., Koucheryavy, Y.

Publication date: 2015

Peer-reviewed: Yes

### Publication information

Journal: Eurasip Journal on Wireless Communications and Networking

Volume: 2015

Issue number: 1

Article number: 178

ISSN (Print): 1687-1472

Ratings:

Scopus rating (2015): CiteScore 0.96 SJR 0.362 SNIP 1.138

Original language: English

ASJC Scopus subject areas: Computer Networks and Communications, Signal Processing, Computer Science Applications

Keywords: Bluetooth low energy, Internet of Things, Sensors, Smart home gateway, Wireless energy transfer

DOIs:

10.1186/s13638-015-0393-3

Source: Scopus

Source ID: 84938840129

Research output: Contribution to journal > Article > Scientific > peer-review

### Towards dependable automation

Automation runs the modern society and its critical systems. It is a networked software product depending on the co-operation of old and new technologies. Information security for automation systems should be regarded in light of the most important quality required from automation—dependability. This chapter focuses on process of developing dependable solutions for the entire lifecycle of automation systems. The approach includes a guideline for securing automation and a dependability model that is a data flow model extended with security and automation requirements. Results of this analysis should be used in final requirements specification for implementation. Dependability model is the key tool in secure development lifecycle. It can be used in new product development, improving an old automation system and also during the active lifecycle of automation to manage inevitable changes occurring during the entire lifespan of automation system.

### General information

Publication status: Published

MoE publication type: A3 Part of a book or another research book

Organisations: Tampere University of Technology, Department of Automation Science and Engineering, Research area: Information Systems in Automation

Contributors: Seppälä, J., Salmenperä, M.

Number of pages: 21

Pages: 229-249

Publication date: 2015

### Host publication information

Title of host publication: Cyber Security: Analytics, Technology and Automation : Part IV

Publisher: Springer International Publishing

ISBN (Print): 978-3-319-18301-5

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Name: Intelligent Systems, Control and Automation: Science and Engineering

Volume: 78

ISSN (Print): 2213-8986

ASJC Scopus subject areas: Computer Science Applications, Control and Systems Engineering, Mechanical Engineering, Control and Optimization

DOIs:

10.1007/978-3-319-18302-2\_15

URLs:

<http://www.scopus.com/inward/record.url?scp=84934873164&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84934873164

Research output: Chapter in Book/Report/Conference proceeding › Chapter › Scientific › peer-review

### **Uncertainty propagation of iron loss from characterization measurements to computation of electrical machines**

**Purpose** - The purpose of this paper is to find out how uncertainties in the characterization of magnetic materials propagate through identification and numerical simulation to the computation of iron losses in electrical machines. **Design/methodology/approach** - The probabilistic uncertainties in the iron losses are modelled with the spectral approach using chaos polynomials. The Sobol indices are used for the global sensitivity analysis. The machine is modelled with a 2D finite element method and the iron losses are computed with a previously developed accurate method. **Findings** - The uncertainties propagate in different ways to the different components of losses, i.e. eddy current, hysteresis, and excess losses. The propagation is also different depending on the investigated region of the machine, i.e. Stator or rotor teeth, yokes, tooth tips. **Research limitations/implications** - The method does not account for uncertainties related to the manufacturing process, which might result in even larger variability. **Practical implications** - A major implication of the findings is that the identification of iron loss parameters at low frequencies does not affect the loss variability. The identification with high-frequency measurement is very important for the rotor tooth tips. The variability in the excess loss parameters is of low impact. **Originality/value** - The presented results are of importance for the magnetic material manufacturers and the electrical machine designers. The manufacturers can plan the measurement and identification procedures as to minimize the output variability of the parameters. The designers of the machine can use the result and the presented procedures to estimate the variability of their design.

### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Smart Energy Systems (SES), Aalto University, L2EP, Université Lille 1, L2EP, Arts et Metiers Paris Tech

Contributors: Belahcen, A., Rasilo, P., Nguyen, T. T., Clénet, S.

Number of pages: 13

Pages: 624-636

Publication date: 2015

Peer-reviewed: Yes

### **Publication information**

Journal: COMPEL: The International Journal for Computation and Mathematics in Electrical and Electronic Engineering

Volume: 34

Issue number: 3

ISSN (Print): 0332-1649

Ratings:

Scopus rating (2015): CiteScore 0.68 SJR 0.231 SNIP 0.554

Original language: English

ASJC Scopus subject areas: Electrical and Electronic Engineering, Computer Science Applications, Computational Theory and Mathematics, Applied Mathematics

Keywords: Electrical machine, Finite element methods, Iron losses, Uncertainty estimation

DOIs:

10.1108/COMPEL-10-2014-0271

Source: Scopus

Source ID: 84929258660

Research output: Contribution to journal › Article › Scientific › peer-review

### **Class-Specific Reference Discriminant Analysis With Application in Human Behavior Analysis**

In this paper, a novel nonlinear subspace learning technique for class-specific data representation is proposed. A novel data representation is obtained by applying nonlinear class-specific data projection to a discriminant feature space, where the data belonging to the class under consideration are enforced to be close to their class representation, while the data belonging to the remaining classes are enforced to be as far as possible from it. A class is represented by an optimized class vector, enhancing class discrimination in the resulting feature space. An iterative optimization scheme is proposed to this end, where both the optimal nonlinear data projection and the optimal class representation are determined in each optimization step. The proposed approach is tested on three problems relating to human behavior analysis: Face recognition, facial expression recognition, and human action recognition. Experimental results denote the effectiveness of the proposed approach, since the proposed class-specific reference discriminant analysis outperforms kernel discriminant analysis, kernel spectral regression, and class-specific kernel discriminant analysis, as well as support vector machine-based classification, in most cases.

### General information

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Research Community on Data-to-Decision (D2D), Aristotle University of Thessaloniki, Department of Informatics

Contributors: Iosifidis, A., Tefas, A., Pitas, I.

Pages: 315-326

Publication date: 25 Dec 2014

Peer-reviewed: Yes

### Publication information

Journal: IEEE Transactions on Human-Machine Systems

Volume: 45

Issue number: 3

ISSN (Print): 2168-2291

Ratings:

Scopus rating (2014): CiteScore 2.98 SJR 1.28 SNIP 3.04

Original language: English

ASJC Scopus subject areas: Artificial Intelligence, Signal Processing, Human Factors and Ergonomics, Computer Networks and Communications, Computer Science Applications, Human-Computer Interaction, Control and Systems Engineering

DOIs:

10.1109/THMS.2014.2379274

Research output: Contribution to journal > Article > Scientific > peer-review

### Comparative evaluation of gene set analysis approaches for RNA-Seq data

**Background:** Over the last few years transcriptome sequencing (RNA-Seq) has almost completely taken over microarrays for high-throughput studies of gene expression. Currently, the most popular use of RNA-Seq is to identify genes which are differentially expressed between two or more conditions. Despite the importance of Gene Set Analysis (GSA) in the interpretation of the results from RNA-Seq experiments, the limitations of GSA methods developed for microarrays in the context of RNA-Seq data are not well understood. **Results:** We provide a thorough evaluation of popular multivariate and gene-level self-contained GSA approaches on simulated and real RNA-Seq data. The multivariate approach employs multivariate non-parametric tests combined with popular normalizations for RNA-Seq data. The gene-level approach utilizes univariate tests designed for the analysis of RNA-Seq data to find gene-specific  $-values$  and combines them into a pathway  $-value$  using classical statistical techniques. Our results demonstrate that the Type I error rate and the power of multivariate tests depend only on the test statistics and are insensitive to the different normalizations. In general standard multivariate GSA tests detect pathways that do not have any bias in terms of pathways size, percentage of differentially expressed genes, or average gene length in a pathway. In contrast the Type I error rate and the power of gene-level GSA tests are heavily affected by the methods for combining  $-values$ , and all aforementioned biases are present in detected pathways. **Conclusions:** Our result emphasizes the importance of using self-contained non-parametric multivariate tests for detecting differentially expressed pathways for RNA-Seq data and warns against applying gene-level GSA tests, especially because of their high level of Type I error rates for both, simulated and real data.

### General information

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Research Community on Data-to-Decision (D2D), University of Arkansas for Medical Sciences, Computational Biology and Machine Learning, Queen's University, Belfast, Northern Ireland

Contributors: Rahmatallah, Y., Emmert-Streib, F., Glazko, G.

Publication date: 5 Dec 2014

Peer-reviewed: Yes

### Publication information

Journal: BMC Bioinformatics

Volume: 15

Issue number: 1

Article number: 397

ISSN (Print): 1471-2105

Ratings:

Scopus rating (2014): CiteScore 2.91 SJR 1.916 SNIP 1.185

Original language: English

ASJC Scopus subject areas: Applied Mathematics, Structural Biology, Biochemistry, Molecular Biology, Computer Science Applications

DOIs:

10.1186/s12859-014-0397-8

URLs:

<http://www.scopus.com/inward/record.url?scp=84923922737&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84923922737

Research output: [Contribution to journal](#) › [Article](#) › [Scientific](#) › [peer-review](#)

### **Regularized extreme learning machine for multi-view semi-supervised action recognition**

In this paper, three novel classification algorithms aiming at (semi-)supervised action classification are proposed. Inspired by the effectiveness of discriminant subspace learning techniques and the fast and efficient Extreme Learning Machine (ELM) algorithm for Single-hidden Layer Feedforward Neural networks training, the ELM algorithm is extended by incorporating discrimination criteria in its optimization process, in order to enhance its classification performance. The proposed Discriminant ELM algorithm is extended, by incorporating proper regularization in its optimization process, in order to exploit information appearing in both labeled and unlabeled action instances. An iterative optimization scheme is proposed in order to address multi-view action classification. The proposed classification algorithms are evaluated on three publicly available action recognition databases providing state-of-the-art performance in all the cases.

#### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Research Community on Data-to-Decision (D2D), Aristotle University of Thessaloniki, Department of Informatics

Contributors: Iosifidis, A., Tefas, A., Pitas, I.

Number of pages: 13

Pages: 250-262

Publication date: 5 Dec 2014

Peer-reviewed: Yes

#### **Publication information**

Journal: Neurocomputing

Volume: 145

ISSN (Print): 0925-2312

Ratings:

Scopus rating (2014): CiteScore 2.99 SJR 0.875 SNIP 1.717

Original language: English

ASJC Scopus subject areas: Artificial Intelligence, Computer Science Applications, Cognitive Neuroscience

Keywords: Extreme learning machine, Multi-view learning, Semi-supervised learning

DOIs:

10.1016/j.neucom.2014.05.036

Source: Scopus

Source ID: 84906935799

Research output: [Contribution to journal](#) › [Article](#) › [Scientific](#) › [peer-review](#)

### **Body-touching: An embodied interaction technique for health information systems in developing regions**

We present a study of using embodied health information system for developing regions focusing on users not familiar with technology. We designed and developed a health information system with two gesture-based selection techniques: pointing to a screen and touching one's own body part. We evaluated the prototype in user study with 37 semi-literate and literate participants. Our results indicate a clear preference (76%) for touching in the healthcare domain. Based on our observations and user feedback, we present four design guidelines for developing embodied systems for the developing world: designing bodycentric interaction to overcome literacy and technological proficiency barriers, addressing the misconceptions of system behaviors with users not familiar with technology, understanding effects of cultural constraints on interaction, and utilizing interactive virtual avatars to connect with the users.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Augmented Human Activities (AHA), IBM Research, Indian Institute of Technology

Contributors: Sharma, S., Srivastava, S., Sorathia, K., Hakulinen, J., Heimonen, T., Turunen, M., Rajput, N.

Number of pages: 8

Pages: 49-56

Publication date: 4 Nov 2014

#### **Host publication information**

Title of host publication: MINDTREK 2014 - Proceedings of the 18th International Academic MindTrek Conference: "Media Business, Management, Content and Services"

Publisher: Association for Computing Machinery, Inc

ISBN (Electronic): 9781450330060

ASJC Scopus subject areas: Computer Science Applications, Human-Computer Interaction, Software

Keywords: Body-centric interaction, Embodied interaction, gesture-based interaction, HCI4D, Health information systems, Information access

DOIs:

10.1145/2676467.2676514

URLs:

<http://www.scopus.com/inward/record.url?scp=84964053943&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84964053943

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

### **DYNAMO sound engine - Exploring the aesthetics of dynamic sound interactions**

This paper outlines the design and development process of the Dynamic Audio Motion (Dynamo) concept. The Dynamo audio engine was developed for driving dynamic sound interaction states via custom made finite state machine. Further, a generative sound design approach was employed for creating sonic and musical structures. Designed dynamic sound interactions were tested in an embodied information wall application with endusers. During the testing situation, end-users engaged in a reflective creation process providing valuable insight of their experiences of using the system. In this paper we present key questions driving the research, theoretical background, research approach, an audio engine development process, and end-user research activities. The results indicate that dynamic sound interactions supported people's personal, emotional, and creative needs in the design context.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Augmented Human Activities (AHA)

Contributors: Luhtala, M., Heimonen, T., Mäkelä, V., Keskinen, T., Turunen, M., Saarinen, S.

Number of pages: 8

Pages: 159-166

Publication date: 4 Nov 2014

#### **Host publication information**

Title of host publication: MINDTREK 2014 - Proceedings of the 18th International Academic MindTrek Conference: "Media Business, Management, Content and Services"

Publisher: Association for Computing Machinery, Inc

ISBN (Electronic): 9781450330060

ASJC Scopus subject areas: Computer Science Applications, Human-Computer Interaction, Software

Keywords: Aesthetic experience, Artistic interfaces, Dynamic sound interaction, Multimodal interaction, Musicalization, Procedural sound design, Sonic interaction design

DOIs:

10.1145/2676467.2676522

URLs:

<http://www.scopus.com/inward/record.url?scp=84963995207&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84963995207

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

### **Email intensity, productivity and control in the knowledge worker's performance on the desktop**

Experiencing stress, disturbing interruptions, loss of ability to concentrate, hurry and challenges to meet tight deadlines at work are very common in working life. At the same time, while variety of digital communication channels like instant messaging, video calls and social networking sites are getting more popular in working life, email is still intensively utilized work communication media. The goal of the empirical field study analyzing daily desktop computing of knowledge workers was to analyze association between email intensity in work time spending and subjectively experienced quality of work performance. It was found that while intensive email use does not impair subjectively experienced productivity, it may harm ability to concentrate, may increase forgetfulness and inability to solve problems at work effectively. Copyright is held by the owner/author(s). Publication rights licensed to ACM.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Augmented Human Activities (AHA), University of Tampere

Contributors: Franssila, H., Okkonen, J., Savolainen, R.

Number of pages: 4

Pages: 19-22  
Publication date: 4 Nov 2014

#### Host publication information

Title of host publication: MINDTREK 2014 - Proceedings of the 18th International Academic MindTrek Conference: "Media Business, Management, Content and Services"

Publisher: Association for Computing Machinery, Inc

ISBN (Electronic): 9781450330060

ASJC Scopus subject areas: Computer Science Applications, Human-Computer Interaction, Software

Keywords: Email intensity, Knowledge work, Measurement, Productivity, Work performance

DOIs:

10.1145/2676467.2676513

URLs:

<http://www.scopus.com/inward/record.url?scp=84964078815&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84964078815

Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

#### Games and energy: Profiling power usage during play

Computer gaming is a globally growing industry, with hundreds of millions of gaming-capable computers consuming an ever increasing amount of energy. Several of the world's most popular computer games tend to make a heavy use of computers' central processing units and/or graphics processing units. When such games execute on typical computers, for much of the time those components are kept in high energy-consuming states, regardless of what is happening in the game. We analyze this pattern of energy usage and we assess the scope for economizing on energy. The results presented also give insight into the energy implications of the hardware platform and operating systems used for hosting such games. We use the results to provide practical suggestions to both the industry and the gamers. Copyright is held by the owner/author(s). Publication rights licensed to ACM.

#### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Mathematical modelling with wide societal impact (MathImpact), European Organization for Nuclear Research

Contributors: Salmela, J. M., Thanisch, P., Sotamaa, O., Niemi, T.

Number of pages: 8

Pages: 192-199

Publication date: 4 Nov 2014

#### Host publication information

Title of host publication: MINDTREK 2014 - Proceedings of the 18th International Academic MindTrek Conference: "Media Business, Management, Content and Services"

Publisher: Association for Computing Machinery, Inc

ISBN (Electronic): 9781450330060

ASJC Scopus subject areas: Computer Science Applications, Human-Computer Interaction, Software

Keywords: Computer games, Energy measurement

DOIs:

10.1145/2676467.2676488

URLs:

<http://www.scopus.com/inward/record.url?scp=84963995284&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84963995284

Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

#### MurMur Moderators, the talking playful seats

In this article we present the concept of MurMur Moderators, talking playful seats facilitating playful atmosphere and creativity at office environments. The article describes the design and technological composition of our first prototype, and our experiences exposing the concept to audiences at two science fairs in Italy (2013) and Finland (2014). This research has served as an informative pilot study, consequently directing our focus to the ways the accompanying narrative brings additional design value to the interactive seats. Our goal with the fairs was to investigate what are the preliminary audience reactions for the high level concept and how people interact with the initial prototype. The feedback was used for generating further ideas for ambient play and furniture-as-a-service, some of which carries on to future research and second prototype of the seat.

#### General information

Publication status: Published  
MoE publication type: A4 Article in a conference publication  
Organisations: Mathematical modelling with wide societal impact (MathImpact)  
Contributors: Nummenmaa, T., Kultima, A., Tyni, H., Alha, K.  
Number of pages: 7  
Pages: 231-237  
Publication date: 4 Nov 2014

#### Host publication information

Title of host publication: MINDTREK 2014 - Proceedings of the 18th International Academic MindTrek Conference: "Media Business, Management, Content and Services"  
Publisher: Association for Computing Machinery, Inc  
ISBN (Electronic): 9781450330060  
ASJC Scopus subject areas: Computer Science Applications, Human-Computer Interaction, Software  
Keywords: Arduino, Audio feedback, Design research, Diy, Game studies, Internet of things, Playful furniture, Raspberry pi  
DOIs:  
10.1145/2676467.2676505  
URLs:  
<http://www.scopus.com/inward/record.url?scp=84964027379&partnerID=8YFLogxK> (Link to publication in Scopus)  
Source: Scopus  
Source ID: 84964027379  
Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

#### On computation of calcium cycling anomalies in cardiomyocytes data

Induced pluripotent stem cell (iPSC) lines derived from skin fibroblasts of patients suffering from cardiac disorders were differentiated to cardiomyocytes and used to generate a data set of  $Ca^{2+}$  transients of 136 recordings. The objective was to separate normal signals for later medical research from abnormal signals. We constructed a signal analysis procedure to detect peaks representing calcium cycling in signals and another procedure to classify them into either normal or abnormal peaks. Using machine learning methods we classified signals into normal or abnormal signals on the basis of peak findings in them. We compared classification results obtained to those made visually by an expert biotechnologist who assessed the signals independent of the computer method. Classification accuracies of around 85% indicated high congruence between two modes denoting the high capability and usefulness of computer based processing for the present data.

#### General information

Publication status: Published  
MoE publication type: A4 Article in a conference publication  
Organisations: BioMediTech, Augmented Human Activities (AHA), Integrated Technologies for Tissue Engineering Research (ITTE)  
Contributors: Juhola, M., Joutsijoki, H., Varpa, K., Saarikoski, J., Rasku, J., Iltanen, K., Laurikkala, J., Hyyro, H., Avalos-Salguero, J., Siirtola, H., Penttinen, K., Aalto-Setälä, K.  
Number of pages: 4  
Pages: 1444-1447  
Publication date: 2 Nov 2014

#### Host publication information

Title of host publication: 2014 36th Annual International Conference of the IEEE Engineering in Medicine and Biology Society, EMBC 2014  
Publisher: Institute of Electrical and Electronics Engineers Inc.  
Article number: 6943872  
ISBN (Electronic): 9781424479290  
ASJC Scopus subject areas: Health Informatics, Computer Science Applications, Biomedical Engineering  
Keywords: Calcium cycling, cardiomyocytes, classification, signal analysis  
DOIs:  
10.1109/EMBC.2014.6943872  
URLs:  
<http://www.scopus.com/inward/record.url?scp=84929461388&partnerID=8YFLogxK> (Link to publication in Scopus)  
Source: Scopus  
Source ID: 84929461388  
Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

#### RF tag front-end design for uncompromised communication and harvesting

Typically, low-cost and low-power backscatter radio communicators utilize a switching mechanism for alternating the antenna load between two values. In this way, they achieve modulation by reflection of the RF waves induced at the communicator's antenna. For tags that employ a rectifier for wireless energy harvesting, a single transistor may switch

between the matched harvester and a reflective load (an open or short). However, optimized backscatter communication occurs when switching between two reflective loads, ideally an open and a short. This prohibits the use of a harvester that requires a good matching (i.e. no reflections) and produces a tradeoff of either compromising communication performance or not employing a harvester. Although this may not pose a problem for commodity RFID tags that operate in short ranges and do not require high computational ability, it is a strong limitation for applications like wireless sensor networks that employ backscatter radio as a low-cost and low-power communication scheme. In this work, an RF front-end is designed, analyzed, and implemented, that overcomes the limitation of compromising communication performance when employing a harvester.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Sensing Systems for Wireless Medicine (MediSense), Georgia Institute of Technology

Contributors: Kimionis, J., Tentzeris, M. M.

Number of pages: 6

Pages: 109-114

Publication date: 22 Oct 2014

#### **Host publication information**

Title of host publication: 2014 IEEE RFID Technology and Applications Conference, RFID-TA 2014

Publisher: Institute of Electrical and Electronics Engineers Inc.

Article number: 6934210

ISBN (Electronic): 9781479946808

ASJC Scopus subject areas: Computer Networks and Communications, Computer Science Applications, Electrical and Electronic Engineering

Keywords: backscatter radio, communication, harvesting, RFID, tag design

DOIs:

10.1109/RFID-TA.2014.6934210

URLs:

<http://www.scopus.com/inward/record.url?scp=84912130713&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84912130713

Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

#### **Understanding social OER environments-A quantitative study on factors influencing the motivation to share and collaborate**

Social software environments are increasingly used for open education: teachers and learners share and collaborate in these environments. While there are various possibilities for the inclusion of such social functionalities for OER, many organizational, individual and technological challenges can hinder the motivation of teachers to share and collaborate in these environments. Current research cannot explain what barriers teachers face in social OER environments and how those challenges influence their motivation to engage in such environments. An exploratory factor analysis was used in the context of schools and higher education institutions to investigate the possible barriers to engaging in social OER environments; a linear regression analysis was used to predict how the extracted factors influenced the motivation of teachers (N = 754) to share and collaborate. The findings allude to barriers within social OER environments; the main challenges relate to the lack of organizational support, language and culture as well as quality concerns. The key results depict how teachers' motivation to share and collaborate in these environments decreases when they perceive higher language and cultural barriers. These findings can support OER providers as well as educational institutions in their efforts to minimize those barriers.

#### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Managing digital industrial transformation (mDIT), Jyväskylän yliopisto

Contributors: Pirkkalainen, H., Jokinen, J. P. P., Pawlowski, J. M.

Number of pages: 13

Pages: 388-400

Publication date: 1 Oct 2014

Peer-reviewed: Yes

#### **Publication information**

Journal: IEEE Transactions on Learning Technologies

Volume: 7

Issue number: 4

Article number: 6823168

ISSN (Print): 1939-1382

Ratings:

Scopus rating (2014): CiteScore 2.42 SJR 0.768 SNIP 2.144

Original language: English

ASJC Scopus subject areas: Engineering(all), Computer Science Applications, Education

Keywords: knowledge management, knowledge sharing, Social technologies, user generated learning content

DOIs:

10.1109/TLT.2014.2323970

URLs:

<http://www.scopus.com/inward/record.url?scp=84919783368&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84919783368

Research output: Contribution to journal › Article › Scientific › peer-review

### Density functional theory study of transition metals doped B<sub>80</sub> fullerene

Density functional theory calculations have been carried out to investigate 3d, Pd and Pt transition metal (TM) atoms exohedrally and endohedrally doped B<sub>80</sub> fullerene. We find that the most preferred doping site of the TM atom gradually moves from the outer surface (TM = Sc), to the inner surface (TM = Ti and V) and the center (TM = Cr, Mn, Fe and Zn), then to the outer surface (TM = Co, Ni, Cu, Pd, and Pt) again with the TM atom varying from Sc to Pt. From the formation energy calculations, we find that doping TM atom can further improve the stability of B<sub>80</sub> fullerene. The magnetic moments of doped V, Cr, Mn, Fe, Co and Ni atoms are reduced from their free-atom values and other TM atoms are completely quenched. Charge transfer and hybridization between 4s and 3d states of TM and 2s and 2p states of B were observed. The energy gaps of TM@B<sub>80</sub> are usually smaller than that of the pure B<sub>80</sub>. Endohedrally doped B<sub>80</sub> fullerene with two Mn and two Fe atoms were also considered, respectively. It is found that the antiferromagnetic (AFM) state is more energetically favorable than the ferromagnetic (FM) state for Mn<sub>2</sub>- and Fe<sub>2</sub>@B<sub>80</sub>. The Mn and Fe atoms carry the residual magnetic moments of ~ 3 μ<sub>B</sub> and 2 μ<sub>B</sub> in the AFM states.

#### General information

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Computational Science X (CompX), National Key Laboratory of Photoelectric Technology and Functional Materials in Shaanxi Province, Northwest University China, Nanjing University

Contributors: Wang, J., Ma, L., Liang, Y., Gao, M., Wang, G.

Publication date: 22 Sep 2014

Peer-reviewed: Yes

#### Publication information

Journal: Journal of Theoretical and Computational Chemistry

Volume: 13

Issue number: 6

Article number: 1450050

ISSN (Print): 0219-6336

Ratings:

Scopus rating (2014): CiteScore 0.48 SJR 0.22 SNIP 0.243

Original language: English

ASJC Scopus subject areas: Physical and Theoretical Chemistry, Computational Theory and Mathematics, Computer Science Applications

Keywords: B<sub>80</sub> fullerene, density functional theory, doped, Transition metal

DOIs:

10.1142/S0219633614500503

URLs:

<http://www.scopus.com/inward/record.url?scp=84929575039&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84929575039

Research output: Contribution to journal › Article › Scientific › peer-review

### Effect of feeder cable's phase tolerance on the first sidelobe level of base station antenna

The sidelobe level of a base station antenna is one of the important parameters to describe the performance of an antenna array. Given a required value of the sidelobe level, we can obtain a set of initial phases, and then further get a set of cable lengths. However, a tolerance (or error range) associated with manufacturing techniques will introduce an error in each cable length, thereby influencing the sidelobe level. This paper uses the knowledge of probability and mathematical statistics to make a statistical analysis for the reliability of the first sidelobe of the antenna array based on Monte Carlo simulations. We also obtain a distribution curve of reliabilities of the first sidelobe versus phase tolerances, which can bring great convenience for practical applications.

### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Sensing Systems for Wireless Medicine (MediSense), Georgia Institute of Technology, Shenzhen University

Contributors: He, Y., Pan, Z., Yang, J., Sun, G., Tentzeris, M. M.

Number of pages: 5

Pages: 1022-1026

Publication date: 22 Sep 2014

### Host publication information

Title of host publication: IWCMC 2014 - 10th International Wireless Communications and Mobile Computing Conference

Publisher: Institute of Electrical and Electronics Engineers Inc.

Article number: 6906495

ISBN (Electronic): 9781479909599

ASJC Scopus subject areas: Computer Science Applications, Electrical and Electronic Engineering, Computer Networks and Communications

Keywords: first sidelobe, MATLAB, Monte Carlo, phase tolerance

DOIs:

10.1109/IWCMC.2014.6906495

URLs:

<http://www.scopus.com/inward/record.url?scp=84908637018&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84908637018

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

### Adaptive sampling for compressed sensing based image compression

The compressed sensing (CS) theory shows that a sparse signal can be recovered at a sampling rate that is (much) lower than the required Nyquist rate. In practice, many image signals are sparse in a certain domain, and because of this, the CS theory has been successfully applied to the image compression in the past few years. The most popular CS-based image compression scheme is the block-based CS (BCS). In this paper, we focus on the design of an adaptive sampling mechanism for the BCS through a deep analysis of the statistical information of each image block. Specifically, this analysis will be carried out at the encoder side (which needs a few overhead bits) and the decoder side (which requires a feedback to the encoder side), respectively. Two corresponding solutions will be compared carefully in our work. We also present experimental results to show that our proposed adaptive method offers a remarkable quality improvement compared with the traditional BCS schemes.

### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Department of Signal Processing, Research group: Video, Research Community on Data-to-Decision (D2D), Institute of Image Processing, University of Electronic Science and Technology of China

Contributors: Zhu, S., Zeng, B., Gabbouj, M.

