Frequency Comb Generation in a Continuous-Wave Pumped Second-Order Nonlinear Waveguide Resonator

Optical frequency comb generation has been experimentally studied using an integrated system based on a lithium niobate waveguide resonator featuring a strong quadratic nonlinearity. Our theoretical model shows good agreement with the experimental results.

General information

Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Physics, Paderborn University, University of Helsinki, VTT Technical Research Centre of Finland
Contributors: Abdallah, Z., Stefszky, M., Ulvila, V., Silberhorn, C., Vainio, M.
Publication date: 1 May 2019

Host publication information

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Publisher: IEEE
ISBN (Electronic): 9781943580576
ASJC Scopus subject areas: Spectroscopy, Industrial and Manufacturing Engineering, Safety, Risk, Reliability and Quality , Management, Monitoring, Policy and Law, Electronic, Optical and Magnetic Materials, Radiology Nuclear Medicine and imaging, Instrumentation, Atomic and Molecular Physics, and Optics
DOIs:

10.23919/CLEO.2019.8750403
Source: Scopus
Source ID: 85069196416
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Adaptive multiresolution method for MAP reconstruction in electron tomography

3D image reconstruction with electron tomography holds problems due to the severely limited range of projection angles and low signal to noise ratio of the acquired projection images. The maximum a posteriori (MAP) reconstruction methods have been successful in compensating for the missing information and suppressing noise with their intrinsic regularization techniques. There are two major problems in MAP reconstruction methods: (1) selection of the regularization parameter that controls the balance between the data fidelity and the prior information, and (2) long computation time. One aim of this study is to provide an adaptive solution to the regularization parameter selection problem without having additional knowledge about the imaging environment and the sample. The other aim is to realize the reconstruction using sequences of resolution levels to shorten the computation time. The reconstructions were analyzed in terms of accuracy and computational efficiency using a simulated biological phantom and publically available experimental datasets of electron tomography. The numerical and visual evaluations of the experiments show that the adaptive multiresolution method can provide more accurate results than the weighted back projection (WBP), simultaneous iterative reconstruction technique (SIRT), and sequential MAP expectation maximization (sMAPEM) method. The method is superior to sMAPEM also in terms of computation time and usability since it can reconstruct 3D images significantly faster without requiring any parameter to be set by the user.

General information

Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Signal Processing, BioMediTech
Contributors: Acar, E., Peltonen, S., Ruotsalainen, U.
Number of pages: 11
Pages: 24-34
Publication date: 1 Nov 2016
Peer-reviewed: Yes

Publication information

Journal: Ultramicroscopy
Volume: 170
ISSN (Print): 0304-3991
Ratings:

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Original language: English
ASJC Scopus subject areas: Electronic, Optical and Magnetic Materials, Atomic and Molecular Physics, and Optics, Instrumentation
Keywords: Adaptive reconstruction, Electron tomography (ET), Maximum a posteriori (MAP) reconstruction, Missing wedge, Multiresolution reconstruction, Regularization parameter
DOIs:

10.1016/j.ultramic.2016.08.002

Source: Scopus
Source ID: 84981309739
Research output: Contribution to journal › Article › Scientific › peer-review

Methods for simultaneous robot-world-hand–eye calibration: A comparative study

In this paper, we propose two novel methods for robot-world-hand-eye calibration and provide a comparative analysis against six state-of-the-art methods. We examine the calibration problem from two alternative geometrical interpretations, called 'hand-eye' and 'robot-world-hand-eye', respectively. The study analyses the effects of specifying the objective function as pose error or reprojection error minimization problem. We provide three real and three simulated datasets with rendered images as part of the study. In addition, we propose a robotic arm error modeling approach to be used along with the simulated datasets for generating a realistic response. The tests on simulated data are performed in both ideal cases and with pseudo-realistic robotic arm pose and visual noise. Our methods show significant improvement and robustness on many metrics in various scenarios compared to state-of-the-art methods.

General information

Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Computing Sciences, Remote Handling Project Team
Contributors: Ali, I., Suominen, O., Gotchev, A., Morales, E. R.
Publication date: 2 Jun 2019
Peer-reviewed: Yes

Publication information

Journal: Sensors (Switzerland)
Volume: 19
Issue number: 12
Article number: 2837
ISSN (Print): 1424-8220
Original language: English
ASJC Scopus subject areas: Analytical Chemistry, Atomic and Molecular Physics, and Optics, Biochemistry, Instrumentation, Electrical and Electronic Engineering
Keywords: Hand-eye calibration, Optimization, Robot-world-hand-eye calibration
Electronic versions:

sensors-19-02837-v2
DOIs:

10.3390/s19122837
URLs:

http://urn.fi/URN:NBN:fi:tty-201909032055
Source: Scopus
Source ID: 85068904338
Research output: Contribution to journal › Article › Scientific › peer-review

Sensor Fusion for Unobtrusive Respiratory Rate Estimation in Dogs

Respiration is vital to land-dwelling mammals; besides, salient information is encoded in the respiratory rate. Objective assessment of the respiratory rate is difficult in dogs; in particular, if the unobtrusive measurement is desired. The goal of this work was to develop and evaluate a method for unobtrusive sensing of respiratory rate in dogs. For this, the 'FlexPock' multisensor system, originally developed for unobtrusive estimation of heart rate and respiratory rate in humans via magnetic impedance; accelerometry; and optical measurements, was used to assess canine respiratory rate. In a proof-of-concept study with 10 healthy dogs of different breeds and sizes, a total of 240 minutes of data was recorded in the phases standing, sitting, lying down, and walking. An algorithm was developed that estimates the respiratory rate by fusing the information from multiple sensors for increased accuracy and robustness. To discard unusable data, a simple yet effective signal quality metric was introduced. Impedance pneumography recorded using adhesive electrodes was used as a reference. Analysis of the raw FlexPock data revealed that the magnetic impedance and accelerometry were the best individual sensing modalities and fusion of these data further increased the accuracy. Using leave-one-dog-out cross-validation, the average estimation error was 9.5% at a coverage of 50.1%. However, strong variation between dogs and phases was observed. During the walking phase, neither reference nor unobtrusive sensor reported usable results, while the sitting phase exhibited the best performance. In conclusion, the fusion of magnetic impedance and accelerometry can be used for unobtrusive respiratory rate estimation in stationary dogs.

General information

Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Computing Sciences, Research area: User experience, BioMediTech, RWTH Aachen University, Tampere University, University of Helsinki, Massachusetts Institute of Technology

Contributors: Antink, C. H., Pirhonen, M., Väätäjä, H., Somppi, S., Tornqvist, H., Cardo, A., Teichmann, D., Vainio, O., Surakka, V., Vehkaoja, A.
Number of pages: 10
Pages: 7072-7081
Publication date: 15 Aug 2019
Peer-reviewed: Yes

Publication information
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Original language: English
ASJC Scopus subject areas: Instrumentation, Electrical and Electronic Engineering
Keywords: animal health management, dogs, monitoring, respiratory rate, Sensor fusion, unobtrusive sensing
DOIs:

10.1109/JSEN.2019.2912002

Bibliographical note
dupl=49134380
Source: Scopus
Source ID: 85069512410
Research output: Contribution to journal › Article › Scientific › peer-review

Impact of Different Concrete Types on Radio Propagation: Fundamentals and Practical RF Measurements
By the 1960's, European countries faced a massive housing shortage due to changes in social structure and migration from rural areas to towns. This led to a rapid growth of suburban areas in the 1960's and 1970's. Concrete, as a building material became popular as the prefabrication techniques of precast concrete structures developed rapidly during this era, and these trends continue even today. In the near future, the number of frequency bands used by mobile wireless communication systems will increase and, in general, the trend is towards higher frequencies. This paper presents the results of measurements in which the RF attenuations of several different concrete types were determined on the basis of the permittivity of the material samples. The frequency ranges used in the measurements were 4.5 to 19 GHz and 26 to 40 GHz. In particular, at higher frequencies, the attenuation of various concrete grades is very different, and the level of RF attenuation of the outer wall cannot be predicted without knowing the age of the building and the concrete quality used in the element.

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Electrical Engineering, Tampere University, VTT Technical Research Centre of Finland
Contributors: Asp, A., Hentilä, T., Valkama, M., Pikkuvirta, J., Hujanen, A., Huhtinen, I.
Publication date: 1 Jun 2019

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Title of host publication: 2019 4th International Conference on Smart and Sustainable Technologies, SpliTech 2019
Publisher: IEEE
Editors: Rodrigues, J. J., Solic, P., Perkovic, T., Vukojevic, K., Rodrigues, J. J., Patrono, L., Nizetic, S.
ISBN (Electronic): 9789532900910
ASJC Scopus subject areas: Artificial Intelligence, Computer Networks and Communications, Instrumentation, Energy Engineering and Power Technology, Renewable Energy, Sustainability and the Environment
Keywords: energy-efficient buildings, outdoor-To-indoor propagation, penetration loss, plastering net, Radiowave propagation, RF measurements
DOIs:

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Bibliographical note
INT=ceng,"Pikkuvirta, Jussa"
Source: Scopus
Source ID: 85070820498
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Routing light with nematicons: Light localization and steering in liquid crystals
Liquid crystals in the nematic phase support light self-confinement via reorientational nonlinearity and nonlocality, yielding robust spatial solitons which can trap, switch and route optical signals. We review the major achievements in the field.

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Nonlinear Optics and OptoElectronics Lab, CNISM and University of Rome, INRS-EMT Université du Québec
Contributors: Assanto, G., Peccianti, M., Alberucci, A., Piccardi, A.
Number of pages: 2
Pages: 2281-2282
Publication date: 2009

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Title of host publication: Optics InfoBase Conference Papers
Publisher: Optical Society of America
ISBN (Print): 9781557528698
ASJC Scopus subject areas: Instrumentation, Atomic and Molecular Physics, and Optics
DOIs:

10.1364/IQEC.2009.ITuG1
URLs:

http://www.scopus.com/inward/record.url?scp=84897963487&partnerID=8YFLogxK (Link to publication in Scopus)
Source: Scopus
Source ID: 84897963487
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Rapid and sensitive detection of norovirus antibodies in human serum with a biolayer interferometry biosensor
Here, we describe the use of a biolayer interferometry biosensor for the fast and sensitive detection of virus-specific antibodies from human serum samples. Norovirus-like particles and norovirus P-particles were used to functionalise the biosensor tip. The detection of antibodies directly from serum samples was challenging, but the addition of a metal chelator (DAB) combined with an anti-human horseradish peroxidase-tagged antibody enabled enhanced detection of virus-specific antibodies in serum dilutions up to 1:100,000. Biolayer interferometry provides results faster than an ELISA, with results in as little as 10-20 min when using pre-functionalised sensors. Therefore, biolayer interferometry combined with DAB enhancement offers an attractive method for quick and sensitive quantification of biomolecules from complicated sample matrices.

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Multi-scaled biodata analysis and modelling (MultiBAM), Fimlab Laboratories Ltd
Contributors: Auer, S., Koho, T., Uusi-Kerttula, H., Vesikari, T., Blazevic, V., Hytönen, V. P.
Number of pages: 8
Pages: 507-514
Publication date: 31 Dec 2015
Peer-reviewed: Yes

Publication information
Journal: Sensors and Actuators B: Chemical
Volume: 221
ISSN (Print): 0925-4005
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Scopus rating (2015): CiteScore 4.84 SJR 1.225 SNIP 1.484
Original language: English
ASJC Scopus subject areas: Electrical and Electronic Engineering, Condensed Matter Physics, Electronic, Optical and Magnetic Materials, Metals and Alloys, Surfaces, Coatings and Films, Materials Chemistry, Instrumentation
Keywords: Biolayer interferometry, Fast diagnostics, Non-labelled detection, Norovirus, P-particles, Virus-like particles (VLPs)
DOIs:

10.1016/j.snb.2015.06.088
URLs:

http://www.scopus.com/inward/record.url?scp=84956972181&partnerID=8YFLogxK (Link to publication in Scopus)
Source: Scopus
Source ID: 84956972181
Research output: Contribution to journal › Article › Scientific › peer-review

Coupled dictionaries for exemplar-based speech enhancement and automatic speech recognition
Exemplar-based speech enhancement systems work by decomposing the noisy speech as a weighted sum of speech and noise exemplars stored in a dictionary and use the resulting speech and noise estimates to obtain a time-varying filter in

the full-resolution frequency domain to enhance the noisy speech. To obtain the decomposition, exemplars sampled in lower dimensional spaces are preferred over the full-resolution frequency domain for their reduced computational complexity and the ability to better generalize to unseen cases. But the resulting filter may be sub-optimal as the mapping of the obtained speech and noise estimates to the full-resolution frequency domain yields a low-rank approximation. This paper proposes an efficient way to directly compute the full-resolution frequency estimates of speech and noise using coupled dictionaries: an input dictionary containing atoms from the desired exemplar space to obtain the decomposition and a coupled output dictionary containing exemplars from the full-resolution frequency domain. We also introduce modulation spectrogram features for the exemplar-based tasks using this approach. The proposed system was evaluated for various choices of input exemplars and yielded improved speech enhancement performances on the AURORA-2 and AURORA-4 databases. We further show that the proposed approach also results in improved word error rates (WERs) for the speech recognition tasks using HMM-GMM and deep-neural network (DNN) based systems.

General information

Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Signal Processing, Research group: Audio research group, Research Community on Data-to-Decision (D2D), Signal Processing Research Community (SPRC), Speech Processing Research Group, Electrical Engineering Department (ESAT), KU Leuven
Contributors: Baby, D., Virtanen, T., Gemmeke, J. F., Van hamme, H.
Number of pages: 12
Pages: 1788-1799
Publication date: 1 Nov 2015
Peer-reviewed: Yes

Publication information

Journal: Ieee-Acm transactions on audio speech and language processing
Volume: 23
Issue number: 11
ISSN (Print): 2329-9290
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Scopus rating (2015): CiteScore 2.4 SJR 1.13 SNIP 1.58
Original language: English
ASJC Scopus subject areas: Signal Processing, Electrical and Electronic Engineering, Media Technology, Acoustics and Ultrasonics, Instrumentation, Linguistics and Language, Speech and Hearing
Keywords: Exemplar-based, Modulation envelope, Noise robust automatic speech recognition, Non-negative sparse coding
DOIs:

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Source: Scopus
Source ID: 84942609488
Research output: Contribution to journal › Article › Scientific › peer-review

Blind Separation of Audio Mixtures Through Nonnegative Tensor Factorization of Modulation Spectrograms

This paper presents an algorithm for unsupervised single-channel source separation of audio mixtures. The approach specifically addresses the challenging case of separation where no training data are available. By representing mixtures in the modulation spectrogram (MS) domain, we exploit underlying similarities in patterns present across frequency. A three-dimensional tensor factorization is able to take advantage of these redundant patterns, and is used to separate a mixture into an approximated sum of components by minimizing a divergence cost. Furthermore, we show that the basic tensor factorization can be extended with convolution in time being used to improve separation results and provide update rules to learn components in such a manner. Following factorization, sources are reconstructed in the audio domain from estimated components using a novel approach based on reconstruction masks that are learned using MS activations, and then applied to a mixture spectrogram. We demonstrate that the proposed method produces superior separation performance to a spectrally based nonnegative matrix factorization approach, in terms of source-to-distortion ratio. We also compare separation with the perceptually motivated interference-related perceptual score metric and identify cases with higher performance.

General information

Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Signal Processing, Research group: Audio research group
Contributors: Barker, T., Virtanen, T.
Number of pages: 13
Pages: 2377-2389
Publication date: 1 Dec 2016
Peer-reviewed: Yes

Publication information
Journal: Ieee-Acm transactions on audio speech and language processing
Volume: 24
Issue number: 12
ISSN (Print): 2329-9290
Ratings:

Scopus rating (2016): CiteScore 3.5 SJR 0.711 SNIP 2.949
Original language: English
ASJC Scopus subject areas: Signal Processing, Media Technology, Instrumentation, Acoustics and Ultrasonics, Linguistics and Language, Speech and Hearing, Electrical and Electronic Engineering
Keywords: Factorization, nonnegative matrix factorization (NMF), source separation, speech enhancement
DOIs:

10.1109/TASLP.2016.2602546
Source: Scopus
Source ID: 84991442139
Research output: Contribution to journal › Article › Scientific › peer-review

Advancements in Solution Processable Devices using Metal Oxides For Printed Internet-of-Things Objects
Internet-of-things (IoT) objects are expected to exceed 75 billion objects by 2020, and a large part of the expansion is expected to be at a finer granularity than existing silicon-based IoT objects (i.e. tablets and cell phones) can deliver [1]. Currently, placing a room light or a thermostat on the internet for remote control is considered progressive. However, if printed electronics can achieve performance increases, then IoT objects could be affixed to almost anything, such as coffee creamer cartons, cereal boxes, or that missing sock. Each of these IoT objects could be driving a sensor, perhaps position, temperature or pressure, essentially a multitude of applications. In order for IoT objects to emulate a simple postage stamp, with self-powering from energy scavenging and local energy storage, all housed in a non-toxic flexible form factor, advances in solution processable devices need to occur.

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Electrical Engineering, Ohio State University, Wayne State University
Contributors: Berger, P. R., Li, M., Mattei, R. M., Niang, M. A., Talisa, N., Tripepi, M., Harris, B., Bhalerao, S. R., Chowdhury, E. A., Winter, C. H., Lupo, D.
Number of pages: 3
Pages: 160-162
Publication date: 1 Mar 2019

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Title of host publication: 2019 Electron Devices Technology and Manufacturing Conference, EDTM 2019
Publisher: IEEE
ISBN (Electronic): 9781538665084
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Keywords: ALD, CMOS and SOI, energy scavenging, IoT, low-power electronics, Manufacturing, NDR, tunnel diodes
DOIs:

10.1109/EDTM.2019.8731322
Source: Scopus
Source ID: 85067814337
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Secure environmental monitoring for industrial internet of things: From framework to live implementation
Worldwide changes in climate and increasing pollution level are tremendously affecting the need for environmental monitoring solutions. Recent activities in wireless sensor networks (WSNs) together with Cloud computing paradigm brought an entirely new perspective on monitoring as part of the Industrial Internet of Things (IIoT). However, most of the systems developed today are still facing lack of flexibility and security. This work presents the results of prototyping the IIoT wireless environmental monitoring system from both hardware and software sides. The developed mechanisms enable connectivity in infrastructure and mesh-like modes, where each sensor could act as relay allowing for improved node-failure resistance and scalability. Next, the authentication mechanism is proposed to enable transparent migration of any node between different network segments while keeping the overall operation secure. Finally, proof of the concept prototype deployment in real-life conditions shows the potential of metropolitan-scale utilization of the developed system.

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

Organisations: Electrical Engineering, St. Petersburg State University of Aerospace Instrumentation, ITMO University
Contributors: Bezzateev, S., Voloshina, N., Zhidanov, K., Ometov, A.
Publication date: 1 Jun 2019

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Publisher: IEEE
Editors: Lohan, E., Rugamer, A., Nurmi, J., Koch, W., Heuberger, A.
ISBN (Electronic): 9781728124452
ASJC Scopus subject areas: Computer Networks and Communications, Aerospace Engineering, Instrumentation
Keywords: Authentication, Environmental monitoring, IIoT, Prototype, Security, Sensor network
DOIs:

10.1109/ICL-GNSS.2019.8752764
Source: Scopus
Source ID: 85069530591
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Restoration of low-dose digital breast tomosynthesis
In breast cancer screening, the radiation dose must be kept to the minimum necessary to achieve the desired diagnostic objective, thus minimizing risks associated with cancer induction. However, decreasing the radiation dose also degrades the image quality. In this work we restore digital breast tomosynthesis (DBT) projections acquired at low radiation doses with the goal of achieving a quality comparable to that obtained from current standard full-dose imaging protocols. A multiframe denoising algorithm was applied to low-dose projections, which are filtered jointly. Furthermore, a weighted average was used to inject a varying portion of the noisy signal back into the denoised one, in order to attain a signal-to-noise ratio comparable to that of standard full-dose projections. The entire restoration framework leverages a signal-dependent noise model with quantum gain which varies both upon the projection angle and on the pixel position. A clinical DBT system and a 3D anthropomorphic breast phantom were used to validate the proposed method, both on DBT projections and slices from the 3D reconstructed volume. The framework is shown to attain the standard full-dose image quality from data acquired at 50% lower radiation dose, whereas progressive loss of relevant details compromises the image quality if the dosage is further decreased.

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Signal Processing, University of São Paulo, Noiseless Imaging Ltd, University of Pennsylvania
Contributors: Borges, L. R., Azzari, L., Bakic, P. R., Maidment, A. D., Vieira, M. A., Foi, A.
Publication date: 19 Apr 2018
Peer-reviewed: Yes

Publication information
Journal: Measurement Science and Technology
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Article number: 064003
ISSN (Print): 0957-0233
Ratings:

Scopus rating (2018): CiteScore 2.21 SJR 0.57 SNIP 1.243
Original language: English
ASJC Scopus subject areas: Instrumentation, Engineering (miscellaneous), Applied Mathematics
Keywords: denoising, digital breast tomosynthesis, dose reduction, variance stabilization
Electronic versions:

Borges-DBT_Restoration-IOPMST2018. Embargo ended: 19/04/19
DOIs:

10.1088/1361-6501/aab2f6
URLs:

http://urn.fi/URN:NBN:fi:tty-201807252021. Embargo ended: 19/04/19
Source: Scopus
Source ID: 85047322570
Research output: Contribution to journal › Article › Scientific › peer-review

Theory of near-IR metatronic nanocircuits using transparent conducting oxides (TCO)
We theoretically investigate TCO nanorods functioning as optical nanocircuits in NIR regimes. Using the circuit theory and FDTD simulations, we explore the nanoscale circuit element functionalities controlled by the polarization of incident E-field.

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Department of Electrical and Systems Engineering, University of Pennsylvania
Contributors: Caglayan, H., Engheta, N.
Publication date: 2011

Host publication information
Title of host publication: Frontiers in Optics 2011
Publisher: Optical Society of America
ISBN (Print): 9781557529176
ASJC Scopus subject areas: Instrumentation, Atomic and Molecular Physics, and Optics
DOIs:

10.1364/FIO.2011.FTuG2
URLs:

http://www.scopus.com/inward/record.url?scp=84893520875&partnerID=8YFLogxK (Link to publication in Scopus)

Bibliographical note
EXT="Caglayan, Humeyra"
Source: Scopus
Source ID: 84893520875
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Observation of defect formation in metamaterials
We report subwavelength localization of electromagnetic fields within cavities based on metamaterials. Cavity resonances are observed in the transmission spectrum of a split ring resonator and composite metamaterials cavity structures. These cavity resonances are shown to exhibit high quality factors. Since the unit cells of metamaterials are much smaller than the operation wavelength, subwavelength localization is possible within these metamaterial cavity structures. In the present paper, we show that the electromagnetic field is localized into a region of λ/8, where λ is the cavity resonance wavelength.

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Nanotechnology Research Center-NANOTAM, Bilkent University, Harvard University
Contributors: Caglayan, H., Bulu, I., Loncar, M., Ozbay, E.
Number of pages: 2
Publication date: 2008

Host publication information
Title of host publication: Plasmonics and Metamaterials 2008
Publisher: Optical Society of America
Article number: MMC7
ISBN (Print): 9781557528612
ASJC Scopus subject areas: Instrumentation, Atomic and Molecular Physics, and Optics
DOIs:

10.1364/META_PLAS.2008.MMC7
URLs:

http://www.scopus.com/inward/record.url?scp=84898623312&partnerID=8YFLogxK (Link to publication in Scopus)

Bibliographical note
EXT="Caglayan, Humeyra"
Source: Scopus
Source ID: 84898623312
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Directional selectivity through the subwavelength slit in metallic gratings
An approach for obtaining strong directional selectivity through a single subwavelength slit in non-symmetric metallic gratings is shown theoretically and experimentally. Directionality effect originates from the different resonance frequencies of two interfaces.

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

Organisations: Bilkent University, Nanotechnology Research Center
Contributors: Cakmakyapan, S., Caglayan, H., Serebryannikov, A., Ozbay, E.
Publication date: 2011

Host publication information
Title of host publication: CLEO: Applications and Technology
ISBN (Print): 9781557529107
ASJC Scopus subject areas: Instrumentation, Atomic and Molecular Physics, and Optics
DOIs:

10.1364/CLEO_AT.2011.JTuI67
URLs:

http://www.scopus.com/inward/record.url?scp=84893621842&partnerID=8YFLogxK (Link to publication in Scopus)
Source: Scopus
Source ID: 84893621842
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Directional selectivity through the subwavelength slit in metallic gratings
An approach for obtaining strong directional selectivity through a single subwavelength slit in non-symmetric metallic gratings is shown theoretically and experimentally. Directionality effect originates from the different resonance frequencies of two interfaces.

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Bilkent University, Nanotechnology Research Center
Contributors: Cakmakyapan, S., Caglayan, H., Serebryannikov, A., Ozbay, E.
Publication date: 2011

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ISBN (Print): 9781557529107
ASJC Scopus subject areas: Instrumentation, Atomic and Molecular Physics, and Optics
DOIs:

10.1364/CLEO_AT.2011.JTuI67
URLs:

http://www.scopus.com/inward/record.url?scp=84893590543&partnerID=8YFLogxK (Link to publication in Scopus)

Bibliographical note
EXT="Caglayan, Humeyra"
Source: Scopus
Source ID: 84893590543
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Directional selectivity through the subwavelength slit in metallic gratings
An approach for obtaining strong directional selectivity through a single subwavelength slit in non-symmetric metallic gratings is shown theoretically and experimentally. Directionality effect originates from the different resonance frequencies of two interfaces.

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Bilkent University, Nanotechnology Research Center
Contributors: Cakmakyapan, S., Caglayan, H., Serebryannikov, A., Ozbay, E.
Number of pages: 3
Publication date: 2011

Host publication information
Title of host publication: Quantum Electronics and Laser Science Conference, QELS 2011
ISBN (Print): 9781557529107
ASJC Scopus subject areas: Instrumentation, Atomic and Molecular Physics, and Optics
DOIs:

10.1364/CLEO_AT.2011.JTuI67
URLs:

http://www.scopus.com/inward/record.url?scp=84894054350&partnerID=8YFLogxK (Link to publication in Scopus)

Bibliographical note
EXT="Caglayan, Humeyra"
Source: Scopus
Source ID: 84894054350
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Measurement of the refractive index dispersion of As_2Se_3 bulk glass and thin films prior to and after laser irradiation and annealing using prism coupling in the near- and mid-infrared spectral range
The prism coupling technique has been utilized to measure the refractive index in the near- and mid-IR spectral region of chalcogenide glasses in bulk and thin film form. A commercial system (Metricon model 2010) has been modified with additional laser sources, detectors, and a new GaP prism to allow the measurement of refractive index dispersion over the 1.5-10.6m range. The instrumental error was found to be 0.001 refractive index units across the entire wavelength region examined. Measurements on thermally evaporated AMTIR2 thin films confirmed that (i) the film deposition process provides thin films with reduced index compared to that of the bulk glass used as a target, (ii) annealing of the films increases the refractive index of the film to the level of the bulk glass used as a target to create it, and (iii) it is possible to locally increase the refractive index of the chalcogenide glass using laser exposure at 632.8 nm.

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Frontier Photonics, School of Materials Science and EngineeringCOMSET, Pacific Northwest National Laboratory
Contributors: Carlie, N., Anheier, N. C., Qiao, H. A., Bernacki, B., Phillips, M. C., Petit, L., Musgraves, J. D., Richardson, K.
Publication date: May 2011
Peer-reviewed: Yes

Publication information
Journal: Review of Scientific Instruments
Volume: 82
Issue number: 5
Article number: 053103
ISSN (Print): 0034-6748
Ratings:
Scopus rating (2011): CiteScore 1.43 SJR 0.868 SNIP 1.118
Original language: English
ASJC Scopus subject areas: Instrumentation
DOIs:
10.1063/1.3587616
URLs:
http://www.scopus.com/inward/record.url?scp=79958074043&partnerID=8YFLogxK (Link to publication in Scopus)
Source: Scopus
Source ID: 79958074043
Research output: Contribution to journal › Article › Scientific › peer-review

Fabrication and reliability evaluation of passive UHF RFID T-shirts
In this paper, we present textile antennas fabricated for T-shirt RFID applications by cutting from commercially available electro-textile, by sewing with conductive thread, and by 3D printing with stretchable silver ink on a 100 % cotton fabric. The ready tags with attached ICs are coated with a protective stretchable encapsulant. The wireless performance of the T-shirt tags is evaluated initially as well as after seven washing cycles, followed by nine washing-drying cycles in a household washing and drying machines. The initial read ranges of all kinds of tags, when measured on-body, are around 3.5 meters. Based on the reliability testing results, the coating effectively protects the components from cyclic washing and drying.

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, Department of Electronic Engineering, City University of Hong Kong
Contributors: Chen, X., He, H., Ukkonen, L., Virkki, J., Lu, Y., Lam, H.
Number of pages: 4
Pages: 1-4
Publication date: 8 Jun 2018

Host publication information
Title of host publication: 2018 IEEE International Workshop on Antenna Technology, iWAT2018 - Proceedings
Publisher: IEEE
ISBN (Electronic): 9781538618516
ASJC Scopus subject areas: Instrumentation, Computer Networks and Communications, Electronic, Optical and Magnetic Materials
Keywords: 3D Printing, electro-textiles, embroidery, passive UHF RFID, T-shirts, textiles, washing, wearable electronics
DOIs:

10.1109/IWAT.2018.8379146

Bibliographical note
jufoid=79362
Source: Scopus
Source ID: 85050037887
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

RFID-based sensors for zero-power autonomous wireless sensor networks
Radio frequency identification (RFID) technology has enabled a new class of low cost, wireless zero-power sensors, which open up applications in highly pervasive and distributed RFID-enabled sensing, which were previously not feasible with wired or battery powered wireless sensor nodes. This paper provides a review of RFID sensing techniques utilizing chip-based and chipless RFID principles, and presents a variety of implementations of RFID-based sensors, which can be used to detect strain, temperature, water quality, touch, and gas.

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, LAAS-CNRS
Contributors: Cook, B. S., Vyas, R., Kim, S., Thai, T., Le, T., Traille, A., Aubert, H., Tentzeris, M. M.
Number of pages: 13
Pages: 2419-2431
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: IEEE Sensors Journal
Volume: 14
Issue number: 8
Article number: 6701187
ISSN (Print): 1530-437X
Ratings:

Scopus rating (2014): CiteScore 2.5 SJR 0.775 SNIP 1.875
Original language: English
ASJC Scopus subject areas: Instrumentation, Electrical and Electronic Engineering
Keywords: inkjet printing, mmwave, RFID, Wireless sensors
DOIs:

10.1109/JSEN.2013.2297436
URLs:

http://www.scopus.com/inward/record.url?scp=84903626370&partnerID=8YFLogxK (Link to publication in Scopus)
Source: Scopus
Source ID: 84903626370
Research output: Contribution to journal › Article › Scientific › peer-review

Chipless graphene tag and dual-CP reader for Internet of Things
This paper proposes a printable chipless tag that encodes more bits than a conventional tag, and also a dual circularly polarized (CP) reader that achieves high isolation as well as insensitive orientation. To demonstrate this concept, a radio-frequency identification (RFID) tag with a compact size of 12mm × 12mm is designed to encode 8 bits covering 6-9 GHz, and is investigated with dual-CP backscattering characteristics. Using conductive ink such as graphene, it is possible to directly print this kind of chipless tag on A4 papers, clothes, plastics, etc. This flexible low-cost tag and dual-CP reader are promising to significantly benefit the Internet of Things (IoT).

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, BioMediTech, Southeast University, BioMediTech Institute
Contributors: Dong, G., Shen, Y., He, H., Virkki, J., Hu, S.
Publication date: 26 Sep 2017

Host publication information
Title of host publication: 2017 International Applied Computational Electromagnetics Society Symposium in China, ACES-China 2017
Publisher: IEEE
ISBN (Electronic): 9780996007856
ASJC Scopus subject areas: Electrical and Electronic Engineering, Computational Mathematics, Instrumentation, Computer Networks and Communications
Keywords: Chipless tag, dual circular polarization, Internet of Things (IoT), radar cross section (RCS), radio-frequency identification (RFID)
Source: Scopus
Source ID: 85032786773
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Binary Non-Negative Matrix Deconvolution for Audio Dictionary Learning
In this study, we propose an unsupervised method for dictionary learning in audio signals. The new method, called binary nonnegative matrix deconvolution (BNMD), is developed and used to discover patterns from magnitude-scale spectrograms. The BNMD models an audio spectrogram as a sum of delayed patterns having binary gains (activations). Only small subsets of patterns can be active for a given spectrogram excerpt. The proposed method was applied to speaker identification and separation tasks. The experimental results show that dictionaries obtained by the BNMD bring much higher speaker identification accuracies averaged over a range of SNRs from -6 dB to 9 dB (91.3%) than the NMD-based dictionaries (37.8-75.4%). The BNMD also gives a benefit over dictionaries obtained using vector quantization (87.8%). For bigger dictionaries the difference between the BNMD and the vector quantization (VQ) is getting smaller. For the speech separation task the BNMD dictionary gave a slight improvement over the VQ.