Publication date: 3 Sep 2014

### Host publication information

Title of host publication: 2014 IEEE International Conference on Multimedia and Expo (ICME), 14-18 July 2014, Chengdu

ISBN (Print): 9781479947607

ASJC Scopus subject areas: Computer Networks and Communications, Computer Science Applications

Keywords: adaptive CS sampling, compressed sensing (CS), image compression

DOIs:

10.1109/ICME.2014.6890268

Source: Scopus

Source ID: 84937510540

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

### Analysis of a city-region from the knowledge perspective: Tampere, Finland

Purpose - The paper aims to evaluate the knowledge-based urban development (KBUD) dynamics of a rapidly emerging knowledge city-region, Tampere region, Finland. Design/methodology/approach - The paper empirically investigates Tampere region's development achievements and progress from the knowledge perspective. Findings - The research, through qualitative and quantitative analyses, reveals the regional development strengths, weaknesses, opportunities and threats of Tampere region. Originality/value - The paper provides useful suggestions based on the lessons learned from the Tampere case investigation that could shed light on the KBUD journey of city-regions.

### General information

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Department of Information Management and Logistics, Research group: Novi, Queensland University of Technology QUT, School of Management

Contributors: Yigitcanlar, T., Lönnqvist, A., Salenius, H.

Number of pages: 22

Pages: 445-466

Publication date: 5 Aug 2014

Peer-reviewed: Yes

### Publication information

Journal: VINE

Volume: 44

Issue number: 3

ISSN (Print): 0305-5728

Ratings:

Scopus rating (2014): CiteScore 0.89 SJR 0.243 SNIP 0.547

Original language: English

ASJC Scopus subject areas: Computer Science Applications, Library and Information Sciences

Keywords: City-region, Finland, Knowledge-based urban development, Regional development, Tampere

DOIs:

10.1108/VINE-09-2013-0056

URLs:

<http://www.scopus.com/inward/record.url?scp=84908236523&partnerID=8YFLogxK> (Link to publication in Scopus)

### Bibliographical note

EXT="Lönnqvist, Antti"

Source: Scopus

Source ID: 84908236523

Research output: Contribution to journal > Article > Scientific > peer-review

### An enumeration-based model predictive control strategy for the cascaded H-bridge multilevel rectifier

In this paper, a model predictive control strategy is adapted to the cascaded H-bridge (CHB) multilevel rectifier. The proposed control scheme aims to keep the sinusoidal input current in phase with the supply voltage and to achieve independent voltage regulation of the H-bridge cells. To do so, the switches are directly manipulated without the need of a modulator. Furthermore, since all the possible switching combinations are taken into account, the controller exhibits favorable performance not only under nominal conditions but also under asymmetrical voltage potentials and unbalanced loads. Finally, a short horizon is employed in order to ensure robustness; this way, the required computational effort remains reasonable, making it possible to implement the algorithm in a real-time system. Experimental results obtained from a two-cell CHB rectifier are presented in order to demonstrate the performance of the proposed approach.

### General information

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Smart Energy Systems (SES), Technische Universität München, ABB Oy, National Technical University of Athens

Contributors: Karamanakos, P., Pavlou, K., Manias, S.

Number of pages: 10

Pages: 3480-3489

Publication date: Jul 2014

Peer-reviewed: Yes

### Publication information

Journal: IEEE Transactions on Industrial Electronics

Volume: 61

Issue number: 7

ISSN (Print): 0278-0046

Ratings:

Scopus rating (2014): CiteScore 9.19 SJR 2.341 SNIP 4.549

Original language: English

ASJC Scopus subject areas: Electrical and Electronic Engineering, Control and Systems Engineering, Computer Science Applications

Keywords: Cascaded H-bridge (CHB) multilevel rectifier, model predictive control (MPC), optimal control

DOIs:

10.1109/TIE.2013.2278965

Source: Scopus

Source ID: 84894195338

Research output: Contribution to journal › Article › Scientific › peer-review

### **NetBioV: An R package for visualizing large network data in biology and medicine**

NetBioV (Network Biology Visualization) is an R package that allows the visualization of large network data in biology and medicine. The purpose of NetBioV is to enable an organized and reproducible visualization of networks by emphasizing or highlighting specific structural properties that are of biological relevance.

#### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Research Community on Data-to-Decision (D2D), Prostate cancer research center (PCRC), Queen's University, Belfast, Northern Ireland, Universität der Bundeswehr München, Computational Biology and Machine Learning

Contributors: Tripathi, S., Dehmer, M., Emmert-Streib, F.

Number of pages: 3

Pages: 2834-2836

Publication date: 2 Apr 2014

Peer-reviewed: Yes

#### **Publication information**

Journal: Bioinformatics

Volume: 30

Issue number: 19

ISSN (Print): 1367-4803

Ratings:

Scopus rating (2014): CiteScore 5.5 SJR 4.171 SNIP 1.838

Original language: English

ASJC Scopus subject areas: Biochemistry, Molecular Biology, Computational Theory and Mathematics, Computer Science Applications, Computational Mathematics, Statistics and Probability, Medicine(all)

DOIs:

10.1093/bioinformatics/btu384

URLs:

<http://www.scopus.com/inward/record.url?scp=84911403383&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84911403383

Research output: Contribution to journal › Article › Scientific › peer-review

### **The emerging application ecosystems: An introductory analysis of android ecosystem**

Emerging mobile application ecosystems have had a clear effect on the software business. Apple App Store and Google Play have gathered both existing large software companies and new start-ups. In creating a healthy ecosystem, the role of the software developer is significant. In practice, the ecosystems' ability to entice developers to create software products to the ecosystem can be argued to be a major factor driving the competitiveness of the ecosystem. This article empirically investigates Google Play, by gathering the data of 350,000 applications from the marketplace. With the dataset, common assumptions linked to the marketplace are studied. The results show that the direct software sale is a practical revenue model only for a few while offering a trial and paid version of the application seems to improve the revenue. The impact of the number of applications in the marketplace is questioned.

#### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Managing digital industrial transformation (mDIT), University of Turku, Turku School of Economics, University of Turku, VTT Technical Research Centre of Finland

Contributors: Hyrynsalmi, S., Suominen, A., Mäkilä, T., Knuutila, T.

Number of pages: 21

Pages: 61-81

Publication date: 1 Apr 2014

Peer-reviewed: Yes

#### **Publication information**

Journal: INTERNATIONAL JOURNAL OF E-BUSINESS RESEARCH

Volume: 10

Issue number: 2

ISSN (Print): 1548-1131

Ratings:

Scopus rating (2014): CiteScore 0.4 SJR 0.174 SNIP 0.218

Original language: English

ASJC Scopus subject areas: Management Information Systems, Computer Science Applications

Keywords: App economy, Application marketplace, Freemium, Google play, Mobile ecosystem

DOIs:

10.4018/ijebr.2014040104

Source: Scopus

Source ID: 84928235907

Research output: Contribution to journal › Article › Scientific › peer-review

### **System integration for real-time mobile manipulation**

Mobile manipulators are one of the most complicated types of mechatronics systems. The performance of these robots in performing complex manipulation tasks is highly correlated with the synchronization and integration of their low-level components. This paper discusses in detail the mechatronics design of a four wheel steered mobile manipulator. It presents the manipulator's mechanical structure and electrical interfaces, designs low-level software architecture based on embedded PC-based controls, and proposes a systematic solution based on code generation products of MATLAB and Simulink. The remote development environment described here is used to develop real-time controller software and modules for the mobile manipulator under a POSIX-compliant, real-time Linux operating system. Our approach enables developers to reliably design controller modules that meet the hard real-time constraints of the entire low-level system architecture. Moreover, it provides a systematic framework for the development and integration of hardware devices with various communication mediums and protocols, which facilitates the development and integration process of the software controller. © 2014 The Author(s). Licensee InTech.

### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Tampere University of Technology, Department of Intelligent Hydraulics and Automation, Research group:

Mobile manipulation, Research group: Field robotics and control, Field robotics for efficient work sites (FIRE)

Contributors: Oftadeh, R., Aref, M. M., Ghabelloo, R., Mattila, J.

Publication date: 28 Mar 2014

Peer-reviewed: Yes

### **Publication information**

Journal: international Journal of Advanced Robotic Systems

Volume: 11

Issue number: 1

Article number: 51

ISSN (Print): 1729-8806

Ratings:

Scopus rating (2014): CiteScore 0.89 SJR 0.297 SNIP 0.76

Original language: English

ASJC Scopus subject areas: Software, Artificial Intelligence, Computer Science Applications

Keywords: Autonomous vehicles, Mechatronic design, Mobile manipulators, Real-time systems

DOIs:

10.5772/58467

URLs:

<http://www.scopus.com/inward/record.url?scp=84897565578&partnerID=8YFLogxK> (Link to publication in Scopus)

### **Bibliographical note**

Contribution: organisation=iha,FACT1=1<br/>Portfolio EDEND: 2014-05-30<br/>Publisher name: InTech Open Access Publisher

Source: researchoutputwizard

Source ID: 1179

Research output: Contribution to journal › Article › Scientific › peer-review

### **Radar micro-Doppler feature extraction using the Singular Value Decomposition**

The micro-Doppler spectrogram depends on parts of a target moving and rotating in addition to the main body motion (e.g., spinning rotor blades) and is thus characteristic for the type of target. In this study, the micro-Doppler spectrogram is exploited to distinguish between birds and small unmanned aerial vehicles (UAVs). The focus hereby is on micro-Doppler features enabling fast classification of birds and mini-UAVs. In a second classification step, it is desired to exploit micro-Doppler features to further characterize the type of UAV, e.g., fixed-wing vs. rotary-wing. In this paper, potentially robust features are discussed supporting the first classification step, i.e., separation of birds and UAVs. The Singular Value Decomposition seems a powerful tool to extract such features, since the information content of the micro-Doppler

spectrogram is preserved in the singular vectors. In the paper, some examples of micro-Doppler feature extraction via Singular Value Decomposition are given.

#### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Department of Signal Processing, TNO, Thales Nederland B.V.

Contributors: De Wit, J. J. M., Harmanny, R. I. A., Molchanov, P.

Publication date: 12 Mar 2014

#### Host publication information

Title of host publication: 2014 International Radar Conference, Radar 2014

Publisher: The Institute of Electrical and Electronics Engineers, Inc.

ISBN (Print): 9781479941957

ASJC Scopus subject areas: Computer Science Applications, Computer Networks and Communications, Signal Processing, Electrical and Electronic Engineering

Keywords: classification, micro-Doppler signature, mini-UAVs, radar, singular value decomposition, time-frequency analysis

DOIs:

10.1109/RADAR.2014.7060268

Source: Scopus

Source ID: 84946690619

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

#### A computational approach to construct a multivariate complete graph invariant

In this paper, we present a computational approach for finding complete graph invariants. Specifically, we generate exhaustive sets of connected, non-isomorphic graphs with 9 and 10 vertices and demonstrate that a 97-dimensional multivariate graph invariant is capable to distinguish each of the non-isomorphic graphs. Furthermore, in order to tame the computational complexity of the problem caused by the vast number of graphs, e.g., involving over 10 million networks with 10 vertices, we suggest a low-dimensional, iterative procedure that is based on highly discriminative individual graph invariants. We show that also this computational approach leads to a perfect discrimination. Overall, our numerical results prove the existence of such graph invariants for networks with 9 and 10 vertices. Furthermore, we show that our iterative approach has a polynomial time complexity.

#### General information

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Research Community on Data-to-Decision (D2D), 6060 Hall in Tyrol, Computational Biology and Machine Learning, Queen's University, Belfast, Northern Ireland

Contributors: Dehmer, M., Emmert-Streib, F., Grabner, M.

Number of pages: 9

Pages: 200-208

Publication date: 1 Mar 2014

Peer-reviewed: Yes

#### Publication information

Journal: Information Sciences

Volume: 260

ISSN (Print): 0020-0255

Ratings:

Scopus rating (2014): CiteScore 5.47 SJR 2.226 SNIP 3.198

Original language: English

ASJC Scopus subject areas: Artificial Intelligence, Software, Control and Systems Engineering, Theoretical Computer Science, Computer Science Applications, Information Systems and Management

Keywords: Information inequality, Quantitative graph theory, Random network model, Statistics

DOIs:

10.1016/j.ins.2013.11.008

URLs:

<http://www.scopus.com/inward/record.url?scp=84891738883&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84891738883

Research output: Contribution to journal > Article > Scientific > peer-review

### **Developing novel multimodal interaction techniques for touchscreen in-vehicle infotainment systems**

Haptics has been an integral part of multimodal systems in Human Computer Interaction (HCI). The ability to touch and sense virtual components of any system has long been the holy grail of HCI, which is particularly useful in mission critical environments where other modalities are weakened by environmental noise. Haptics also compliments most modalities of interaction by reinforcing the intimate and personal aspect of interaction. Haptics becomes much more important in environments that prove to be far too noisy for audio feedback. The driving environment is one such area, which the addition of haptics is not just additive, but critical in HCI. However, most of the research on haptic feedback in the car has been conducted using vibro-tactile feedback. In this paper, we present a system in which we have developed a novel haptic feedback environment using pneumatic and vibrotactile technologies, to facilitate in car communication, using the In-vehicle Infotainment System. Our aim was to build on the user haptic perception and experience the advance multimodal interaction system by utilizing available feedback techniques in, in-car interaction. The qualitative results of our study show that haptic feedback has great potential for safety and communication use, but the difficulty in interpreting haptic signals requires additional translation means ('semantic linkages'), to support the right interpretation of the haptic information.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Augmented Human Activities (AHA)

Contributors: Farooq, A., Evreinov, G., Raisamo, R., Mäkinen, E., Nukarinen, T., Majeed, A. A.

Number of pages: 11

Pages: 32-42

Publication date: 2 Feb 2014

#### **Host publication information**

Title of host publication: ICOSST 2014 - 2014 International Conference on Open Source Systems and Technologies, Proceedings

Publisher: Institute of Electrical and Electronics Engineers Inc.

Article number: 7029317

ISBN (Electronic): 9781479920549

ASJC Scopus subject areas: Computer Science Applications, Software

Keywords: haptic feedback, human computer interaction, In-Vehicle Infotainment Systems, Multimodal Interaction, pneumatic feedback, tactile/vibro-tactile feedback

DOIs:

10.1109/ICOSST.2014.7029317

URLs:

<http://www.scopus.com/inward/record.url?scp=84946688361&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84946688361

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

### **Haptic user interface enhancement system for touchscreen based interaction: A novel system for multimodal interaction with touchscreen interfaces**

Touchscreens are becoming a more attractive interaction technology in our daily lives and they are quickly replacing most of the conventional user interface controls. The ability to continuously modify and reconfigure screen contacts is a valuable feature in any device, especially in mobile devices like smartphones and tablets, where every inch matters. Perhaps the most inviting aspect of touchscreens is their ability to detect gestures and recognize human activities. Unlike externally static interfaces with a dedicated input device, such as a keypad with discrete well-defined keys; most touch sensitive displays are embodied as a flat, stiff and ridged screen surface. As a result, touch sensitive displays are breaking down and do not follow either ergonomic rules and standards nor physiological and psychological models/concepts of the afferent flow information processing. This, in turn, means that these systems diminish perceptual and intuitive haptic feedback which hinders and sometime limits user interaction. This paper defines a Haptic User Interface Enhancement System (UIES) that transforms the conventionally flat and stiff touchscreen surfaces into a haptically adaptive interaction hub which is not only able to provide generic vibrotactile stimulation for conformational haptic feedback but is able to guide the user through onscreen User Interface controls via kinetic feedback cues which includes components of forces and torques applied dynamically in the place of contact to the fingertips.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Augmented Human Activities (AHA)

Contributors: Farooq, A., Evreinov, G., Raisamo, R., Majeed, A. A.

Number of pages: 7

Pages: 25-31

Publication date: 2 Feb 2014

### Host publication information

Title of host publication: ICOSST 2014 - 2014 International Conference on Open Source Systems and Technologies, Proceedings

Publisher: Institute of Electrical and Electronics Engineers Inc.

Article number: 7029316

ISBN (Electronic): 9781479920549

ASJC Scopus subject areas: Computer Science Applications, Software

Keywords: Haptics, kinesthetic feedback, Multimodal Interaction, Touchscreen Interaction, Vibrotactile

DOIs:

10.1109/ICOSST.2014.7029316

URLs:

<http://www.scopus.com/inward/record.url?scp=84946686310&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84946686310

Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

### Gene Sets Net Correlations Analysis (GSNCA): A multivariate differential coexpression test for gene sets

Motivation: To date, gene set analysis approaches primarily focus on identifying differentially expressed gene sets (pathways). Methods for identifying differentially coexpressed pathways also exist but are mostly based on aggregated pairwise correlations or other pairwise measures of coexpression. Instead, we propose Gene Sets Net Correlations Analysis (GSNCA), a multivariate differential coexpression test that accounts for the complete correlation structure between genes. Results: In GSNCA, weight factors are assigned to genes in proportion to the genes' cross-correlations (intergene correlations). The problem of finding the weight vectors is formulated as an eigenvector problem with a unique solution. GSNCA tests the null hypothesis that for a gene set there is no difference in the weight vectors of the genes between two conditions. In simulation studies and the analyses of experimental data, we demonstrate that GSNCA captures changes in the structure of genes' cross-correlations rather than differences in the averaged pairwise correlations. Thus, GSNCA infers differences in coexpression networks, however, bypassing method-dependent steps of network inference. As an additional result from GSNCA, we define hub genes as genes with the largest weights and show that these genes correspond frequently to major and specific pathway regulators, as well as to genes that are most affected by the biological difference between two conditions. In summary, GSNCA is a new approach for the analysis of differentially coexpressed pathways that also evaluates the importance of the genes in the pathways, thus providing unique information that may result in the generation of novel biological hypotheses.

### General information

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Research Community on Data-to-Decision (D2D), University of Arkansas for Medical Sciences, Computational Biology and Machine Learning, Queen's University, Belfast, Northern Ireland

Contributors: Rahmatallah, Y., Emmert-Streib, F., Glazko, G.

Number of pages: 9

Pages: 360-368

Publication date: 1 Feb 2014

Peer-reviewed: Yes

### Publication information

Journal: Bioinformatics

Volume: 30

Issue number: 3

ISSN (Print): 1367-4803

Ratings:

Scopus rating (2014): CiteScore 5.5 SJR 4.171 SNIP 1.838

Original language: English

ASJC Scopus subject areas: Biochemistry, Molecular Biology, Computational Theory and Mathematics, Computer Science Applications, Computational Mathematics, Statistics and Probability, Medicine(all)

DOIs:

10.1093/bioinformatics/btt687

URLs:

<http://www.scopus.com/inward/record.url?scp=84893275855&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84893275855

Research output: Contribution to journal › Article › Scientific › peer-review

### **The lord of the sense: A privacy preserving reputation system for participatory sensing applications**

Electronic devices we use on a daily basis collect sensitive information without preserving user's privacy. In this paper, we propose the lord of the sense (LotS), a privacy preserving reputation system for participatory sensing applications. Our system maintains the privacy and anonymity of information with the use of cryptographic techniques and combines voting approaches to support users' reputation. Furthermore, LotS maintains accountability by tracing back a misbehaving user while maintaining k-anonymity. A detailed security analysis is presented with the current advantages and disadvantages of our system.

#### **General information**

Publication status: Published  
MoE publication type: A4 Article in a conference publication  
Organisations: Security Lab, SICS, City University London  
Contributors: Michalás, A., Komninos, N.  
Publication date: 1 Jan 2014

#### **Host publication information**

Title of host publication: 2014 IEEE Symposium on Computers and Communications, ISCC 2014 - Proceedings  
Publisher: Institute of Electrical and Electronics Engineers Inc.  
Article number: 6912480  
ISBN (Electronic): 9781479942787  
ASJC Scopus subject areas: Software, Signal Processing, Mathematics(all), Computer Science Applications, Computer Networks and Communications  
Keywords: Anonymity, Distributed Sensing, Participatory Sensing, Privacy, Reputation Systems, Security, Urban Sensing  
DOIs:  
10.1109/ISCC.2014.6912480  
Source: Scopus  
Source ID: 84908199099  
Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

### **A hand-held immaterial volumetric display**

We have created an ultralight, movable, "immaterial" fogscreen. It is based on the fogscreen mid-air imaging technology. The hand-held unit is roughly the size and weight of an ordinary toaster. If the screen is tracked, it can be swept in the air to create mid-air slices of volumetric objects, or to show augmented reality (AR) content on top of real objects. Interfacing devices and methodologies, such as hand and gesture trackers, camera-based trackers and object recognition, can make the screen interactive. The user can easily interact with any physical object or virtual information, as the screen is permeable. Any real objects can be seen through the screen, instead of e.g., through a video-based augmented reality screen. It creates a mixed reality setup where both the real world object and the augmented reality content can be viewed and interacted with simultaneously. The hand-held mid-air screen can be used e.g., as a novel collaborating or classroom tool for individual students or small groups.

#### **General information**

Publication status: Published  
MoE publication type: A4 Article in a conference publication  
Organisations: Augmented Human Activities (AHA), University of Tampere  
Contributors: Sand, A., Rakkolainen, I.  
Publication date: 2014

#### **Host publication information**

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Volume: 9011  
Publisher: SPIE  
Article number: 90110Q  
ISBN (Print): 9780819499288  
ASJC Scopus subject areas: Electronic, Optical and Magnetic Materials, Condensed Matter Physics, Computer Science Applications, Applied Mathematics, Electrical and Electronic Engineering  
Keywords: display technology, Fog screen, mixed reality, volumetric, walk-through screen  
DOIs:  
10.1117/12.2035280  
URLs:  
<http://www.scopus.com/inward/record.url?scp=84901008644&partnerID=8YFLogxK> (Link to publication in Scopus)  
Source: Scopus  
Source ID: 84901008644  
Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

### **An origami inspired reconfigurable spiral antenna**

Modern day systems often require reconfigurability in the operating parameters of the transmit and receive antennas, such as the resonant frequency, radiation pattern, impedance, or polarization. In this work a novel approach to antenna reconfigurability is presented by integrating antennas with the ancient art of origami. The proposed antenna consists of an inkjet printed center-fed spiral antenna, which is designed to resonate at 1.0GHz and have a reconfigurable radiation pattern while maintaining the 1.0GHz resonance with little variation in input impedance. When flat, the antenna is a planar spiral exhibiting a bidirectional radiation pattern. By a telescoping action, the antenna can be reconfigured into a conical spiral with a directional pattern and higher gain, which gives the antenna a large front-to-back ratio. Construction of the antenna in this manner allows for a simple, lightweight, transportable antenna that can expand to specifications in the field.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Sensing Systems for Wireless Medicine (MediSense), Georgia Institute of Technology

Contributors: Saintsing, C. D., Cook, B. S., Tentzeris, M. M.

Publication date: 2014

#### **Host publication information**

Title of host publication: 38th Mechanisms and Robotics Conference

Volume: 5B

Publisher: The American Society of Mechanical Engineers ASME

ISBN (Electronic): 9780791846377

ASJC Scopus subject areas: Modelling and Simulation, Mechanical Engineering, Computer Science Applications, Computer Graphics and Computer-Aided Design

DOIs:

10.1115/DETC201435353

URLs:

<http://www.scopus.com/inward/record.url?scp=84926029890&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84926029890

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

### **Avoiding anomalies when modeling a many-to-many relationship in a multidimensional database**

Multidimensional database cubes are easier to design and use when the dimension attributes and fact table measures are in one-to-many relationships in the data warehouse. The anomalies that can arise when users browse a cube that incorporates dimensions with many-to-many relationships are widely documented by practitioners. We categorise many-to-many relationships in terms of their associated design problems and we present two techniques for modelling restricted forms of many-to-many relationships. We demonstrate that the techniques can avoid anomalies and we discuss performance implications.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Research Community on Data-to-Decision (D2D), Mathematical modelling with wide societal impact (MathImpact)

Contributors: Thanisch, P., Lindell, T., Nummenmaa, J., Nummenmaa, T.

Publication date: 2014

#### **Host publication information**

Title of host publication: BIR 2009 - 8th International Conference on Perspectives in Business Informatics Research

Publisher: Kristianstad Academic Press

ASJC Scopus subject areas: Management of Technology and Innovation, Computer Science Applications

URLs:

<http://www.scopus.com/inward/record.url?scp=84918824678&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84918824678

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

### **Building energy-efficiency interventions in North-East Europe: Effects on indoor environmental quality and public health**

INSULAtE project aims to develop a common protocol for assessment of improving energy efficiency (EE) of dwellings on indoor environmental quality (IEQ) and public health in Europe. So far, measurement data on IEQ parameters (PM, CO, CO<sub>2</sub>, VOCs, formaldehyde, NO<sub>2</sub>, radon, T and RH) and questionnaire data from occupants were collected from 16 multifamily buildings (94 apartments in Finland and 20 (96 apartments) in Lithuania before renovation. Most parameters were within recommended limits; however, the data revealed different baselines (before renovation) for each country both in terms of the IEQ parameters and the respondents' satisfaction regarding their residence and indoor air quality. Post

renovation data (from one building in each country) showed potential changes in the measured parameters, while further analyses are needed once the data have been collected. The results of this project will be used in developing guidance and support the implementation of the related policies.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Life Cycle Effectiveness of the Built Environment (LCE@BE), Research group: Concrete and Bridge Structures, Department of Civil Engineering, Research group: Responsible Construction, National Public Health Institute, Kaunas University of Technology

Contributors: Du, L., Prasauskas, T., Leivo, V., Turunen, M., Aaltonen, A., Kiviste, M., Martuzevicius, D., Haverinen-Shaughnessy, U.

Number of pages: 3

Pages: 637-639

Publication date: 2014

#### **Host publication information**

Title of host publication: Indoor Air 2014 - 13th International Conference on Indoor Air Quality and Climate

Publisher: International Society of Indoor Air Quality and Climate

ASJC Scopus subject areas: Pollution, Building and Construction, Health, Toxicology and Mutagenesis, Computer Science Applications

Keywords: Environmental monitoring, Exposure, Health questionnaire, Residential buildings

URLs:

<http://www.scopus.com/inward/record.url?scp=84924672127&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84924672127

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

#### **Characterization of charge in airborne fungal spores**

##### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Department of Physics, Research area: Aerosol Physics, Research area: Optics, Urban circular bioeconomy (UrCirBio), University of Cincinnati, Ita-Suomen yliopisto, Dekati Ltd

Contributors: Reponen, T., Saari, S., Mensah-Attipoe, J., Ukkonen, A., Veijalainen, A., Pasanen, P., Keskinen, J.

Number of pages: 3

Pages: 359-361

Publication date: 2014

##### **Host publication information**

Title of host publication: Indoor Air 2014 - 13th International Conference on Indoor Air Quality and Climate

Publisher: International Society of Indoor Air Quality and Climate

ASJC Scopus subject areas: Pollution, Building and Construction, Health, Toxicology and Mutagenesis, Computer Science Applications

Keywords: Aerosolization, Agar, Air velocity, Surface

URLs:

<http://www.scopus.com/inward/record.url?scp=84924739791&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84924739791

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

#### **Compressive strain measurement using RFID patch antenna sensors**

In this research, two radiofrequency identification (RFID) antenna sensor designs are tested for compressive strain measurement. The first design is a passive (battery-free) folded patch antenna sensor with a planar dimension of 61mm × 69mm. The second design is a slotted patch antenna sensor, whose dimension is reduced to 48mm × 44mm by introducing slots on antenna conducting layer to detour surface current path. A three-point bending setup is fabricated to apply compression on a tapered aluminum specimen mounted with an antenna sensor. Mechanics-electromagnetics coupled simulation shows that the antenna resonance frequency shifts when each antenna sensor is under compressive strain. Extensive compression tests are conducted to verify the strain sensing performance of the two sensors. Experimental results confirm that the resonance frequency of each antenna sensor increases in an approximately linear relationship with respect to compressive strain. The compressive strain sensing performance of the two RFID antenna sensors, including strain sensitivity and determination coefficient, is evaluated based on the experimental data.

##### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Sensing Systems for Wireless Medicine (MediSense), Georgia Institute of Technology, Georgia Institute of Technology, School of Electrical and Computer Engineering, Virginia Tech

Contributors: Cho, C., Yi, X., Wang, Y., Tentzeris, M. M., Leon, R. T.

Publication date: 2014

### Host publication information

Title of host publication: Sensors and Smart Structures Technologies for Civil, Mechanical, and Aerospace Systems 2014

Volume: 9061

Publisher: SPIE

Article number: 90610X

ISBN (Print): 9780819499875

ASJC Scopus subject areas: Electronic, Optical and Magnetic Materials, Condensed Matter Physics, Computer Science Applications, Applied Mathematics, Electrical and Electronic Engineering

Keywords: Folded patch antenna, Passive wireless sensor, RFID, Slotted patch antenna, Strain sensor

DOIs:

10.1117/12.2045122

URLs:

<http://www.scopus.com/inward/record.url?scp=84902151393&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84902151393

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

### Crack propagation measurement using a battery-free slotted patch antenna sensor

This research studies the performance of a battery-free wireless antenna sensor for measuring crack propagation. In our previous work, a battery-free folded patch antenna was designed for wireless strain and crack sensing. When experiencing deformation, the antenna shape changes, causing shift in electromagnetic resonance frequency of the antenna. The wireless interrogation system utilizes the principle of electromagnetic backscattering and adopts off-the-shelf 900MHz radiofrequency identification (RFID) technology. Following the same sensing mechanism, a slotted patch antenna sensor of smaller size is designed. The antenna detours surface current using slot patterns, so that the effective electrical length is kept similar as previous folded patch antenna. As a result, the sensor footprint is reduced and the antenna resonance frequency is maintained within 900MHz RFID band. To validate the sensor performance for crack sensing, a fatigue crack experiment is conducted on a steel compact-tension specimen. A slotted patch antenna sensor is installed at the center of the A36 steel specimen. For wireless interrogation, a Yagi reader antenna is placed 36 in. away from the antenna sensor to wirelessly measure the resonance frequency shift of the antenna sensor. The measurement is taken after every 10,000 loading cycles, till the specimen fails. Meanwhile, the length and width of the fatigue crack are also recorded. Finally, the resonance frequency shift of the antenna sensor is correlated with crack length and width at each loading stage.

### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Sensing Systems for Wireless Medicine (MediSense), Georgia Institute of Technology, Georgia Institute of Technology, School of Electrical and Computer Engineering, Virginia Tech

Contributors: Yi, X., Cho, C., Wang, Y., Cook, B., Tentzeris, M. M., Leon, R. T.

Number of pages: 8

Pages: 1040-1047

Publication date: 2014

### Host publication information

Title of host publication: 7th European Workshop on Structural Health Monitoring, EWSHM 2014 - 2nd European Conference of the Prognostics and Health Management (PHM) Society

Publisher: INRIA

ASJC Scopus subject areas: Civil and Structural Engineering, Safety, Risk, Reliability and Quality, Building and Construction, Computer Science Applications

Keywords: Battery-free sensor, Fatigue crack, RFID, Slotted patch antenna

URLs:

<http://www.scopus.com/inward/record.url?scp=84939455742&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84939455742

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

### **Functional and genetic analysis of the colon cancer network.**

Cancer is a complex disease that has proven to be difficult to understand on the single-gene level. For this reason a functional elucidation needs to take interactions among genes on a systems-level into account. In this study, we infer a colon cancer network from a large-scale gene expression data set by using the method BC3Net. We provide a structural and a functional analysis of this network and also connect its molecular interaction structure with the chromosomal locations of the genes enabling the definition of cis- and trans-interactions. Furthermore, we investigate the interaction of genes that can be found in close neighborhoods on the chromosomes to gain insight into regulatory mechanisms. To our knowledge this is the first study analyzing the genome-scale colon cancer network.

#### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Research Community on Data-to-Decision (D2D), Queen's University Belfast

Contributors: Emmert-Streib, F., de Matos Simoes, R., Glazko, G., McDade, S., Haibe-Kains, B., Holzinger, A., Dehmer, M., Campbell, F.

Publication date: 2014

Peer-reviewed: Yes

#### **Publication information**

Journal: BMC Bioinformatics

Volume: 15

Issue number: Suppl 6

Article number: S6

ISSN (Print): 1471-2105

Ratings:

Scopus rating (2014): CiteScore 2.91 SJR 1.916 SNIP 1.185

Original language: English

ASJC Scopus subject areas: Biochemistry, Molecular Biology, Computer Science Applications, Applied Mathematics, Structural Biology

URLs:

<http://www.scopus.com/inward/record.url?scp=84907412397&partnerID=8YFLogxK> (Link to publication in Scopus)

Research output: Contribution to journal › Article › Scientific › peer-review

### **Graph based representation and analyses for conceptual stages**

What is the fundamental similarity between investing in stock of a company, because you like the products of this company, and selecting a design concept, because you have been impressed by the esthetic quality of the presentation made by the team developing the concept? Except that both decisions are based on a surface analysis of the situations, they both reflect a fundamental human's cognitive feature. Human brain is profoundly trying to minimize the efforts required to solve a cognitive task and is using when possible an automatic mode relying on recognition, memory, and causality. This mode is even used in some occasion without the engineer being conscious of it. Such type of tendencies are naturally pushing engineers to rush into known solutions, to avoid analyzing the context of a design problem, to avoid modelling design problems and to take decision based on isolated evidences. Those behaviors are familiar to experience teachers and engineers. This tendency is magnified by the time pressure imposed to the engineering design process. Early phases in particular have to be kept short despite the large impact of decisions taken at this stage. Few support tools are capable of supporting a deep analysis of the early design conditions and problems regarding the fuzziness and complexity of the early stage. The present article is hypothesizing that the natural ability of humans to deal with cause-effects relations push toward the massive usage of causal graphs analysis during the design process and specifically during the early phases. A global framework based on graphs is presented in this paper to efficiently support the early stages. The approach used to generate graphs, to analyze them and to support creativity based on the analysis is forming the central contribution of this paper.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Intelligent dexterity for secure networked infrastructure and applications (IDSNIA), Aalto University

Contributors: Coatanéa, E., Nonsiri, S., Christophe, F., Mokammel, F.

Publication date: 2014

#### **Host publication information**

Title of host publication: 34th Computers and Information in Engineering Conference

Volume: 1A

Publisher: The American Society of Mechanical Engineers ASME

ISBN (Electronic): 9780791846285

ASJC Scopus subject areas: Mechanical Engineering, Computer Graphics and Computer-Aided Design, Computer Science Applications, Modelling and Simulation

DOIs:

10.1115/DETC201435652

URLs:

<http://www.scopus.com/inward/record.url?scp=84961306932&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84961306932

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

### **Maturity assessment for implementing and using product lifecycle management in project-oriented engineering companies**

Product lifecycle management (PLM) is a systematic and holistic way to approach challenges that exist in managing product-related information along a product's lifecycle from product design to its disposal. There is an established set of information management approaches that address important subsets of lifecycle information management challenges, e.g., product data management (PDM), customer relationship management (CRM) and enterprise resource planning (ERP). A common characteristic of PLM is that implementation is a very challenging and complex long-term process, requiring changes in organisation, systems, conventions and importantly, skills and capabilities. The aim of this paper is to discuss the issue of PLM maturity assessment and its use and application in the specific industrial context of project-oriented engineering companies. Within this context, the empirical part of the paper studies the usefulness and tailoring needs of generic capability maturity assessment in implementing and facilitating PLM.

#### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Department of Information Management and Logistics, Research group: Novi, Augmented Human Activities (AHA), Managing digital industrial transformation (mDIT), Lappeenranta University of Technology

Contributors: Kärkkäinen, H., Myllärniemi, J., Okkonen, J., Silventoinen, A.

Number of pages: 23

Pages: 176-198

Publication date: 2014

Peer-reviewed: Yes

#### **Publication information**

Journal: International Journal of Electronic Business

Volume: 11

Issue number: 2

ISSN (Print): 1470-6067

Original language: English

ASJC Scopus subject areas: Business, Management and Accounting(all), Computer Science Applications

Keywords: Capability maturity assessment, Capability maturity model, CMM, Maturity models, PLM, Product lifecycle management, Project business

DOIs:

10.1504/IJEB.2014.060218

Source: Scopus

Source ID: 84946840351

Research output: Contribution to journal > Article > Scientific > peer-review

### **Mode coupling in few-mode large-mode-area fibers**

We present an experimental study on mode coupling characteristics of few-mode large-mode-area (LMA) fibers, which are widely used in high power fiber lasers. The modal power allocation is measured by modal decomposition of the nearfield intensity profile of the output beam. Cut-back measurements are carried out with commonly-used fibers with different fiber geometries. The evolution of the modal power content due to mode coupling is presented. The influence of the fiber geometry on mode coupling is discussed.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Frontier Photonics, nLIGHT Corporation

Contributors: Ye, C., Koponen, J., Aallos, V., Petit, L., Kimmelma, O., Kokki, T.

Publication date: 2014

#### **Host publication information**

Title of host publication: Fiber Lasers XI: Technology, Systems, and Applications

Volume: 8961

Publisher: SPIE

Article number: 89612W

ISBN (Print): 9780819498748

ASJC Scopus subject areas: Applied Mathematics, Computer Science Applications, Electrical and Electronic Engineering, Electronic, Optical and Magnetic Materials, Condensed Matter Physics

Keywords: Beam quality, Few-mode, Large-mode-area fiber, Mode coupling, Mode decomposition, Silica optical fiber  
DOIs:

10.1117/12.2038575

URLs:

<http://www.scopus.com/inward/record.url?scp=84900835091&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84900835091

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

### **Optical and topographic changes in water-responsive patterned cholesteric liquid crystalline polymer coatings**

In this work, we present patterned water-responsive coatings, which alter both their topological and optical properties. The polymer coatings are based on a hydrogen-bonded cholesteric liquid crystalline polymer network. A two-step photopolymerization procedure leads to a patterned coating with repeating liquid crystalline and isotropic areas. The cholesteric liquid crystalline areas reflect green light, whilst the isotropic areas are transparent for visible light. Treatment with alkaline solution results in a hygroscopic polymer salt coating. When placed in demineralized water, the polymer films swells, leading to an enhancement of the surface topography structure in which the liquid crystalline areas swell more. Moreover, the pitch of the helical organization in the cholesteric areas increases due to this swelling leading to a color change from green to red.

### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Eindhoven University of Technology, School of Mathematical Sciences

Contributors: Stumpel, J. E., Broer, D. J., Bastiaansen, C. W. M., Schenning, A. P. H. J.

Publication date: 2014

### **Host publication information**

Title of host publication: Proceedings of SPIE : Organic Photonics VI

Volume: 9137

Publisher: SPIE

Article number: 91370U

ISBN (Print): 9781628410853

### **Publication series**

Name: Proceedings of SPIE: the International Society for Optical Engineering

Publisher: SPIE

ISSN (Print): 0277-786X

ISSN (Electronic): 1996-756X

ASJC Scopus subject areas: Applied Mathematics, Computer Science Applications, Electrical and Electronic Engineering, Electronic, Optical and Magnetic Materials, Condensed Matter Physics

Keywords: cholesteric liquid crystals, patterned surfaces, responsive optical coatings, responsive surface topographies, water-responsive

DOIs:

10.1117/12.2052678

URLs:

<http://www.scopus.com/inward/record.url?scp=84902324488&partnerID=8YFLogxK> (Link to publication in Scopus)

### **Bibliographical note**

EXT="Stumpel, Jelle"

Source: Scopus

Source ID: 84902324488

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

### **Pulsed high-power yellow-orange VECSEL**

We report on the development of a pulsed high-power frequency doubled vertical-external-cavity surface-emitting laser (VECSEL) with a peak output power of 14 W and emission spectrum near 588 nm. The semiconductor gain chip was grown by molecular beam epitaxy and comprised 10 GaInAs quantum wells. The gain structure was designed to be antiresonant at 1180 nm. The fundamental wavelength was frequency doubled to the yellow-orange spectral range using a 10-mm long critically phase matched lithium triborate nonlinear crystal, situated at the mode waist of the V-shaped laser cavity. The emission spectrum was narrowed down to FWHM of < 0.2 nm by employing a 1.5 mm birefringent filter and a 100- $\mu$ m-thick etalon inside the cavity. By directly modulating the pump laser of the VECSEL, we were able to produce pulse widths down to 570 ns with average and peak output power of 81 mW and 14 W, respectively. The repetition rate

was kept constant at 10 kHz throughout the measurements. The maximum peak power obtained was pump power limited. In comparison, at the same coolant temperature, a maximum of 8.5 W was achieved in continuous wave. The maximum optical-to-optical conversion efficiency (absorbed peak pump power to peak output power) was calculated to be 20-21 %. © 2014 SPIE.

#### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Optoelectronics Research Centre, Research group: Semiconductor Technology and Applications, Frontier Photonics, Optoelectronics Research Centre, Tampere University of Technology

Contributors: Kantola, E., Leinonen, T., Ranta, S., Tavast, M., Guina, M.

Publication date: 2014

#### Host publication information

Title of host publication: Photonics Europe 2014, Semiconductor Lasers and Laser Dynamics VI, April 14-17, 2014, Brussels, Belgium. Proceedings of SPIE

Volume: 9134

Publisher: SPIE

Article number: 91340Z

ISBN (Print): 978-1-6284-1090-7

#### Publication series

Name: SPIE Conference Proceedings

Volume: 9134

ISSN (Print): 0277-786X

ISSN (Electronic): 1996-756X

ASJC Scopus subject areas: Applied Mathematics, Computer Science Applications, Electrical and Electronic Engineering, Electronic, Optical and Magnetic Materials, Condensed Matter Physics

Keywords: Frequency doubling, Gain modulation, High-efficiency, High-power, Pulsed, SHG, Yellow-orange VECSEL

DOIs:

10.1117/12.2054716

URLs:

<http://www.scopus.com/inward/record.url?scp=84902438552&partnerID=8YFLogxK> (Link to publication in Scopus)

#### Bibliographical note

Contribution: organisation=orc,FACT1=1<br/>Portfolio EDEND: 2014-08-31<br/>Publisher name: SPIE - International Society for Optical Engineering

Source: researchoutputwizard

Source ID: 654

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

#### Transparency of intentions decreases privacy concerns in ubiquitous surveillance

An online experiment (n=1,897) was carried out to understand how data disclosure practices in ubiquitous surveillance affect users' privacy concerns. Information about the identity and intentions of a data collector was manipulated in hypothetical surveillance scenarios. Privacy concerns were found to differ across the scenarios and moderated by knowledge about the collector's identity and intentions. Knowledge about intentions exhibited a stronger effect. When no information about intentions was disclosed, the respondents postulated negative intentions. A positive effect was found for disclosing neutral intentions of an organization or unknown data collector, but not for a private data collector. The findings underline the importance of disclosing intentions of data use to users in an easily understandable manner.

#### General information

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Mathematical modelling with wide societal impact (MathImpact), Cluster of Excellence on Multimodal Computing and Interaction, Saarland University, Aalto University, Helsinki Institute for Information Technology HIIT, Department of Information and Service Economy

Contributors: Oulasvirta, A., Suomalainen, T., Hamari, J., Lampinen, A., Karvonen, K.

Publication date: 2014

Peer-reviewed: Yes

#### Publication information

Journal: CYBERPSYCHOLOGY BEHAVIOR AND SOCIAL NETWORKING

Volume: 17

Issue number: 10

ISSN (Print): 2152-2715

Ratings:

Scopus rating (2014): CiteScore 3.33 SJR 1.712 SNIP 1.819

Original language: English

ASJC Scopus subject areas: Human-Computer Interaction, Applied Psychology, Communication, Computer Science Applications, Social Psychology, Medicine(all)

DOIs:

10.1089/cyber.2013.0585

URLs:

<http://www.scopus.com/inward/record.url?scp=84907285570&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84907285570

Research output: Contribution to journal › Article › Scientific › peer-review

### **Learning sparse representations for view-independent human action recognition based on fuzzy distances**

In this paper, a method aiming at view-independent human action recognition is presented. Actions are described as series of successive human body poses. Action videos representation is based on fuzzy vector quantization, while action classification is performed by a novel classification algorithm, the so-called Sparsity-based Learning Machine (SbLM), involving two optimization steps. The first one determines a non-linear data mapping to a high-dimensional feature space determined by an l1-minimization process exploiting an overcomplete dictionary formed by the training samples. The second one, involves a training process in order to determine the optimal separating hyperplanes in the resulted high-dimensional feature space. The performance of the proposed human action recognition method is evaluated on two publicly available action recognition databases aiming at different application scenarios.

#### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Research Community on Data-to-Decision (D2D), Aristotle University of Thessaloniki, Department of Informatics

Contributors: Iosifidis, A., Tefas, A., Pitas, I.

Number of pages: 10

Pages: 344-353

Publication date: 9 Dec 2013

Peer-reviewed: Yes

#### **Publication information**

Journal: Neurocomputing

Volume: 121

ISSN (Print): 0925-2312

Ratings:

Scopus rating (2013): CiteScore 2.95 SJR 0.817 SNIP 1.915

Original language: English

ASJC Scopus subject areas: Artificial Intelligence, Computer Science Applications, Cognitive Neuroscience

Keywords: Action classification, Activity recognition, Fuzzy vector quantization, Sparse data representation

DOIs:

10.1016/j.neucom.2013.05.021

Source: Scopus

Source ID: 84884142409

Research output: Contribution to journal › Article › Scientific › peer-review

### **Netmes: Assessing gene network inference algorithms by network-based measures**

Gene regulatory network inference (GRNI) algorithms are essential for efficiently utilizing large-scale microarray datasets to elucidate biochemical interactions among molecules in a cell. Recently, the combination of network-based error measures complemented with an ensemble approach became popular for assessing the inference performance of the GRNI algorithms. For this reason, we developed a software package to facilitate the usage of such metrics. In this paper, we present netmes, an R software package that allows the assessment of GRNI algorithms. The software package netmes is available from the R-Forge web site <https://r-forge.r-project.org/projects/netmes/>.

#### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Research Community on Data-to-Decision (D2D), Bahçeşehir University, Yıldız Technical University, UMIT - The Health and Life Sciences University, Computational Biology and Machine Learning Lab., Faculty of Medicine, Health and Life Sciences, Queen's University, Belfast, Northern Ireland

Contributors: Altay, G., Kurt, Z., Dehmer, M., Emmert-Streib, F.

Publication date: 7 Dec 2013

Peer-reviewed: Yes

### Publication information

Journal: Evolutionary Bioinformatics

Volume: 10

ISSN (Print): 1176-9343

Ratings:

Scopus rating (2013): CiteScore 1.23 SJR 0.565 SNIP 0.406

Original language: English

ASJC Scopus subject areas: Ecology, Evolution, Behavior and Systematics, Computer Science Applications, Genetics

Keywords: Gene regulatory networks, Global network-based measures, Local network-based measures, Metrics for assessing ensemble datasets, R package for the network-based measures

DOIs:

10.4137/EBO.S13481

URLs:

<http://www.scopus.com/inward/record.url?scp=84893596910&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84893596910

Research output: Contribution to journal › Article › Scientific › peer-review

### Social Network Games: Players' Perspectives

This article presents the results of an interview study on how people perceive and play social network games on Facebook. During recent years, social games have become the biggest genre of games if measured by the number of registered users. These games are designed to cater for large audiences in their design principles and values, a free-to-play revenue model and social network integration that make them easily approachable and playable with friends. Although these games have made the headlines and have been seen to revolutionize the game industry, we still lack an understanding of how people perceive and play them. For this article, we interviewed 18 Finnish Facebook users from a larger questionnaire respondent pool of 134 people. This study focuses on a user-centric approach, highlighting the emergent experiences and the meaning-making of social games players. Our findings reveal that social games are usually regarded as single player games with a social twist, and as suffering partly from their design characteristics, while still providing a wide spectrum of playful experiences for different needs. The free-to-play revenue model provides an easy access to social games, but people disagreed with paying for additional content for several reasons.

### General information

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Mathematical modelling with wide societal impact (MathImpact)

Contributors: Paavilainen, J., Hamari, J., Stenros, J., Kinnunen, J.

Number of pages: 27

Pages: 794-820

Publication date: Dec 2013

Peer-reviewed: Yes

### Publication information

Journal: SIMULATION AND GAMING

Volume: 44

Issue number: 6

ISSN (Print): 1046-8781

Ratings:

Scopus rating (2013): CiteScore 1.21 SJR 0.444 SNIP 1.018

Original language: English

ASJC Scopus subject areas: Business, Management and Accounting (miscellaneous), Computer Science Applications

Keywords: attitudes, experience, Facebook, free-to-play, frustration, game design, gameplay, interviews, micropayments, motivation, perception, playful experience, sociability, social games, social networks, user study, video games

DOIs:

10.1177/1046878113514808

URLs:

<http://www.scopus.com/inward/record.url?scp=84891936877&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84891936877

Research output: Contribution to journal › Article › Scientific › peer-review

### **[COMMODE] a large-scale database of molecular descriptors using compounds from PubChem**

Background: Molecular descriptors have been extensively used in the field of structure-oriented drug design and structural chemistry. They have been applied in QSPR and QSAR models to predict ADME-Tox properties, which specify essential features for drugs. Molecular descriptors capture chemical and structural information, but investigating their interpretation and meaning remains very challenging. Results: This paper introduces a large-scale database of molecular descriptors called COMMODE containing more than 25 million compounds originated from PubChem. About 2500 DRAGON-descriptors have been calculated for all compounds and integrated into this database, which is accessible through a web interface at <http://commode.i-med.ac.at>.

#### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Research Community on Data-to-Decision (D2D), Oncotryol, Institute for Bioinformatics and Translational Research, Innsbruck Medical University, Computational Biology and Machine Learning Lab., Faculty of Medicine, Health and Life Sciences, Queen's University, Belfast, Northern Ireland

Contributors: Dander, A., Mueller, L. A. J., Gallasch, R., Pabinger, S., Emmert-Streib, F., Graber, A., Dehmer, M.

Publication date: 13 Nov 2013

Peer-reviewed: Yes

#### **Publication information**

Journal: Source Code for Biology and Medicine

Volume: 8

Article number: 22

ISSN (Print): 1751-0473

Ratings:

Scopus rating (2013): CiteScore 1.37 SJR 0.529 SNIP 0.46

Original language: English

ASJC Scopus subject areas: Information Systems, Computer Science Applications, Information Systems and Management, Health Informatics

Keywords: Chemical databases, Molecular descriptors, PubChem, QSAR, QSPR

DOIs:

10.1186/1751-0473-8-22

URLs:

<http://www.scopus.com/inward/record.url?scp=84887399081&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84887399081

Research output: Contribution to journal > Article > Scientific > peer-review

### **Wearable and implantable antennas for wireless body-centric sensing systems**

In this poster abstract, we present recent advances on implantable and wearable antennas for wireless body-centric sensing systems. Prominent examples of such systems are the wireless brainmachine interface (BMI) system and wearable embroidered antennas. In the poster, we present more detailed simulation and measurement results.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Research group: Wireless Identification and Sensing Systems Research Group, Department of Electronics and Communications Engineering, Sensing Systems for Wireless Medicine (MediSense), Nano Communication Centre, Berkeley, Electrical Engineering Department, University of California, Los Angeles (UCLA)

Contributors: Björninen, T., Moradi, E., Koski, K., Sydänheimo, L., Ukkonen, L., Muller, R., Ledochowitsch, P., Rabaey, J. M., Rahmat-Samii, Y.

Number of pages: 1

Pages: 288

Publication date: 29 Oct 2013

#### **Host publication information**

Title of host publication: BODYNETS 2013 - 8th International Conference on Body Area Networks

Publisher: ICST

ISBN (Electronic): 9781936968893

ASJC Scopus subject areas: Computer Science Applications, Computer Networks and Communications, Artificial Intelligence

DOIs:

10.4108/icst.bodynets.2013.253580

URLs:

<http://www.scopus.com/inward/record.url?scp=84947068176&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84947068176

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

### **Importance of the ion-pair interactions in the OPEP coarse-grained force field: Parametrization and validation**

We have derived new effective interactions that improve the description of ion pairs in the Optimized Potential for Efficient protein structure Prediction (OPEP) coarse-grained force field without introducing explicit electrostatic terms. The iterative Boltzmann inversion method was used to extract these potentials from all-atom simulations by targeting the radial distribution function of the distance between the center of mass of the side chains. The new potentials have stabilities, and number of ion pairs. Our modeling, by refining the packing of the charged amino acids, impacts the stability of secondary structure motifs and the population of intermediate states during temperature folding/unfolding; it also improves the aggregation propensity of peptides. The new version of the OPEP force field has the potentiality to describe more realistically a large spectrum of situations where salt-bridges are key interactions. (Figure Presented)

#### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Multi-scaled biodata analysis and modelling (MultiBAM), Université Paris Diderot, Laboratoire de Biochimie Théorique, Institut Universitaire de France

Contributors: Sterpone, F., Nguyen, P. H., Kalimeri, M., Derreumaux, P.

Number of pages: 11

Pages: 4574-4584

Publication date: 8 Oct 2013

Peer-reviewed: Yes

#### **Publication information**

Journal: Journal of Chemical Theory and Computation

Volume: 9

Issue number: 10

ISSN (Print): 1549-9618

Ratings:

Scopus rating (2013): CiteScore 5.41 SJR 2.437 SNIP 1.558

Original language: English

ASJC Scopus subject areas: Physical and Theoretical Chemistry, Computer Science Applications

DOIs:

10.1021/ct4003493

URLs:

<http://www.scopus.com/inward/record.url?scp=84891948959&partnerID=8YFLogxK> (Link to publication in Scopus)

#### **Bibliographical note**

EXT="Kalimeri, Maria"

Source: Scopus

Source ID: 84891948959

Research output: Contribution to journal > Article > Scientific > peer-review

### **Comparison of Saltation, Amplitude Modulation, and a Hybrid Method of Vibrotactile Stimulation**

Illusory vibrotactile movement can be used to provide directional tactile information on the skin. Our research question was how the presentation method affects the perception of vibrotactile movement. Illusion of vibrotactile mediolateral movement was elicited to a left dorsal forearm to investigate cognitive and emotional experiences to vibrotactile stimulation. Eighteen participants were presented with stimuli delivered to a linearly aligned row of three vibrotactile actuators. Three presentation methods were used-saltation, amplitude modulation, and a hybrid method-to form 12 distinct patterns of movement. First, the stimuli were compared pairwise using a two-alternative forced-choice procedure (same-different judgments). Second, the stimuli were rated using three nine-point bipolar scales measuring the continuity, pleasantness, and arousal of each stimulus. The stimuli presented with the amplitude modulation method were rated significantly more continuous and pleasant, and less arousing. Strong correlations between the cognition-related scale of continuity and the emotion-related scales of pleasantness and arousal were found: More continuous stimuli were rated more pleasant and less arousing.

#### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Augmented Human Activities (AHA)

Contributors: Raisamo, J., Raisamo, R., Surakka, V.

Number of pages: 5

Pages: 517-521  
Publication date: Oct 2013  
Peer-reviewed: Yes

#### Publication information

Journal: IEEE Transactions on Haptics

Volume: 6

Issue number: 4

Article number: 6517847

ISSN (Print): 1939-1412

Ratings:

Scopus rating (2013): CiteScore 3.1 SJR 0.754 SNIP 2.328

Original language: English

ASJC Scopus subject areas: Human-Computer Interaction, Computer Science Applications, Medicine(all)

Keywords: evaluation/methodology, haptic I/O, Information interfaces and representation (HCI), user interfaces

DOIs:

10.1109/TOH.2013.25

URLs:

<http://www.scopus.com/inward/record.url?scp=84890532189&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84890532189

Research output: Contribution to journal › Article › Scientific › peer-review

#### Transfer learning using a nonparametric sparse topic model

In many domains data items are represented by vectors of counts; count data arises, for example, in bioinformatics or analysis of text documents represented as word count vectors. However, often the amount of data available from an interesting data source is too small to model the data source well. When several data sets are available from related sources, exploiting their similarities by transfer learning can improve the resulting models compared to modeling sources independently. We introduce a Bayesian generative transfer learning model which represents similarity across document collections by sparse sharing of latent topics controlled by an Indian buffet process. Unlike a prominent previous model, hierarchical Dirichlet process (HDP) based multi-task learning, our model decouples topic sharing probability from topic strength, making sharing of low-strength topics easier. In experiments, our model outperforms the HDP approach both on synthetic data and in first of the two case studies on text collections, and achieves similar performance as the HDP approach in the second case study.

#### General information

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Research Community on Data-to-Decision (D2D), Aalto University, deCODE Genetics

Contributors: Faisal, A., Gillberg, J., Leen, G., Peltonen, J.

Number of pages: 14

Pages: 124-137

Publication date: 18 Jul 2013

Peer-reviewed: Yes

#### Publication information

Journal: Neurocomputing

Volume: 112

ISSN (Print): 0925-2312

Ratings:

Scopus rating (2013): CiteScore 2.95 SJR 0.817 SNIP 1.915

Original language: English

ASJC Scopus subject areas: Artificial Intelligence, Computer Science Applications, Cognitive Neuroscience

Keywords: Latent Dirichlet allocation, Nonparametric Bayesian inference, Small sample size, Sparsity, Topic models,

Transfer learning

DOIs:

10.1016/j.neucom.2012.12.038

URLs:

<http://www.scopus.com/inward/record.url?scp=84877602437&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84877602437

Research output: Contribution to journal › Article › Scientific › peer-review

## **Transforming homo economicus into homo ludens: A field experiment on gamification in a utilitarian peer-to-peer trading service**

During recent years, the addition of game mechanisms to non-game services has gained a relatively large amount of attention. Popular discussion connects gamification to successful marketing and increased profitability through higher customer engagement, however, there is a dearth of empirical studies that confirm such expectations. This paper reports the results of a field experiment, which gamifies a utilitarian peer-to-peer trading service by implementing the game mechanism of badges that users can earn from a variety of tasks. There were 3234 users who were randomly assigned to treatment groups and subjected to different versions of the badge system in a  $2 \times 2$  design. The results show that the mere implementation of gamification mechanisms does not automatically lead to significant increases in use activity in the studied utilitarian service, however, those users who actively monitored their own badges and those of others in the study showed increased user activity.

### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Mathematical modelling with wide societal impact (MathImpact), Department of Information and Service Economy, Aalto University

Contributors: Hamari, J.