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Signal Processing, Research group: Audio research group - ARG, Poznan University of Technology, University of Oldenburg, Yousician Ltd.
Contributors: Drgas, S., Virtanen, T., Lücke, J., Hurmalainen, A.
Number of pages: 13
Pages: 1644-1656
Publication date: 1 Aug 2017
Peer-reviewed: Yes

Publication information
Journal: IEEE/ACM Transactions on Audio Speech and Language Processing
Volume: 25
Issue number: 8
ISSN (Print): 2329-9290
Ratings:

Scopus rating (2017): CiteScore 4.4 SJR 0.841 SNIP 2.138
Original language: English
ASJC Scopus subject areas: Signal Processing, Media Technology, Instrumentation, Acoustics and Ultrasonics, Linguistics and Language, Speech and Hearing, Electrical and Electronic Engineering
Keywords: Sparse coding, speaker recognition, speech separation
Electronic versions:

BNMD
DOIs:

10.1109/TASLP.2017.2709909
URLs:

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Bibliographical note
EXT="Hurmalainen, Antti"
Source: Scopus
Source ID: 85028409183
Research output: Contribution to journal › Article › Scientific › peer-review

Evaluating transparent liquid screen overlay as a haptic conductor: Method of enhancing touchscreen based user interaction by a transparent deformable liquid screen overlay

In line with our previous work, this research focuses on a method for attenuating acoustic components (noise) while providing enhanced vibrotactile feedback signals on mobile devices using, deformable touchscreen overlays. Traditional mechanism of providing tactile feedback to the fingertip via a flat rigid touchscreen is limited due to the dampening of the mechanoreceptors which are sensitive to static deformation and lie at the tips of the intermediate ridges in the epidermal-dermal junction. This tactile mechanism becomes useless when the fingertip acts against a ridged surface (chemically strengthened alkali-aluminosilicate glass). Furthermore, the actuation provided by most devices is indirect with little or no mediation mechanism, which results in filtering various signal frequencies, loss of signal intensity as well as creating acoustic noise. The resulting haptic signal is considerably inefficient and incongruent to the applied signal, which was designed to stimulate user skin contact. To resolve these issues we developed a unique transparent screen overlay conductor which contains an oil based composition (a low viscosity inert nonconductive liquid), that acts as a soft deformable interaction point, enhancing the ratio between tactile signals and the acoustic components, provided by haptic actuators. Using surface mounted and embedded actuators to the overlay, while being attached to an ExoPC Slate, we measured haptic signal to noise correlation, as well as signal efficiency and strength over multiple frequencies and concluded that the haptic conductor was able to limit auditory noise and mediate tactile signals more efficiently than traditional rigid glass based surfaces.

General information

Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Augmented Human Activities (AHA), Fukoku-Rubber Co.
Contributors: Farooq, A., Evreinov, G., Raisamo, R., Takahata, D.
Publication date: 31 Dec 2015

Host publication information

Title of host publication: 2015 IEEE SENSORS - Proceedings
Publisher: Institute of Electrical and Electronics Engineers Inc.
Article number: 7370186
ISBN (Electronic): 9781479982028
ASJC Scopus subject areas: Instrumentation, Electronic, Optical and Magnetic Materials, Spectroscopy, Electrical and Electronic Engineering
Keywords: haptic signal mediation, haptics user interface, Liquid transparent screen overlay, piezoelectric and voice coil actuators, vibrotactile mechano-transduction
DOIs:

10.1109/ICSENS.2015.7370186
URLs:

http://www.scopus.com/inward/record.url?scp=84963615224&partnerID=8YFLogxK (Link to publication in Scopus)
Source: Scopus
Source ID: 84963615224
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Dilute nitride SOAs for high-speed data processing in variable temperature conditions

We present the first experimental study of a Dilute Nitride SOA with high-speed gain dynamics and attractive thermal characteristics as a data processing element at 10Gb/s and at different operating temperatures.

General information

Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Frontier Photonics, Optoelectronics Research Centre, Research group: Semiconductor Technology and Applications, Aristotle University of Thessaloniki, School of Electrical and Computer Engineering, National Technical University of Athens
Contributors: Giannoulis, G., Korpijärvi, V. M., Iliadis, N., Mäkelä, J., Viheriälä, J., Apostolopoulos, D., Guina, M., Avramopoulos, H.
Publication date: 13 Mar 2015

Host publication information

Title of host publication: Optical Fiber Communication Conference, OFC 2015
Publisher: OSA - The Optical Society
ISBN (Print): 9781557529374
ASJC Scopus subject areas: Electronic, Optical and Magnetic Materials, Computer Networks and Communications, Instrumentation, Atomic and Molecular Physics, and Optics
URLs:

http://www.scopus.com/inward/record.url?scp=84930886920&partnerID=8YFLogxK (Link to publication in Scopus)
Source: Scopus

Source ID: 84930886920
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Humidity passive sensors based on UHF RFID using cork dielectric slabs

In this paper we show the design of passive UHF RFID tag antenna on cork substrate. Due to the cork sensitivity to humidity changes, we can use the developed sensor to sense changes in the relative humidity of the environment, without the need for batteries. The antenna is built using inkjet printing technology, which allows a good accuracy of the design manufacturing. The sensor proved usable for humidity changes detection with a variation of threshold power from 11 to 15 dB between 60 and near 100% humidity levels. Presenting, therefore, reading ranges between 3 to 5 meters.

General information

Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Sensing Systems for Wireless Medicine (MediSense), Universidade de Aveiro, Instituto Superior de Engenharia de Lisboa, Georgia Institute of Technology
Contributors: Goncalves, R., Pinho, P., Carvalho, N. B., Tentzeris, M. M.
Publication date: 27 Aug 2015

Host publication information

Title of host publication: 2015 9th European Conference on Antennas and Propagation, EuCAP 2015
Publisher: Institute of Electrical and Electronics Engineers Inc.
Article number: 7228346
ISBN (Electronic): 9788890701856
ASJC Scopus subject areas: Instrumentation, Radiation, Computer Networks and Communications
Keywords: cork substrate, humidity sensor, RFID
URLs:

http://www.scopus.com/inward/record.url?scp=84949672907&partnerID=8YFLogxK (Link to publication in Scopus)
Source: Scopus
Source ID: 84949672907
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

RFID-Based Wireless Passive Sensors Utilizing Cork Materials

This paper presents the design of low-cost, conformal UHF antennas and RFID tags on two types of cork substrates: 1) natural cork and 2) agglomerate cork. Such RFID tags find an application in wine bottle and barrel identification, and in addition, they are suitable for numerous antenna-based sensing applications. This paper includes the high-frequency characterization of the selected cork substrates considering the anisotropic behavior of such materials. In addition, the variation of their permittivity values as a function of the humidity is also verified. As a proof-of-concept demonstration, three conformal RFID tags have been implemented on cork, and their performance has been evaluated using both a commercial Alien ALR8800 reader and an in-house measurement setup. The reading of all tags has been checked, and a satisfactory performance has been verified, with reading ranges spanning from 0.3 to 6 m. In addition, this paper discusses how inkjet printing can be applied to cork surfaces, and an RFID tag printed on cork is used as a humidity sensor. Its performance is tested under different humidity conditions, and a good range in excess of 3 m has been achieved, allied to a good sensitivity obtained with a shift of >5 dB in threshold power of the tag for different humid conditions.

General information

Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Sensing Systems for Wireless Medicine (MediSense), Universidade de Aveiro, Centre Tecnologic de Telecomunicacions de Catalunya, Instituto Superior de Engenharia de Lisboa, Georgia Institute of Technology
Contributors: Gonçalves, R., Rima, S., Magueta, R., Pinho, P., Collado, A., Georgiadis, A., Hester, J., Carvalho, N. B., Tentzeris, M. M.
Number of pages: 10
Pages: 7242-7251
Publication date: 1 Dec 2015
Peer-reviewed: Yes

Publication information

Journal: IEEE Sensors Journal
Volume: 15
Issue number: 12
Article number: 7222363
ISSN (Print): 1530-437X
Ratings:

Scopus rating (2015): CiteScore 2.85 SJR 0.655 SNIP 1.829
Original language: English
ASJC Scopus subject areas: Instrumentation, Electrical and Electronic Engineering
Keywords: cork characterization, humidity sensor, inkjet printing, passive sensor, UHF RFID, wireless sensor
DOIs:

10.1109/JSEN.2015.2472980
URLs:

http://www.scopus.com/inward/record.url?scp=84960192714&partnerID=8YFLogxK (Link to publication in Scopus)
Source: Scopus
Source ID: 84960192714
Research output: Contribution to journal › Article › Scientific › peer-review

Polarization control of the bound state of a vector soliton

This article demonstrates that the number of pulses in a group of vector bound solitons can be accurately adjusted by polarization control. We could achieve states with up to seven pulses trapped in a group with equally firm pulse separation. The stable relative phase between pulses within the group is manifested as an interference pattern in the soliton spectrum. © 2013 Astro Ltd.

General information

Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Research group: Ultrafast and intense lasers, Optoelectronics Research Centre, Frontier Photonics
Contributors: Gumenyuk, R., Okhotnikov, O. G.
Number of pages: 3
Pages: 1-3
Publication date: May 2013
Peer-reviewed: Yes

Publication information

Journal: Laser Physics Letters
Volume: 10
Issue number: 5
Article number: 055111
ISSN (Print): 1612-2011
Ratings:

Scopus rating (2013): CiteScore 3.45 SJR 1.418 SNIP 1.667
Original language: English
ASJC Scopus subject areas: Physics and Astronomy (miscellaneous), Instrumentation
DOIs:

10.1088/1612-2011/10/5/055111
URLs:

http://www.scopus.com/inward/record.url?scp=84879033640&partnerID=8YFLogxK (Link to publication in Scopus)

Bibliographical note

Contribution: organisation=orc,FACT1=1
Portfolio EDEND: 2013-07-29
Publisher name: Institute of Physics Publishing
Source: researchoutputwizard
Source ID: 2201
Research output: Contribution to journal › Article › Scientific › peer-review

Developing curiosity and multimedia skills with programming experiments

Browsers have become the most common communication channel. We spend hours using them to get news and communicate with friends, far more time than communicating face-to face. WWW-based communication and content-creation for www will be the most common job in future work life for students specializing in software engineering. We expect our screens to be colorful and animated, thus students should understand technologies, which are used for e.g. for painting jumping Mario to screen. But massive flow of new software engineering ideas, technologies and frameworks which appear in all-increasing temp tend to make students passive receivers of descriptions of new menus and commands without giving them any possibility to investigate and understand, what is behind these menus and commands, killing their natural curiosity. There should be time to experiment, compare formats, technologies and investigate their relations. In the presentation are described experiments used for investigating, how different formats for describing animation in HTML5 document influence animation rendering speed.

General information

Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Research group: Software Engineering and Intelligent Systems, Pervasive Computing, Tallinn University of Technology, University of Lapland
Contributors: Henno, J., Jaakkola, H., Mäkelä, J.
Number of pages: 6
Pages: 694-699
Publication date: 10 Jul 2017

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Title of host publication: 2017 40th International Convention on Information and Communication Technology, Electronics and Microelectronics, MIPRO 2017 - Proceedings
Publisher: IEEE
ISBN (Electronic): 9789532330922
ASJC Scopus subject areas: Computer Networks and Communications, Information Systems, Electrical and Electronic Engineering, Instrumentation
Electronic versions:

ce_14_4587
DOIs:

10.23919/MIPRO.2017.7973512
URLs:

http://urn.fi/URN:NBN:fi:tty-201712012297
Source: Scopus
Source ID: 85027728907
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Third order nonlinear optical response of TTF-based molecular corners
Comparative study of the nonlinear optical response of pyrrolo- tetrathiafulvalene polygons has been carried out. These materials are of great importance for photonics, because they can be used as building blocks for more complicated molecular systems like rotaxanes, catenanes which are promising candidates for opto-electronic applications like optical computing, optical switching etc. During this work the third order nonlinear susceptibility ($X^{(3)}$) has been determined by the Degenerate Four Wave Mixing experiment, while the imaginary part of the $X^{(3)}$, which is related with the nonlinear absorption was determined by "open-aperture" Z-scan measurements. Moreover measurements have been carried out in order to provide information about the optical limiting efficiency of the materials. High $X^{(3)}$ has been found reaching 2.30 × 10^{-21} m^2/V^2, corresponding to second order hyperpolarizability γ values of about 6.5 × 10^{-45} m^5/V^2.

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Frontier Photonics, CNRS, Centre National de la Recherche Scientifique (CNRS), Universite de Bordeaux - PRES, Lab Bordelais Rech Informat, PICTURA Res Grp, UMR 5800, Univ Angers, Centre National de la Recherche Scientifique (CNRS), University of Nantes Angers Le Mans, University of Angers, CNRS UMR 6200, Inst Sci & Technol Mol Angers, LUNAM Université, Laboratoire MOLTECH-Anjou
Contributors: Iliopoulos, K., Czaplicki, R., Ouazzani, H. E., Balandier, J., Chas, M., Goeb, S., Sallé, M., Gindre, D., Sahraoui, B.
Number of pages: 8
Pages: 205-212
Publication date: 2012
Peer-reviewed: Yes

Publication information
Journal: Nonlinear Optics, Quantum Optics
Volume: 43
Issue number: 1-4
ISSN (Print): 1543-0537
Ratings:

Scopus rating (2012): CiteScore 0.45 SJR 0.211 SNIP 0.272
Original language: English
ASJC Scopus subject areas: Atomic and Molecular Physics, and Optics, Statistical and Nonlinear Physics, Instrumentation , Computer Science(all), Electronic, Optical and Magnetic Materials
Keywords: Degenerate four wave mixing (DFWM), Nonlinear optical response, TTF derivatives, Z-scan
URLs:

http://www.scopus.com/inward/record.url?scp=84862149419&partnerID=8YFLogxK (Link to publication in Scopus)
Source: Scopus
Source ID: 84862149419

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

Multimode waveguides in nematic liquid crystals

We report on the first experimental observation of higher-order modes guided by soliton-induced waveguides in nematic liquid crystals, identifying the power domains where guided modes are supported.

General information

Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Frontier Photonics, Australian National University, Nonlinear Optics and OptoElectronics Lab, University "Roma Tre"
Contributors: Izdebskaya, Y. V., Desyatnikov, A. S., Assanto, G., Kivshar, Y. S.
Number of pages: 2
Pages: 1912-1913
Publication date: 2011

Host publication information

Title of host publication: Conference on Lasers and Electro-Optics/Pacific Rim, CLEOPR 2011
ISBN (Print): 9780977565771
ASJC Scopus subject areas: Instrumentation, Atomic and Molecular Physics, and Optics
URLs:

http://www.scopus.com/inward/record.url?scp=84893575091&partnerID=8YFLogxK (Link to publication in Scopus)
Source: Scopus
Source ID: 84893575091
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Spatial solitons carrying phase singularities in nematic liquid crystals

We demonstrate self-trapped laser beams carrying optical vortices in nematic liquid crystals. We experimentally observe astigmatic transformations of vortex beams into spiralling dipole azimuthons accompanied by a nontrivial power-dependent charge-flipping of on-axis phase dislocations.

General information

Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Frontier Photonics, Australian National University, Nonlinear Optics and OptoElectronics Lab, University "Roma Tre"
Contributors: Izdebskaya, Y. V., Desyatnikov, A. S., Assanto, G., Kivshar, Y.
Number of pages: 2
Pages: 444-445
Publication date: 2011

Host publication information

Title of host publication: Conference on Lasers and Electro-Optics/Pacific Rim, CLEOPR 2011
ISBN (Print): 9780977565771
ASJC Scopus subject areas: Instrumentation, Atomic and Molecular Physics, and Optics
URLs:

http://www.scopus.com/inward/record.url?scp=84893535991&partnerID=8YFLogxK (Link to publication in Scopus)
Source: Scopus
Source ID: 84893535991
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Today is the future of yesterday; What is the future of today?

In the educational context, understanding the future is important for two reasons. First, we are educating people for future tasks, which need skills that are useful in the future. Secondly, educators have to be able to select the most promising tools and technologies to apply in their work. The problem is that there is no clear way to weigh the importance of the alternatives - what the real importance of a certain technology will be in the near future and especially in the long term. In our paper, we focus on analyzing selected technologies. Our approach applies the framework developed by the authors. The promising technologies are reviewed by a systematic literature study, focusing on and restricted to the information and communication technology (ICT) sector. The findings are classified according to their importance and the time span of their effectiveness. The question we answer is What should every educator know about changes in technology?

General information

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

Organisations: Research group: Software Engineering and Intelligent Systems, Pervasive Computing, Tallinn University of Technology, University of Lapland, Computer Science Institute
Contributors: Jaakkola, H., Henno, J., Mäkelä, J., Thalheim, B.
Number of pages: 9
Pages: 635-643
Publication date: 10 Jul 2017

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Title of host publication: 2017 40th International Convention on Information and Communication Technology, Electronics and Microelectronics, MIPRO 2017 - Proceedings
Publisher: IEEE
ISBN (Electronic): 9789532330922
ASJC Scopus subject areas: Computer Networks and Communications, Information Systems, Electrical and Electronic Engineering, Instrumentation
Electronic versions:

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Source: Scopus
Source ID: 85027689860
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

The educators' telescope to the future of technology
We live in a world of accelerating changes, where technology plays an important role as an enabler. Looking ahead means being prepared for these changes. Preparedness may be reactive - reacting to the situation at the moment something happens; proactive - being prepared in advance for a situation that may happen; or preactive - being able in advance to affect something that may happen in the future and how it happens. Forecasting the future helps us to be prepared for new situations. It is based on making predictions that are derived from understanding past and present data. Known data is organized in the form of trends and further extrapolated to cover the future. From the technical point of view, there are a variety of approaches for forecasting: algorithmic, simulation, statistical analysis etc. The methods used may be quantitative (future data is seen as a function of past data) or qualitative (subjective, based on the opinion or judgment of the target group used in the analysis). Technology is an essential part of education, both in supporting effective learning and as a content of teaching itself. As a result, every educator needs skills to analyze the future of relevant technologies. In this paper, we introduce a framework that can be used in analysis of the importance of technological changes in education and as a part of curricula. The approach is based on trend analysis and classification of the relevant technologies to take into account the time span of their effects in society. The question we answer in this paper is How can an educator analyze the consequences of technological changes in their work?.

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Research group: Software Engineering and Intelligent Systems, Pervasive Computing, Tallinn University of Technology, Computer Science Institute, University of Lapland
Contributors: Jaakkola, H., Henno, J., Thalheim, B., Mäkelä, J.
Number of pages: 6
Pages: 660-665
Publication date: 10 Jul 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
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ASJC Scopus subject areas: Computer Networks and Communications, Information Systems, Electrical and Electronic Engineering, Instrumentation
Electronic versions:

Telescope
DOIs:

10.23919/MIPRO.2017.7973506
URLs:

http://urn.fi/URN:NBN:fi:tty-201712012294
Source: Scopus

Source ID: 85027689985
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

A novel technique for analysis of postural information with wearable devices

These days, as many jobs involve sitting behind desks and working with computers for extended periods, more and more people are suffering from back problems. Maintenance of an appropriate posture may prevent future back problems. There are various medical methods for studying postures abnormalities of the back but most of these methods are limited to be utilized in diagnostics and follow-up of treatment and not used in a continuous or in a preventive manner. Therefore, designing and developing methods for measuring, analyzing and reporting of posture information, aimed for prevention of future back problems is of fundamental interest. In this work, a proof-of-concept system, including five accelerometer sensor units is presented. Additionally, an index, which we call spine inclination index (SII), is introduced and used for converting the raw data to meaningful presentable information. Initial evaluation includes measurements with six subjects. Subjects were asked to mimic accentuated kyphotic, straight and accentuated lordotic postures while sitting. Our results show that the designed device and SII index are able to distinguish between different postures very well. In addition, since this device measures the inclination angle of different spinal postures, its output can be directly compared with other widely used methods.

General information

Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Faculty of Biomedical Sciences and Engineering, VTT Technical Research Centre of Finland, Tampere University Hospital
Contributors: Jeyhani, V., Mahdiani, S., Viik, J., Oksala, N., Vehkaoja, A.
Number of pages: 4
Pages: 30-33
Publication date: 2 Apr 2018

Host publication information

Title of host publication: 2018 IEEE 15th International Conference on Wearable and Implantable Body Sensor Networks, BSN 2018
Publisher: IEEE
ISBN (Electronic): 9781538611098
ASJC Scopus subject areas: Health Informatics, Instrumentation, Computer Networks and Communications, Human-Computer Interaction, Biomedical Engineering
Electronic versions:

A Novel Technique for Analysis of Postural Information with Wearable Devices - post-print
DOIs:

10.1109/BSN.2018.8329651
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http://urn.fi/URN:NBN:fi:tty-201809252338
Source: Scopus
Source ID: 85049665171
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Double-side pumped membrane external-cavity surface-emitting laser (MECSEL) with increased efficiency emitting > 3 W in the 780 nm region

We demonstrate a double-side pumped MECSEL emitting more than 3 W of output power in the 780 nm wavelength region. The laser exhibits an efficiency as high as 34.4 %.

General information

Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Physics
Contributors: Kahle, H., Phung, H., Penttinen, J., Rajala, P., Tukiainen, A., Ranta, S., Guina, M.
Publication date: 1 May 2019

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Title of host publication: 2019 Conference on Lasers and Electro-Optics, CLEO 2019 - Proceedings
Publisher: IEEE
ISBN (Electronic): 9781943580576
ASJC Scopus subject areas: Spectroscopy, Industrial and Manufacturing Engineering, Safety, Risk, Reliability and Quality , Management, Monitoring, Policy and Law, Electronic, Optical and Magnetic Materials, Radiology Nuclear Medicine and imaging, Instrumentation, Atomic and Molecular Physics, and Optics
DOIs:

10.23919/CLEO.2019.8749958

Bibliographical note
INT=phys,"Rajala, Patrik"
Source: Scopus
Source ID: 85069191246
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Bioimpedance Sensor Array for Long-Term Monitoring of Wound Healing from Beneath the Primary Dressings and Controlled Formation of H_2O_2 Using Low-Intensity Direct Current
Chronic wounds impose a significant financial burden for the healthcare system. Currently, assessment and monitoring of hard-to-heal wounds are often based on visual means and measuring the size of the wound. The primary wound dressings must be removed before assessment can be done. We have developed a quasi-monopolar bioimpedance-measurement-based method and a measurement system to determine the status of wound healing. The objective of this study was to demonstrate that with an appropriate setup, long-term monitoring of wound healing from beneath the primary dressings is feasible. The developed multielectrode sensor array was applied on the wound area and left under the primary dressings for 142 h. The impedance of the wounds and the surrounding intact skin area was measured regularly during the study at 150 Hz, 300 Hz, 1 kHz, and 5 kHz frequencies. At the end of the follow-up period, the wound impedance had reached the impedance of the intact skin at the higher frequencies and increased significantly at the lowest frequencies. The measurement frequency affected the measurement sensitivity in wound monitoring. The skin impedance remained stable over the measurement period. The sensor array also enabled the administration of periodical low-intensity direct current (LIDC) stimulation in order to create an antimicrobial environment across the wound area via the controlled formation of hydrogen peroxide (H2O2).

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: BioMediTech, Turku University Hospital, Kaarinantie 700, Åbo Akademi University
Contributors: Kekonen, A., Bergelin, M., Johansson, M., Kumar Joon, N., Bobacka, J., Viik, J.
Publication date: 31 May 2019
Peer-reviewed: Yes

Publication information
Journal: Sensors
Volume: 19
Issue number: 11
ISSN (Print): 1424-8220
Original language: English
ASJC Scopus subject areas: Analytical Chemistry, Atomic and Molecular Physics, and Optics, Biochemistry, Instrumentation, Electrical and Electronic Engineering
Keywords: beneath the dressings, bioimpedance, hydrogen peroxide, long-term monitoring, low-intensity direct current, multielectrode, quasi-monopolar, sensor array, wound dressing, wound monitoring, wound stimulation
Electronic versions:

sensors-19-02505-v2
DOIs:

10.3390/s19112505
URLs:

http://urn.fi/URN:NBN:fi:tty-201906241904
Source: Scopus
Source ID: 85067176313
Research output: Contribution to journal › Article › Scientific › peer-review

Alpha radiation-induced luminescence by am-241 in aqueous nitric acid solution
When exposed to air, alpha particles cause the production of light by exciting the molecules surrounding them. This light, the radioluminescence, is indicative of the presence of alpha radiation, thus allowing for the optical sensing of alpha radiation from distances larger than the few centimeters an alpha particle can travel in air. While the mechanics of radioluminescence in air and other gas compositions is relatively well understood, the same cannot be said about the radioluminescence properties of liquids. Better understanding of the radioluminescence properties of liquids is essential to design methods for the detection of radioactively contaminated liquids by optical means. In this article, we provide radioluminescence images of Am-241 dissolved in aqueous nitric acid (HNO_3) solution and present the recorded radioluminescence spectrum with a maximum between and, and a steep decrease at the short wavelength side of the maximum. The shape of the spectrum resembles a luminescence process rather than Cerenkov light, bremsstrahlung, or other mechanisms with broadband emission. We show that the amount of light produced is about 150 times smaller compared to that of the same amount of Am-241 in air. The light production in the liquid is evenly distributed throughout the sample volume with a slight increase on the surface of the liquid. The radioluminescence intensity is shown to scale

linearly with the Am-241 concentration and not be affected by the HNO_3 concentration.

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Physics, University of Helsinki, European Commission Joint Research Centre
Contributors: Kerst, T., Malmbeck, R., lal Banik, N. L., Toivonen, J.
Publication date: 1 Apr 2019
Peer-reviewed: Yes

Publication information
Journal: Sensors (Switzerland)
Volume: 19
Issue number: 7
Article number: 1602
ISSN (Print): 1424-8220
Original language: English
ASJC Scopus subject areas: Analytical Chemistry, Atomic and Molecular Physics, and Optics, Biochemistry, Instrumentation, Electrical and Electronic Engineering
Keywords: Alpha radiation, Americium, Liquid phase luminescence, Radioluminescence
Electronic versions:

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DOIs:

10.3390/s19071602
URLs:

http://urn.fi/URN:NBN:fi:tty-201906111890
Source: Scopus
Source ID: 85064822061
Research output: Contribution to journal › Article › Scientific › peer-review

Electromagnetism and cross-disciplinary problems
Electromagnetic theory is a model of the electromagnetic phenomenon. As is well known, the model can be expressed in many different ways. All the formulations are, however, concretizations of the same so-called 'abstract general' of electromagnetism. In this paper we consider the Maxwell house as this abstract general. The motivation for this is, an increasing amount of progress in engineering science takes place on the interfaces between different fields. Cross-disciplinary results are best achieved by formalizing first the logical reasoning behind electromagnetism, as this then results in an unambiguous basis for cross-disciplinary communication.

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Department of Electrical Engineering, Research area: Electromagnetics
Contributors: Kettunen, L., Kovanen, T.
Number of pages: 2
Pages: 500-501
Publication date: 19 Sep 2016

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Publisher: IEEE
ISBN (Electronic): 9781509025022
ASJC Scopus subject areas: Instrumentation, Radiation
DOIs:

10.1109/URSI-EMTS.2016.7571436
Source: Scopus
Source ID: 84992161982
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Strain Reliability of Embroidered Passive UHF RFID Tags on 3D-printed Substrates
Flexible electronics is an emerging field where the electronic components, antennas, and interconnections can endure significant mechanical stresses. This paper presents the fabrication and strain reliability evaluation of embroidered passive UHF RFID tags on 3D-printed (NinjaFlex) substrates. Based on the achieved results, these wireless platforms can withstand increases up to 14 % in length and remain functional. These preliminary results are promising, considering the current trend towards flexible and stretchable electronics structures.

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: BioMediTech, Research group: Wireless Identification and Sensing Systems Research Group, Prenta Oy
Contributors: Khan, Z., Rizwan, M., Rusanen, R., Ukkonen, L., Virkki, J.
Publication date: 1 Mar 2019

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Title of host publication: 13th European Conference on Antennas and Propagation, EuCAP 2019
Publisher: IEEE
ISBN (Electronic): 9788890701887
ASJC Scopus subject areas: Computer Networks and Communications, Instrumentation
Keywords: 3D Printing, embroidery, flexible electronics, NinjaFlex, passive RFID, strain reliability, stretchable electronics
Source: Scopus
Source ID: 85068467001
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Automatic detection of water inside concrete slabs using ground penetrating radar
Ground Penetrating Radar (GPR) is generally used as a non-destructive method of inspection for structures and for finding defects in concrete slabs. In this paper, GPR is used in the detection of water inside the cavities of concrete hollow core slabs. We propose an algorithm that determines the water level inside the concrete slab by analyzing the time delays of the reflections originating from inside the cavity. The algorithm is based on utilizing prior knowledge about the geometry of the hollow core slab. The presence of water was successfully detected and an estimate for the height of the water surface was obtained with a GPR system operating with a central frequency of 2.7 GHz. Based on the experiments, the proposed method holds promise in providing a robust and accurate method for the detection of water inside the concrete slabs. Results, possible future research and analysis of the feasibility of GPR systems in water detection are presented and discussed.

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Computing Sciences, Research group: MMDM
Contributors: Khan, M. A., Vehmas, R., Visa, A.
Publication date: 1 Apr 2019

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Publisher: IEEE
ISBN (Electronic): 9781728116792
ASJC Scopus subject areas: Computer Networks and Communications, Signal Processing, Instrumentation
DOIs:

10.1109/RADAR.2019.8835797

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jufoid=57477
Source: Scopus
Source ID: 85073122917
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Low-cost inkjet-printed fully passive RFID tags for calibration-free capacitive/haptic sensor applications
A fully passive, compact, and low-cost capacitive wireless radio frequency identification (RFID)-enabled sensing system for capacitive sensing and other Internet of Things applications is proposed. This calibration-free sensor utilizes a dual-tag topology, which consists of two closely spaced RFID tags with dipole antennas and printed capacitive sensor component connected to one of the tags. A series LC resonator is used to both reduce the antenna size and improve the isolation between the two antennas and the design/optimization steps are discussed in detail. All components except for the RFID chips are inkjet printed on an off-the-shelf photopaper using a silver nanoparticle ink. The complete sensor dimension is 84mm × 95mm and the sensor is compatible with EPC Class 1 Gen 2 (UHF) standard reader technology at 915 MHz.

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Sensing Systems for Wireless Medicine (MediSense), Georgia Institute of Technology, University of Tokyo , Centre Tecnologic de Telecomunicacions de Catalunya
Contributors: Kim, S., Kawahara, Y., Georgiadis, A., Collado, A., Tentzeris, M. M.
Number of pages: 11

Pages: 3135-3145
Publication date: 1 Jun 2015
Peer-reviewed: Yes

Publication information
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Issue number: 6
Article number: 6945328
ISSN (Print): 1530-437X
Ratings:

Scopus rating (2015): CiteScore 2.85 SJR 0.655 SNIP 1.829
Original language: English
ASJC Scopus subject areas: Electrical and Electronic Engineering, Instrumentation
Keywords: Capacitive sensing, cross-talk suppression, differential sensing, haptic sensors, inkjet-printing technology, Internet of Things (IoT), remote sensing, RFID, RFID-enabled sensor, wireless sensors
DOIs:

10.1109/JSEN.2014.2366915
URLs:

http://www.scopus.com/inward/record.url?scp=84928112627&partnerID=8YFLogxK (Link to publication in Scopus)
Source: Scopus
Source ID: 84928112627
Research output: Contribution to journal › Article › Scientific › peer-review

Screen-printed curvature sensors for soft robots
Castable elastomers have been used to fabricate soft robotic devices and it has been shown that the technique scales well from prototyping to mass manufacturing. However, similarly scalable techniques for integrating strain or curvature sensors into such devices are still lacking. In this paper, we show that screenprinted silver conductors serve well as curvature sensors for soft robotic devices. The sensors are produced onto elastomer substrates in a single printing step and integrated into soft pneumatic actuators. We characterized the resistance-curvature relationship of the sensors, which allows the curvature of the actuators to be estimated from the sensor measurements. Hysteresis was observed, which does limit the absolute accuracy of the sensors. However, temperature characterizations showed that the sensor measurements are not significantly affected by temperature fluctuations during normal operation. Dynamic experiments showed that the bandwidth of the sensors is larger than the bandwidth of the actuators. We experimentally validated that these sensors can be used to detect whether the motion of an actuator has been blocked, clearing the way towards simple-tofabricate soft robots that react to their surroundings. Finally, we demonstrate a three-fingered soft robotic gripper with integrated sensors. We conclude that screen-printing is a promising way to integrate curvature sensors into soft robots.