Number of pages: 10

Pages: 236-245

Publication date: Jul 2013

Peer-reviewed: Yes

### **Publication information**

Journal: Electronic Commerce Research and Applications

Volume: 12

Issue number: 4

ISSN (Print): 1567-4223

Ratings:

Scopus rating (2013): CiteScore 2.6 SJR 0.93 SNIP 2.115

Original language: English

ASJC Scopus subject areas: Computer Science Applications, Computer Networks and Communications, Marketing, Management of Technology and Innovation

Keywords: Badges, Collaborative consumption, Game design, Gamification, Service marketing, Social commerce

DOIs:

10.1016/j.elerap.2013.01.004

URLs:

<http://www.scopus.com/inward/record.url?scp=84883135229&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84883135229

Research output: Contribution to journal > Article > Scientific > peer-review

## **Indirect measurement of the vascular endothelial glycocalyx layer thickness in human submucosal capillaries with a plug-in for ImageJ**

**Background:** The thickness of vascular endothelial glycocalyx layer can be measured indirectly during a spontaneous leukocyte passage from oral submucosal capillaries in humans. The subsequent differences in red blood cell (RBC) column widths, before a spontaneous white blood cell passage (pre-WBC) and after a spontaneous WBC passage (post-WBC) can be used in off-line analysis to measure glycocalyx thickness:  $[\text{pre-WBC width} - \text{post-WBC width}]/2$ . We created and validated a semi-automatic plug-in for ImageJ to measure the endothelial glycocalyx layer thickness. **Methods:** Video clips presenting human sublingual microvasculature were created with a side-stream dark field imaging device. Spontaneous leukocyte passages in capillaries were analyzed from video clips with ImageJ. The capillary glycocalyx layer thickness was measured by the indirect approach with two manual and two semi-automatic methods. **Results:** There were no statistically significant differences between glycocalyx layer thicknesses measured with different methods, even though small inter-method differences in RBC column thicknesses could be detected. Inter-rater differences were systematically smaller with both semi-automatic methods. Intra-rater coefficient of variation [CV] (95% CI) was largest when measurements were made completely manually [9.2% (8.4-10.0)], but improved significantly with automatic image enhancement prior to manual measurement [7.2% (6.4-8.0)]. CV could be improved further when using semi-automatic analysis with an in-frame median filter radius of 1 pixel [5.8% (5.0-6.6)], or a median filter radius of 2 pixels [4.3% (3.5-5.1)]. **Conclusions:** Semi-automatic analysis of glycocalyx decreased the intra-rater CV and the inter-rater differences compared to the manual method. On average, each of the four methods yielded equal results for the glycocalyx thickness. Being the only feasible bedside method in most clinical scenarios, indirect measurement of glycocalyx thickness with orthogonal polarization spectral imaging or side-stream dark field imaging device and our plug-in can advance the study of glycocalyx layer pathology in man.

### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Integrated Technologies for Tissue Engineering Research (ITTE), Helsinki University Central Hospital, University of Helsinki, Uppsala University, Tampere University Hospital

Contributors: Liuhanen, S., Sallialmi, M., Pettilä, V., Oksala, N., Tenhunen, J.

Number of pages: 10

Pages: 38-47

Publication date: Apr 2013

Peer-reviewed: Yes

### Publication information

Journal: Computer Methods and Programs in Biomedicine

Volume: 110

Issue number: 1

ISSN (Print): 0169-2607

Ratings:

Scopus rating (2013): CiteScore 2.28 SJR 0.628 SNIP 1.459

Original language: English

ASJC Scopus subject areas: Computer Science Applications, Software, Health Informatics

Keywords: Endothelial surface layer, Glycocalyx, Imagej, Open source, Side-stream dark field

DOIs:

10.1016/j.cmpb.2012.10.019

URLs:

<http://www.scopus.com/inward/record.url?scp=84875094399&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84875094399

Research output: Contribution to journal > Article > Scientific > peer-review

### Variable switching point predictive torque control

In this paper an approach to include a variable switching time point into predictive torque control (PTC) is introduced. In PTC the switching frequency is limited by the sampling frequency; its theoretical maximum value is half the sampling frequency. In reality, however, the switching frequency is lower than this value, resulting in high current and torque ripples compared to modulator-based control methods. In order to overcome this an optimization problem is formulated and solved in real-time. The goal is to find the time point at which the switches of the inverter should change state in order to not only achieve the regulation of the torque and the flux magnitude to their references, but also the minimization of the torque ripple. Further advantages of the proposed method include the design flexibility and great performance during transients. Experimental results that verify the performance of the presented control strategy are included.

### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Smart Energy Systems (SES), Department of Electrical and Computer Engineering, National Technical University of Athens, Technische Universität München, University of Stellenbosch

Contributors: Karamanakos, P., Stolze, P., Kennel, R., Manias, S., Mouton, T.

Number of pages: 6

Pages: 422-427

Publication date: Feb 2013

### Host publication information

Title of host publication: Proceedings - 2013 IEEE International Conference on Industrial Technology, ICIT 2013

ISBN (Print): 9781467345699

ASJC Scopus subject areas: Electrical and Electronic Engineering, Computer Science Applications

DOIs:

10.1109/ICIT.2013.6505709

Source: Scopus

Source ID: 84877596084

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

### A novel framework for design and implementation of adaptive stream mining systems

With the increasing need for accurate mining and classification from multimedia data content, and the growth of such multimedia applications in mobile and distributed architectures, stream mining systems require increasing amounts of flexibility, extensibility, and adaptivity for effective deployment. To address this challenge, we propose a novel approach that rigorously integrates foundations of dataflow modeling for high level signal processing system design, and adaptive stream mining based on dynamic topologies of classifiers. In particular, we introduce a new design environment, called the lightweight dataflow for dynamic data driven application systems (LiD4E) environment. LiD4E provides formal semantics,

rooted in dataflow principles, for design and implementation of a broad class of multimedia stream mining topologies. We demonstrate the capabilities of LiD4E using a face detection application that systematically adapts the type of classifier used based on dynamically changing application constraints.

#### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Signal Processing Research Community (SPRC), University of Maryland

Contributors: Sudusinghe, K., Won, S., Van Der Schaar, M., Bhattacharyya, S.

Publication date: 2013

#### Host publication information

Title of host publication: 2013 IEEE International Conference on Multimedia and Expo, ICME 2013

Article number: 6607565

ISBN (Print): 9781479900152

ASJC Scopus subject areas: Computer Networks and Communications, Computer Science Applications

Keywords: Adaptive stream mining, dataflow graphs, dynamic data-driven adaptive systems

DOIs:

10.1109/ICME.2013.6607565

URLs:

<http://www.scopus.com/inward/record.url?scp=84885660099&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84885660099

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

#### Bio-inspired service management framework: Green data-centres case study

The internet is evolving into a full-scale distributed service platform, offering a plethora of services from communications to business, entertainment, social connectivity and much more. The range of services and applications offered is diversifying, with new applications constantly emerging. For example, utility-based computing (e.g. HPC and cloud computing) which relies heavily on data-centre resources. These services will be more dynamic and sophisticated, providing a range of complex capabilities, which puts further burden on datacentres, in terms of supporting and managing these services. At the same time, society is becoming acutely aware of the significant energy burden the communications industry, and in particular data-centres, are becoming. With these trends in mind we propose a biologically inspired service framework that supports services which can autonomously carry out management functions. We then apply this framework to address the emerging problem of a sustainable future internet by autonomously migrating services to greener locations.

#### General information

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Wireless Communications and Positioning (WICO), Waterford Institute of Technology, Telecommunications Software and Systems Group (TSSG), University of Massachusetts Boston, Imperial College London and Nanyang Technological University

Contributors: Carroll, R., Balasubramaniam, S., Suzuki, J., Lee, C., Donnelly, W., Botvich, D.

Number of pages: 15

Pages: 278-292

Publication date: 2013

Peer-reviewed: Yes

#### Publication information

Journal: International Journal of Grid and Utility Computing

Volume: 4

Issue number: 4

ISSN (Print): 1741-847X

Ratings:

Scopus rating (2013): CiteScore 0.81 SJR 0.176 SNIP 0.858

Original language: English

ASJC Scopus subject areas: Management Information Systems, Computer Science Applications, Applied Mathematics

Keywords: Bio-inspired services, Genetic algorithm, Green data-centres

DOIs:

10.1504/IJGUC.2013.057115

URLs:

<http://www.scopus.com/inward/record.url?scp=84886912413&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84886912413

Research output: Contribution to journal > Article > Scientific > peer-review

### **Checking visual data flow programs with finite process models**

A visual data flow language (VDFL) allows graphical presentation of a computer program in the form of a directed graph, where data tokens travel through the arcs of the graph, and the vertices present e.g. the input token streams, calculations, comparisons, and conditionals. Amongst their benefits, VDFLs allow parallel computing and they are presumed to improve the quality of programming due to their intuitive readability. Thus, they are also suitable for computing education. However, the token-based computational model allowing parallel processing may make the programs more complicated than what they look. We propose a method for checking properties of VDFL programs using finite state processes (FSPs) using a commonly available labelled transition system analyser (LTSA) tool. The method can also be used to study different VDFL programming constructs for development or re-design of VDFLs. For our method, we have implemented a compiler that compiles a textual representation of a VDFL into FSPs.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Research Community on Data-to-Decision (D2D), Mathematical modelling with wide societal impact (MathImpact), Ita-Suomen yliopisto

Contributors: Nummenmaa, J., Marttila-Kontio, M., Nummenmaa, T.

Number of pages: 14

Pages: 245-258

Publication date: 2013

#### **Host publication information**

Title of host publication: 13th Symposium on Programming Languages and Software Tools, SPLST 2013 - Proceedings

Publisher: University of Szeged

ISBN (Electronic): 9789633062289

ASJC Scopus subject areas: Computer Science Applications, Software

URLs:

<http://www.scopus.com/inward/record.url?scp=84923622331&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84923622331

Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

### **Chip-to-package wireless power transfer and its application to mm-Wave antennas and monolithic radiometric receivers**

A chip-to-package wireless power transfer concept is applied to MMIC and antennas on LCP substrate is presented. Electromagnetic simulations show the feasibility of the proposed approach. As a benchmarking topology at the working frequency of 35.4 GHz, an Archimedean spiral antenna matched to a heterogeneous transformer, which couples the power received by the antenna to the chip, has been simulated. Transistor level circuit simulations are also proposed for the LNA and the detector, which together will constitute the system-on-chip (SoC) radiometer to be integrated in the LCP-SoP.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Sensing Systems for Wireless Medicine (MediSense), University of Perugia, Georgia Institute of Technology

Contributors: Aluigi, L., Thai, T. T., Tentzeris, M. M., Roselli, L., Alimenti, F.

Number of pages: 3

Pages: 202-204

Publication date: 2013

#### **Host publication information**

Title of host publication: RSW 2013 - 2013 IEEE Radio and Wireless Symposium - RWW 2013

Article number: 6486688

ISBN (Print): 9781467329309

ASJC Scopus subject areas: Computer Networks and Communications, Computer Science Applications, Electrical and Electronic Engineering, Communication

Keywords: Electromagnetic coupling, flexible electronics, heterogeneous integration, imaging, LNA, mm-wave, SoC, SoP  
DOIs:

10.1109/RWS.2013.6486688

URLs:

<http://www.scopus.com/inward/record.url?scp=84876750099&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84876750099

### **Design and simulation of a slotted patch antenna sensor for wireless strain sensing**

In this work, a slotted patch antenna is employed as a wireless sensor for monitoring structural strain and fatigue crack. Using antenna miniaturization techniques to increase the current path length, the footprint of the slotted patch antenna can be reduced to one quarter of a previously presented folded patch antenna. Electromagnetic simulations show that the antenna resonance frequency varies when the antenna is under strain. The resonance frequency variation can be wirelessly interrogated and recorded by a radiofrequency identification (RFID) reader, and can be used to derive strain/deformation. The slotted patch antenna sensor is entirely passive (battery-free), by exploiting an inexpensive off-the-shelf RFID chip that receives power from the wireless interrogation by the reader.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Sensing Systems for Wireless Medicine (MediSense), Georgia Institute of Technology, Georgia Institute of Technology, School of Electrical and Computer Engineering, Virginia Tech

Contributors: Yi, X., Cho, C., Cook, B., Wang, Y., Tentzeris, M. M., Leon, R. T.

Publication date: 2013

#### **Host publication information**

Title of host publication: Nondestructive Characterization for Composite Materials, Aerospace Engineering, Civil Infrastructure, and Homeland Security 2013

Volume: 8694

Article number: 86941J

ISBN (Print): 9780819494771

ASJC Scopus subject areas: Applied Mathematics, Computer Science Applications, Electrical and Electronic Engineering, Electronic, Optical and Magnetic Materials, Condensed Matter Physics

Keywords: RFID, Slotted patch antenna, Strain sensor, Wireless passive sensor

DOIs:

10.1117/12.2009233

URLs:

<http://www.scopus.com/inward/record.url?scp=84878419679&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84878419679

Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

### **Exploiting RSS measurements among neighbouring devices: A matter of trust**

In this paper we present experimental evaluations of cooperative ranging-based approaches in mobile positioning. Our main contribution is represented by experimental investigations, analysis of the errors introduced in the distance estimation and exploitation of the knowledge of environmental perturbations with a NLLS algorithm, highlighting the limits of such cooperative schemes, proving that the effect of cooperation might be very limited in real-life scenarios.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Department of Electronics and Communications Engineering, Research group: System-on-Chip for GNSS, Wireless Communications and Cyber-Physical Embedded Computing, Wireless Communications and Positioning (WICO), Aalborg University

Contributors: Rosa, F. D., Paakki, T., Nurmi, J., Pelosi, M.

Publication date: 2013

#### **Host publication information**

Title of host publication: 2013 International Conference on Indoor Positioning and Indoor Navigation, IPIN 2013

Publisher: IEEE COMPUTER SOCIETY PRESS

ISBN (Print): 9781479940431

ASJC Scopus subject areas: Computer Science Applications

Keywords: Cooperation, peer-to-peer, Positioning, WiFi

DOIs:

10.1109/IPIN.2013.6817902

Source: Scopus

Source ID: 84902204262

Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

### **How do students solve parsons programming problems? - Execution-based vs. line-based feedback**

In large introductory programming classes, there typically are no resources for adequate individual guidance. Automatic feedback for programming tasks can facilitate students' learning by allowing them to get immediate individual feedback regardless of time and place. This paper presents a study on how the type of automatic feedback in Parsons problems affects how students solve them. Students on their first programming class were divided into two groups and, in two assignments, each group in turn received different type of feedback. The type of feedback had an effect on how students constructed their programs and how quickly they were able to complete them. With feedback based on execution as opposed to the visible arrangement of code, the programs were more frequently executable when feedback was requested and, overall, feedback was requested less frequently. Based on the analysis, we discuss possible future improvements to automatic feedback in this type of an assignment.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Regulation of learning and active learning methods (REALMEE), Aalto University, Department of Computer Science and Eng.

Contributors: Helminen, J., Ihantola, P., Karavirta, V., Alaoutinen, S.

Number of pages: 7

Pages: 55-61

Publication date: 2013

#### **Host publication information**

Title of host publication: Proceedings - 2013 Learning and Teaching in Computing and Engineering, LaTiCE 2013

Article number: 6542239

ISBN (Print): 9780769549606

ASJC Scopus subject areas: Computer Science Applications, Education

Keywords: Automatic Feedback, Parsons Puzzles, Python

DOIs:

10.1109/LaTiCE.2013.26

URLs:

<http://www.scopus.com/inward/record.url?scp=84881103728&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84881103728

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

### **Inkjet printing of radio frequency electronics: Design methodologies and application of novel nanotechnologies**

We discuss here the use of inkjet printing technology as an attractive alternative for the fabrication of radio frequency (RF) electronics. Inkjet printing is compared to widely used traditional methods such as wet etching and mechanical milling with discussion of the advantages and potential disadvantages afforded by the technology. Next the paper presents the current state of the art for RF printed electronics, including fundamental fabrication technologies, methodologies, and materials. Included are detailed discussions of the fabrication of foundational conductive elements, integration of external elements via low temperature bonding techniques, and enhancement strategies focusing on the addition of novel materials. We then present some current challenges related to inkjet printing, along with some exciting recent advances in materials technology seeking to overcome the current limitations and to expand the frontier of the technology. Following are multiple examples detailing the successful use of inkjet printing methods in the creation of novel RF devices, providing proof of concept and illustrating in greater detail the concepts presented in the theoretical sections.

#### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Sensing Systems for Wireless Medicine (MediSense), Georgia Institute of Technology, School of Electrical and Computer Engineering

Contributors: Le, T., Lin, Z., Vyas, R., Lakafosis, V., Yang, L., Traille, A., Tentzeris, M. M., Wong, C. P.

Publication date: 2013

Peer-reviewed: Yes

#### **Publication information**

Journal: Journal of Electronic Packaging

Volume: 135

Issue number: 1

Article number: 011007

ISSN (Print): 1043-7398

Ratings:

Scopus rating (2013): CiteScore 0.94 SJR 0.43 SNIP 0.804

Original language: English

ASJC Scopus subject areas: Electronic, Optical and Magnetic Materials, Mechanics of Materials, Computer Science Applications, Electrical and Electronic Engineering  
Keywords: Annealing, CNT, Conductive silver ink, Direct write, Electrical design, Flexible circuits, Graphene, Inkjet-printed electronics, Low temperature bonding, Microwave, Organic electronics, Paper-based electronics, Sensors, SOP  
DOIs:

10.1115/1.4023671

URLs:

<http://www.scopus.com/inward/record.url?scp=84878547011&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84878547011

Research output: Contribution to journal > Article > Scientific > peer-review

### **Magnetomechanical coupled FE simulations of rotating electrical machines**

**Purpose** - The purpose is to implement and compare different approaches for modelling the magnetostriction phenomenon in iron sheet used in rotating electrical machines. **Design/methodology/approach** - In the force-based approach, the magnetostriction is modelled as a set of equivalent forces, which produce the same deformation of the material as the magnetostriction strains. These forces among other magnetic forces are computed from the solution of the finite element (FE) field computation and used as loads for the displacement-based mechanical FE analysis. In the strain-based approach, the equivalent magnetostrictive forces are not needed and an energy-based model is used to define magnetomechanically coupled constitutive equations of the material. These equations are then space-discretised and solved with the FE method for the magnetic field and the displacements. **Findings** - It is found that the equivalent forces method can reproduce the displacements and strains of the structure but it results in erroneous stress states. The energy-based method has the ability to reproduce both the stress and strains correctly; thus enabling the analysis of stress-dependent quantities such as the iron losses and the magnetostriction itself. **Research limitations/implications** - The investigated methods do not account for hysteresis and other dynamic effects. They also require long computation times. With the available computing resources, the computation time does not present any problem as far as they are not used in everyday design procedures but the modelling of dynamic effect needs to be elaborated. **Originality/value** - The developed and implemented methods are verified with measurements and simulation experiments and applied to as complex structure as an electrical machine. The problems related to the different approaches are investigated and explained through simulations. © Emerald Group Publishing Limited.

### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Department of Mechanical Engineering and Industrial Systems, Life Cycle Effectiveness of the Built Environment (LCE@BE), Smart Energy Systems (SES), Aalto University

Contributors: Belahcen, A., Fonteyn, K., Kouhia, R., Rasilo, P., Arkkio, A.

Number of pages: 16

Pages: 1484-1499

Publication date: 2013

Peer-reviewed: Yes

### **Publication information**

Journal: COMPEL: The International Journal for Computation and Mathematics in Electrical and Electronic Engineering

Volume: 32

Issue number: 5

Article number: 17095978

ISSN (Print): 0332-1649

Ratings:

Scopus rating (2013): CiteScore 0.55 SJR 0.215 SNIP 0.6

Original language: English

ASJC Scopus subject areas: Electrical and Electronic Engineering, Computer Science Applications, Computational Theory and Mathematics, Applied Mathematics

Keywords: Coupled systems, Electrical equipment, Finite element simulation, Iron, Iron losses, Magnetoelasticity, Stress, Stress analysis

DOIs:

10.1108/COMPEL-04-2013-0109

URLs:

<http://www.scopus.com/inward/record.url?scp=84884134763&partnerID=8YFLogxK> (Link to publication in Scopus)

### **Bibliographical note**

Contribution: organisation=ede,FACT1=1<br/>Portfolio EDEND: 2013-10-29<br/>Publisher name: Emerald Group Publishing

Source: researchoutputwizard

Source ID: 1975

### **Multidimensional sequence classification based on fuzzy distances and discriminant analysis**

In this paper, we present a novel method aiming at multidimensional sequence classification. We propose a novel sequence representation, based on its fuzzy distances from optimal representative signal instances, called states. We also propose a novel modified clustering discriminant analysis algorithm minimizing the adopted criterion with respect to both the data projection matrix and the class representation, leading to the optimal discriminant sequence class representation in a low-dimensional space, respectively. Based on this representation, simple classification algorithms, such as the nearest subclass centroid, provide high classification accuracy. A three step iterative optimization procedure for choosing states, optimal discriminant subspace and optimal sequence class representation in the final decision space is proposed. The classification procedure is fast and accurate. The proposed method has been tested on a wide variety of multidimensional sequence classification problems, including handwritten character recognition, time series classification and human activity recognition, providing very satisfactory classification results.

#### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Research Community on Data-to-Decision (D2D), Aristotle University of Thessaloniki, Department of Informatics

Contributors: Iosifidis, A., Tefas, A., Pitas, I.

Number of pages: 12

Pages: 2564-2575

Publication date: 2013

Peer-reviewed: Yes

#### **Publication information**

Journal: IEEE Transactions on Knowledge and Data Engineering

Volume: 25

Issue number: 11

ISSN (Print): 1041-4347

Ratings:

Scopus rating (2013): CiteScore 4.61 SJR 1.385 SNIP 4.055

Original language: English

ASJC Scopus subject areas: Computational Theory and Mathematics, Information Systems, Computer Science Applications

Keywords: clustering-based discriminant analysis, codebook learning, fuzzy vector quantization, Sequence classification

DOIs:

10.1109/TKDE.2012.223

Source: Scopus

Source ID: 84884791250

Research output: Contribution to journal › Article › Scientific › peer-review

### **Multi-physics modeling and simulation of a slotted patch antenna for wireless strain sensing**

This research studies multi-physics simulation of a slotted patch antenna sensor. In our previous work, a folded patch antenna was designed for passive wireless strain and crack sensing. When experiencing deformation, the antenna shape changes, causing shift in electromagnetic resonance frequency of the antenna. The wireless interrogation system utilizes the principle of electromagnetic backscattering and adopts off-the-shelf 900MHz radiofrequency identification (RFID) technology. In this research, a slotted patch antenna sensor is designed, while maintaining antenna resonance frequency to be around 900MHz. The slotted antenna detours surface current using slotted patterns, so that the electrical length is kept similar as previous folded patch antenna sensor yet sensor footprint is reduced. To accurately describe both mechanical and electromagnetic behaviors of the antenna sensor, a multi-physics coupled simulation approach is pursued. A multiphysics finite element model uses the same geometry and meshing for both mechanical and electromagnetic simulations. Because electromagnetism has little influence on the mechanical behavior of the sensor, displacement field and electrical field can be solved separately using segregated steps. Known as sequential coupling, the solution method involves two or more analyses, each solving for a different physical field. The mechanics-electromagnetics coupled simulation is implemented using a commercial software package, COMSOL. Strain sensing performance predicted by the multi-physics simulation is presented.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Sensing Systems for Wireless Medicine (MediSense), Georgia Institute of Technology, School of Civil and Environmental Engineering, Georgia Institute of Technology, School of Electrical and Computer Engineering, Virginia Tech

Contributors: Yi, X., Wang, Y., Tentzeris, M. M., Leon, R. T.

Number of pages: 8  
Pages: 1857-1864  
Publication date: 2013

#### Host publication information

Title of host publication: Structural Health Monitoring 2013: A Roadmap to Intelligent Structures - Proceedings of the 9th International Workshop on Structural Health Monitoring, IWSHM 2013

Volume: 2

Publisher: DEStech Publications

ISBN (Electronic): 9781605951157

ASJC Scopus subject areas: Computer Science Applications, Health Information Management

URLs:

<http://www.scopus.com/inward/record.url?scp=84945174604&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84945174604

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

#### On the optimal class representation in linear discriminant analysis

Linear discriminant analysis (LDA) is a widely used technique for supervised feature extraction and dimensionality reduction. LDA determines an optimal discriminant space for linear data projection based on certain assumptions, e.g., on using normal distributions for each class and employing class representation by the mean class vectors. However, there might be other vectors that can represent each class, to increase class discrimination. In this brief, we propose an optimization scheme aiming at the optimal class representation, in terms of Fisher ratio maximization, for LDA-based data projection. Compared with the standard LDA approach, the proposed optimization scheme increases class discrimination in the reduced dimensionality space and achieves higher classification rates in publicly available data sets.

#### General information

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Research Community on Data-to-Decision (D2D), Aristotle University of Thessaloniki, Department of Informatics

Contributors: Iosifidis, A., Tefas, A., Pitas, I.

Number of pages: 7

Pages: 1491-1497

Publication date: 2013

Peer-reviewed: Yes

#### Publication information

Journal: IEEE Transactions on Neural Networks and Learning Systems

Volume: 24

Issue number: 9

ISSN (Print): 2162-237X

Ratings:

Scopus rating (2013): CiteScore 5.5 SJR 2.33 SNIP 3.576

Original language: English

ASJC Scopus subject areas: Artificial Intelligence, Computer Networks and Communications, Computer Science Applications, Software

Keywords: Class representation, data projection, linear discriminant analysis (LDA), subspace learning

DOIs:

10.1109/TNNLS.2013.2258937

Source: Scopus

Source ID: 84882899597

Research output: Contribution to journal > Article > Scientific > peer-review

#### Person identification from actions based on dynemes and discriminant learning

In this paper we present a view-independent person identification method exploiting motion information. A multi-camera setup is used in order to capture the human body during action execution from different viewing angles. The method is able to incorporate several everyday actions in person identification. A comparative study of the discriminative ability of different actions for person identification is provided, denoting that several actions, except walk, can be exploited for person identification.

#### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Research Community on Data-to-Decision (D2D), Aristotle University of Thessaloniki, Department of Informatics

Contributors: Iosifidis, A., Tefas, A., Pitas, I.

Publication date: 2013

#### Host publication information

Title of host publication: 2013 International Workshop on Biometrics and Forensics, IWBF 2013

ISBN (Print): 9781467349895

ASJC Scopus subject areas: Biotechnology, Computer Science Applications

Keywords: Action-based person identification, Classification results fusion, Discriminant learning, Dyneme video representation

DOIs:

10.1109/IWBF.2013.6547320

Source: Scopus

Source ID: 84881350564

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

#### Preparation of water-based carbon nanotube inks and application in the inkjet printing of carbon nanotube gas sensors

Water-based carbon nanotube (CNT) is highly desirable for inkjet printing devices due to its environmentally benign and low-cost features. To improve the dispersion of CNT in water, oxygen-containing functional groups are introduced into the surface of CNT via an acid oxidation process. The CNT-based gas sensor is fabricated by inkjet printing, which shows a high sensitivity toward NO<sub>2</sub>. The application of inkjet-printed CNT in a printed RF antenna for wireless sensing is also discussed.

#### General information

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Sensing Systems for Wireless Medicine (MediSense), Georgia Institute of Technology, Georgia Institute of Technology, School of Electrical and Computer Engineering, Georgia Tech Research Institute, Chinese University of Hong Kong

Contributors: Lin, Z., Le, T., Song, X., Yao, Y., Li, Z., Moon, K. S., Tentzeris, M. M., Wong, C. P.

Publication date: 2013

Peer-reviewed: Yes

#### Publication information

Journal: Journal of Electronic Packaging

Volume: 135

Issue number: 1

Article number: 011001

ISSN (Print): 1043-7398

Ratings:

Scopus rating (2013): CiteScore 0.94 SJR 0.43 SNIP 0.804

Original language: English

ASJC Scopus subject areas: Electronic, Optical and Magnetic Materials, Mechanics of Materials, Computer Science Applications, Electrical and Electronic Engineering

Keywords: Carbon Nanotube, Inkjet Printing, Nanotechnology, Water-Based Ink, Wireless Gas Sensor

DOIs:

10.1115/1.4023758

URLs:

<http://www.scopus.com/inward/record.url?scp=84878587853&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84878587853

Research output: Contribution to journal > Article > Scientific > peer-review

#### Service-oriented approach to improve interoperability of e-learning systems

We present a design and open source implementation for a service oriented e-learning system, which utilizes external services for supporting a wide range of learning content and also offers a REST API for external clients to fetch information stored in the system. The design will separate different concerns, such as user authentication and exercise assessment, into separate services, which together form a complete e-learning environment. A key component of the design is identifying a general set of characteristics among existing exercise assessment systems, by which the assessment methods are grouped into three types: synchronous, asynchronous and static exercises.

#### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication  
Organisations: Regulation of learning and active learning methods (REALMEE), Aalto University, Department of Computer Science and Eng., Houston Inc. Consulting Oy  
Contributors: Karavirta, V., Ihantola, P., Koskinen, T.  
Number of pages: 5  
Pages: 341-345  
Publication date: 2013

#### Host publication information

Title of host publication: Proceedings - 2013 IEEE 13th International Conference on Advanced Learning Technologies, ICALT 2013  
Article number: 6601947  
ISBN (Print): 9780769550091  
ASJC Scopus subject areas: Computer Science Applications  
Keywords: automatic assessment, e-learning, interoperability, LMS, service oriented  
DOIs:  
10.1109/ICALT.2013.105  
URLs:  
<http://www.scopus.com/inward/record.url?scp=84885222805&partnerID=8YFLogxK> (Link to publication in Scopus)  
Source: Scopus  
Source ID: 84885222805  
Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

#### Towards an approach for evaluating the quality of requirements

In engineering design, the needs of stakeholders are often captured and expressed in natural language (NL). While this facilitates such tasks as sharing information with nonspecialists, there are several associated problems including ambiguity, incompleteness, understandability, and testability. Traditionally, these issues were managed through tedious procedures such as reading requirements documents and looking for errors, but new approaches are being developed to assist designers in collecting, analysing, and clarifying requirements. The quality of the end-product is strongly related to the clarity of requirements and, thus, requirements should be managed carefully. This paper proposes to combine diverse requirements quality measures found from literature. These metrics are coherently integrated in a single software tool. This paper also proposes a new metric for clustering requirements based on their similarity to increase the quality of requirement model. The proposed methodology is tested on a case study and results show that this tool provides designers with insight on the quality of individual requirements as well as with a holistic assessment of the entire set of requirements.

#### General information

Publication status: Published  
MoE publication type: A4 Article in a conference publication  
Organisations: Intelligent dexterity for secure networked infrastructure and applications (IDSNIA), Aalto University  
Contributors: Mokammel, F., Coatanea, E., Christophe, F., Ba Khouya, M., Medyna, G.  
Publication date: 2013

#### Host publication information

Title of host publication: 33rd Computers and Information in Engineering Conference  
Volume: 2 B  
Publisher: American Society of Mechanical Engineers  
Article number: V02BT02A024  
ISBN (Print): 9780791855867  
ASJC Scopus subject areas: Mechanical Engineering, Computer Graphics and Computer-Aided Design, Computer Science Applications, Modelling and Simulation  
DOIs:  
10.1115/DETC2013-13708  
URLs:  
<http://www.scopus.com/inward/record.url?scp=84896914578&partnerID=8YFLogxK> (Link to publication in Scopus)  
Source: Scopus  
Source ID: 84896914578  
Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

#### View-independent human action recognition based on multi-view action images and discriminant learning

In this paper a novel view-independent human action recognition method is proposed. A multi-camera setup is used to capture the human body from different viewing angles. Actions are described by a novel action representation, the so-called multi-view action image (MVAI), which effectively addresses the camera viewpoint identification problem, i.e., the identification of the position of each camera with respect to the person's body. Linear Discriminant Analysis is applied on the MVAIs in order to map actions to a discriminant feature space where actions are classified by using a simple

nearest class centroid classification scheme. Experimental results denote the effectiveness of the proposed action recognition approach.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Research Community on Data-to-Decision (D2D), Aristotle University of Thessaloniki, Department of Informatics

Contributors: Iosifidis, A., Tefas, A., Pitas, I.

Publication date: 2013

#### **Host publication information**

Title of host publication: 2013 IEEE 11th IVMSP Workshop: 3D Image/Video Technologies and Applications, IVMSP 2013 - Proceedings

ISBN (Print): 9781467358583

ASJC Scopus subject areas: Computer Graphics and Computer-Aided Design, Computer Vision and Pattern Recognition, Computer Science Applications

Keywords: Discriminant Learning, Human Action Recognition, Multi-camera Setup, Multi-view Action Images

DOIs:

10.1109/IVMSPW.2013.6611931

Source: Scopus

Source ID: 84888154998

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

#### **Virtualizing power cords by wireless power transmission and energy harvesting**

In this paper, we introduce two different approaches for the virtualization of power cords for electrical devices. The first approach is a new concept for routing electric power by wireless transfer on two-dimensional surfaces, such as floors and walls. Unlike any other existing wireless power transfer scheme, this method can deliver electric power over a wide range with minimal loss. We realize this method using multi-hop displacement of a magnetic antenna array. Each array element can be selectively resonated with adjacent elements to deliver power without physical contact. The second approach utilizes far-field RF energy harvesting. Using an efficient voltage multiplier and adaptive software-based control, it is possible to operate low-power wireless sensors continuously.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Sensing Systems for Wireless Medicine (MediSense), University of Tokyo, Georgia Institute of Technology

Contributors: Kawahara, Y., Wei, W., Narusue, Y., Shigeta, R., Asami, T., Tentzeris, M.

Number of pages: 3

Pages: 37-39

Publication date: 2013

#### **Host publication information**

Title of host publication: RSW 2013 - 2013 IEEE Radio and Wireless Symposium - RWW 2013

Article number: 6486633

ISBN (Print): 9781467329309

ASJC Scopus subject areas: Computer Networks and Communications, Computer Science Applications, Electrical and Electronic Engineering, Communication

Keywords: RF energy harvesting, Wireless power transmission

DOIs:

10.1109/RWS.2013.6486633

URLs:

<http://www.scopus.com/inward/record.url?scp=84876754120&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84876754120

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

#### **Wireless chipless passive electromagnetic transducers for SHM applications**

The energy autonomy of wireless sensors is crucial especially for buried or inaccessible sensors that are often the case in SHM applications. This problem can be overcome by using classical passive sensors (RFID or SAW sensors) but they suffer from a problem of low reading distances (<math>\leq 10\text{m}</math>). For few years emerged a new kind of passive sensors using electromagnetic transducers, combining very high autonomy, high resistance to harsh environment, potential interrogation distance higher than SAW sensors and wide variety of sensing principles. We started to work in this new research field in 2005 and several sensor principles have been validated in our lab (pressure, temperature, stress) with FMCW (Frequency Modulated Continuous Wave) Radar interrogation.

### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Sensing Systems for Wireless Medicine (MediSense), University of Toulouse, INP, LAAS-CNRS, Georgia Institute of Technology

Contributors: Pons, P., Aubert, H., Tentzeris, M.

Number of pages: 8

Pages: 577-584

Publication date: 2013

### Host publication information

Title of host publication: Structural Health Monitoring 2013: A Roadmap to Intelligent Structures - Proceedings of the 9th International Workshop on Structural Health Monitoring, IWSHM 2013

Volume: 1

Publisher: DEStech Publications

ISBN (Electronic): 9781605951157

ASJC Scopus subject areas: Computer Science Applications, Health Information Management

URLs:

<http://www.scopus.com/inward/record.url?scp=84945197244&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84945197244

Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

### Gene set analysis for self-contained tests: Complex null and specific alternative hypotheses

Motivation: The analysis of differentially expressed gene sets became a routine in the analyses of gene expression data. There is a multitude of tests available, ranging from aggregation tests that summarize gene-level statistics for a gene set to true multivariate tests, accounting for intergene correlations. Most of them detect complex departures from the null hypothesis but when the null hypothesis is rejected the specific alternative leading to the rejection is not easily identifiable. Results: In this article we compare the power and Type I error rates of minimum-spanning tree (MST)-based non-parametric multivariate tests with several multivariate and aggregation tests, which are frequently used for pathway analyses. In our simulation study, we demonstrate that MST-based tests have power that is for many settings comparable with the power of conventional approaches, but outperform them in specific regions of the parameter space corresponding to biologically relevant configurations. Further, we find for simulated and for gene expression data that MST-based tests discriminate well against shift and scale alternatives. As a general result, we suggest a two-step practical analysis strategy that may increase the interpretability of experimental data: first, apply the most powerful multivariate test to find the subset of pathways for which the null hypothesis is rejected and second, apply MST-based tests to these pathways to select those that support specific alternative hypotheses.

### General information

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Prostate cancer research center (PCRC), University of Arkansas for Medical Sciences, Computational Biology and Machine Learning, Queen's University, Belfast, Northern Ireland

Contributors: Rahmatallah, Y., Emmert-Streib, F., Glazko, G.

Number of pages: 8

Pages: 3073-3080

Publication date: Dec 2012

Peer-reviewed: Yes

### Publication information

Journal: Bioinformatics

Volume: 28

Issue number: 23

ISSN (Print): 1367-4803

Ratings:

Scopus rating (2012): CiteScore 6.73 SJR 5.275 SNIP 2.051

Original language: English

ASJC Scopus subject areas: Biochemistry, Molecular Biology, Computational Theory and Mathematics, Computer Science Applications, Computational Mathematics, Statistics and Probability, Medicine(all)

DOIs:

10.1093/bioinformatics/bts579

URLs:

<http://www.scopus.com/inward/record.url?scp=84870441671&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84870441671

### **Elastic image registration for guiding focal laser ablation of prostate cancer: Preliminary results**

**Purpose:** To guide ultrasound-driven prostate photodynamic therapy using information from MRI-based treatment planning. **Methods:** Robust points matching (RPM) and thin plate splines (TPS) are used to solve correspondences and to map optimally positioned landmarks from MR images to transrectal ultrasound (TRUS) images. The algorithm uses a reduced number of anatomical markers that are initialized on the images. **Results:** Both phantom and patient data were used to evaluate precision and robustness of the method. Mean registration error ( $\pm$ standard deviation) was of 2.18.  $\pm$ . 0.25. mm and 1.55.  $\pm$ . 0.31. mm for patient prostate and urethra, respectively. Repeated tests with different markers initialization conditions showed that the quality of registration was neither influenced by the number of markers nor to the human observer. **Conclusion:** This method allows for satisfyingly accurate and robust non rigid registration of MRI and TRUS and provides practitioners with substantial help in mapping treatment planning from pre-operative MRI to interventional TRUS.

#### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Frontier Photonics, Univ Paris 06, Centre National de la Recherche Scientifique (CNRS), Pierre & Marie Curie University - Paris 6, Institut de Recherche pour le Developpement (IRD), Inria, Institut National de la Sante et de la Recherche Medicale (Inserm), Univ Sorbonne, CNRS,ICM,UMR S 1127,UMR 7225,U1127, INSERM,Inria Paris Rocquencourt,Inst Cerveau & Mo, Lille University Hospital - CHRU, CHU Angers, Univ Lille Nord de France

Contributors: Makni, N., Puech, P., Colin, P., Azzouzi, A., Mordon, S., Betrouni, N.

Number of pages: 11

Pages: 213-223

Publication date: Oct 2012

Peer-reviewed: Yes

#### **Publication information**

Journal: Computer Methods and Programs in Biomedicine

Volume: 108

Issue number: 1

ISSN (Print): 0169-2607

Ratings:

Scopus rating (2012): CiteScore 2.08 SJR 0.489 SNIP 1.525

Original language: English

ASJC Scopus subject areas: Computer Science Applications, Software, Health Informatics

**Keywords:** Image-guided interventions, Magnetic resonance imaging, Non rigid registration, PDT, Prostate cancer, Transrectal ultrasound imaging

DOIs:

10.1016/j.cmpb.2012.04.001

URLs:

<http://www.scopus.com/inward/record.url?scp=84865711653&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84865711653

Research output: Contribution to journal › Article › Scientific › peer-review

### **Implementation of a direct procedure for critical point computations using preconditioned iterative solvers**

Computation of critical points on an equilibrium path requires the solution of a non-linear eigenvalue problem. These critical points could be either bifurcation or limit points. When the external load is parametrized by a single parameter, the non-linear stability eigenvalue problem consists of solving the equilibrium equations along the criticality condition. Several techniques exist for solution of such a system. Their algorithmic treatment is usually focused for direct linear solvers and thus use the block elimination strategy. In this paper special emphasis is given for a strategy which can be used also with iterative linear solvers. Comparison to the block elimination strategy with direct linear solvers is given. Due to the non-uniqueness of the critical eigenmode a normalizing condition is required. In addition, for bifurcation points, the Jacobian matrix of the augmented system is singular at the critical point and additional stabilization is required in order to maintain the quadratic convergence of the Newton's method. Depending on the normalizing condition, convergence to a critical point with negative load parameter value can happen. The form of the normalizing equation is critically discussed. Due to the slenderness of the buckling sensitive structures the resulting matrices are ill-conditioned and a good preconditioner is mandatory for efficient solution. © 2012 Civil-Comp Ltd. and Elsevier Ltd. All rights reserved.

#### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Department of Mechanics and Design, Department of Civil Engineering, Life Cycle Effectiveness of the Built Environment (LCE@BE), Academy of Sciences of the Czech Republic, Institute of Computer Science of the

Academy of Sciences of the Czech Republic, Department of Civil and Structural Engineering, Aalto University  
Contributors: Kouhia, R., Tůma, M., Mäkinen, J., Fedoroff, A., Marjamäki, H.  
Number of pages: 8  
Pages: 110-117  
Publication date: Oct 2012  
Peer-reviewed: Yes

#### Publication information

Journal: Computers & Structures  
Volume: 108-109  
ISSN (Print): 0045-7949  
Ratings:

Scopus rating (2012): CiteScore 2.19 SJR 1.354 SNIP 2.195

Original language: English

ASJC Scopus subject areas: Computer Science Applications, Civil and Structural Engineering, Mechanical Engineering, Modelling and Simulation, Materials Science(all)

Keywords: Critical points, Equilibrium equations, Non-linear eigenvalue problem, Preconditioned iterations

DOIs:

10.1016/j.compstruc.2012.02.009

URLs:

<http://www.scopus.com/inward/record.url?scp=84865782578&partnerID=8YFLogxK> (Link to publication in Scopus)

#### Bibliographical note

/kir12<br/>Contribution: organisation=mec,FACT1=1<br/>Publisher name: Elsevier

Source: researchoutputwizard

Source ID: 4554

Research output: Contribution to journal > Article > Scientific > peer-review

#### Elemental and mixed actinide dioxides: An ab initio study

We present a systematic study of the electronic, geometric, and magnetic properties of the actinide dioxides,  $\text{UO}_2$ ,  $\text{PuO}_2$ ,  $\text{AmO}_2$ ,  $\text{U}_{0.5}\text{Pu}_{0.5}\text{O}_2$ ,  $\text{U}_{0.5}\text{Am}_{0.5}\text{O}_2$  and  $\text{Pu}_{0.5}\text{Am}_{0.5}\text{O}_2$ . For  $\text{UO}_2$ ,  $\text{PuO}_2$  and  $\text{AmO}_2$ , both density functional and hybrid density functional theory (DFT and HDFT) have been used. The fractions of exact HartreeFock (HF) exchange chosen were 25% and 40% for the hybrid density functional. For  $\text{U}_{0.5}\text{Pu}_{0.5}\text{O}_2$ ,  $\text{U}_{0.5}\text{Am}_{0.5}\text{O}_2$  and  $\text{Pu}_{0.5}\text{Am}_{0.5}\text{O}_2$ , only HDFT with 40% exact HF exchange was used. Each compound has been studied at the nonmagnetic, ferromagnetic and anti-ferromagnetic configurations, with and without spinorbit coupling (SOC). The lattice parameters, magnetic structures, bulk moduli, band gaps and density of states have been computed and compared to available experimental data and other theoretical results. Pure DFT fails to provide a satisfactory qualitative description of the electronic and magnetic structures of the actinide dioxides. On the other hand, HDFT performs very well in the prediction and description of the properties of the actinide dioxides. Our total energy calculations clearly indicate that the ground-state structures are anti-ferromagnetic for all actinide dioxides considered here. The lattice constants and the band gaps expand with an increase of HF exchange in HDFT. The influence of SOC is found to be significant.

#### General information

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Computational Science X (CompX), University of Texas at Arlington, Pacific Northwest National Laboratory

Contributors: Ma, L., Atta-Fynn, R., Ray, A. K.

Number of pages: 19

Pages: 611-629

Publication date: Jun 2012

Peer-reviewed: Yes

#### Publication information

Journal: Journal of Theoretical and Computational Chemistry

Volume: 11

Issue number: 3

ISSN (Print): 0219-6336

Ratings:

Scopus rating (2012): CiteScore 0.69 SJR 0.315 SNIP 0.304

Original language: English

ASJC Scopus subject areas: Physical and Theoretical Chemistry, Computational Theory and Mathematics, Computer Science Applications

Keywords: Actinide dioxides, hybrid density functional theory, mixed actinide oxides

DOIs:

10.1142/S021963361250040X

URLs:

<http://www.scopus.com/inward/record.url?scp=84862874223&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84862874223

Research output: Contribution to journal › Article › Scientific › peer-review

### **Rethinking Playing Research: DJ HERO and Methodological Observations in the Mix**

Playing games has a crucial methodological role within the study of games. At the same time, detailed overviews of how academic playing is conducted are difficult to find. In this article, the authors begin with Espen Aarseth's outline of playing research and offer some updates to it in order to build a more context-aware approach. To exemplify the elaborated methodology, the authors apply it to the rhythm game DJ HERO. They emphasize in this article that a game not only creates a world of its own, but also is in many ways connected to the traditions directed by real-world culture and economics. Thus, playing research needs to go beyond the limits of gameworld and normative gameplay, and move toward a concept or assemblage of play that takes into account games as singular and multifaceted technocultural entities.

#### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Mathematical modelling with wide societal impact (MathImpact), Turun Yliopisto/Turun Biomateriaalikeskus

Contributors: Karppi, T., Sotamaa, O.

Number of pages: 17

Pages: 413-429

Publication date: Jun 2012

Peer-reviewed: Yes

#### **Publication information**

Journal: SIMULATION AND GAMING

Volume: 43

Issue number: 3

ISSN (Print): 1046-8781

Ratings:

Scopus rating (2012): CiteScore 1.73 SJR 1.037 SNIP 2.174

Original language: English

ASJC Scopus subject areas: Business, Management and Accounting (miscellaneous), Computer Science Applications

Keywords: assemblage, cheating, controller, DJ HERO, gameplay, methodology, modification, playing games, playing research, real world, remix culture, research methods, rhythm games

DOIs:

10.1177/1046878111434263

URLs:

<http://www.scopus.com/inward/record.url?scp=84862604514&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84862604514

Research output: Contribution to journal › Article › Scientific › peer-review

### **Studying the Elusive Experience in Pervasive Games**

Studying pervasive games is inherently difficult and different from studying computer or board games. This article builds upon the experiences of staging and studying several playful pervasive technology prototypes. It discusses the challenges and pitfalls of evaluating pervasive game prototypes and charts methods that have proven useful in previous research. The aim is to open discussion on the situated methodology of qualitative study of evaluating and researching pervasive play.

#### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Mathematical modelling with wide societal impact (MathImpact), Stockholm University

Contributors: Stenros, J., Waern, A., Montola, M.

Number of pages: 17

Pages: 339-355

Publication date: Jun 2012

Peer-reviewed: Yes

#### **Publication information**

Journal: SIMULATION AND GAMING

Volume: 43  
Issue number: 3  
ISSN (Print): 1046-8781  
Ratings:

Scopus rating (2012): CiteScore 1.73 SJR 1.037 SNIP 2.174

Original language: English

ASJC Scopus subject areas: Business, Management and Accounting (miscellaneous), Computer Science Applications

Keywords: ambiguity, design, design-play relationship, elusiveness, evaluation methods, experience, game genres, game studies, pervasive games, pervasive play, play experience, qualitative study, research methodology, situated methodology  
DOIs:

10.1177/1046878111422532

URLs:

<http://www.scopus.com/inward/record.url?scp=84862597533&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84862597533

Research output: Contribution to journal › Article › Scientific › peer-review

### **Organizational structure and the periphery of the gene regulatory network in B-cell lymphoma.**

The physical periphery of a biological cell is mainly described by signaling pathways which are triggered by transmembrane proteins and receptors that are sentinels to control the whole gene regulatory network of a cell. However, our current knowledge about the gene regulatory mechanisms that are governed by extracellular signals is severely limited. The purpose of this paper is three fold. First, we infer a gene regulatory network from a large-scale B-cell lymphoma expression data set using the C3NET algorithm. Second, we provide a functional and structural analysis of the largest connected component of this network, revealing that this network component corresponds to the peripheral region of a cell. Third, we analyze the hierarchical organization of network components of the whole inferred B-cell gene regulatory network by introducing a new approach which exploits the variability within the data as well as the inferential characteristics of C3NET. As a result, we find a functional bisection of the network corresponding to different cellular components. Overall, our study allows to highlight the peripheral gene regulatory network of B-cells and shows that it is centered around hub transmembrane proteins located at the physical periphery of the cell. In addition, we identify a variety of novel pathological transmembrane proteins such as ion channel complexes and signaling receptors in B-cell lymphoma.

### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Research Community on Data-to-Decision (D2D), Prostate cancer research center (PCRC), Queen's University, Belfast, Northern Ireland, Computational Biology and Machine Learning Lab., Faculty of Medicine, Health and Life Sciences

Contributors: de Matos Simoes, R., Tripathi, S., Emmert-Streib, F.

Publication date: 14 May 2012

Peer-reviewed: Yes

### **Publication information**

Journal: BMC Systems Biology

Volume: 6

Article number: 38

ISSN (Print): 1752-0509

Ratings:

Scopus rating (2012): CiteScore 3.32 SJR 1.577 SNIP 1.009

Original language: English

ASJC Scopus subject areas: Molecular Biology, Structural Biology, Applied Mathematics, Modelling and Simulation, Computer Science Applications

Keywords: B-cell lymphoma, Gene expression data, Gene regulatory network, Statistical network inference

DOIs:

10.1186/1752-0509-6-38

URLs:

<http://www.scopus.com/inward/record.url?scp=84865119369&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84865119369

Research output: Contribution to journal › Article › Scientific › peer-review

### **Body area nanonetworks with molecular communications in nanomedicine**

Recent developments in nano and biotechnology enable promising therapeutic nanomachines (NMs) that operate on inter- or intracellular area of human body. The networks of such therapeutic NMs, body area nanonetworks (BAN<sup>2</sup>s), also empower sophisticated nanomedicine applications. In these applications, therapeutic NMs share information to perform

computation and logic operations, and make decisions to treat complex diseases. Hence, one of the most challenging subjects for these sophisticated applications is the realization of BAN<sup>2</sup> through a nanoscale communication paradigm. In this article, we introduce the concept of a BAN<sup>2</sup> with molecular communication, where messenger molecules are used as communication carrier from a sender to a receiver NM. The current state of the art of molecular communication and BAN<sup>2</sup> in nanomedicine applications is first presented. Then communication theoretical efforts are reviewed, and open research issues are given. The objective of this work is to introduce this novel and interdisciplinary research field and highlight major barriers toward its realization from the viewpoint of communication theory.

### General information

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Wireless Communications and Positioning (WICO), Next-Generation Wireless Communications Laboratory (NWCL), Waterford Institute of Technology

Contributors: Atakan, B., Akan, O. B., Balasubramaniam, S.

Number of pages: 7

Pages: 28-34

Publication date: Jan 2012

Peer-reviewed: Yes

### Publication information

Journal: IEEE Communications Magazine

Volume: 50

Issue number: 1

Article number: 6122529

ISSN (Print): 0163-6804

Ratings:

Scopus rating (2012): CiteScore 5.73 SJR 2.524 SNIP 5.384

Original language: English

ASJC Scopus subject areas: Electrical and Electronic Engineering, Computer Science Applications, Computer Networks and Communications

DOIs:

10.1109/MCOM.2012.6122529

URLs:

<http://www.scopus.com/inward/record.url?scp=84855682134&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84855682134

Research output: Contribution to journal > Article > Scientific > peer-review

### Short-term power load forecasting using grey correlation contest modeling

Power load has the characteristic of nonlinear fluctuation and random growth. Aiming at the drawback that the forecasting accuracy of general GM(1,1) model goes down when there is a greater load mutation, this paper proposes a new grey model with grey correlation contest for short-term power load forecasting. In order to cover the impact of various certain and uncertain factors in climate and society on the model as fully as possible, original series are selected from different viewpoints to construct different forecasting strategies. By making full use of the characteristic that GM(1,1) model can give a perfect forecasting result in the smooth rise and drop phase of power load, and the feature that there are several peaks and valleys within daily power load, the predicted day is divided into several smooth segments for separate forecasting. Finally, the different forecasting strategies are implemented respectively in the different segments through grey correlation contest, so as to avoid the error amplification resulted from the improper choice of initial condition. A practical application verifies that, compared with the existing grey forecasting models, the proposed model is a stable and feasible forecasting model with a higher forecasting accuracy.

### General information

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Sensing Systems for Wireless Medicine (MediSense), Hunan University, Sany Smart Control Equipment Ltd., Georgia Institute of Technology

Contributors: Jin, M., Zhou, X., Zhang, Z. M., Tentzeris, M. M.

Number of pages: 7

Pages: 773-779

Publication date: Jan 2012

Peer-reviewed: Yes

### Publication information

Journal: Expert Systems with Applications

Volume: 39

Issue number: 1  
ISSN (Print): 0957-4174  
Ratings:

Scopus rating (2012): CiteScore 3.38 SJR 1.148 SNIP 2.407

Original language: English

ASJC Scopus subject areas: Engineering(all), Computer Science Applications, Artificial Intelligence

Keywords: External optimization, Grey correlation contest, Hybrid grey model, Internal optimization, Short-term power load forecasting, Time-segment

DOIs:

10.1016/j.eswa.2011.07.072

URLs:

<http://www.scopus.com/inward/record.url?scp=81855218656&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 81855218656

Research output: Contribution to journal › Article › Scientific › peer-review

### **A system for real-time detection and tracking of vehicles from a single car-mounted camera**

A novel system for detection and tracking of vehicles from a single car-mounted camera is presented. The core of the system are high-performance vision algorithms: the WaldBoost detector [1] and the TLD tracker [2] that are scheduled so that a real-time performance is achieved. The vehicle monitoring system is evaluated on a new dataset collected on Italian motorways which is provided with approximate ground truth (GT0) obtained from laser scans. For a wide range of distances, the recall and precision of detection for cars are excellent. Statistics for trucks are also reported. The dataset with the ground truth is made public.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Research Community on Data-to-Decision (D2D), Advanced Technology Division, Czech Technical University in Prague

Contributors: Caraffi, C., Vojir, T., Trefný, J., Šochman, J., Matas, J.

Number of pages: 8

Pages: 975-982

Publication date: 2012

#### **Host publication information**

Title of host publication: 2012 15th International IEEE Conference on Intelligent Transportation Systems, ITSC 2012

Article number: 6338748

ISBN (Print): 9781467330640

ASJC Scopus subject areas: Automotive Engineering, Mechanical Engineering, Computer Science Applications

DOIs:

10.1109/ITSC.2012.6338748

URLs:

<http://www.scopus.com/inward/record.url?scp=84871239330&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84871239330

Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

### **Design and synthesis for multimedia systems using the targeted dataflow interchange format**

Development of multimedia systems that can be targeted to different platforms is challenging due to the need for rigorous integration between high-level abstract modeling, and low-level synthesis and optimization. In this paper, a new dataflow-based design tool called the targeted dataflow interchange format is introduced for retargetable design, analysis, and implementation of embedded software for multimedia systems. Our approach provides novel capabilities, based on principles of task-level dataflow analysis, for exploring and optimizing interactions across design components; object-oriented data structures for encapsulating contextual information for components; a novel model for representing parameterized schedules that are derived from repetitive graph structures; and automated code generation for programming interfaces and low-level customizations that are geared toward high-performance embedded-processing architectures. We demonstrate our design tool for cross-platform application design, parameterized schedule representation, and associated dataflow graph-code generation using a case study centered around an image registration application.

#### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Signal Processing Research Community (SPRC), University of Maryland, SAIC, New Jersey Institute of Technology, Department of Electrical and Computer Engineering

Contributors: Shen, C. C., Wu, S., Sane, N., Wu, H. H., Plishker, W., Bhattacharyya, S. S.  
Number of pages: 11  
Pages: 630-640  
Publication date: 2012  
Peer-reviewed: Yes

#### Publication information

Journal: IEEE Transactions on Multimedia

Volume: 14

Issue number: 3 PART1

Article number: 6172244

ISSN (Print): 1520-9210

Ratings:

Scopus rating (2012): CiteScore 3.75 SJR 0.815 SNIP 2.573

Original language: English

ASJC Scopus subject areas: Signal Processing, Media Technology, Computer Science Applications, Electrical and Electronic Engineering

Keywords: Dataflow graphs, design tools, embedded signal processing, scheduling, software synthesis

DOIs:

10.1109/TMM.2012.2191397

URLs:

<http://www.scopus.com/inward/record.url?scp=84861152678&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84861152678

Research output: Contribution to journal › Article › Scientific › peer-review

#### Evaluation of effectiveness of the stickgrip device for detecting the topographic heights on digital maps

Multimodal visualization of landscapes and cityscapes requires new concepts and metaphors for intuitive operations with multidimensional data in fully immersive virtual environments. Variations in lighting conditions and perceptual interpretation of the reduced topographic colors can significantly modify an assessment of the true elevation profiles on a digital map. This paper describes the results of the empirical evaluation of the new interaction technique that has potential to enhance the imaging functionality of the two-dimensional maps. It was demonstrated that untrained subjects become much more accurate at detecting the altitudes in a range of 0-4000 m assigned within the palette when values of the light intensity had been associated with the haptic information. The results confirmed that the accuracy of the height estimation with the StickGrip haptic device appeared to be higher by about 32% in comparison to visual assessment.

#### General information

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Augmented Human Activities (AHA)

Contributors: Evreinova, T. V., Evreinov, G., Raisamo, R.