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Faculty of Biomedical Sciences and Engineering, Electronics and Communications Engineering, Research group: Wireless Communications and Positioning, Research group: Micro and Nanosystems Research Group, Research group: Bioinspired Materials and Robotics (BMR)
Contributors: Koivikko, A., Raei, E. S., Mosallaei, M., Mäntysalo, M., Sariola, V.
Pages: 223-230
Publication date: 2018
Peer-reviewed: Yes

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Journal: IEEE Sensors Journal
Volume: 18
Issue number: 1
ISSN (Print): 1530-437X
Ratings:

Scopus rating (2018): CiteScore 3.96 SJR 0.726 SNIP 1.709
Original language: English
ASJC Scopus subject areas: Instrumentation, Electrical and Electronic Engineering
Keywords: Actuators, Electrical resistance measurement, Flexible printed circuit, Mechanical Sensors, Sensor phenomena and characterization, Silver, Soft robotics, Strain measurement, Temperature measurement
Electronic versions:

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URLs:
http://urn.fi/URN:NBN:fi:tty-201711202174
Source: Scopus
Source ID: 85032437182
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

Frequency domain penetration loss in the terahertz band

Results on penetration loss measurements in the THz frequencies between 0.1-2 THz are reported. The measurements were conducted with time domain spectroscopy using the TeraView TeraPulse 4000 measurement equipment. We concentrate on the frequency-dependent penetration characteristics of various materials typical for indoor environments, providing both qualitative and quantitative assessment. The results show that the lower end of the THz band (<0.5 THz) suffers only modest loss in comparison to the higher frequencies. For the materials considered in this paper, plastic, glass and hard-board, the exact penetration properties are both frequency- and material-dependent. The incident angle to the material increases the penetration loss through increased path length inside the material. The exact values of these losses are provided.

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, University of Oulu
Contributors: Kokkoniemi, J., Lehtomäki, J., Petrov, V., Moltchanov, D., Juntti, M.
Publication date: 27 Jun 2016

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Title of host publication: 2016 Global Symposium on Millimeter Waves (GSMM) & ESA Workshop on Millimetre-Wave Technology and Applications

Publisher: IEEE
ISBN (Electronic): 9781509013487
ASJC Scopus subject areas: Electrical and Electronic Engineering, Instrumentation, Radiation, Computer Networks and Communications
DOIs:
10.1109/GSMM.2016.7500309
Source: Scopus
Source ID: 84979518440
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Optimization of RFID-Based Tunnel Access Monitoring System Antenna Reading Areas

This work focuses on a nuclear waste storage facility's RFID (Radio Frequency Identification)-based access monitoring system and especially on antenna reading area mapping results. The objective of this research is to find out the effects of sprayed concrete bedrock caverns and height of reader antennas on RFID antenna reading areas. First, we will shortly introduce the access monitoring system, equipment, and program that have been developed for the tunnel system. Next, we describe the research area, the locations of the antennas, and the study protocol. Finally, we discuss the effects of sprayed concrete and antenna height on the antenna reading areas. Further, we introduce other noted factors that affect the reading area sizes, for example bedrock fractures and fillings. Based on the results, a sprayed concrete surface improves the reflectiveness of the radio signal and thus the reading capabilities of the ID (Identification)-cards. Another clear result was that the higher the antenna or ID-card was placed, the longer the MRRR (Maximum Reliable Read Range) range was.

General information

Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: BioMediTech, Cimcorp Oy, Posiva Oy, Aitosolutions Oyj
Contributors: Kordelin, K., Virkki, J., Kordelin, J., Kuusman, J., Mattila, J., Johansson, M., Ukkonen, L., Sydänheimo, L.
Publication date: 1 Mar 2019

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Publisher: IEEE
Article number: 8739592
ISBN (Electronic): 9788890701887
ASJC Scopus subject areas: Computer Networks and Communications, Instrumentation
Keywords: Antenna, Measurement, RFID, Tunnel system
Source: Scopus
Source ID: 85068475092
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Amplifier similariton laser with extra-broad bandwidth output pulse

We propose an advanced scheme of amplifier similariton laser providing an output pulse spectrum much wider than the gain bandwidth. The upgrade is an additional dispersive element introduced into the cavity to locally increase the peak pulse power. The proposed scheme demonstrates a drastic increase in the output pulse spectrum width, reduction of the pulse duration, and an increase in the output peak pulse power after compression.

General information

Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Optoelectronics Research Centre, Research group: Ultrafast and intense lasers, Ulyanovsk State University
Contributors: Korobko, D. A., Okhotnikov, O. G., Zolotovskii, I. O.
Publication date: 1 Mar 2016
Peer-reviewed: Yes

Publication information

Journal: Laser Physics Letters
Volume: 13
Issue number: 3
Article number: 035106
ISSN (Print): 1612-2011
Ratings:
Scopus rating (2016): CiteScore 1.89 SJR 0.942 SNIP 1.098
Original language: English

ASJC Scopus subject areas: Physics and Astronomy (miscellaneous), Instrumentation
Keywords: amplifier similariton laser, gain bandwidth, parabolic pulses
DOIs:
10.1088/1612-2011/13/3/035106
Source: Scopus
Source ID: 84974823891
Research output: Contribution to journal › Article › Scientific › peer-review

Improved Session Continuity in 5G NR with Joint Use of Multi-Connectivity and Guard Bandwidth

The intermittent millimeter-wave radio links as a result of human-body blockage are an inherent feature of the 5G New Radio (NR) technology by 3GPP. To improve session continuity in these emerging systems, two mechanisms have recently been proposed, namely, multi-connectivity and guard bandwidth. The former allows to establish multiple spatially-diverse connections and switch between them dynamically, while the latter reserves a fraction of system bandwidth for sessions changing their state from non-blocked to blocked, which ensures that the ongoing sessions have priority over the new ones. In this paper, we assess the joint performance of these two schemes for the user- and system-centric metrics of interest. Our numerical results reveal that the multi-connectivity operation alone may not suffice to increase the ongoing session drop probability considerably. On the other hand, the use of guard bandwidth significantly improves session continuity by somewhat compromising new session drop probability and system resource utilization. Surprisingly, the 5G NR system implementing both these techniques inherits their drawbacks. However, complementing it with an initial AP selection procedure effectively alleviates these limitations by maximizing the system resource utilization, while still providing sufficient flexibility to enable the desired trade-off between new and ongoing session drop probabilities.

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Electrical Engineering, Department of Chemistry and Bioengineering, Peoples' Friendship University of Russia
Contributors: Kovalchukov, R., Moltchanov, D., Begishev, V., Samuylov, A., Andreev, S., Koucheryavy, Y., Samouylov, K.
Publication date: 20 Feb 2019

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Title of host publication: 2018 IEEE Global Communications Conference, GLOBECOM 2018
Publisher: IEEE
ISBN (Electronic): 9781538647271
ASJC Scopus subject areas: Information Systems and Management, Renewable Energy, Sustainability and the Environment, Safety, Risk, Reliability and Quality, Signal Processing, Modelling and Simulation, Instrumentation, Computer Networks and Communications
DOIs:
10.1109/GLOCOM.2018.8647608
Source: Scopus
Source ID: 85063532495
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Circularly Polarized Textile Tag Antenna for Wearable Passive UHF RFID Systems

We present a circularly polarized tag antenna using textile materials for wearable passive ultra high frequency (UHF) radio frequency identification (RFID) system. A corner-truncated square patch with a shorting pin and an inductive feed network are used to achieve circularly polarization and conjugate impedance matching. The antenna has similar best axial ratio values of 2.1 dB and 2.2 dB for both in air and on-body conditions, and desirable corresponding read range of 9.1 m and 8.4 m.

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: BioMediTech, Donghua University
Contributors: Kuang, Y., Ma, S., Ukkonen, L., Virkki, J., Björninen, T.
Publication date: 18 Mar 2019

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Title of host publication: 2018 International Applied Computational Electromagnetics Society Symposium in China, ACES-China 2018
Publisher: IEEE
ISBN (Electronic): 9780996007849
ASJC Scopus subject areas: Computational Mathematics, Instrumentation, Electrical and Electronic Engineering, Computer Networks and Communications

Keywords: Circularly polarized antenna, Radio frequency identification, Wearable antenna
DOIs:
10.23919/ACESS.2018.8669314
Source: Scopus
Source ID: 85063790306
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Single KTiOPO4 nanocrystals for nonlinear probing of local optical fields and interaction with a metallic nanostructure

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: ESPCI, Laboratoire de Physique de la Matière Condensée-Ecole Polytechnique-CNRS, ENS de Cachan, Laboratoire de Photonique Quantique et Moléculaire UMR 8537, Laboratoire Photons Et Matière-UPR A0005, Ecole Polytechnique, Cristal Laser S.A., Laboratoire de Photonique Quantique et Moléculaire-ENS Cachan
Contributors: Le Xuan, L., Slablab, A., Zhou, C., Chauvat, D., De Wilde, Y., Perruchas, S., Tard, C., Gacoin, T., Villeval, P. , Roch, J. F.
Publication date: 2009

Host publication information
Title of host publication: Optics InfoBase Conference Papers
Publisher: Optical Society of America
ISBN (Print): 9781424440801
ASJC Scopus subject areas: Instrumentation, Atomic and Molecular Physics, and Optics
URLs:
http://www.scopus.com/inward/record.url?scp=84898050536&partnerID=8YFLogxK (Link to publication in Scopus)
Source: Scopus
Source ID: 84898050536
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
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Publication date: 1 May 2019

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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:

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Source: Scopus
Source ID: 85071915507
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Open data based value networks: Finnish examples of public events and agriculture

In recent years, several countries have placed strong emphasis on openness, especially open data, which can be shared and further processed into various applications. Based on studies, the majority of open data providers are government organizations. This study presents two cases in which the data providers are companies. The cases are analyzed using a framework for open data based business models derived from the literature and several case studies. The analysis focuses on the beginning of the data value chain. As a result, the study highlights the role of data producers in the ecosystem, which has not been the focus in current frameworks.

General information

Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Research group: Software Engineering and Intelligent Systems, Pervasive Computing, Research group: Business Ecosystems, Networks and Innovations
Contributors: Linna, P., Mäkinen, T., Yrjönkoski, K.
Number of pages: 6
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Publisher: IEEE
ISBN (Electronic): 9789532330922
ASJC Scopus subject areas: Computer Networks and Communications, Information Systems, Electrical and Electronic Engineering, Instrumentation
DOIs:
10.23919/MIPRO.2017.7973649

Bibliographical note

INT=tie,"Mäkinen, T."
Source: Scopus
Source ID: 85027692081
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Comparison of Human Head Phantoms with Different Complexities for Implantable Antenna Development

Human body phantom with electrical properties is widely used in electromagnetics solvers to model the lossy human tissue environment. The selection of the phantoms affects the computational efficiency and results accuracy. In this work, we evaluated four human head phantoms with an intracranial implantable antenna. Results of phantom complexity and antenna parameters are compared to provide the reference in phantom selection for implantable antenna development.

General information

Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: BioMediTech
Contributors: Ma, S., Ukkonen, L., Sydänheimo, L., Björninen, T.
Publication date: 18 Mar 2019

Host publication information

Title of host publication: 2018 International Applied Computational Electromagnetics Society Symposium in China, ACES-China 2018
Publisher: IEEE
ISBN (Electronic): 9780996007849
ASJC Scopus subject areas: Computational Mathematics, Instrumentation, Electrical and Electronic Engineering, Computer Networks and Communications
Keywords: anatomical head phantom, implantable antenna, multilayer head phantom
DOIs:
10.23919/ACESS.2018.8669363
Source: Scopus
Source ID: 85063771074

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 Mechatronic 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

Fluid Transmission Line Modeling Using a Variational Method

A variational method is used to derive numerical models for transient flow simulation in fluid transmission lines. These are generalizations of models derived using the more traditional modal method. Three different transient compressible laminar pipe flow models are considered (inviscous, one-dimensional linear viscous, and two-dimensional dissipative viscous flow), and a model for transient turbulent pipe flow is given. The (model) equations in the laminar case are given in the form of a set of constant coefficient ordinary differential equations, and for the turbulent case (model) in the form of a set of nonlinear ordinary differential equations. Explicit equations are given for various end conditions. Attenuation factors, similar to the window functions used in spectral analysis, are used to attenuate Gibbs phenomenon oscillations.

General information

Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Civil Engineering, Research group: Structural Mechanics, Tampere University of Technology, Department of Mathematics, Institute of Hydraulics and Automation, Research group: Positioning
Contributors: Mäkinen, J., Piché, R., Ellman, A.
Number of pages: 10
Pages: 153-162
Publication date: Mar 2000
Peer-reviewed: Yes

Publication information

Journal: Journal of Dynamic Systems, Measurement and Control: Transactions of the ASME
Volume: 122
Issue number: 1
ISSN (Print): 0022-0434
Ratings:

Scopus rating (2000): SJR 0.648 SNIP 1.394
Original language: English
ASJC Scopus subject areas: Control and Systems Engineering, Instrumentation
URLs:

http://ojps.aip.org/journal_cgi/dbt?KEY=JDSMAA
URLs:

http://www.scopus.com/inward/record.url?scp=4244134506&partnerID=8YFLogxK (Link to publication in Scopus)

Bibliographical note
Contribution: organisation=mat,FACT1=1
Source: researchoutputwizard
Source ID: 26963
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

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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

Improving reliability for classification of metallic objects using a WTMD portal
In this paper, a walk-through metal detection (WTMD) portal is used for classification of metallic objects. The classification is based on the inversion of the magnetic polarisability tensor (tensor) of the object. The nature of bias and noise components in the tensor are examined by using real walk-through data, and consequently, a novel classifier is introduced. Furthermore, a novel method for detecting poorly inverted tensors is presented, enabling self-diagnostics for the WTMD portal. Based on the results, the novel methods increase the accuracy of metal object classification and have the potential to improve the reliability of a WTMD system.

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Signal Processing, Research group: MMDM, Signal Processing Research Community (SPRC), School of Electrical and Electronic Engineering, University of Manchester, Rapiscan Systems Oy
Contributors: Makkonen, J., Marsh, L. A., Vihonen, J., Järvi, A., Armitage, D. W., Visa, A., Peyton, A. J.
Publication date: 26 Aug 2015
Peer-reviewed: Yes

Publication information
Journal: Measurement Science and Technology
Volume: 26
Issue number: 10
Article number: 105103
ISSN (Print): 0957-0233
Ratings:

Scopus rating (2015): CiteScore 1.71 SJR 0.704 SNIP 1.396
Original language: English
ASJC Scopus subject areas: Applied Mathematics, Instrumentation
Keywords: bias, classification, eigenvalues, electromagnetic polarisability, noise, tensor, WTMD
DOIs:

10.1088/0957-0233/26/10/105103
Source: Scopus
Source ID: 84941975778
Research output: Contribution to journal › Article › Scientific › peer-review

Development of Low Cost, Wireless, Inkjet Printed Microfluidic RF Systems and Devices for Sensing or Tunable Electronics
In this paper, a review of recent improvements on inkjet-printed microfluidic-based tunable/sensing RF systems is reported. The devices, such as Radio Frequency IDentification (RFID) passive wireless tags, coplanar patch antennas, bandstop filters, and loop antennas, are all fabricated by combining the inkjet printing technology on photographic paper for metallization and bonding layers, and laser etching for cavities and channels manufacturing. A novelty is also introduced for the loop antennas where the photographic paper is replaced with a polymer based substrate [i.e., (Poly(methyl-methacrylate))], to reduce the substrate losses for the RF part and solve the issue of paper hydrophylia. Along this paper an evolution toward higher working frequencies and higher detecting performance is shown, demonstrating a sensitivity up to 0.5%/εr with at most 6 μL of liquid in the channel.

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Sensing Systems for Wireless Medicine (MediSense), University of Perugia, Georgia Institute of Technology
Contributors: Mariotti, C., Su, W., Cook, B. S., Roselli, L., Tentzeris, M. M.
Number of pages: 8
Pages: 3156-3163
Publication date: 1 Jun 2015
Peer-reviewed: Yes

Publication information
Journal: IEEE Sensors Journal
Volume: 15
Issue number: 6
Article number: 6966729
ISSN (Print): 1530-437X
Ratings:

Scopus rating (2015): CiteScore 2.85 SJR 0.655 SNIP 1.829
Original language: English
ASJC Scopus subject areas: Instrumentation, Electrical and Electronic Engineering
Keywords: Inkjet Printing, Microfluidics, RFID, Sensors, Tag, Tunable Electronics
DOIs:

10.1109/JSEN.2014.2374874
URLs:

http://www.scopus.com/inward/record.url?scp=84928485604&partnerID=8YFLogxK (Link to publication in Scopus)
Source: Scopus
Source ID: 84928485604
Research output: Contribution to journal › Article › Scientific › peer-review

Circularly polarized shorted ring slot rectenna with a mesh design for optimized inkjet printing on paper substrate
The design of a 2.45 GHz circularly polarized rectenna inkjet printed on paper is presented. The proposed antenna structure is a shorted ring slot with a modified ground plane where a mesh design is employed in order to reduce the required amount of silver nanoparticle ink that needs to be inkjet-printed. A meshed ground plane with 29 % conducting surface relative to a solid ground was demonstrated with a simulated gain of 2.2 dB, axial ratio of 0.6 dB at 2.45 GHz and a peak rectifier efficiency of 45 % for -15 dBm input received power at the antenna terminals.

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Sensing Systems for Wireless Medicine (MediSense), Centre Tecnologic de Telecomunicacions de Catalunya, Georgia Institute of Technology, Herriot-Watt University, Technical University of Cartagena (UPCT)
Contributors: Martinez, R., Kimionis, J., Georgiadis, A., Collado, A., Tentzeris, M., Goussetis, G., Tornero, J. L.
Publication date: 27 Aug 2015

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Title of host publication: 2015 9th European Conference on Antennas and Propagation, EuCAP 2015
Publisher: Institute of Electrical and Electronics Engineers Inc.
Article number: 7228814
ISBN (Electronic): 9788890701856
ASJC Scopus subject areas: Instrumentation, Radiation, Computer Networks and Communications
Keywords: circularly polarized rectenna, Inkjet printing, paper substrate, slot antenna
URLs:

http://www.scopus.com/inward/record.url?scp=84949643447&partnerID=8YFLogxK (Link to publication in Scopus)
Source: Scopus
Source ID: 84949643447
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Structural characterization, spectroscopic, thermal, AC conductivity and dielectric properties and antimicrobial studies of $(C_8H_{12}N)_2[SnCl_6]$

A new inorganic-organic hybrid material produced from 2,6-dimethylanilinium cations and tin halide $(SnCl_6)^{2-}$ has been synthesized and structurally determined by X-ray diffraction method. The title compound crystallizes in the monoclinic system, space group C2/m with a = 19.8772(4), b = 6.9879(1), c = 8.3001(2) Å, β = 98.487(2)° and V = 1140.26(4) $Å^3$. The crystal structure is built up of sheets of $(SnCl_6)^{2-}$ octahedral anions and 2,6-xylidinium cations. The optical band gap was calculated and found to be 4.11 eV. At high temperature this compound exhibits a structural phase transition at 338 K. This has been characterized by differential scanning calorimetric and dielectric studies. Measurements of AC conductivity as a function of frequency at different temperatures indicated the hopping conduction mechanism. The bioassay results showed that the structure exhibits significant antibacterial activity.

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering, Carthage University
Contributors: Mathlouthi, M., Valkonen, A., Rzaigui, M., Smirani, W.
Number of pages: 16
Pages: 399-414
Publication date: 2017
Peer-reviewed: Yes
Early online date: 1 Jul 2016

Publication information
Journal: PHASE TRANSITIONS
Volume: 90
Issue number: 4
ISSN (Print): 0141-1594
Ratings:

Scopus rating (2017): CiteScore 0.8 SJR 0.233 SNIP 0.61
Original language: English
ASJC Scopus subject areas: Instrumentation, Materials Science(all)
Keywords: antibacterial activity, Crystal structure, fluorescent properties, phase transition, spectroscopies
DOIs:

10.1080/01411594.2016.1212194
Source: Scopus
Source ID: 84979648011
Research output: Contribution to journal › Article › Scientific › peer-review

An activity recognition framework deploying the random forest classifier and a single optical heart rate monitoring and triaxial accelerometer wrist-band

Wrist-worn sensors have better compliance for activity monitoring compared to hip, waist, ankle or chest positions. However, wrist-worn activity monitoring is challenging due to the wide degree of freedom for the hand movements, as well as similarity of hand movements in different activities such as varying intensities of cycling. To strengthen the ability of wrist-worn sensors in detecting human activities more accurately, motion signals can be complemented by physiological

signals such as optical heart rate (HR) based on photoplethysmography. In this paper, an activity monitoring framework using an optical HR sensor and a triaxial wrist-worn accelerometer is presented. We investigated a range of daily life activities including sitting, standing, household activities and stationary cycling with two intensities. A random forest (RF) classifier was exploited to detect these activities based on the wrist motions and optical HR. The highest overall accuracy of 89.6 ± 3.9% was achieved with a forest of a size of 64 trees and 13-s signal segments with 90% overlap. Removing the HR-derived features decreased the classification accuracy of high-intensity cycling by almost 7%, but did not affect the classification accuracies of other activities. A feature reduction utilizing the feature importance scores of RF was also carried out and resulted in a shrunken feature set of only 21 features. The overall accuracy of the classification utilizing the shrunken feature set was 89.4 ± 4.2%, which is almost equivalent to the above-mentioned peak overall accuracy.

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: BioMediTech, Faculty of Biomedical Sciences and Engineering, Research group: Personal Health Informatics-PHI, Department of Future Technologies
Contributors: Mehrang, S., Pietilä, J., Korhonen, I.
Publication date: 22 Feb 2018
Peer-reviewed: Yes

Publication information
Journal: Sensors
Volume: 18
Issue number: 2
Article number: 613
ISSN (Print): 1424-8220
Ratings:

Scopus rating (2018): CiteScore 3.72 SJR 0.592 SNIP 1.576
Original language: English
ASJC Scopus subject areas: Analytical Chemistry, Atomic and Molecular Physics, and Optics, Biochemistry, Instrumentation, Electrical and Electronic Engineering
Keywords: Accelerometer, Activity recognition, Context awareness, Machine learning, Photoplethysmography, Random forest, Wrist-worn sensors
Electronic versions:

sensors-18-00613-v2
DOIs:

10.3390/s18020613
URLs:

http://urn.fi/URN:NBN:fi:tty-201803141373
Source: Scopus
Source ID: 85042489750
Research output: Contribution to journal › Article › 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

Detection and Classification of Acoustic Scenes and Events: Outcome of the DCASE 2016 Challenge

Public evaluation campaigns and datasets promote active development in target research areas, allowing direct comparison of algorithms. The second edition of the challenge on Detection and Classification of Acoustic Scenes and Events (DCASE 2016) has offered such an opportunity for development of state-of-the-art methods, and succeeded in drawing together a large number of participants from academic and industrial backgrounds. In this paper, we report on the tasks and outcomes of the DCASE 2016 challenge. The challenge comprised four tasks: acoustic scene classification, sound event detection in synthetic audio, sound event detection in real-life audio, and domestic audio tagging. We present in detail each task and analyse the submitted systems in terms of design and performance. We observe the emergence of deep learning as the most popular classification method, replacing the traditional approaches based on Gaussian mixture models and support vector machines. By contrast, feature representations have not changed substantially throughout the years, as mel frequency-based representations predominate in all tasks. The datasets created for and used in DCASE 2016 are publicly available and are a valuable resource for further research.

General information

Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Signal Processing, Research group: Audio research group - ARG, School of Mathematical Sciences, Ecole Centrale de Nantes, IRCCyN UMR CNRS 6597 1, University of Surrey
Contributors: Mesaros, A., Heittola, T., Benetos, E., Foster, P., Lagrange, M., Virtanen, T., Plumbley, M. D.
Pages: 379-393
Publication date: Feb 2018
Peer-reviewed: Yes
Early online date: 28 Nov 2017

Publication information

Journal: IEEE/ACM Transactions on Audio Speech and Language Processing
Volume: 26
Issue number: 2
ISSN (Print): 2329-9290
Ratings:

Scopus rating (2018): CiteScore 5.06 SJR 1.045 SNIP 2.382
Original language: English
ASJC Scopus subject areas: Signal Processing, Media Technology, Instrumentation, Acoustics and Ultrasonics, Linguistics and Language, Electrical and Electronic Engineering, Speech and Hearing
Keywords: Acoustic scene classification, Acoustics, audio datasets, Event detection, Hidden Markov models, pattern recognition, sound event detection, Speech, Speech processing, Tagging
Electronic versions:

dcase2016_taslp
DOIs:

10.1109/TASLP.2017.2778423
URLs:

http://urn.fi/URN:NBN:fi:tty-201802081200
Source: Scopus
Source ID: 85037645922
Research output: Contribution to journal › Article › Scientific › peer-review

Texture region detection by trained neural network

In this paper we consider an important practical aspect of texture region detection in remote sensing images. One specific feature of our study is that we assume a processed image noisy with a priori known type and parameters of the noise. Another specific feature is that we try to detect textural regions for a wide variety of textures without having a priori knowledge of their properties. The considered task is solved by means of trained neural networks. In the paper, we analyze the aspects of choosing input local parameters used in detection (recognition) and carrying out training. The verification results provide valuable conclusions for these aspects.

General information

Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Department of Signal Processing, Research group: Computational Imaging-CI, National Aerospace University (KhAI), Dept of Transmitters
Contributors: Naumenko, A., Krivenko, S., Lukin, V., Egiazarian, K.
Publication date: 9 Aug 2016

Host publication information

Title of host publication: 9th International Kharkiv Symposium on Physics and Engineering of Microwaves, Millimeter and Submillimeter Waves, MSMW 2016
Publisher: IEEE
ISBN (Electronic): 9781509022663
ASJC Scopus subject areas: Radiology Nuclear Medicine and imaging, Instrumentation, Computer Networks and Communications, Radiation
Keywords: image, noise, remote sensing, texture detection
DOIs:
10.1109/MSMW.2016.7538174

Bibliographical note

EXT="Lukin, V."
Source: Scopus
Source ID: 84988036836
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Separation of Moving Sound Sources Using Multichannel NMF and Acoustic Tracking

In this paper we propose a method for separation of moving sound sources. The method is based on first tracking the sources and then estimation of source spectrograms using multichannel non-negative matrix factorization (NMF) and extracting the sources from the mixture by single-channel Wiener filtering. We propose a novel multichannel NMF model with time-varying mixing of the sources denoted by spatial covariance matrices (SCM) and provide update equations for optimizing model parameters minimizing squared Frobenius norm. The SCMs of the model are obtained based on estimated directions of arrival of tracked sources at each time frame. The evaluation is based on established objective separation criteria and using real recordings of two and three simultaneous moving sound sources. The compared methods include conventional beamforming and ideal ratio mask separation. The proposed method is shown to exceed the separation quality of other evaluated blind approaches according to all measured quantities. Additionally, we evaluate the method's susceptibility towards tracking errors by comparing the separation quality achieved using annotated ground truth source trajectories.

General information

Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Signal Processing, Research group: Audio research group - ARG
Contributors: Nikunen, J., Diment, A., Virtanen, T.
Pages: 281-295
Publication date: 2018
Peer-reviewed: Yes
Early online date: 16 Nov 2017

Publication information

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Volume: 26
Issue number: 2
ISSN (Print): 2329-9290
Ratings:
Scopus rating (2018): CiteScore 5.06 SJR 1.045 SNIP 2.382

Original language: English
ASJC Scopus subject areas: Signal Processing, Media Technology, Instrumentation, Acoustics and Ultrasonics, Linguistics and Language, Electrical and Electronic Engineering, Speech and Hearing
Keywords: acoustic source tracking, Acoustics, Array signal processing, Direction-of-arrival estimation, Estimation, Mathematical model, microphone arrays, Microphones, moving sound sources, Sound source separation, Spectrogram, time-varying mixing model
DOIs:
10.1109/TASLP.2017.2774925
Source: Scopus
Source ID: 85035748523
Research output: Contribution to journal › Article › Scientific › peer-review

High power fiber lasers

Over 1 kW of output power has now been reached with nearly diffraction-limited ytterbium-doped fiber lasers. Amplifiers can reach comparable powers, even with single-frequency beams. We review these and other recent results and discuss the possibilities for further progress.

General information

Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Optoelectronics Research Centre, Southampton Photonics, Inc., University of Southampton
Contributors: Nilsson, J., Sahu, J. K., Jeong, Y., Filippov, V. N., Soh, D. B. S., Codemard, C. A., Dupriez, P., Kim, J., Richardson, D. J., Malinowski, A., Piper, A. N., Price, J. H. V., Furusawa, K., Clarkson, W. A., Payne, D. N.
Publication date: 2006

Host publication information

Title of host publication: Optics InfoBase Conference Papers
Publisher: Optical Society of America
ISBN (Print): 1557528020, 9781557528025
ASJC Scopus subject areas: Instrumentation, Atomic and Molecular Physics, and Optics
URLs:
http://www.scopus.com/inward/record.url?scp=84899075367&partnerID=8YFLogxK (Link to publication in Scopus)
Source: Scopus
Source ID: 84899075367
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Secure and connected wearable intelligence for content delivery at a mass event: A case study

Presently, smart and connected wearable systems, such as on-body sensors and head-mounted displays, as well as other small form factor but powerful personal computers are rapidly pervading all areas of our life. Motivated by the opportunities that next-generation wearable intelligence is expected to provide, the goal of this work is to build a comprehensive understanding around some of the user-centric security and trust aspects of the emerging wearable and close-to-body wireless systems operating in mass events and under heterogeneous conditions. The paper thus intends to bring the attention of the research community to this emerging paradigm and discuss the pressing security and connectivity challenges within a popular consumer context. Our selected target scenario is that of a sports match, where wearable-equipped users may receive their preferred data over various radio access protocols. We also propose an authentication framework that allows for delivery of the desired content securely within the considered ecosystem.

General information

Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Electronics and Communications Engineering, Pervasive Computing, Research group: Emerging Technologies for Nano-Bio-Info-Cogno, Research area: Information security, Research group: Wireless Communications and Positioning, ITMO University
Contributors: Ometov, A., Solomitckii, D., Olsson, T., Bezzateev, S., Shchesniak, A., Andreev, S., Harju, J., Koucheryavy, Y.
Publication date: 1 Jun 2017
Peer-reviewed: Yes

Publication information

Journal: Journal of Sensor and Actuator Networks
Volume: 6
Issue number: 2
Article number: 5
ISSN (Print): 2224-2708

Ratings:

Scopus rating (2017): SNIP 0.669
Original language: English
ASJC Scopus subject areas: Computer Networks and Communications, Control and Optimization, Instrumentation
Keywords: Authentication, Challenges, Mass event, Security, Wearables, WiGig, Wireless
Electronic versions:

jsan-06-00005
DOIs:

10.3390/jsan6020005
URLs:

http://urn.fi/URN:NBN:fi:tty-201710091990
Source: Scopus
Source ID: 85029506641
Research output: Contribution to journal › Article › Scientific › peer-review

Positioning information privacy in intelligent transportation systems: An overview and future perspective

Today, the Intelligent Transportation Systems (ITS) are already in deep integration phase all over the world. One of the most significant enablers for ITS are vehicle positioning and tracking techniques. Worldwide integration of ITS employing Dedicated Short Range Communications (DSRC) and European standard for vehicular communication, known as ETSI ITS-G5, brings a variety of options to improve the positioning in areas where GPS connectivity is lacking precision. Utilization of the ready infrastructure, next-generation cellular 5G networks, and surrounding electronic devices together with conventional positioning techniques could become the solution to improve the overall ITS operation in vehicle-to-everything (V2X) communication scenario. Nonetheless, effective and secure communication protocols between the vehicle and roadside units should be both analyzed and improved in terms of potential attacks on the transmitted positioning-related data. In particular, said information might be misused or stolen at the infrastructure side conventionally assumed to be trusted. In this paper, we first survey different methods of vehicle positioning, which is followed by an overview of potential attacks on ITS systems. Next, we propose potential improvements allowing mutual authentication between the vehicle and infrastructure aiming at improving positioning data privacy. Finally, we propose a vision on the development and standardization aspects of such systems.

General information

Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Electrical Engineering, St. Petersburg State University of Aerospace Instrumentation, ITMO University, Brno University of Technology
Contributors: Ometov, A., Bezzateev, S., Davydov, V., Shchesniak, A., Masek, P., Lohan, E. S., Koucheryavy, Y.
Publication date: 1 Apr 2019
Peer-reviewed: Yes

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Original language: English
ASJC Scopus subject areas: Analytical Chemistry, Atomic and Molecular Physics, and Optics, Biochemistry, Instrumentation, Electrical and Electronic Engineering
Keywords: Authentication, Data privacy, GDPR, Intelligent transportation systems, Positioning
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10.3390/s19071603
URLs:

http://urn.fi/URN:NBN:fi:tty-201906111889
Source: Scopus
Source ID: 85064829981
Research output: Contribution to journal › Article › Scientific › peer-review

Highly directive radiation and negative refraction using photonic crystals

In this article, we present an experimental and numerical study of certain optical properties of two-dimensional dielectric photonic crystals (PCs). By modifying the band structure of a two-dimensional photonic crystal through its crystal parameters, we show how it is possible to confine the angular distribution of radiation from an embedded omnidirectional source. We then demonstrate that the anomalous band dispersions of PCs give rise to completely novel optical

phenomena, in particular, the negative refraction of electromagnetic waves at the interface of a PC. We investigate the spectral negative refraction, which utilizes a transverse magnetic (TM)-polarized upper band of a PC, in detail and show that a high degree of isotropy can be achieved for the corresponding effective index of refraction. The presence of nearly a isotropic negative refractive index leads to focusing of omnidirectional sources by a PC slab lens, which can surpass certain limitations of conventional (positive refractive) lenses. These examples indicate the potential of PCs for photonics applications utilizing the band structure.