Number of pages: 16

Pages: 61-76

Publication date: 2012

Peer-reviewed: Yes

#### Publication information

Journal: INTERNATIONAL JOURNAL OF COMPUTER SCIENCE AND APPLICATIONS

Volume: 9

Issue number: 3

ISSN (Print): 0972-9038

Ratings:

Scopus rating (2012): CiteScore 0.66 SJR 0.235 SNIP 0.719

Original language: English

ASJC Scopus subject areas: Computer Science Applications

Keywords: Geoscientific data, The stickgrip haptic device, Topographic elevation profile

URLs:

<http://www.scopus.com/inward/record.url?scp=84872773600&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84872773600

Research output: Contribution to journal › Article › Scientific › peer-review

#### Face typing: Vision-based perceptual interface for hands-free text entry with a scrollable virtual keyboard

We present a novel vision-based perceptual user interface for hands-free text entry that utilizes face detection and visual gesture detection to manipulate a scrollable virtual keyboard. A thorough experimentation was undertaken to quantitatively

define a performance of the interface in hands-free pointing, selection and scrolling tasks. The experiments were conducted with nine participants in laboratory conditions. Several face and head gestures were examined for detection robustness and user convenience. The system gave a reasonable performance in terms of high gesture detection rate and small false alarm rate. The participants reported that a new interface was easy to understand and operate. Encouraged by these results, we discuss advantages and constraints of the interface and suggest possibilities for design improvements.

#### General information

Publication status: Published  
MoE publication type: A4 Article in a conference publication  
Organisations: Augmented Human Activities (AHA)  
Contributors: Gizatdinova, Y., Spakov, Ö., Surakka, V.  
Number of pages: 7  
Pages: 81-87  
Publication date: 2012

#### Host publication information

Title of host publication: 2012 IEEE Workshop on the Applications of Computer Vision, WACV 2012  
Article number: 6162997  
ISBN (Print): 9781467302333  
ASJC Scopus subject areas: Computer Vision and Pattern Recognition, Computer Science Applications  
DOIs:  
10.1109/WACV.2012.6162997  
URLs:  
<http://www.scopus.com/inward/record.url?scp=84860699077&partnerID=8YFLogxK> (Link to publication in Scopus)  
Source: Scopus  
Source ID: 84860699077  
Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

#### High-content screening data management for drug discovery in a small- to medium- size laboratory: Results of a collaborative pilot study focused on user expectations as indicators of effectiveness

High-content screening (HCS) technology provides a powerful vantage point to approach biological problems; it allows analysis of cell parameters, including changes in cell or protein movement, shape, or texture. As part of a collaborative pilot research project to improve bioscience research data integration, we identified HCS data management as an area ripe for advancement. A primary goal was to develop an integrated data management and analysis system suitable for small- to medium-size HCS programs that would improve research productivity and increase work satisfaction. A system was developed that uses Labmatrix, a Webbased research data management platform, to integrate and query data derived from a Cellomics STORE database. Focusing on user expectations, several barriers to HCS productivity were identified and reduced or eliminated. The impact of the project on HCS research productivity was tested through a series of 18 lab-requested integrated data queries, 7 of which were fully enabled, 7 partially enabled, and 4 enabled through data export to standalone data analysis tools. The results are limited to one laboratory, but this pilot suggests that through an "implementation research" approach, a network of small- to medium-size laboratories involved in HCS projects could achieve greater productivity and satisfaction in drug discovery research.

#### General information

Publication status: Published  
MoE publication type: A1 Journal article-refereed  
Organisations: Prostate cancer research center (PCRC), Wilmer Eye Institute, Fraunhofer Center for Experimental Software Engineering, BioFortis, Inc., University of Texas Health Science Center at Houston, Universite' Pierre et Marie Curie, Sorbonne, France, 13.12.2011, Johns Hopkins School of Medicine  
Contributors: Berlinicke, C. A., Ackermann, C. F., Chen, S. H., Schulze, C., Shafranovich, Y., Myneni, S., Patel, V. L., Wang, J., Zack, D. J., Lindvall, M., Bova, G. S.  
Number of pages: 11  
Pages: 255-265  
Publication date: 2012  
Peer-reviewed: Yes

#### Publication information

Journal: JALA: JOURNAL OF LABORATORY AUTOMATION  
Volume: 17  
Issue number: 4  
ISSN (Print): 2211-0682  
Ratings:  
Scopus rating (2012): CiteScore 0.93 SJR 0.485 SNIP 0.633  
Original language: English  
ASJC Scopus subject areas: Computer Science Applications, Medical Laboratory Technology

Keywords: Bioscience laboratory data management research, Drug discovery, High-content screening, Implementation research, Vision research

DOIs:

10.1177/2211068211431207

URLs:

<http://www.scopus.com/inward/record.url?scp=84868231968&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84868231968

Research output: Contribution to journal › Article › Scientific › peer-review

### **Multiobjective TDMA optimization for neuron-based molecular communication**

This paper proposes and evaluates Neuronal TDMA, a TDMA-based signaling protocol framework for molecular communication, which utilizes neurons as a primary component to build in-body sensor-actuator networks (IBSAs). Neuronal TDMA leverages an evolutionary multiobjective optimization algorithm (EMOA) that optimizes the signaling schedule for nanomachines in IBSAs. The proposed EMOA uses a population of solution candidates, each of which represents a particular signaling schedule, and evolves them via several operators such as selection, crossover, mutation and offspring size adjustment. The evolution process is performed to seek Pareto-optimal signaling schedules subject to given constraints. Simulation results verify that the proposed EMOA efficiently obtains quality solutions. It outperforms several conventional EMOAs.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Wireless Communications and Positioning (WICO), University of Massachusetts Boston,

Telecommunications Software and Systems Group (TSSG), Waterford Institute of Technology, Trinity College Dublin

Contributors: Suzuki, J., Balasubramaniam, S., Prina-Mello, A.

Publication date: 2012

#### **Host publication information**

Title of host publication: BODYNETS 2012 - 7th International Conference on Body Area Networks

Publisher: ICST

ISBN (Electronic): 9781936968602

ASJC Scopus subject areas: Computer Science Applications, Artificial Intelligence, Computer Networks and Communications

Keywords: Evolutionary multiobjective optimization algorithms, Molecular communication, Neuronal networks, TDMA scheduling

DOIs:

10.4108/icst.bodynets.2012.250037

URLs:

<http://www.scopus.com/inward/record.url?scp=84908577240&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84908577240

Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

### **On the definition of dynamic software measures**

The quantification of several software attributes (e.g., size, complexity, cohesion, coupling) is usually carried out in a static fashion, and several hundreds of measures have been defined to this end. However, static measurement may only be an approximation for the measurement of these attributes during software use. The paper proposes a theoretical framework based on Axiomatic Approaches for the definition of sensible dynamic software measures that can dynamically capture these attributes. Dynamic measures based on this framework are defined for dynamically quantifying size and coupling. In this paper, we also compare dynamic measures of size and coupling against well-known static measures by correlating them with fault-pronenesses of four case studies.

#### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Università degli Studi Dell'Insubria, Former organisation of the author

Contributors: Lavazza, L., Morasca, S., Taibi, D., Tosi, D.

Number of pages: 10

Pages: 39-48

Publication date: 2012

Peer-reviewed: Yes

#### **Publication information**

Journal: International Symposium on Empirical Software Engineering and Measurement

ISSN (Print): 1949-3770

Original language: English

ASJC Scopus subject areas: Computer Science Applications, Software

Keywords: Code coverage, Dynamic coupling, Dynamic measures, Dynamic size

DOIs:

10.1145/2372251.2372259

URLs:

<http://www.scopus.com/inward/record.url?scp=84867570388&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84867570388

Research output: Contribution to journal › Article › Scientific › peer-review

### **Systematic integration of flowgraph- and module-level parallelism in implementation of DSP applications on multiprocessor systems-on-chip**

Increasing use of multiprocessor system-on-chip (MPSoC) technology is an important trend in the design and implementation of signal processing systems. However, the design of efficient DSP software for MPSoC platforms involves complex inter-related steps, including data decomposition, memory management, and inter-task and inter-thread synchronization. These design steps are challenging, especially under strict constraints on performance and power consumption, and tight time to market pressures. To facilitate these steps, we have developed a new dataflow based design flow within the targeted dataflow interchange format (TDIF) design tool. Our new MPSoC-oriented design flow, called TDIF-PPG, is geared towards analysis and mapping of embedded DSP applications on MPSoCs. An important feature of TDIF-PPG is its capability to integrate graph level parallelism for DSP system flowgraphs and actor level parallelism for DSP functional modules into the application mapping processing. Here, graph level parallelism is exposed by the dataflow graph application representation in TDIF, and actor level parallelism is modeled by a novel model for multiprocessor dataflow graph implementation that we call the parallel processing group (PPG) model. We demonstrate our approach through actor and subsystem design for software defined radio.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Signal Processing Research Community (SPRC), University of Maryland, Department of Electrical and Computer Engineering

Contributors: Zhou, Z., Shen, C. C., Plishker, W., Wu, H. H., Bhattacharyya, S. S.

Number of pages: 7

Pages: 402-408

Publication date: 2012

#### **Host publication information**

Title of host publication: ICSP 2012 - 2012 11th International Conference on Signal Processing, Proceedings

Volume: 1

Article number: 6491686

ISBN (Print): 9781467321945

ASJC Scopus subject areas: Software, Signal Processing, Computer Science Applications

DOIs:

10.1109/ICoSP.2012.6491686

URLs:

<http://www.scopus.com/inward/record.url?scp=84876463174&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84876463174

Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

### **Thermal effects on a passive wireless antenna sensor for strain and crack sensing**

For application in structural health monitoring, a folded patch antenna has been previously designed as a wireless sensor that monitors strain and crack in metallic structures. Resonance frequency of the RFID patch antenna is closely related with its dimension. To measure stress concentration in a base structure, the sensor is bonded to the structure like a traditional strain gage. When the antenna sensor is under strain/deformation together with the base structure, the antenna resonance frequency varies accordingly. The strain-related resonance frequency variation is wirelessly interrogated and recorded by a reader, and can be used to derive strain/deformation. Material properties of the antenna components can have significant effects on sensor performance. This paper investigates thermal effects through both numerical simulation and temperature chamber testing. When temperature fluctuates, previous sensor design (with a glass microfiber-reinforced PTFE substrate) shows relatively large variation in resonance frequency. To improve sensor performance, a new ceramic-filled PTFE substrate material is chosen for re-designing the antenna sensor. Temperature chamber experiments are also conducted to the sensor with new substrate material, and compared with previous design.

### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Sensing Systems for Wireless Medicine (MediSense), Georgia Institute of Technology, Georgia Institute of Technology, School of Electrical and Computer Engineering, Virginia Tech

Contributors: Yi, X., Vyas, R., Cho, C., Fang, C. H., Cooper, J., Wang, Y., Leon, R. T., Tentzeris, M. M.

Publication date: 2012

### Host publication information

Title of host publication: Sensors and Smart Structures Technologies for Civil, Mechanical, and Aerospace Systems 2012

Volume: 8345

Article number: 83450F

ISBN (Print): 9780819490025

ASJC Scopus subject areas: Applied Mathematics, Computer Science Applications, Electrical and Electronic Engineering, Electronic, Optical and Magnetic Materials, Condensed Matter Physics

Keywords: Crack sensor, Folded patch antenna, Passive wireless sensor, RFID, Strain sensor, Thermal effect

DOIs:

10.1117/12.914833

URLs:

<http://www.scopus.com/inward/record.url?scp=84861112128&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84861112128

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

### Wear and corrosion behaviour of HVOF coatings engineered from conventional WC-Co-Cr and conventional WC-Co-Cr added nanostructured Wc-Co powders

Tungsten carbide base coatings deposited by High Velocity Oxy-Fuel (HVOF) technique are the most common materials deposited in order to protect the components surface against wear and corrosion. The purpose of this study is to investigate the sliding and abrasion wear and also the corrosion behaviour of HVOF coatings engineered from conventional WC-10Co-4Cr and conventional WC-10Co-4Cr with addition of WC-15Co nanostructured powders. A 5% addition of nanostructured WC-15Co powder was added to a conventional WC-10Co4Cr powder in order to improve the properties of the coating. The coatings have been characterized by SEM equipped with EDAX analyzer, XRD as well as the microhardness testing were performed. The wear behavior was evaluated by means of rubber wheel abrasion and ball-on-disk tests. The worn surfaces have been investigated by FESEM microscope and optical profilometer. The corrosion behavior of the coatings were tested with electrochemical open-cell potential measurements. The results showed that the nanostructured powder had a positive influence on sliding wear and corrosion behavior of the coating in comparison with the conventional coating.

### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Materials Science, Department of Materials Science, Engineering materials science and solutions (EMASS), Politehnica University of Timișoara

Contributors: Hulka, I., Șerban, V. A., Uțu, D., Koivuluoto, H., Vuoristo, P., Niemi, K.

Number of pages: 6

Pages: 322-327

Publication date: 2012

### Host publication information

Title of host publication: NANOCON 2012 - Conference Proceedings, 4th International Conference

Publisher: TANGER Ltd.

ISBN (Electronic): 9788087294352

ASJC Scopus subject areas: Electrical and Electronic Engineering, Computer Science Applications, Materials Science(all)

Keywords: HVOF, Nanostructures, WC based coatings, Wear

URLs:

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Source: Scopus

Source ID: 84923673812

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

### Wireless communications at the nanoscale

The importance of wireless communications is increasing thanks to the numerous types of services supported by wireless devices, which allow the realization of the always best connected vision. However, the dramatic boost toward miniaturization and nanoscale technologies requires rethinking of wireless communications on such a scale. While the transformation from wired to wireless communication has improved connectivity for end users and spawned new research

areas, the field as a whole is approaching a crossroad. The main reason for this is the emergence of miniature devices, in particular devices that are built from nano components, which has led to new challenges for the wireless communication paradigm. Calcium signaling is a natural intercellular calcium wave found in biology cells that enables communication at short range between cells. Using this form of signaling can enable short-range communication that exploits a combination of biological constructs and engineered cells.

#### General information

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Wireless Communications and Positioning (WICO), Università degli Studi di Catania, Next-Generation Wireless Communications Laboratory (NWCL), Bio-Inspired Network Research Unit, TSSG, starMobile, Inc.

Contributors: Galluccio, L., Akan, O. B., Balasubramaniam, S., Sivakumar, R.

Number of pages: 2

Pages: 10-11

Publication date: 2012

Peer-reviewed: Yes

#### Publication information

Journal: IEEE Wireless Communications

Volume: 19

Issue number: 5

Article number: 6339466

ISSN (Print): 1536-1284

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Original language: English

ASJC Scopus subject areas: Electrical and Electronic Engineering, Computer Science Applications

DOIs:

10.1109/MWC.2012.6339466

URLs:

<http://www.scopus.com/inward/record.url?scp=84879211532&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84879211532

Research output: Contribution to journal › Article › Scientific › peer-review

#### Wireless sensing and identification of passive electromagnetic sensors based on millimetre-wave FMCW RADAR

The wireless measurement of various physical quantities from the analysis of the RADAR Cross Sections variability of passive electromagnetic sensors is presented. A millimetre-wave Frequency-Modulated Continuous-Wave RADAR is used for both remote sensing and wireless identification of sensors. Long reading ranges (up to some decameters) may be reached at the expense of poor measurement resolution (typically 10%).

#### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Sensing Systems for Wireless Medicine (MediSense), University of Toulouse, INP, LAAS-CNRS, IPDIA, Georgia Institute of Technology, CNRS UMR 5218, IPB

Contributors: Aubert, H., Chebila, F., Jatlaoui, M., Thai, T., Hallil, H., Traille, A., Bouaziz, S., Rifai, A., Pons, P., Menini, P., Tentzeris, M.

Number of pages: 6

Pages: 398-403

Publication date: 2012

#### Host publication information

Title of host publication: 2012 IEEE International Conference on RFID-Technologies and Applications, RFID-TA 2012

Article number: 6404554

ISBN (Print): 9781467346566

ASJC Scopus subject areas: Computer Networks and Communications, Computer Science Applications

DOIs:

10.1109/RFID-TA.2012.6404554

URLs:

<http://www.scopus.com/inward/record.url?scp=84873122062&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84873122062

Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

## Structural Measures for Network Biology Using QuACN

**Background:** Structural measures for networks have been extensively developed, but many of them have not yet demonstrated their sustainability. That means, it remains often unclear whether a particular measure is useful and feasible to solve a particular problem in network biology. Exemplarily, the classification of complex biological networks can be named, for which structural measures are used leading to a minimal classification error. Hence, there is a strong need to provide freely available software packages to calculate and demonstrate the appropriate usage of structural graph measures in network biology. **Results:** Here, we discuss topological network descriptors that are implemented in the R-package QuACN and demonstrate their behavior and characteristics by applying them to a set of example graphs. Moreover, we show a representative application to illustrate their capabilities for classifying biological networks. In particular, we infer gene regulatory networks from microarray data and classify them by methods provided by QuACN. Note that QuACN is the first freely available software written in R containing a large number of structural graph measures. **Conclusion:** The R package QuACN is under ongoing development and we add promising groups of topological network descriptors continuously. The package can be used to answer intriguing research questions in network biology, e.g., classifying biological data or identifying meaningful biological features, by analyzing the topology of biological networks.

### General information

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Research Community on Data-to-Decision (D2D), Institute for Bioinformatics and Translational Research, Computational Biology and Machine Learning Lab., Faculty of Medicine, Health and Life Sciences, Queen's University, Belfast, Northern Ireland

Contributors: Mueller, L. A. J., Kugler, K. G., Graber, A., Emmert-Streib, F., Dehmer, M.

Publication date: 24 Dec 2011

Peer-reviewed: Yes

### Publication information

Journal: BMC Bioinformatics

Volume: 12

Issue number: 1

Article number: 492

ISSN (Print): 1471-2105

Ratings:

Scopus rating (2011): CiteScore 3.34 SJR 1.662 SNIP 1.196

Original language: English

ASJC Scopus subject areas: Biochemistry, Molecular Biology, Computer Science Applications, Applied Mathematics, Structural Biology

DOIs:

10.1186/1471-2105-12-492

URLs:

<http://www.scopus.com/inward/record.url?scp=84155173344&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84155173344

Research output: Contribution to journal > Article > Scientific > peer-review

## Distributed pervasive services using group service communication supporting body area networks

Body Area Network (BAN) provide critical data in healthcare monitoring environments, where such monitoring can be performed in a ubiquitous manner using various miniature device technologies. However, a key requirement in supporting the full capacity of a BAN is an efficient distribution, processing and application of the acquired data. The architecture and applications which capitalize on the huge potential of this data, provide significant added value to BANs. This paper proposes an architecture which is service oriented and integrates the data produced by BANs into a healthcare environment, supporting remote interactions between medical officers to maximise patient care. The dynamic interaction of distributed services in this diverse environment is a key ingredient in the way technology can enhance healthcare. The architecture defines group services which facilitate the control of the dynamic behaviour of services within this heterogeneous environment.

### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Wireless Communications and Positioning (WICO), Waterford Institute of Technology, Telecommunications Software and Systems Group (TSSG), Technical University of Dortmund, Brigham and Women's Hospital

Contributors: Foley, C., Balasubramaniam, S., Botvich, D., Donnelly, W., Michaelis, S., Schmutzler, J., Stair, T.

Publication date: 29 Nov 2011

### Host publication information

Title of host publication: BODYNETS 2008 - 3rd International ICST Conference on Body Area Networks

Publisher: ICST

ISBN (Electronic): 9789639799172

ASJC Scopus subject areas: Computer Science Applications, Computer Networks and Communications, Artificial Intelligence

Keywords: Groups, Health-care, Monitoring, Policies, Services

DOIs:

10.4108/ICST.BODYNETS2008.2960

URLs:

<http://www.scopus.com/inward/record.url?scp=84912141219&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84912141219

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

### Biological principles for future Internet architecture design

Currently, a large number of activities on Internet redesign are being discussed in the research community. While today's Internet was initially planned as a datagram-oriented communication network among research facilities, it has grown and evolved to accommodate unexpected diversity in services and applications. For the future Internet this trend is anticipated to continue even more. Such developments demand that the architecture of the new-generation Internet be designed in a dynamic, modular, and adaptive way. Features like these can often be observed in biological processes that serve as inspiration for designing new cooperative architectural concepts. Our contribution in this article is twofold. First, unlike previous discussions on biologically inspired network control mechanisms, we do not limit ourselves to a single method, but consider ecosystems and coexisting environments of entities that can cooperate based on biological principles. Second, we illustrate our grand view by not only taking inspiration from biology in the design process, but also sketching a possible way to implement biologically driven control in a future Internet architecture.

### General information

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Wireless Communications and Positioning (WICO), Waterford Institute of Technology, Osaka University, University of Cambridge

Contributors: Balasubramaniam, S., Leibnitz, K., Lio, P., Botvich, D., Murata, M.

Number of pages: 9

Pages: 44-52

Publication date: Jul 2011

Peer-reviewed: Yes

### Publication information

Journal: IEEE Communications Magazine

Volume: 49

Issue number: 7

Article number: 5936154

ISSN (Print): 0163-6804

Ratings:

Scopus rating (2011): CiteScore 4.97 SJR 1.976 SNIP 5.011

Original language: English

ASJC Scopus subject areas: Computer Science Applications, Computer Networks and Communications, Electrical and Electronic Engineering

DOIs:

10.1109/MCOM.2011.5936154

URLs:

<http://www.scopus.com/inward/record.url?scp=79960029644&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 79960029644

Research output: Contribution to journal > Article > Scientific > peer-review

### Social interaction in games

Due to the popularity of social media networks and the games played on those platforms interest in the so-called social games has piqued. This article looks at those games in the context of general social aspects of game play. By approaching game play as an activity, it is possible to distinguish between different kinds of social interaction: the sociability players engage in around the game and the social play contained and mediated by the game. In charting the social space of playing, this article shows the inherent social aspects of singleplayer games - and the solitary aspects of

social games.

#### General information

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Mathematical modelling with wide societal impact (MathImpact)

Contributors: Stenros, J., Paavilainen, J., Mäyrä, F.

Number of pages: 17

Pages: 342-358

Publication date: Jul 2011

Peer-reviewed: Yes

#### Publication information

Journal: International Journal of Arts and Technology

Volume: 4

Issue number: 3

ISSN (Print): 1754-8853

Ratings:

Scopus rating (2011): CiteScore 0.48 SJR 0.137 SNIP 0.515

Original language: English

ASJC Scopus subject areas: Visual Arts and Performing Arts, Computer Science Applications

Keywords: Games, Gaming capital, Massive single player, Multiplayer, Performance, Play, Single player, Sociability, Social interaction, Social play

DOIs:

10.1504/IJART.2011.041486

URLs:

<http://www.scopus.com/inward/record.url?scp=84858774885&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84858774885

Research output: Contribution to journal › Article › Scientific › peer-review

#### **BACOM: In silico detection of genomic deletion types and correction of normal cell contamination in copy number data**

Motivation: Identification of somatic DNA copy number alterations (CNAs) and significant consensus events (SCEs) in cancer genomes is a main task in discovering potential cancer-driving genes such as oncogenes and tumor suppressors. The recent development of SNP array technology has facilitated studies on copy number changes at a genome-wide scale with high resolution. However, existing copy number analysis methods are oblivious to normal cell contamination and cannot distinguish between contributions of cancerous and normal cells to the measured copy number signals. This contamination could significantly confound downstream analysis of CNAs and affect the power to detect SCEs in clinical samples. Results: We report here a statistically principled in silico approach, Bayesian Analysis of COpy number Mixtures (BACOM), to accurately estimate genomic deletion type and normal tissue contamination, and accordingly recover the true copy number profile in cancer cells. We tested the proposed method on two simulated datasets, two prostate cancer datasets and The Cancer Genome Atlas high-grade ovarian dataset, and obtained very promising results supported by the ground truth and biological plausibility. Moreover, based on a large number of comparative simulation studies, the proposed method gives significantly improved power to detect SCEs after in silico correction of normal tissue contamination. We develop a cross-platform open-source Java application that implements the whole pipeline of copy number analysis of heterogeneous cancer tissues including relevant processing steps. We also provide an R interface, *bacomR*, for running BACOM within the R environment, making it straightforward to include in existing data pipelines.

#### General information

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Prostate cancer research center (PCRC), Virginia Tech, Johns Hopkins School of Medicine, Wake Forest University School of Medicine

Contributors: Yu, G., Zhang, B., Bova, G. S., Xu, J., Shih, I. M., Wang, Y.

Number of pages: 8

Pages: 1473-1480

Publication date: Jun 2011

Peer-reviewed: Yes

#### Publication information

Journal: Bioinformatics

Volume: 27

Issue number: 11

Article number: btr183

ISSN (Print): 1367-4803

Ratings:

Scopus rating (2011): CiteScore 5.61 SJR 4.118 SNIP 1.83

Original language: English

ASJC Scopus subject areas: Biochemistry, Molecular Biology, Computational Theory and Mathematics, Computer Science Applications, Computational Mathematics, Statistics and Probability, Medicine(all)

DOIs:

10.1093/bioinformatics/btr183

URLs:

<http://www.scopus.com/inward/record.url?scp=79957859881&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 79957859881

Research output: Contribution to journal › Article › Scientific › peer-review

### **Multithreaded simulation for synchronous dataflow graphs**

For system simulation, Synchronous DataFlow (SDF) has been widely used as a core model of computation in design tools for digital communication and signal processing systems. The traditional approach for simulating SDF graphs is to compute and execute static schedules in single-processor desktop environments. Nowadays, however, multicore processors are increasingly popular desktop platforms for their potential performance improvements through thread-level parallelism. Without novel scheduling and simulation techniques that explicitly explore thread-level parallelism for executing SDF graphs, current design tools gain only minimal performance improvements on multicore platforms. In this article, we present a new multithreaded simulation scheduler, called MSS, to provide simulation runtime speedup for executing SDF graphs on multicore processors. MSS strategically integrates graph clustering, intracluster scheduling, actor vectorization, and intercluster buffering techniques to construct InterThread Communication (ITC) graphs at compile-time. MSS then applies efficient synchronization and dynamic scheduling techniques at runtime for executing ITC graphs in multithreaded environments. We have implemented MSS in the Advanced Design System (ADS) from Agilent Technologies. On an Intel dual-core, hyper-threading (4 processing units) processor, our results from this implementation demonstrate up to 3.5 times speedup in simulating modern wireless communication systems (e.g., WCDMA3G, CDMA 2000, WiMax, EDGE, and Digital TV).

### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Signal Processing Research Community (SPRC), Agilent Technologies, Department of Electrical and Computer Engineering, University of Maryland

Contributors: Hsu, C. J., Pino, J. L., Bhattacharyya, S. S.

Publication date: Jun 2011

Peer-reviewed: Yes

### **Publication information**

Journal: ACM Transactions on Design Automation of Electronic Systems

Volume: 16

Issue number: 3

Article number: 25

ISSN (Print): 1084-4309

Ratings:

Scopus rating (2011): CiteScore 1.39 SJR 0.493 SNIP 1.129

Original language: English

ASJC Scopus subject areas: Computer Science Applications, Computer Graphics and Computer-Aided Design, Electrical and Electronic Engineering

Keywords: Multithreaded simulation, Scheduling, Synchronous dataflow

DOIs:

10.1145/1970353.1970358

URLs:

<http://www.scopus.com/inward/record.url?scp=79960659084&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 79960659084

Research output: Contribution to journal › Article › Scientific › peer-review

### **Forward simulation and inverse dipole localization with the lowest order Raviart - Thomas elements for electroencephalography**

Electroencephalography is a non-invasive imaging modality in which a primary current density generated by the neural activity in the brain is to be reconstructed based on external electric potential measurements. This paper focuses on the finite element method (FEM) from both forward and inverse aspects. The goal is to establish a clear correspondence between the lowest order Raviart-Thomas basis functions and dipole sources as well as to show that the adopted FEM

approach is computationally effective. Each basis function is associated with a dipole moment and a location. Four candidate locations are tested. Numerical experiments cover two different spherical multilayer head models, four mesh resolutions and two different forward simulation approaches, one based on FEM and another based on the boundary element method (BEM) with standard dipoles as sources. The forward simulation accuracy is examined through column- and matrix-wise relative errors as well as through performance in inverse dipole localization. A closed-form approximation of dipole potential was used as the reference forward simulation. The present approach is compared to the BEM and indirectly also to the recent FEM-based subtraction approach regarding both accuracy, computation time and accessibility of implementation.

#### General information

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Mathematical modelling with wide societal impact (MathImpact), Aalto University, Dipartimento di Matematica, Università di Genova, University of Warwick, University of Helsinki, CNR-SPIN

Contributors: Pursiainen, S., Sorrentino, A., Campi, C., Piana, M.