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Bilkent University
Contributors: Ozbay, E., Bulu, I., Aydin, K., Caglayan, H., Alici, K. B., Guven, K.
Number of pages: 8
Pages: 217-224
Publication date: Feb 2005
Peer-reviewed: Yes

Publication information
Journal: Laser Physics
Volume: 15
Issue number: 2
ISSN (Print): 1054-660X
Ratings:

Scopus rating (2005): SJR 0.343 SNIP 0.32
Original language: English
ASJC Scopus subject areas: Atomic and Molecular Physics, and Optics, Instrumentation, Condensed Matter Physics, Industrial and Manufacturing Engineering
URLs:

http://pleiades.online/cgi-perl/search.pl?type=abstract&name=lasphys&number=2&year=5&page=217
URLs:

http://www.scopus.com/inward/record.url?scp=16244395788&partnerID=8YFLogxK (Link to publication in Scopus)

Bibliographical note
EXT="Caglayan, H."
Source: Scopus
Source ID: 16244395788
Research output: Contribution to journal › Article › Scientific › peer-review

High performance corrosion resistant coatings by novel coaxial cold- and hot-wire laser cladding methods
In the last few years, coaxial laser heads have been developed with centric wire feeding equipment, which enables the laser processing of complex-shaped objects in various applications. These newly developed laser heads are being used particularly in laser brazing experiments in the automotive industry. This study presents experimental results of using a coaxial laser head for cold- and hot-wire cladding application. The coaxial wire cladding method has significant improvements compared with the off-axis wire cladding method such as independence of the travel direction, alignment of the wire to the laser beam, and a reduced number of controlling parameters. These features are important to achieve high quality coatings. Cladding tests were conducted on mild steel with a coaxial laser wire welding head using Ni-based Inconel 625 and Thermanit 2509 super duplex stainless steel solid wires in order to determine the properties of the cladding process and the coatings deposited. The corrosion resistance of the obtained coatings was examined by long-term acetic acid salt spray (AASS) and electrochemical critical pitting temperature tests. The test results showed that by using the coaxial wire cladding method, defect-free high quality and corrosion resistant Inconel 625 and super duplex stainless steel coatings with low dilution were achieved. The average pitting temperature for Thermanit 2509 duplex coating was 75 °C in 1M NaCl solution, which was comparable to wrought 2507 duplex stainless steel. Low diluted Inconel 625 coating survived the AASS test for 2000 h without signs of corrosion.

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Materials Science, Research group: Surface Engineering, Tampere University of Technology, Technology Centre Ketek Ltd.
Contributors: Pajukoski, H., Näkki, J., Thieme, S., Tuominen, J., Nowotny, S., Vuoristo, P.
Publication date: 2016
Peer-reviewed: Yes
Early online date: 8 Dec 2015

Publication information

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Article number: 012011
ISSN (Print): 1042-346X
Ratings:

Scopus rating (2016): CiteScore 1.56 SJR 0.673 SNIP 1.219
Original language: English
ASJC Scopus subject areas: Atomic and Molecular Physics, and Optics, Electronic, Optical and Magnetic Materials, Biomedical Engineering, Instrumentation
Keywords: coaxial wire feed, hot-wire laser cladding, Inconel 625, super duplex stainless steel
DOIs:

10.2351/1.4936988

Bibliographical note
AUX=mol,"Pajukoski, H."
Source: Scopus
Source ID: 84950156186
Research output: Contribution to journal › Article › Scientific › peer-review

Third harmonic generation enhancement in nematic liquid crystals via nonlocal solitons propagation
We demonstrate type I third harmonic generation enhanced by the tight localization of fs laser light in nonlocal spatial solitons excited in nematic liquid crystals.

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Department of Physics, Frontier Photonics, Sapienza University, INRS Énergie, Matériaux et Télécommunications, Nonlinear Optics and OptoElectronics Lab, University “Roma Tre”
Contributors: Peccianti, M., Pasquazi, A., Assanto, G., Morandotti, R.
Publication date: 2011

Host publication information
Title of host publication: CLEO: Science and Innovations, CLEO_SI 2011
ISBN (Print): 9781557529107
ASJC Scopus subject areas: Instrumentation, Atomic and Molecular Physics, and Optics
URLs:

http://www.scopus.com/inward/record.url?scp=84893600063&partnerID=8YFLogxK (Link to publication in Scopus)
Source: Scopus
Source ID: 84893600063
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Light beam hysteresis in liquid crystals
We investigate optical bistability with light beams propagating in reorientational nematic liquid crystals. In a given interval of input powers, light beams can propagate in either diffracting or soliton states, depending on the 'history' of the system. We use biased planar samples exhibiting an abrupt self-focusing response with threshold.

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Frontier Photonics, University “Roma Tre”, Nonlinear Optics and OptoElectronics Lab, University of Southampton, United Kingdom
Contributors: Piccardi, A., Alberucci, A., Kravets, N., Assanto, G., Buchnev, O., Kaczmarek, M.
Publication date: 2014

Host publication information
Title of host publication: 2014 Fotonica AEIT Italian Conference on Photonics Technologies, Fotonica AEIT 2014
Publisher: IEEE COMPUTER SOCIETY PRESS
Article number: 6843888
ISBN (Print): 9788887237177
ASJC Scopus subject areas: Instrumentation
Keywords: Hysteresis, Nematic liquid crystal, Obtical bistability, Spatial soliton
DOIs:

10.1109/Fotonica.2014.6843888

URLs:

http://www.scopus.com/inward/record.url?scp=84904488923&partnerID=8YFLogxK (Link to publication in Scopus)
Source: Scopus
Source ID: 84904488923
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Spatial solitons in a self-focusing medium with tunable nonlinearity

We employ a suitably designed planar cell with inter-digitated electrodes and nematic liquid crystals to investigate the role of nonlinearity in generation and propagation of spatial solitons.

General information

Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Frontier Photonics, University “Roma Tre”, Nonlinear Optics and OptoElectronics Lab, University of Southampton, United Kingdom
Contributors: Piccardi, A., Alberucci, A., Assanto, G., Kaczmarek, M.
Publication date: 2011

Host publication information

Title of host publication: Optics InfoBase Conference Papers
ISBN (Print): 9781557529152
ASJC Scopus subject areas: Instrumentation, Atomic and Molecular Physics, and Optics
DOIs:

10.1364/NLO.2011.NWE7
Source: Scopus
Source ID: 84894325209
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Dark solitons in nematic liquid crystals

We demonstrate the formation of dark spatial solitons in nematic liquid crystals, with an azo-dye dopant providing the self-defocusing response. A collinear copolarized beam is used to probe the guiding properties of the soliton. NLO/ISOM/ODS

General information

Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Frontier Photonics, Nonlinear Optics and OptoElectronics Lab, Beam Engineering for Advanced Measurements Co
Contributors: Piccardi, A., Alberucci, A., Assanto, G., Tabiryan, N.
Publication date: 2011

Host publication information

Title of host publication: Optics InfoBase Conference Papers
ISBN (Print): 9781557529152
ASJC Scopus subject areas: Instrumentation, Atomic and Molecular Physics, and Optics
DOIs:

10.1364/NLO.2011.NWE4
URLs:

http://www.scopus.com/inward/record.url?scp=84894332639&partnerID=8YFLogxK (Link to publication in Scopus)
Source: Scopus
Source ID: 84894332639
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Nematicon routing in liquid crystal light valve

Using external beams on the photoconductive layer of a liquid crystal light valve we demonstrate all-optical control of soliton induced waveguides in nematics. Using this approach we implement a half-adder and a 3-bit demultiplexer.

General information

Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: University “Roma Tre”, Nonlinear Optics and OptoElectronics Lab, CNRS
Contributors: Piccardi, A., Alberucci, A., Bortolozzo, U., Residori, S., Assanto, G.
Publication date: 2010

Host publication information
Title of host publication: Optics InfoBase Conference Papers
ISBN (Print): 9781557528964
ASJC Scopus subject areas: Instrumentation, Atomic and Molecular Physics, and Optics
URLs:

http://www.scopus.com/inward/record.url?scp=84896750605&partnerID=8YFLogxK (Link to publication in Scopus)
Source: Scopus
Source ID: 84896750605
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Soliton self-deflection via power-dependent walk-off
We demonstrate and model power-dependent self-bending of spatial solitons in nematic liquid crystals. The deflection is explained by nonlinear changes in walk-off, as induced by the rotation of the optic axis via reorientation.

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: University “Roma Tre”, Nonlinear Optics and OptoElectronics Lab
Contributors: Piccardi, A., Alberucci, A., Assanto, G.
Publication date: 2010

Host publication information
Title of host publication: Optics InfoBase Conference Papers
ISBN (Print): 9781557528964
ASJC Scopus subject areas: Instrumentation, Atomic and Molecular Physics, and Optics
DOIs:

10.1364/NP.2010.NMD1
Source: Scopus
Source ID: 84896757925
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Automatic numerical differentiation by maximum likelihood estimation of a linear Gaussian state space model
A linear Gaussian state-space smoothing algorithm is presented for off-line estimation of derivatives from a sequence of noisy measurements. The algorithm uses numerically stable square-root formulas, can handle simultaneous independent measurements and non-equally spaced abscissas, and can compute state estimates at points between the data abscissas. The state space model's parameters, including driving noise intensity, measurement variance, and initial state, are determined from the given data sequence using maximum likelihood estimation computed using an expectation maximisation iteration. In tests with synthetic biomechanics data, the algorithm is found to be more accurate compared to a widely used open source automatic numerical differentiation algorithm, especially for acceleration estimation.

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Computing Sciences
Contributors: Piche, R.
Number of pages: 5
Pages: 1861-1865
Publication date: 1 Jun 2019

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Publisher: IEEE
ISBN (Electronic): 9783907144008
ASJC Scopus subject areas: Instrumentation, Control and Optimization
Electronic versions:

ThA11.4_Piche
DOIs:

10.23919/ECC.2019.8795960
URLs:

http://urn.fi/URN:NBN:fi:tuni-201910304221
Source: Scopus
Source ID: 85071535987
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Methods for long-term GNSS clock offset prediction

Clock offset predictions along with satellite orbit predictions are used in self-assisted GNSS to reduce the Time-to-First-Fix of a satellite positioning device. This paper compares three methods for predicting GNSS satellite clock offsets: polynomial regression, Kalman filtering and support vector machines (SVM). The regression polynomial and support vector machine model are trained from past offsets. The Kalman filter uses past offsets to estimate the clock offset coefficients. In tests with GPS and GLONASS data, it is found that all three methods significantly improve the clock predictions relative to extrapolation with the basic clock model of the last obtained broadcast ephemeris (BE). In particular, the 68% quantile of 7 day clock offset errors of GPS satellites was reduced by 66% with polynomial regression, 69% with Kalman filtering and 56% with SVM on average.

General information

Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Computing Sciences, Automation Technology and Mechanical Engineering, Tampere University
Contributors: Pihlajasalo, J., Leppäkoski, H., Kuismanen, S., Ali-Löytty, S., Piche, R.
Publication date: 1 Jun 2019

Host publication information

Title of host publication: 2019 International Conference on Localization and GNSS, ICL-GNSS 2019
Publisher: IEEE
Editors: Lohan, E., Rugamer, A., Nurmi, J., Koch, W., Heuberger, A.
ISBN (Electronic): 9781728124452
ASJC Scopus subject areas: Computer Networks and Communications, Aerospace Engineering, Instrumentation
DOIs:
10.1109/ICL-GNSS.2019.8752725

Bibliographical note

int=comp,"Kuismanen, Saara"
Source: Scopus
Source ID: 85069483768
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Acquiring respiration rate from photoplethysmographic signal by recursive bayesian tracking of intrinsic modes in time-frequency spectra

Respiration rate (RR) provides useful information for assessing the status of a patient. We propose RR estimation based on photoplethysmography (PPG) because the blood perfusion dynamics are known to carry information on breathing, as respiration-induced modulations in the PPG signal. We studied the use of amplitude variability of transmittance mode finger PPG signal in RR estimation by comparing four time-frequency (TF) representation methods of the signal cascaded with a particle filter. The TF methods compared were short-time Fourier transform (STFT) and three types of synchrosqueezing methods. The public VORTAL database was used in this study. The results indicate that the advanced frequency reallocation methods based on synchrosqueezing approach may present improvement over linear methods, such as STFT. The best results were achieved using wavelet synchrosqueezing transform, having a mean absolute error and median error of 2.33 and 1.15 breaths per minute, respectively. Synchrosqueezing methods were generally more accurate than STFT on most of the subjects when particle filtering was applied. While TF analysis combined with particle filtering is a promising alternative for real-time estimation of RR, artefacts and non-respiration-related frequency components remain problematic and impose requirements for further studies in the areas of signal processing algorithms an PPG instrumentation.

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)
Contributors: Pirhonen, M., Peltokangas, M., Vehkaoja, A.
Publication date: 1 Jun 2018
Peer-reviewed: Yes

Publication information

Journal: Sensors
Volume: 18
Issue number: 6
Article number: 1693
ISSN (Print): 1424-8220
Ratings:

Scopus rating (2018): CiteScore 3.72 SJR 0.592 SNIP 1.576
Original language: English
ASJC Scopus subject areas: Analytical Chemistry, Atomic and Molecular Physics, and Optics, Biochemistry, Instrumentation, Electrical and Electronic Engineering
Keywords: Particle filters, Photoplethysmography, Respiration, Synchrosqueezing, Time-frequency analysis
Electronic versions:

sensors-18-01693
DOIs:

10.3390/s18061693
URLs:

http://urn.fi/URN:NBN:fi:tty-201806212010

Bibliographical note
int=TUT-BMT,"Pirhonen, Mikko"
Source: Scopus
Source ID: 85047608517
Research output: Contribution to journal › Article › Scientific › peer-review

Charge Storage Level Sensor RFID Tag: Impedance Matching and Experimental Characterisation
We present an RF energy harvesting system where two distinct passive UHF RFID microchips provide different tag IDs to detect low and high states of the harvester's charge storage. This enables the backend system to acknowledge when the harvesting system is ready for advanced power consuming operations. Overall, we were able to read the separate IDs of the tag at the distance of 3 m from an RFID reader that is emitting the regulated EIRP of 3.28 W and charging harvester's storage capacitor to 0.625 V through 8.7 dBi harvesting antenna.

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: BioMediTech, Research group: Wireless Identification and Sensing Systems Research Group
Contributors: Pournoori, N., Ukkonen, L., Sydänheimo, L., Björninen, T.
Publication date: 1 Mar 2019

Host publication information
Title of host publication: 13th European Conference on Antennas and Propagation, EuCAP 2019
Publisher: IEEE
ISBN (Electronic): 9788890701887
ASJC Scopus subject areas: Computer Networks and Communications, Instrumentation
Keywords: Far-field RF energy harvesting, impedance matching, PIN diode, RF rectifier, RF switch, RFID
Source: Scopus
Source ID: 85068468704
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Composite nonlinear feedback control of a JIB trolley of a tower cranebehaviors
Cranes are required to lift and carry loads swiftly to desired positions without causing excessive swaying motion of the load. These are conflicting requirements, which make feedback control of crane systems challenging. Furthermore, variations in rope length and load mass complicate controller design, since they significantly influence swaying dynamics. This paper considers automatic control of Quanser 3DOF tower crane system using composite nonlinear feedback (CNF) methodology. To be more specific, a CNF controller is designed for the jib trolley position of the crane using partial state measurements. The performance of the CNF controller is compared with Quanser's built-in linear quadratic regulator (LQR) controller both in simulation and experimental setups. The results show that the CNF controller provides better load handling capability in terms of fast positioning of the jib trolley and damping of load swaying.

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Automation Technology and Mechanical Engineering, Research group: Automation and Systems Theory
Contributors: Pyrhönen, V., Vilkko, M. K.
Number of pages: 6
Pages: 1124-1129
Publication date: 1 Jun 2019

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Title of host publication: 2019 18th European Control Conference, ECC 2019
Publisher: IEEE

Article number: 8796229
ISBN (Electronic): 9783907144008
ASJC Scopus subject areas: Instrumentation, Control and Optimization
DOIs:
10.23919/ECC.2019.8796229
Source: Scopus
Source ID: 85071530876
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Measurement of sensitivity distribution map of a ferroelectret polymer film

ElectroMechanical Film (EMFi) is an electroactive ferroelectret polymer film with a special cellular structure. Sensitivity distribution maps of EMFi sensors were measured in this study. Seven EMFi sensors with evaporated gold electrodes, size 55 mm x 55 mm, were measured with a measurement grid spacing of 5 mm. The sensitivity is defined here as the charge generated by the EMFi sensor divided by the force applied to excite the sensor, and this is closely related to piezoelectric d33 coefficient. The sensitivity of EMFi was found to vary in different places of the sensors and between the measured sensors. This is presumably due to the relatively large gas voids and local corona breakdowns. The maximum and minimum sensitivities were found to vary around 30 % from the measured average sensitivity value. Thermally stimulated current (TSC) analysis confirmed the results obtained in the sensitivity distribution map measurements.