Publication date: Apr 2011

Peer-reviewed: Yes

#### Publication information

Journal: Inverse Problems

Volume: 27

Issue number: 4

Article number: 045003

ISSN (Print): 0266-5611

Ratings:

Scopus rating (2011): CiteScore 1.9 SJR 1.208 SNIP 1.579

Original language: English

ASJC Scopus subject areas: Theoretical Computer Science, Signal Processing, Mathematical Physics, Computer Science Applications, Applied Mathematics

DOIs:

10.1088/0266-5611/27/4/045003

URLs:

<http://www.scopus.com/inward/record.url?scp=79953662770&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 79953662770

Research output: Contribution to journal > Article > Scientific > peer-review

#### Fault tolerant machine learning for nanoscale cognitive radio

We introduce a machine learning-based classifier that identifies free radio channels for cognitive radio. The architecture is designed for nanoscale implementation, under nanoscale implementation constraints; we do not describe all physical details but believe future physical implementation to be feasible. The system uses analog computation and consists of cyclostationary feature extraction and a radial basis function network for classification. We describe a model for nanoscale faults in the system, and simulate experimental performance and fault tolerance in recognizing WLAN signals, under different levels of noise and computational errors. The system performs well under expected non-ideal manufacturing and operating conditions.

#### General information

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Research Community on Data-to-Decision (D2D), Aalto University, Nokia

Contributors: Pajarinen, J., Peltonen, J., Uusitalo, M. A.

Number of pages: 12

Pages: 753-764

Publication date: Feb 2011

Peer-reviewed: Yes

#### Publication information

Journal: Neurocomputing

Volume: 74

Issue number: 5

ISSN (Print): 0925-2312

Ratings:

Scopus rating (2011): CiteScore 2.6 SJR 0.898 SNIP 1.793

Original language: English

ASJC Scopus subject areas: Computer Science Applications, Cognitive Neuroscience, Artificial Intelligence

Keywords: Cognitive radio, Fault tolerance, Nanoelectronics, Nanotechnology, Radial basis function network

DOIs:

10.1016/j.neucom.2010.10.007

URLs:

<http://www.scopus.com/inward/record.url?scp=78650719880&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 78650719880

Research output: [Contribution to journal](#) › [Article](#) › [Scientific](#) › [peer-review](#)

### **A design tool for efficient mapping of multimedia applications onto heterogeneous platforms**

Development of multimedia systems on heterogeneous platforms is a challenging task with existing design tools due to a lack of rigorous integration between high level abstract modeling, and low level synthesis and analysis. In this paper, we present a new dataflow-based design tool, called the targeted dataflow interchange format (TDIF), for design, analysis, and implementation of embedded software for multimedia systems. Our approach provides novel capabilities, based on the principles of task-level dataflow analysis, for exploring and optimizing interactions across application behavior; operational context; heterogeneous platforms, including high performance embedded processing architectures; and implementation constraints.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Signal Processing Research Community (SPRC), University of Maryland, Department of Electrical and Computer Engineering

Contributors: Shen, C. C., Wu, H. H., Sane, N., Plishker, W., Bhattacharyya, S. S.

Publication date: 2011

#### **Host publication information**

Title of host publication: Electronic Proceedings of the 2011 IEEE International Conference on Multimedia and Expo, ICME 2011

Article number: 6011952

ISBN (Print): 9781612843490

ASJC Scopus subject areas: Computer Networks and Communications, Computer Science Applications

Keywords: dataflow graphs, design tools, Embedded signal processing, software synthesis

DOIs:

10.1109/ICME.2011.6011952

URLs:

<http://www.scopus.com/inward/record.url?scp=80155156918&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 80155156918

Research output: [Chapter in Book/Report/Conference proceeding](#) › [Conference contribution](#) › [Scientific](#) › [peer-review](#)

### **A probability-based approach to modeling the risk of unauthorized propagation of information in on-line social networks**

The unauthorized propagation of information is an important problem in the Internet, especially because of the increasing popularity of On-line Social Networks. To address this issue, many access control mechanisms have been proposed so far, but there is still a lack of techniques to evaluate the risk of unauthorized flow of information within social networks. This paper introduces a probability-based approach to modeling the likelihood that information propagates from one social network user to users who are not authorized to access it. The approach is demonstrated via an example, to show how it can be applied in practical cases.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Università degli Studi Dell'Insubria

Contributors: Carminati, B., Ferrari, E., Morasca, S., Taibi, D.

Number of pages: 11

Pages: 51-61

Publication date: 2011

#### **Host publication information**

Title of host publication: CODASPY'11 - Proceedings of the 1st ACM Conference on Data and Application Security and Privacy

ISBN (Print): 9781450304665

ASJC Scopus subject areas: Computer Networks and Communications, Computer Science Applications

Keywords: Access control, Information leakage, Privacy, Social networks

DOIs:

10.1145/1943513.1943522

Source: Scopus

Source ID: 79952798687

Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

### **Bio-inspired service management framework: Green data-centres case study**

Following the huge growth in usage over the last 10 years, the Internet has become a critical business and social tool. In the future however, this popularity will continue to rise, with the Internet evolving into a full scale distributed service platform, offering a plethora of services from communications to business, entertainment and much more. These services will be more dynamic and sophisticated providing a range of complex capabilities. However, this dynamic service environment will lead to overwhelming management problems if not dealt with adequately. At the same time, society is now acutely aware of the significant energy burden the communications industry is becoming. With these two trends in mind we propose a biologically-inspired service framework which supports services intelligently solving a number of management problems. We then as a case study application, use this framework to address the new, emerging problem of a sustainable future internet by migrating services to new, greener locations.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Wireless Communications and Positioning (WICO), Waterford Institute of Technology

Contributors: Carroll, R., Balasubramaniam, S., Botvich, D., Donnelly, W.

Number of pages: 6

Pages: 226-231

Publication date: 2011

#### **Host publication information**

Title of host publication: Proceedings - 25th IEEE International Conference on Advanced Information Networking and Applications Workshops, WAINA 2011

Article number: 5763678

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ASJC Scopus subject areas: Computer Networks and Communications, Computer Science Applications

Keywords: Bio-inspired Services, Genetic Algorithm, Green Data-centres

DOIs:

10.1109/WAINA.2011.119

URLs:

<http://www.scopus.com/inward/record.url?scp=79957554186&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 79957554186

Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

### **Database-driven tool support for DisCo executable specifications**

In spite of the advances in theory of formal specifications, they have not gained a wide popularity in the software development industry. This could be due to difficulties in understanding them or positioning them into the current work practices, however, we believe that one major problem is that the tool support still does not make the use of the formal specifications easy enough for the software developer. We discuss the required functionality for comprehensive tool support for executable DisCo specifications, and propose a tool architecture based on database technology, and finally, discuss our implementation of the core part of the tool set.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Research Community on Data-to-Decision (D2D), Mathematical modelling with wide societal impact (MathImpact)

Contributors: Nummenmaa, J., Nummenmaa, T.

Number of pages: 11

Pages: 44-54

Publication date: 2011

#### **Host publication information**

Title of host publication: SPLST'11 - Proceedings 12th Symposium on Programming Languages and Software Tools

ISBN (Print): 9789949231782

ASJC Scopus subject areas: Computer Science Applications, Software

URLs:

<http://www.scopus.com/inward/record.url?scp=84869824785&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84869824785

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

### **Influence factors for sharing open science and open educational resources through social networking services**

In a knowledge society it is crucial to serve the need for accurate and up-to-date knowledge produced by scientists. The possibilities of electronic communication through the use of social software provides means for open discourse and offers easier ways to make scientific and educational resources available that can be used in knowledge management and e-learning. Within this paper, we describe how researchers share knowledge in the form of artefacts. These artefacts consist of open science and open educational resources. The focus will be on understanding the influence factors for sharing these artefacts with social networking services. Through the research, an improved understanding of the decision making and sharing habits of a researcher will be obtained for the use of social software for globally distributed and open scientific communication.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Managing digital industrial transformation (mDIT), University of Jyväskylä

Contributors: Kalb, H., Pirkkalainen, H., Pawlowski, J., Schoop, E.

Number of pages: 10

Pages: 23-32

Publication date: 2011

#### **Host publication information**

Title of host publication: 6th Conference on Professional Knowledge Management: From Knowledge to Action - Proceedings

Volume: P-182

Publisher: Gesellschaft fur Informatik (GI)

ISBN (Print): 978-388579276-5

ASJC Scopus subject areas: Computer Science Applications

URLs:

<http://www.scopus.com/inward/record.url?scp=84901471135&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84901471135

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

### **Multicolor nonlinear pulse compression by consecutive optical parametric amplification in quasi-phase matched structures**

Simultaneous generation of the 2<sup>nd</sup> and 3<sup>rd</sup> harmonic, excited by linearly frequency-chirped fundamental pulse in quasiphase matched grating with linearly varying inverse domain sizes has been studied numerically with taking into account effects of the group velocity mismatches and dispersions. Mechanisms of efficient nonlinear pulse compressions and conversion efficiencies of the generated harmonics have been analyzed.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Frontier Photonics, Academy of Sciences of the Republic of Uzbekistan, Tashkent State Technical University, Nonlinear Optics and OptoElectronics Lab, University "Roma Tre"

Contributors: Sapaev, U. K., Yusupov, D. B., Assanto, G.

Publication date: 2011

#### **Host publication information**

Title of host publication: ICONO 2010: International Conference on Coherent and Nonlinear Optics

Volume: 7993

Article number: 79930Q

ISBN (Print): 9780819485663

ASJC Scopus subject areas: Applied Mathematics, Computer Science Applications, Electrical and Electronic Engineering, Electronic, Optical and Magnetic Materials, Condensed Matter Physics

Keywords: Cascading, Lithium niobate, Nonlinear pulse compression, Parametric effects, Quasi-phase matching, Simultaneous frequency doubling and tripling

DOIs:

10.1117/12.882887

URLs:

<http://www.scopus.com/inward/record.url?scp=79951653950&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 79951653950

Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

### **On delay distribution in IEEE 802.11 wireless networks**

IEEE 802.11 wireless networks have received much attention over the past number of years. Still certain aspects of behavior of wireless networks have not been studied well enough. For example, understanding MAC layer packet delay distribution remains challenging yet. However, obtaining such distribution is highly beneficial for modeling QoS provided by wireless networks. This paper proposes a way of obtaining MAC delay distribution in case of single-hop networks. The proposed way is based on theory of terminating renewal processes and delivers approximation of good precision.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Wireless Communications and Positioning (WICO), Waterford Institute of Technology, Telecommunications Software and Systems Group (TSSG)

Contributors: Ivanov, S., Botvich, D., Balasubramaniam, S.

Number of pages: 3

Pages: 254-256

Publication date: 2011

#### **Host publication information**

Title of host publication: 16th IEEE Symposium on Computers and Communications, ISCC'11

Article number: 5983849

ISBN (Print): 9781457706783

ASJC Scopus subject areas: Software, Signal Processing, Mathematics(all), Computer Science Applications, Computer Networks and Communications

Keywords: delay distribution, IEEE 802.11, MAC layer, modeling

DOIs:

10.1109/ISCC.2011.5983849

URLs:

<http://www.scopus.com/inward/record.url?scp=80052734083&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 80052734083

Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

### **Performance evaluation of distributed NoTA applications on multi-core platforms**

For future applications running on nomadic devices operating in smart spaces, the availability of the services and the quest for better alternative services will go hand in hand to enable the best-possible experience for the end-user. To realize it, a service-level interoperability solution must be devised that would enable applications to access services over heterogeneous platforms and various transport technologies. The recent extension of the Network-on-Terminal-Architecture (NoTA) supports service-level interoperability between mobile devices via a device interconnect protocol (NoTA DIP), enabling applications to access and discover services over multiple transport technologies in a seamless manner. A brisk performance evaluation phase is required for evaluating the feasibility of new NoTA applications on modern multi-core based mobile device platforms. To achieve this goal, NoTA Service Oriented Architecture (SOA) application components. i.e., Application Nodes (ANs) and Service Nodes (ANS) are first refined to encompassing processes and then to platform services and functions to form a layered application architecture. In next step, the NoTA SOA application model layers are mapped to ABSOLUT workload model layers employed in performance simulation. Furthermore, the ABSOLUT workload models corresponding to different NoTA DIP implementations for example NoTA DIP kernel implementation and NoTA DIP Daemon mode must be modeled and integrated to ABSOLUT. The approach is experimented with a case study. The modeled components and approach is not limited to NoTA SOA and can be used for the performance evaluation of other distributed service oriented application architectures. MARTE UML2.0 profile, Papyrus UML 2.0 modeling tool and SystemC were used for modeling and simulation.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Research group: System-on-Chip for GNSS, Wireless Communications and Cyber-Physical Embedded Computing, Department of Computer Systems, Wireless Communications and Positioning (WICO), VTT Technical Research Centre of Finland

Contributors: Khan, S., Saastamoinen, J., Huusko, J., Nurmi, J.

Publication date: 2011

#### **Host publication information**

Title of host publication: Proceedings - 2011 IEEE 2nd International Conference on Networked Embedded Systems for Enterprise Applications, NESEA 2011

Article number: 6144931

ASJC Scopus subject areas: Computer Networks and Communications, Computer Science Applications

Keywords: NoTA, Performance Simulation, SystemC

DOIs:

10.1109/NESEA.2011.6144931

Source: Scopus

Source ID: 84857582538

Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

### **PETMEI 2011: The 1st international workshop on pervasive eye tracking and mobile eye-based interaction**

Recent developments in mobile eye tracking equipment and automated eye movement analysis point the way toward unobtrusive eye-based human-computer interfaces that are pervasively usable in everyday life. We call this new paradigm pervasive eye tracking - continuous eye monitoring and analysis 24/7. PETMEI 2011 provides a forum for researcher from human-computer interaction, context-aware computing, and eye tracking to discuss techniques and applications that go beyond classical eye tracking and stationary eye-based interaction. We aim to discuss the implications of pervasive eye tracking for context-aware computing and to identify the key research challenges of mobile eye-based interaction. The long-term goal is to create a strong interdisciplinary research community linking these research fields together and to establish the workshop as the premier forum for research on pervasive eye tracking and mobile eye-based interaction.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Augmented Human Activities (AHA), Lancaster University, Clemson University

Contributors: Bulling, A., Duchowski, A. T., Majoranta, P.

Number of pages: 2

Pages: 627-628

Publication date: 2011

#### **Host publication information**

Title of host publication: UbiComp'11 - Proceedings of the 2011 ACM Conference on Ubiquitous Computing

ISBN (Print): 9781450309103

ASJC Scopus subject areas: Computational Theory and Mathematics, Computer Science Applications

Keywords: activity and context recognition, cognition-awareness, eye movement analysis, eye tracking, eye-based interaction

DOIs:

10.1145/2030112.2030248

URLs:

<http://www.scopus.com/inward/record.url?scp=80054089504&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 80054089504

Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

### **SkyMedia - UAV-based capturing of HD/3D content with WSN augmentation for immersive media experiences**

In the entertainment industry, technology advances are continuously improving and evolving the portfolio of services and distinguished features that can be experienced by the audience, whether it is attending the event on site or remotely. In this context, the SkyMedia system aims at exploring, designing, and demonstrating a novel multimedia end-to-end architecture that can provide unique immersive media experiences to audience during live events. UAV and WSN technologies play a central role as enabling technologies. UAVs capture HD and 3D videos and images from the sky, while wireless sensors form an augmentation network acquiring side-information to be fused with the main audiovisual contents. All technologies come together to form a very advanced Multimedia Service Platform able to manage in real-time HD/3D processing, and an immersive media experience demonstration is going to be performed during a public live event in order to prove the effectiveness of the system.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Augmented Human Activities (AHA), Mavigex S.r.l., Nimbus S.r.l., TEKEVER S.A., SA Vitec, Thales

Communications SA, Optilink Kft, Fogscreen Oy

Contributors: Neri, M., Campi, A., Suffritti, R., Grimaccia, F., Sinogas, P., Guye, O., Papin, C., Michalareas, T., Gazdag, L., Rakkolainen, I.

Publication date: 2011

### Host publication information

Title of host publication: Electronic Proceedings of the 2011 IEEE International Conference on Multimedia and Expo, ICME 2011

Article number: 6012133

ISBN (Print): 9781612843490

ASJC Scopus subject areas: Computer Networks and Communications, Computer Science Applications

Keywords: 3D processing, immersive and interactive services, live events, multimedia delivery, UAV-based capturing, wireless sensor networks

DOIs:

10.1109/ICME.2011.6012133

URLs:

<http://www.scopus.com/inward/record.url?scp=80155171686&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 80155171686

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

### Thickness variation study of RFID-based folded patch antennas for strain sensing

This paper explores folded patch antennas for the development of low-cost and wireless smart-skin sensors that monitor the strain in metallic structures. When the patch antenna is under strain/deformation, its resonance frequency varies accordingly. The variation can be easily interrogated and recorded by a wireless reader that also provides power for the antenna operation. The patch antenna adopts a specially selected substrate material with low dielectric constant, as well as an inexpensive off-the-shelf radiofrequency identification (RFID) chip for signal modulation. A thicker substrate increases RFID signal-to-noise ratio, but reduces the strain transfer efficiency. To experimentally study the effect of substrate thickness, two prototype folded patch antennas with different substrate thicknesses have been designed and manufactured. For both prototypes, tensile testing results show strong linearity between the interrogated resonance frequency and the strain experienced by the antenna. Longer interrogation range is achieved with the larger substrate thickness.

### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Sensing Systems for Wireless Medicine (MediSense), Georgia Institute of Technology, Georgia Institute of Technology, School of Electrical and Computer Engineering

Contributors: Yi, X., Wu, T., Lantz, G., Wang, Y., Leon, R. T., Tentzeris, M. M.

Publication date: 2011

### Host publication information

Title of host publication: Sensors and Smart Structures Technologies for Civil, Mechanical, and Aerospace Systems 2011

Volume: 7981

Article number: 79811H

ISBN (Print): 9780819485434

ASJC Scopus subject areas: Applied Mathematics, Computer Science Applications, Electrical and Electronic Engineering, Electronic, Optical and Magnetic Materials, Condensed Matter Physics

Keywords: folded patch antenna, passive wireless sensor, RFID, strain sensor, substrate thickness

DOIs:

10.1117/12.879868

URLs:

<http://www.scopus.com/inward/record.url?scp=79956325124&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 79956325124

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

### Visually lossless compression of synthetic aperture radar images

A task of visually lossless but, in fact, lossy compression of synthetic aperture radar (SAR) images corrupted by intensive speckle is considered. A method based on discrete cosine transform (DCT) applied in  $8 \times 8$  blocks is proposed. The method is adapted to spatial DCT spectrum of speckle and its multiplicative nature. It is shown that the proposed method allows providing compression ratio (CR) of about 3.2...3.5 for simulated and real life SAR images which is sufficiently larger than for image lossless compression techniques.

### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Tampere University of Technology, Signal Processing Research Community (SPRC), National Aerospace University

Contributors: Ponomarenko, N. N., Lukin, V. V., Egiazarian, K. O.  
Number of pages: 3  
Pages: 263-265  
Publication date: 2011

#### Host publication information

Title of host publication: 8th International Conference on Antenna Theory and Techniques, ICATT'11  
Article number: 6170755  
ISBN (Print): 978-1-4577-2211-0  
ASJC Scopus subject areas: Computer Networks and Communications, Computer Science Applications, Electrical and Electronic Engineering  
DOIs:  
10.1109/ICATT.2011.6170755  
Source: Scopus  
Source ID: 84860003383  
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

#### Inferring the conservative causal core of gene regulatory networks

Background: Inferring gene regulatory networks from large-scale expression data is an important problem that received much attention in recent years. These networks have the potential to gain insights into causal molecular interactions of biological processes. Hence, from a methodological point of view, reliable estimation methods based on observational data are needed to approach this problem practically. Results: In this paper, we introduce a novel gene regulatory network inference (GRNI) algorithm, called C3NET. We compare C3NET with four well known methods, ARACNE, CLR, MRNET and RN, conducting in-depth numerical ensemble simulations and demonstrate also for biological expression data from E. coli that C3NET performs consistently better than the best known GRNI methods in the literature. In addition, it has also a low computational complexity. Since C3NET is based on estimates of mutual information values in conjunction with a maximization step, our numerical investigations demonstrate that our inference algorithm exploits causal structural information in the data efficiently. Conclusions: For systems biology to succeed in the long run, it is of crucial importance to establish methods that extract large-scale gene networks from high-throughput data that reflect the underlying causal interactions among genes or gene products. Our method can contribute to this endeavor by demonstrating that an inference algorithm with a neat design permits not only a more intuitive and possibly biological interpretation of its working mechanism but can also result in superior results.

#### General information

Publication status: Published  
MoE publication type: A1 Journal article-refereed  
Organisations: Queen's University, Belfast, Northern Ireland, Computational Biology and Machine Learning Lab., Faculty of Medicine, Health and Life Sciences  
Contributors: Altay, G., Emmert-Streib, F.  
Publication date: 28 Sep 2010  
Peer-reviewed: Yes

#### Publication information

Journal: BMC Systems Biology  
Volume: 4  
Article number: 132  
ISSN (Print): 1752-0509  
Ratings:  
Scopus rating (2010): SJR 1.832 SNIP 1.057  
Original language: English  
ASJC Scopus subject areas: Molecular Biology, Structural Biology, Applied Mathematics, Modelling and Simulation, Computer Science Applications  
DOIs:  
10.1186/1752-0509-4-132  
URLs:  
<http://www.scopus.com/inward/record.url?scp=77957141016&partnerID=8YFLogxK> (Link to publication in Scopus)  
Source: Scopus  
Source ID: 77957141016  
Research output: Contribution to journal › Article › Scientific › peer-review

#### Revealing differences in gene network inference algorithms on the network level by ensemble methods

Motivation: The inference of regulatory networks from large-scale expression data holds great promise because of the potentially causal interpretation of these networks. However, due to the difficulty to establish reliable methods based on observational data there is so far only incomplete knowledge about possibilities and limitations of such inference methods in this context. Results: In this article, we conduct a statistical analysis investigating differences and similarities of four

network inference algorithms, ARACNE, CLR, MRNET and RN, with respect to local network-based measures. We employ ensemble methods allowing to assess the inferability down to the level of individual edges. Our analysis reveals the bias of these inference methods with respect to the inference of various network components and, hence, provides guidance in the interpretation of inferred regulatory networks from expression data. Further, as application we predict the total number of regulatory interactions in human B cells and hypothesize about the role of Myc and its targets regarding molecular information processing.

#### General information

Publication status: Published  
MoE publication type: A1 Journal article-refereed  
Organisations: School of Medicine, Computational Biology and Machine Learning  
Contributors: Altay, G., Emmert-Streib, F.  
Number of pages: 7  
Pages: 1738-1744  
Publication date: 25 May 2010  
Peer-reviewed: Yes

#### Publication information

Journal: Bioinformatics  
Volume: 26  
Issue number: 14  
Article number: btq259  
ISSN (Print): 1367-4803  
Ratings:  
Scopus rating (2010): SJR 3.661 SNIP 1.884  
Original language: English  
ASJC Scopus subject areas: Biochemistry, Molecular Biology, Computational Theory and Mathematics, Computer Science Applications, Computational Mathematics, Statistics and Probability, Medicine(all)  
DOIs:  
10.1093/bioinformatics/btq259  
URLs:  
<http://www.scopus.com/inward/record.url?scp=77954484005&partnerID=8YFLogxK> (Link to publication in Scopus)  
Source: Scopus  
Source ID: 77954484005  
Research output: Contribution to journal › Article › Scientific › peer-review

#### A framework for building behavioral models for design-stage failure identification using dimensional analysis

In this paper, a design-stage failure identification framework is proposed using a modeling and simulation approach based on Dimensional Analysis and qualitative physics. The proposed framework is intended to provide a new approach to model the behavior in the Functional-Failure Identification and Propagation (FFIP) framework, which estimates potential faults and their propagation paths under critical event scenarios. The initial FFIP framework is based on combining hierarchical system models of functionality and configuration, with behavioral simulation and qualitative reasoning. This paper proposes to develop a behavioral model derived from information available at the configuration level. Specifically, the new behavioral model uses design variables, which are associated with units and quantities (i.e., Mass, Length, Time, etc...). The proposed framework continues the work to allow the analysis of functional failures and fault propagation at a highly abstract system concept level before any potentially high-cost design commitments are made. The main contribution in this paper consists of developing component behavioral models based on the combination of fundamental design variables used to describe components and their units or quantities, more precisely describing components' behavior. Copyright © 2010 by ASME.

#### General information

Publication status: Published  
MoE publication type: A4 Article in a conference publication  
Organisations: Oregon State University, Helsinki University of Technology, Aalto University  
Contributors: Coatanéa, E., Ritola, T., Tumer, I. Y., Jensen, D.  
Number of pages: 11  
Pages: 591-601  
Publication date: 2010

#### Host publication information

Title of host publication: Proceedings of the ASME Design Engineering Technical Conference  
Volume: 5  
Publisher: AMER SOC MECHANICAL ENGINEERS  
ISBN (Print): 978-0-7918-4413-7  
ASJC Scopus subject areas: Mechanical Engineering, Computer Graphics and Computer-Aided Design, Computer Science Applications, Modelling and Simulation

DOIs:

10.1115/DETC2010-28864

URLs:

<http://www.scopus.com/inward/record.url?scp=80055023958&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: WOS

Source ID: 000320567700053

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

### **Unite and conquer: Univariate and multivariate approaches for finding differentially expressed gene sets**

Motivation: Recently, many univariate and several multivariate approaches have been suggested for testing differential expression of gene sets between different phenotypes. However, despite a wealth of literature studying their performance on simulated and real biological data, still there is a need to quantify their relative performance when they are testing different null hypotheses. Results: In this article, we compare the performance of univariate and multivariate tests on both simulated and biological data. In the simulation study we demonstrate that high correlations equally affect the power of both, univariate as well as multivariate tests. In addition, for most of them the power is similarly affected by the dimensionality of the gene set and by the percentage of genes in the set, for which expression is changing between two phenotypes. The application of different test statistics to biological data reveals that three statistics (sum of squared t-tests, Hotelling's  $T^2$ , N-statistic), testing different null hypotheses, find some common but also some complementing differentially expressed gene sets under specific settings. This demonstrates that due to complementing null hypotheses each test projects on different aspects of the data and for the analysis of biological data it is beneficial to use all three tests simultaneously instead of focusing exclusively on just one.

#### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: University of Rochester Medical Center, Computational Biology and Machine Learning, Queen's University, Belfast, Northern Ireland

Contributors: Glazko, G. V., Emmert-Streib, F.

Number of pages: 7

Pages: 2348-2354

Publication date: Sep 2009

Peer-reviewed: Yes

#### **Publication information**

Journal: Bioinformatics

Volume: 25

Issue number: 18

ISSN (Print): 1367-4803

Ratings:

Scopus rating (2009): SJR 3.111 SNIP 1.834

Original language: English

ASJC Scopus subject areas: Biochemistry, Molecular Biology, Computational Theory and Mathematics, Computer Science Applications, Computational Mathematics, Statistics and Probability

DOIs:

10.1093/bioinformatics/btp406

Source: Scopus

Source ID: 69849105388

Research output: Contribution to journal > Article > Scientific > peer-review

### **On entropy-based molecular descriptors: Statistical analysis of real and synthetic chemical structures**

This paper presents an analysis of entropy-based molecular descriptors. Specifically, we use real chemical structures, as well as synthetic isomeric structures, and investigate properties of and among descriptors with respect to the used data set by a statistical analysis. Our numerical results provide evidence that synthetic chemical structures are notably different to real chemical structures and, hence, should not be used to investigate molecular descriptors. Instead, an analysis based on real chemical structures is favorable. Further, we find strong hints that molecular descriptors can be partitioned into distinct classes capturing complementary information.

#### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: TU Vienna, Technical University Darmstadt, Computational Biology and Machine Learning, School of Medicine

Contributors: Dehmer, M., Varmuza, K., Borgert, S., Emmert-Streib, F.

Number of pages: 9

Pages: 1655-1663  
Publication date: 27 Jul 2009  
Peer-reviewed: Yes

#### Publication information

Journal: Journal of Chemical Information and Modeling

Volume: 49

Issue number: 7

ISSN (Print): 1549-9596

Ratings:

Scopus rating (2009): SJR 1.039 SNIP 1.219

Original language: English

ASJC Scopus subject areas: Chemical Engineering(all), Chemistry(all), Computer Science Applications, Library and Information Sciences

DOIs:

10.1021/ci900060x

URLs:

<http://www.scopus.com/inward/record.url?scp=68149167631&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 68149167631

Research output: Contribution to journal › Article › Scientific › peer-review

#### Hierarchical coordination of periodic genes in the cell cycle of *Saccharomyces cerevisiae*

Background: Gene networks are a representation of molecular interactions among genes or products thereof and, hence, are forming causal networks. Despite intense studies during the last years most investigations focus so far on inferential methods to reconstruct gene networks from experimental data or on their structural properties, e.g., degree distributions. Their structural analysis to gain functional insights into organizational principles of, e.g., pathways remains so far under appreciated. Results: In the present paper we analyze cell cycle regulated genes in *S. cerevisiae*. Our analysis is based on the transcriptional regulatory network, representing causal interactions and not just associations or correlations between genes, and a list of known periodic genes. No further data are used. Partitioning the transcriptional regulatory network according to a graph theoretical property leads to a hierarchy in the network and, hence, in the information flow allowing to identify two groups of periodic genes. This reveals a novel conceptual interpretation of the working mechanism of the cell cycle and the genes regulated by this pathway. Conclusion: Aside from the obtained results for the cell cycle of yeast our approach could be exemplary for the analysis of general pathways by exploiting the rich causal structure of inferred and/or curated gene networks including protein or signaling networks.

#### General information

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Computational Biology and Machine Learning Lab., Faculty of Medicine, Health and Life Sciences, Queen's University, Belfast, Northern Ireland, Institute for Bioinformatics and Translational Research

Contributors: Emmert-Streib, F., Dehmer, M.

Publication date: 20 Jul 2009

Peer-reviewed: Yes

#### Publication information

Journal: BMC Systems Biology

Volume: 3

Article number: 76

ISSN (Print): 1752-0509

Ratings:

Scopus rating (2009): SJR 1.493 SNIP 0.974

Original language: English

ASJC Scopus subject areas: Molecular Biology, Structural Biology, Applied Mathematics, Modelling and Simulation, Computer Science Applications

DOIs:

10.1186/1752-0509-3-76

URLs:

<http://www.scopus.com/inward/record.url?scp=68949220295&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 68949220295

Research output: Contribution to journal › Article › Scientific › peer-review

### **Information processing in the transcriptional regulatory network of yeast: Functional robustness**

Background: Gene networks are considered to represent various aspects of molecular biological systems meaningfully because they naturally provide a systems perspective of molecular interactions. In this respect, the functional understanding of the transcriptional regulatory network is considered as key to elucidate the functional organization of an organism. Results: In this paper we study the functional robustness of the transcriptional regulatory network of *S. cerevisiae*. We model the information processing in the network as a first order Markov chain and study the influence of single gene perturbations on the global, asymptotic communication among genes. Modification in the communication is measured by an information theoretic measure allowing to predict genes that are 'fragile' with respect to single gene knockouts. Our results demonstrate that the predicted set of fragile genes contains a statistically significant enrichment of so called essential genes that are experimentally found to be necessary to ensure vital yeast. Further, a structural analysis of the transcriptional regulatory network reveals that there are significant differences between fragile genes, hub genes and genes with a high betweenness centrality value. Conclusion: Our study does not only demonstrate that a combination of graph theoretical, information theoretical and statistical methods leads to meaningful biological results but also that such methods allow to study information processing in gene networks instead of just their structural properties.

#### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Computational Biology and Machine Learning, Queen's University, Belfast, Northern Ireland, Center for Mathematics Probability and Statistics

Contributors: Emmert-Streib, F., Dehmer, M.

Publication date: 19 Mar 2009

Peer-reviewed: Yes

#### **Publication information**

Journal: BMC Systems Biology

Volume: 3

Article number: 35

ISSN (Print): 1752-0509

Ratings:

Scopus rating (2009): SJR 1.493 SNIP 0.974

Original language: English

ASJC Scopus subject areas: Molecular Biology, Structural Biology, Applied Mathematics, Modelling and Simulation, Computer Science Applications

DOIs:

10.1186/1752-0509-3-35

URLs:

<http://www.scopus.com/inward/record.url?scp=65649087188&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 65649087188

Research output: Contribution to journal > Article > Scientific > peer-review

### **Mobile Journalist Toolkit: A field study on producing news articles with a mobile device**

Today's handheld mobile devices with advanced multimedia capabilities and wireless broadband connectivity have emerged as potential new tools for journalists to produce news articles. It is envisioned that they could enable faster, more authentic, and more efficient news production, and many large news producing organizations, including Reuters and BBC, have recently been experimenting with them. In this paper, we present a field study on using mobile devices to produce news articles. During the study, a group of 19 M.A.-level journalism students used the Mobile Journalist Toolkit, a lightweight set of tools for mobile journalist work built around the Nokia N82 camera phone, to produce an online news blog. Our results indicate that while the mobile device cannot completely replace the traditional tools, for some types of journalist tasks they provide major benefits over the traditional tools, and are thus a useful addition to the journalist's toolbox.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Department of Software Systems, Nokia

Contributors: Jokela, T., Väättäjä, H., Koponen, T.

Number of pages: 8

Pages: 45-52

Publication date: 2009

#### **Host publication information**

Title of host publication: MindTrek 2009 - 13th International Academic MindTrek Conference: Everyday Life in the Ubiquitous Era

ISBN (Print): 9781605586335

ASJC Scopus subject areas: Computer Science Applications, Human-Computer Interaction, Software

Keywords: Camera phones, Field study, Journalism, Mobile devices, Multimedia publishing

DOIs:

10.1145/1621841.1621851

Source: Scopus

Source ID: 76749139559

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

### **The magical world of metamaterials**

We review experimental and theoretical studies performed on left-handed metamaterials (LHM). The metamaterials exhibit quiet unusual electromagnetic properties such as negative refraction, negative phase velocity, subwavelength focusing, subwavelength cavities and enhanced transmission.

### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Nanotechnology Research Center, Bilkent University

Contributors: Caglayan, H., Ozbay, E.

Publication date: 2009

### **Host publication information**

Title of host publication: Photonic Materials, Devices, and Applications III

Volume: 7366

Article number: 73660X

ISBN (Print): 9780819476401

### **Publication series**

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Volume: 7366

ISSN (Print): 0277-786X

ISSN (Electronic): 1996-756X

ASJC Scopus subject areas: Electronic, Optical and Magnetic Materials, Condensed Matter Physics, Computer Science Applications, Applied Mathematics, Electrical and Electronic Engineering

Keywords: Left-handed metamaterial, Metamaterials, Negative refractive index, Superlens

DOIs:

10.1117/12.821407

URLs:

<http://www.scopus.com/inward/record.url?scp=70349983117&partnerID=8YFLogxK> (Link to publication in Scopus)

### **Bibliographical note**

EXT="Caglayan, Humeyra"

Source: Scopus

Source ID: 70349983117

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

### **Towards certifying the testing process of open-source software: New challenges or old methodologies?**

To improve both the quality and the trustworthiness perception of Open Source Software (OSS) products, we introduce the new idea of certifying the testing process of an OSS system. While the global certification of an OSS product is an emerging research field, the idea of certifying only its testing process has never been studied, conversely to the case of Closed Source Software (CSS) products. The certification of the testing process has a twofold goal: simplify the process of testing OSS products by guiding developers in identifying the proper testing strategies and the limitations of their existing testing plans; simplify the selection of equivalent OSS and CSS products by evaluating the certificates released by the companies. Specifically, in this paper we discuss 1) a set of issues, inherent to OSS, that must be taken into account when testing the OSS product; 2) a preliminary methodology that suggests how to certificate the testing process of OSS products; 3) the BusyBox case study that shows how our idea can be applied to real-life OSS.

### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Università degli Studi Dell'Insubria, Former organisation of the author

Contributors: Morasca, S., Taibi, D., Tosi, D.

Number of pages: 6

Pages: 25-30  
Publication date: 2009

#### Host publication information

Title of host publication: Proceedings of the 2009 ICSE Workshop on Emerging Trends in Free/Libre/Open Source Software Research and Development, FLOSS 2009

Article number: 5071356

ISBN (Print): 9781424437207

ASJC Scopus subject areas: Computer Science Applications, Information Systems, Software

DOIs:

10.1109/FLOSS.2009.5071356

URLs:

<http://www.scopus.com/inward/record.url?scp=70349739151&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 70349739151

Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

#### Wrench feasible workspace analysis of cable-driven parallel manipulators using LMI approach

Workspace analysis is one of the most important issues in robotic manipulator design. This paper introduces a systematic method of analysis the wrench feasible workspace for general redundant cable-driven parallel manipulators. In this method, wrench feasible workspace is formulated in term of linear matrix inequalities and projective method is used for solving them. This method is one of the most efficient interiorpoint methods with a polynomial-time complexity. Moreover, the notion of dexterous workspace is defined, which can be determined for redundant cable driven manipulators exerting a worst case external wrench at the end effector. A detailed case study of the wrench feasible workspace and dexterous workspace determination are included for a six DOF, eight actuated cable-driven redundant parallel manipulator.

#### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: K. N. Toosi University of Technology

Contributors: Loloie, A. Z., Mohammadi Aref, M., Taghirad, H. D.

Number of pages: 6

Pages: 1034-1039

Publication date: 2009

#### Host publication information

Title of host publication: IEEE/ASME International Conference on Advanced Intelligent Mechatronics, AIM

Article number: 5229723

ISBN (Print): 9781424428533

ASJC Scopus subject areas: Electrical and Electronic Engineering, Control and Systems Engineering, Computer Science Applications, Software

DOIs:

10.1109/AIM.2009.5229723

URLs:

<http://www.scopus.com/inward/record.url?scp=70350447954&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 70350447954

Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

#### Robustness in scale-free networks: Comparing directed and undirected networks

In this paper, scale-free networks and their functional robustness with respect to structural perturbations of the network are studied. Two types of perturbations are distinguished: random perturbations and attacks. The robustness of directed and undirected scale-free networks is studied numerically for two different measures and the obtained results are compared. For random perturbations, the results indicate that the strength of the perturbation plays a crucial role. In general, directed scale-free networks are more robust than undirected scale-free networks.

#### General information

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Department of Biostatistics and Genome Sciences, TU Vienna

Contributors: Emmert-Streib, F., Dehmer, M.

Number of pages: 10

Pages: 717-726

Publication date: May 2008

Peer-reviewed: Yes

### Publication information

Journal: International Journal of Modern Physics C

Volume: 19

Issue number: 5

ISSN (Print): 0129-1831

Ratings:

Scopus rating (2008): SJR 0.407 SNIP 0.552

Original language: English

ASJC Scopus subject areas: Computational Theory and Mathematics, Computer Science Applications, Mathematical Physics, Physics and Astronomy(all), Statistical and Nonlinear Physics

Keywords: Functional robustness, Markov chain, Scale-free networks

DOIs:

10.1142/S0129183108012510

URLs:

<http://www.scopus.com/inward/record.url?scp=47049131368&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 47049131368

Research output: Contribution to journal > Article > Scientific > peer-review

### Measurement theory and dimensional analysis: Methodological impact on the comparison and evaluation process

Comparison and ranking of solutions are central tasks of the design process. Designers have to deal with decisions simultaneously involving multiple criteria. Those criteria are often inconsistent in the sense that they are expressed according to different types of metrics. This means that usual engineering performance indicators are expressed according to physical quantities (i.e. SI system) and indicators such as preference functions can be "measured" by using other type of qualitative metrics. This aspect limits the scientific consistency of design because a coherent scientific framework will at first require the creation of a unified list of fundamental properties. A combined analysis of the measurement theory, the General Design Theory (GDT) and the dimensional analysis theory give an interesting insight in order to create guidelines for establishing a coherent measurement system. This article establishes a list of fundamental requirements. We expect that these guidelines can help engineers and designers to be more aware of the drawbacks linked with the use of wrong comparison procedures and limitations associated with the use of weak measurement scales. This article makes an analysis of the fundamental aspects available in major scientific publications related to comparison, provides a synthesis of these basic concepts and unifies those concepts together from a designing perspective. A practical design methodology using the fundamental results of this article as prerequisites has been implemented by the authors.

### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: LGI, LGI Laboratory, Helsinki University of Technology, Aalto University

Contributors: Coatanéa, E., Yannou, B., Honkala, S., Lajunen, A., Saarelainen, T., Makkonen, P.

Number of pages: 10

Pages: 173-182

Publication date: 2008

### Host publication information

Title of host publication: 19th International Conference on Design Theory and Methodology and 1st International Conference on Micro and Nano Systems, presented at - 2007 ASME International Design Engineering Technical Conferences and Computers and Information in Engineering Conference, IDETC/CIE2007

Publisher: AMER SOC MECHANICAL ENGINEERS

ISBN (Print): 978-0-7918-4804-3

ASJC Scopus subject areas: Computer Graphics and Computer-Aided Design, Computer Science Applications, Mechanical Engineering, Modelling and Simulation

Keywords: ENGINEERING DESIGN

DOIs:

10.1115/DETC2007-34364

URLs:

<http://www.scopus.com/inward/record.url?scp=44849093457&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: WOS

Source ID: 000254167700017

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

### Network classes and graph complexity measures

In this paper, we propose an information-theoretic approach to discriminate graph classes structurally. For this, we use a measure for determining the structural information content of graphs. This complexity measure is based on a special

information functional that quantifies certain structural information of a graph. To demonstrate that the complexity measure captures structural information meaningfully, we interpret some numerical results.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Center for Mathematics Probability and Statistics, Technical University Darmstadt, Computational Biology and Machine Learning Lab., Faculty of Medicine, Health and Life Sciences, Queen's University, Belfast, Northern Ireland

Contributors: Dehmer, M., Borgert, S., Emmert-Streib, F.

Number of pages: 8

Pages: 77-84

Publication date: 2008

#### **Host publication information**

Title of host publication: Proc. - 2008 1st International Conference on Complexity and Intelligence of the Artificial and Natural Complex Systems. Medical Applications of the Complex Systems. Biomedical Computing, CANS 2008

Article number: 5231507

ISBN (Print): 9780769536217

ASJC Scopus subject areas: Artificial Intelligence, Computer Science Applications, Biomedical Engineering

Keywords: Entropy, Network complexity measures, Network modelling

DOIs:

10.1109/CANS.2008.17

URLs:

<http://www.scopus.com/inward/record.url?scp=70350557662&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 70350557662

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

#### **Towards a channel capacity of communication networks**

We propose a new measure that quantifies the communication capabilities of networks. More precisely, in this paper we show that the well known channel capacity of a memoryless channel, introduced in information theory, can be defined for arbitrary directed networks. We argue that this new measure, which we call network channel capacity, might be useful for characterizing and classifying communication networks. As first examples we present results for random networks and discuss practical implications.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Computational Biology and Machine Learning, Queen's University, Belfast, Northern Ireland, Center for Mathematics Probability and Statistics

Contributors: Emmert-Streib, F., Dehmer, M.

Number of pages: 6

Pages: 94-99

Publication date: 2008

#### **Host publication information**

Title of host publication: Proc. - 2008 1st International Conference on Complexity and Intelligence of the Artificial and Natural Complex Systems. Medical Applications of the Complex Systems. Biomedical Computing, CANS 2008

Article number: 5231493

ISBN (Print): 9780769536217

ASJC Scopus subject areas: Artificial Intelligence, Computer Science Applications, Biomedical Engineering

Keywords: Channel capacity, Information theory, Markov chain, Networks

DOIs:

10.1109/CANS.2008.19

URLs:

<http://www.scopus.com/inward/record.url?scp=70350534877&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 70350534877

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

#### **Nonlinear time series prediction based on a power-law noise model**

In this paper we investigate the influence of a power-law noise model, also called noise, on the performance of a feed-forward neural network used to predict time series. We introduce an optimization procedure that optimizes the parameters the neural networks by maximizing the likelihood function based on the power-law model. We show that our optimization procedure minimizes the mean squared leading to an optimal prediction. Further, we present numerical results applying

method to time series from the logistic map and the annual number of sunspots demonstrate that a power-law noise model gives better results than a Gaussian model.

#### General information

Publication status: Published  
MoE publication type: A1 Journal article-refereed  
Organisations: Stowers Institute for Medical Research, TU Vienna  
Contributors: Emmert-Streib, F., Dehmer, M.  
Number of pages: 14  
Pages: 1839-1852  
Publication date: Dec 2007  
Peer-reviewed: Yes

#### Publication information

Journal: International Journal of Modern Physics C  
Volume: 18  
Issue number: 12  
ISSN (Print): 0129-1831  
Ratings:  
Scopus rating (2007): SJR 0.502 SNIP 0.524  
Original language: English  
ASJC Scopus subject areas: Computer Science Applications, Computational Theory and Mathematics, Physics and Astronomy(all), Statistical and Nonlinear Physics, Mathematical Physics  
Keywords: time series prediction, maximum likelihood, Monte Carlo method, feed-forward, neural network., SELF-ORGANIZED CRITICALITY, NEURAL-NETWORKS, OPTIMIZATION, EXPLANATION  
DOIs:  
10.1142/S0129183107011765  
URLs:  
<http://www.scopus.com/inward/record.url?scp=38149090517&partnerID=8YFLogxK> (Link to publication in Scopus)  
Source: Scopus  
Source ID: 38149090517  
Research output: Contribution to journal › Article › Scientific › peer-review

#### Global information processing in gene networks: Fault tolerance

In this paper we study the fault tolerance of gene networks. We assume single gene knockouts and investigate the effect this kind of perturbation has on the communication between genes globally. For our study we use directed scale-free networks resembling gene networks, e.g., signaling or protein-protein interaction networks, and define a Markov process based on the network topology to model communication. This allows us to evaluate the spread of information in the network and, hence, detect differences due to single gene knockouts in the gene-gene communication asymptotically.

#### General information

Publication status: Published  
MoE publication type: A4 Article in a conference publication  
Organisations: Stowers Institute for Medical Research, TU Vienna  
Contributors: Emmert-Streib, F., Dehmer, M.  
Number of pages: 4  
Pages: 326-329  
Publication date: 2007

#### Host publication information

Title of host publication: Proceedings of the Bio-Inspired Models of Network, Information, and Computing Systems, Bionetics 2007  
Article number: 4610138  
ISBN (Print): 9789639799059  
ASJC Scopus subject areas: Computational Theory and Mathematics, Computer Science Applications, Information Systems  
Keywords: Gene networks, Information processing, Information theory, Robustness, Scale-free networks  
DOIs:  
10.1109/BIMNICS.2007.4610138  
URLs:  
<http://www.scopus.com/inward/record.url?scp=53149089468&partnerID=8YFLogxK> (Link to publication in Scopus)  
Source: Scopus  
Source ID: 53149089468  
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

### **A heterosynaptic learning rule for neural networks**

In this article we introduce a novel stochastic Hebb-like learning rule for neural networks that is neurobiologically motivated. This learning rule combines features of unsupervised (Hebbian) and supervised (reinforcement) learning and is stochastic with respect to the selection of the time points when a synapse is modified. Moreover, the learning rule does not only affect the synapse between pre- and postsynaptic neuron, which is called homosynaptic plasticity, but effects also further remote synapses of the preand postsynaptic neuron. This more complex form of synaptic plasticity has recently come under investigations in neurobiology and is called heterosynaptic plasticity. We demonstrate that this learning rule is useful in training neural networks by learning parity functions including the exclusive-or (XOR) mapping in a multilayer feed-forward network. We find, that our stochastic learning rule works well, even in the presence of noise. Importantly, the mean learning time increases with the number of patterns to be learned polynomially, indicating efficient learning.

#### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Institut für Theoretische Physik, University of Bremen, Stowers Institute for Medical Research

Contributors: Emmert-Streib, F.

Number of pages: 20

Pages: 1501-1520

Publication date: Oct 2006

Peer-reviewed: Yes

#### **Publication information**

Journal: International Journal of Modern Physics C

Volume: 17

Issue number: 10

ISSN (Print): 0129-1831

Ratings:

Scopus rating (2006): SJR 0.498 SNIP 0.581

Original language: English

ASJC Scopus subject areas: Computational Theory and Mathematics, Computer Science Applications, Mathematical Physics, Physics and Astronomy(all), Statistical and Nonlinear Physics

Keywords: Biological reinforcement learning, Hebb-like learning, Heterosynaptic plasticity, Neural networks

DOIs:

10.1142/S0129183106009916

URLs:

<http://www.scopus.com/inward/record.url?scp=33750574569&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 33750574569

Research output: Contribution to journal › Article › Scientific › peer-review

### **Labyrinth based left-handed metamaterials and sub-wavelength focusing of electromagnetic waves**

We propose and demonstrate a resonant structure that solves two major problems related to the split-ring resonator structure. These major problems may be stated as the bianisotropy and electric coupling to the magnetic resonance. These two problems introduce difficulties in obtaining isotropic left-handed metamaterial mediums. The resonant structure that we propose here solves both of these problems. We further show that in addition to the magnetic resonance, when combined with a suitable wire medium, the structure that we propose exhibits left-handed transmission band. We further demonstrate the sub-wavelength focusing of electromagnetic waves by use of a two dimensional labyrinth based metamaterial. Our experimental results showed that it is possible to focus the source field with half widths as small as  $\lambda/4$  by using the labyrinth based metamaterial.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Bilkent University

Contributors: Ozbay, E., Bulu, I., Caglayan, H.

Publication date: 2006

#### **Host publication information**

Title of host publication: Photonic Crystal Materials and Devices IV

Volume: 6128

Article number: 612813

ISBN (Print): 0819461709, 9780819461704

### Publication series

Name: Proceedings of SPIE

Publisher: SPIE

Volume: 6128

ISSN (Print): 0277-786X

ISSN (Electronic): 1996-756X

ASJC Scopus subject areas: Electronic, Optical and Magnetic Materials, Condensed Matter Physics, Computer Science Applications, Applied Mathematics, Electrical and Electronic Engineering

Keywords: Left-handed medium, Magnetic Resonance, Metamaterial, Split-ring Resonator, Sub-wavelength Focusing

DOIs:

10.1117/12.649548

URLs:

<http://www.scopus.com/inward/record.url?scp=33745626124&partnerID=8YFLogxK> (Link to publication in Scopus)

### Bibliographical note

EXT="Caglayan, Humeyra"

Source: Scopus

Source ID: 33745626124

Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

### Stochastic Sznajd Model in open community

We extend the Sznajd Model for opinion formation by introducing persuasion probabilities for opinions. Moreover, we couple the system to an environment which mimics the application of the opinion. This results in a feedback, representing single-state opinion transitions in opposite to the two-state opinion transitions for persuading other people. We call this model opinion formation in an open community (OFOC). It can be seen as a stochastic extension of the Sznajd model for an open community, because it allows for a special choice of parameters to recover the original Sznajd model. We demonstrate the effect of feedback in the OFOC model by applying it to a scenario in which, e.g., opinion B is worse than opinion A but easier explained to other people. Casually formulated we analyzed the question, how much better one has to be, in order to persuade other people, provided the opinion is worse. Our results reveal a linear relation between the transition probability for opinion B and the influence of the environment on B.

### General information

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Stowers Institute for Medical Research

Contributors: Emmert-Streib, F.

Number of pages: 7

Pages: 1693-1699

Publication date: Nov 2005

Peer-reviewed: Yes

### Publication information

Journal: International Journal of Modern Physics C

Volume: 16

Issue number: 11

ISSN (Print): 0129-1831

Ratings:

Scopus rating (2005): SJR 0.525 SNIP 0.61

Original language: English

ASJC Scopus subject areas: Computational Theory and Mathematics, Computer Science Applications, Mathematical Physics, Physics and Astronomy(all), Statistical and Nonlinear Physics

Keywords: Markov process, Monte Carlo simulation, Small-world network, Sznajd Model

DOIs:

10.1142/S0129183105008217

URLs:

<http://www.scopus.com/inward/record.url?scp=29244483126&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 29244483126

Research output: Contribution to journal > Article > Scientific > peer-review

### Classification of large graphs by a local tree decomposition

We present a binary graph classifier (BGC) which allows to classify large, unweighted, undirected graphs. This classifier is based on a local decomposition of the graph for each node in generalized trees. The obtained trees, forming the tree set of the graph, are then pairwise compared by a generalized tree-similarity-algorithm (GTSA) and the resulting similarity scores determine a characteristic similarity distribution of the graph. Classification in this context is defined as mutual

consistency for all pure and mixed tree sets and their resulting similarity distributions in a graph class. We demonstrate the application of this method to an artificially generated data set and for data from microarray experiments of cervical cancer.

#### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Stowers Institute for Medical Research, Technical University Darmstadt

Contributors: Emmert-Streib, F., Dehmert, M., Kilian, J.

Number of pages: 8

Pages: 200-207

Publication date: 2005

#### Host publication information

Title of host publication: Proceedings of the 2005 International Conference on Data Mining, DMIN'05

ISBN (Print): 9781932415797

ASJC Scopus subject areas: Computer Science Applications, Software

URLs:

<http://www.scopus.com/inward/record.url?scp=49749142261&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 49749142261

Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

#### Critical study of Newmark-scheme on manifold of finite rotations

In this paper, we show that the usual material form of the Newmark-time-stepping scheme of finite rotations is only a simplified version of the correct formula. This is because spin material rotation vectors, angular velocity vectors and angular accelerations vectors belong to different tangential vector spaces of a manifold at separate time moments. We give corrected Newmark-time-stepping schemes for material description and for spatial description. © 2001 Elsevier Science B.V. All rights reserved.

#### General information

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Teknillinen mekaniikka ja optimointi

Contributors: Mäkinen, J.

Number of pages: 12

Pages: 817-828

Publication date: 21 Dec 2001

Peer-reviewed: Yes

#### Publication information

Journal: Computer Methods in Applied Mechanics and Engineering

Volume: 191

Issue number: 8-10

ISSN (Print): 0045-7825

Ratings:

Scopus rating (2001): SJR 1.745 SNIP 1.494

Original language: English

ASJC Scopus subject areas: Computer Science Applications, Computational Mechanics

DOIs:

10.1016/S0045-7825(01)00291-2

URLs:

<http://www.scopus.com/inward/record.url?scp=0035930926&partnerID=8YFLogxK> (Link to publication in Scopus)

#### Bibliographical note

Contribution: organisation=tme,FACT1=1

Source: researchoutputwizard

Source ID: 25525

Research output: Contribution to journal › Article › Scientific › peer-review

#### Simulation of oxygen exchange of SnO<sub>2</sub> surface

Oxygen chemistry at the SnO<sub>2</sub> surface is sensitive to the surrounding gas atmosphere, a reason why it is used in gas sensor applications. The operation principle of these sensors is usually based on the reactions of gas molecules with O<sub>2</sub><sup>-</sup> and O<sup>-</sup> ions adsorbed onto the surface. These surface reactions are observed as a measurable change in the electrical conductance of the sensor material. Here, we have studied the temperature dependency of the equilibrium coverages of O<sub>2</sub><sup>-</sup>, O<sup>-</sup> and surface/lattice oxygen content with lattice gas simulations. Earlier, we have studied oxygen reactions at the

SnO<sub>2</sub> surface using rate equation simulations. These models have been used as a basis of our simulations for adsorption, dissociation and desorption steps. Now, the physisorption step has been refined and the oxygen exchange between the adsorbed form and lattice has been added. Simulations have been carried out using an equilibrium lattice gas model. The conductance of the SnO<sub>2</sub> material as a function of temperature is modeled in terms of the different oxygen components. We find that at low temperatures O<sub>2</sub><sup>-</sup> dominates at the SnO<sub>2</sub> surface, while in the higher temperature region oxygen is in the form of O<sup>-</sup>. The transition temperature from O<sub>2</sub><sup>-</sup> dominating coverage to O<sup>-</sup> coverage is about 450 K. The importance of this finding lies in the fact that O<sup>-</sup> is the most reactive component in reducing the adsorbed gases, and therefore, it explains the temperature dependence of the sensitivity of SnO<sub>2</sub> based sensors. The exchange process is slow at lower temperatures and accounts for the hysteresis like behavior at low temperatures. The simulated conductance dependence is in good agreement with the experimental measurements of Lantto et al.

#### General information

Publication status: Published  
MoE publication type: A1 Journal article-refereed  
Organisations: University of Oulu  
Contributors: Pulkkinen, U., Rantala, T. T., Rantala, T. S., Lantto, V.  
Number of pages: 1  
Pages: 720  
Publication date: Sep 1999  
Peer-reviewed: Yes

#### Publication information

Journal: Computer Physics Communications  
Volume: 121  
ISSN (Print): 0010-4655  
Ratings:  
Scopus rating (1999): SJR 1.235 SNIP 1.033  
Original language: English  
ASJC Scopus subject areas: Computer Science Applications, Physics and Astronomy(all)  
URLs:  
<http://www.scopus.com/inward/record.url?scp=0033185516&partnerID=8YFLogxK> (Link to publication in Scopus)  
Source: Scopus  
Source ID: 0033185516  
Research output: Contribution to journal > Article > Scientific > peer-review

#### Soft computing-based controller design for a telecom rectifier

Presents controller design for a telecommunications rectifier based on analogue, digital and fuzzy logic approaches. The required output characteristics contain three modes of operation-constant-voltage, modified constant-power and constant-current. The proposed analogue solution is well proven in practical use and shows excellent performance. The digital solution is simulated and preliminary results predict its applicability. The fuzzy logic solution is outlined for constant-voltage and overload controllers. Preliminary simulations are promising but further optimization must be carried out.

#### General information

Publication status: Published  
MoE publication type: Not Eligible  
Organisations: Aalto University, University of Oulu, Efore Oy  
Contributors: Gadoura, I., Suntio, T., Zenger, K., Vallittu, P.  
Number of pages: 6  
Pages: 80-85  
Publication date: 1 Jan 1999

#### Host publication information

Title of host publication: SMCia 1999 - Proceedings of the 1999 IEEE Midnight-Sun Workshop on Soft Computing Methods in Industrial Applications  
Publisher: Institute of Electrical and Electronics Engineers Inc.  
Editor: Martikainen, J.  
Article number: 782712  
ISBN (Electronic): 0780352807, 9780780352803

#### Publication series

Name: SMCia 1999 - Proceedings of the 1999 IEEE Midnight-Sun Workshop on Soft Computing Methods in Industrial Applications  
ASJC Scopus subject areas: Computer Science Applications, Control and Optimization  
DOIs:  
10.1109/SMCIA.1999.782712

Source: Scopus

Source ID: 84952779655

Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review