General information

Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Automation Science and Engineering, Research area: Microsystems, Research area: Measurement Technology and Process Control, VTT Technical Research Centre of Finland
Contributors: Rajala, S., Paajanen, M., Lekkala, J.
Pages: 8517-8522
Publication date: 27 Sep 2016
Peer-reviewed: Yes

Publication information

Journal: IEEE Sensors Journal
Volume: 16
Issue number: 23
ISSN (Print): 1530-437X
Ratings:
Scopus rating (2016): CiteScore 3.12 SJR 0.654 SNIP 1.673
Original language: English
ASJC Scopus subject areas: Instrumentation, Electrical and Electronic Engineering
Keywords: Electromechanical sensors, measurement, polymer films
DOIs:
10.1109/JSEN.2016.2613876
Source: Scopus
Source ID: 85027524810
Research output: Contribution to journal › Article › Scientific › peer-review

Designing, Manufacturing and Testing of a Piezoelectric Polymer Film In-Sole Sensor for Plantar Pressure Distribution Measurements

We have designed, manufactured, and tested a prototype of an in-sole plantar pressure sensor. The sensor is made of a piezoelectric polymer film (polyvinylidenefluoride, PVDF) with evaporated copper electrodes. The size and the location of measuring sites are carefully considered to produce a light-weighted, practical, and inexpensive matrix sensor for measurement of plantar pressure distribution. The sensor consists of eight measurement locations: hallux, first metatarsal head (under both sesamoid bones), metatarsal heads 2-5 and heel. The developed in-sole sensor was evaluated through piezoelectric sensitivity measurements and test measurements with subjects (used as a platform sensor). Average peak-to-peak pressures from 58 to 486 kPa were obtained in plantar pressure measurements. The in-sole sensor can be used to prevent pressure ulcers. Also other application areas for the sensor are available, e.g., rehabilitation and sports. The developed sensor enables unobtrusive and long-term plantar pressure measurements. In future, an option for manufacturing the PVDF in-soles may be printing of desired electrode pattern on PVDF material, that would allow fast production, and if needed, the production of even individual in-soles.

General information

Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Automation and Hydraulic Engineering, Faculty of Biomedical Sciences and Engineering, Research group: Sensor Technology and Biomeasurements (STB), Tampere University Hospital

Contributors: Rajala, S., Mattila, R., Kaartinen, I., Lekkala, J.
Number of pages: 8
Pages: 6798-6805
Publication date: 15 Oct 2017
Peer-reviewed: Yes

Publication information
Journal: IEEE Sensors Journal
Volume: 17
Issue number: 20
ISSN (Print): 1530-437X
Ratings:

Scopus rating (2017): CiteScore 3.29 SJR 0.619 SNIP 1.568
Original language: English
ASJC Scopus subject areas: Instrumentation, Electrical and Electronic Engineering
Keywords: diabetes, in-sole sensor, piezoelectric polymer PVDF, Plantar pressure
DOIs:

10.1109/JSEN.2017.2750241

Bibliographical note
INT=aut,"Mattila, Raisa"
Source: Scopus
Source ID: 85031124350
Research output: Contribution to journal › Article › Scientific › peer-review

Monitoring pH, temperature and humidity in long-term stem cell culture in CO_2 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_2 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

User Positioning in mmW 5G Networks Using Beam-RSRP Measurements and Kalman Filtering

In this paper, we exploit the 3D-beamforming features of multiantenna equipment employed in fifth generation (5G) networks, operating in the millimeter wave (mmW) band, for accurate positioning and tracking of users. We consider sequential estimation of users' positions, and propose a two-stage extended Kalman filter (EKF) that is based on reference signal received power (RSRP) measurements. In particular, beamformed downlink (DL) reference signals (RSs) are transmitted by multiple base stations (BSs) and measured by user equipments (UEs) employing receive beamforming. The so-obtained beam-RSRP (BRSRP) measurements are reported to the BSs where the corresponding directions of departure (DoDs) are sequentially estimated by a novel EKF. Such angle estimates from multiple BSs are subsequently fused on a central entity into 3D position estimates of UEs by means of another (second-stage) EKF. The proposed positioning scheme is scalable since the computational burden is shared among different network entities, namely transmission/reception points (TRPs) and 5G-NR Node B (gNB), and may be accomplished with the signalling currently specified for 5G. We assess the performance of the proposed algorithm on a realistic outdoor 5G deployment with a detailed ray tracing propagation model based on the METIS Madrid map. Numerical results with a system operating at 39 GHz show that sub-meter 3D positioning accuracy is achievable in future mmW 5G networks.

General information

Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Electronics and Communications Engineering, Research group: Wireless Communications and Positioning , Huawei Technologies Oy (Finland) Co., Ltd
Contributors: Rastorgueva-Foi, E., Costa, M., Koivisto, M., Leppänen, K., Valkama, M.
Number of pages: 7
Pages: 1150-1156
Publication date: 5 Sep 2018

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Title of host publication: 2018 21st International Conference on Information Fusion, FUSION 2018
Publisher: IEEE
Article number: 8455289
ISBN (Print): 978-1-5386-4330-3
ISBN (Electronic): 978-0-9964527-6-2
ASJC Scopus subject areas: Computer Vision and Pattern Recognition, Signal Processing, Statistics, Probability and Uncertainty, Instrumentation
Keywords: 5G networks, beamforming, direction-of-departure, extended Kalman filter, line-of-sight, localization, location-awareness, positioning, RSRP, tracking
DOIs:
10.23919/ICIF.2018.8455289
Source: Scopus
Source ID: 85054063725
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Introduction to the Special Section on Sound Scene and Event Analysis

The papers in this special section are devoted to the growing field of acoustic scene classification and acoustic event recognition. Machine listening systems still have difficulties to reach the ability of human listeners in the analysis of realistic acoustic scenes. If sustained research efforts have been made for decades in speech recognition, speaker identification and to a lesser extent in music information retrieval, the analysis of other types of sounds, such as environmental sounds, is the subject of growing interest from the community and is targeting an ever increasing set of audio categories. This problem appears to be particularly challenging due to the large variety of potential sound sources in the scene, which may in addition have highly different acoustic characteristics, especially in bioacoustics. Furthermore, in realistic environments, multiple sources are often present simultaneously, and in reverberant conditions.

General information

Publication status: Published
MoE publication type: B1 Article in a scientific magazine
Organisations: Signal Processing, University Paris-Saclay, New York University, National Institute of Informatics, University of Toulon
Contributors: Richard, G., Virtanen, T., Bello, J. P., Ono, N., Glotin, H.
Number of pages: 3
Pages: 1169-1171
Publication date: 1 Jun 2017
Peer-reviewed: No

Publication information

Journal: IEEE/ACM Transactions on Audio Speech and Language Processing

Volume: 25
Issue number: 6
ISSN (Print): 2329-9290
Ratings:

Scopus rating (2017): CiteScore 4.4 SJR 0.841 SNIP 2.138
Original language: English
ASJC Scopus subject areas: Signal Processing, Media Technology, Instrumentation, Acoustics and Ultrasonics, Linguistics and Language, Speech and Hearing, Electrical and Electronic Engineering
DOIs:

10.1109/TASLP.2017.2699334
Source: Scopus
Source ID: 85028340233
Research output: Contribution to journal › Article › Scientific

M2M Communication Assessment in Energy-Harvesting and Wake-Up Radio Assisted Scenarios Using Practical Components

Techniques for wireless energy harvesting (WEH) are emerging as a fascinating set of solutions to extend the lifetime of energy-constrained wireless networks, and are commonly regarded as a key functional technique for almost perpetual communications. For example, with WEH technology, wireless devices are able to harvest energy from different light sources or Radio Frequency (RF) signals broadcast by ambient or dedicated wireless transmitters to support their operation and communications capabilities. WEH technology will have increasingly wider range of use in upcoming applications such as wireless sensor networks, Machine-to-Machine (M2M) communications, and the Internet of Things. In this paper, the usability and fundamental limits of joint RF and solar cell or photovoltaic harvesting based M2M communication systems are studied and presented. The derived theoretical bounds are in essence based on the Shannon capacity theorem, combined with selected propagation loss models, assumed additional link nonidealities, diversity processing, as well as the given energy harvesting and storage capabilities. Fundamental performance limits and available capacity of the communicating link are derived and analyzed, together with extensive numerical results evaluated in different practical scenarios, including realistic implementation losses and state-of-the-art printed supercapacitor performance figures with voltage doubler-based voltage regulator. In particular, low power sensor type communication applications using passive and semi-passive wake-up radio (WuR) are addressed in the study. The presented analysis principles and results establish clear feasibility regions and performance bounds for wireless energy harvesting based low rate M2M communications in the future IoT networks.

General information

Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Electronics and Communications Engineering, Nano Communication Centre, Department of Electrical and Computer Engineering, Ohio State University
Contributors: Rinne, J., Keskinen, J., Berger, P. R., Lupo, D., Valkama, M.
Publication date: 16 Nov 2018
Peer-reviewed: Yes

Publication information

Journal: Sensors (Basel, Switzerland)
Volume: 18
Issue number: 11
ISSN (Print): 1424-8220
Ratings:

Scopus rating (2018): CiteScore 3.72 SJR 0.592 SNIP 1.576
Original language: English
ASJC Scopus subject areas: Analytical Chemistry, Atomic and Molecular Physics, and Optics, Biochemistry, Instrumentation, Electrical and Electronic Engineering
Keywords: diversity system, M2M communications, perpetual communications, propagation loss, Shannon limit, supercapacitor, wake-up radio, wireless energy harvesting
Electronic versions:

sensors-18-03992-v2
DOIs:

10.3390/s18113992
URLs:

http://urn.fi/URN:NBN:fi:tty-201901071020
Source: Scopus
Source ID: 85056711381
Research output: Contribution to journal › Article › Scientific › peer-review

On prediction of DCT-based denoising efficiency under spatially correlated noise conditions

In this paper, results of image denoising efficiency prediction for filter based on discrete cosine transform (DCT) for the case of spatially correlated additive Gaussian Noise (SCGN) are given. The considered noise model is analyzed for different degrees of spatial correlation that produce varying non-homogeneous spectrum of the noise. PSNR metric is exploited to assess denoising efficiency. It is shown in this paper, that a prediction of denoising efficiency has high accuracy for data distorted by noise with different degrees of spatial correlation, and require low computational resources.

General information

Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Department of Signal Processing, Research group: Computational Imaging-CI, Kharkiv National Aerospace University
Contributors: Rubel, O., Lukin, V., Egiazarian, K.
Number of pages: 5
Pages: 750-754
Publication date: 12 Apr 2016

Host publication information

Title of host publication: 2016 13th International Conference on Modern Problems of Radio Engineering, Telecommunications and Computer Science (TCSET)
Publisher: IEEE
ISBN (Print): 9786176078067
ASJC Scopus subject areas: Computer Networks and Communications, Electrical and Electronic Engineering, Instrumentation, Radiation, Computer Science (miscellaneous), Signal Processing, Modelling and Simulation
Keywords: Denoising, Efficiency Prediction, Fitting, Spatially Correlated Noise
DOIs:

10.1109/TCSET.2016.7452171
Source: Scopus
Source ID: 84969277857
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

High-Q resonance train in a plasmonic metasurface

We experimentally demonstrate a plasmonic surface that supports a series of high-quality-factor (Q ≈ 100) surface lattice resonances. These resonances are enabled by tuning the thickness of the top-cladding layer to confine higher order diffraction-orders.

General information

Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Physics, University of Ottawa, Canada, Iridian Spectral Technologies, University of Rochester Institute of Optics
Contributors: Saad-Bin-Alam, M., Reshef, O., Huttunen, M. J., Carlow, G., Sullivan, B., Menard, J. M., Dolgaleva, K., Boyd, R. W.
Publication date: 1 May 2019

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Title of host publication: 2019 Conference on Lasers and Electro-Optics, CLEO 2019 - Proceedings
Publisher: IEEE
ISBN (Electronic): 9781943580576
ASJC Scopus subject areas: Spectroscopy, Industrial and Manufacturing Engineering, Safety, Risk, Reliability and Quality , Management, Monitoring, Policy and Law, Electronic, Optical and Magnetic Materials, Radiology Nuclear Medicine and imaging, Instrumentation, Atomic and Molecular Physics, and Optics
DOIs:

10.23919/CLEO.2019.8750206
Source: Scopus
Source ID: 85069156893
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Optical Frequency Comb Photoacoustic Spectroscopy

We combine for the first time a mid-infrared optical frequency comb Fourier transform spectrometer with cantilever-enhanced photoacoustic detection and measure high-resolution broadband spectra of the fundamental band of methane in a few milliliter sample volume.

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Physics, Energy Technology and Thermal Process Chemistry, University of Helsinki
Contributors: Sadiek, I., Mikkonen, T., Vainio, M., Toivonen, J., Foltynowicz, A.
Publication date: 1 May 2019

Host publication information
Title of host publication: 2019 Conference on Lasers and Electro-Optics, CLEO 2019 - Proceedings
Publisher: IEEE
ISBN (Electronic): 9781943580576
ASJC Scopus subject areas: Spectroscopy, Industrial and Manufacturing Engineering, Safety, Risk, Reliability and Quality , Management, Monitoring, Policy and Law, Electronic, Optical and Magnetic Materials, Radiology Nuclear Medicine and imaging, Instrumentation, Atomic and Molecular Physics, and Optics
DOIs:

10.23919/CLEO.2019.8749688
Source: Scopus
Source ID: 85069190764
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Passive resonance sensor based method for monitoring particle suspensions
Control of particle suspensions is needed in several modern industrial processes. A reason for the difficulty in this task has been the lack of a fast and reliable measurement. In this study, we tested the measurement of particle suspension by using a method based on a passive resonance sensor. The relative amounts of dispersing agent and aluminium oxide in the suspension were varied. The studied method yielded signals which depended on the complex permittivity of the suspension. The results indicated that we were able to measure information that can be used as feedback for the suspension preparation process. In addition, the tested instrumentation was simple and robust and thus this method may allow online measurements directly from the industrial processes.

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Automation Science and Engineering, Research area: Microsystems, Research area: Measurement Technology and Process Control, Department of Materials Science, Research group: Ceramic materials, Engineering materials science and solutions (EMASS), Integrated Technologies for Tissue Engineering Research (ITTE), Smart Energy Systems (SES)
Contributors: Salpavaara, T., Järveläinen, M., Seppälä, S., Yli-Hallila, T., Verho, J., Vilkko, M., Lekkala, J., Levänen, E.
Number of pages: 7
Pages: 324-330
Publication date: 8 Jun 2015
Peer-reviewed: Yes

Publication information
Journal: Sensors and Actuators B: Chemical
Volume: 219
ISSN (Print): 0925-4005
Ratings:

Scopus rating (2015): CiteScore 4.84 SJR 1.225 SNIP 1.484
Original language: English
ASJC Scopus subject areas: Electrical and Electronic Engineering, Condensed Matter Physics, Electronic, Optical and Magnetic Materials, Metals and Alloys, Surfaces, Coatings and Films, Materials Chemistry, Instrumentation
Keywords: Complex permittivity, Inductive coupling, Passive resonance sensor, Slurry, Suspension
DOIs:

10.1016/j.snb.2015.04.121
URLs:

http://www.scopus.com/inward/record.url?scp=84930646590&partnerID=8YFLogxK (Link to publication in Scopus)

Bibliographical note
ORG=ase,0.5
ORG=mol,0.5
Source: Scopus
Source ID: 84930646590
Research output: Contribution to journal › Article › Scientific › peer-review

Non-destructive and wireless monitoring of biodegradable polymers

A method for monitoring changes in biodegradable polymers during hydrolysis is proposed. This wireless and non-destructive method is based on inductively coupled passive resonance sensors embedded in the polymer shell. In this study, we prepared specimens using two poly(lactide-co-glycolide) copolymers possessing different degradation profiles. The copolymer embedded sensors were immersed in buffer solution and their resonance features were compared with periodically performed conventional polymer characterization methods. A clear difference was noticed in the wirelessly measured signals between the two tested copolymer materials. Also the reference methods showed clear differences between the degradation profiles of the copolymers. The wirelessly measured signals are likely to correlate to the structural changes in the materials during the hydrolysis. In the future, this technique could be used in the laboratory to provide easy-to-access in situ information about the polymers. Even the state of biodegradable polymer implants could be wirelessly monitored.

General information

Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Faculty of Biomedical Sciences and Engineering, Research area: Microsystems, Research group: Sensor Technology and Biomeasurements (STB), Research group: Biomaterials and Tissue Engineering Group, BioMediTech
Contributors: Salpavaara, T., Hänninen, A., Antniemi, A., Lekkala, J., Kellomäki, M.
Pages: 1018-1025
Publication date: 2017
Peer-reviewed: Yes

Publication information

Journal: Sensors and Actuators B: Chemical
Volume: 251
ISSN (Print): 0925-4005
Ratings:

Scopus rating (2017): CiteScore 5.67 SJR 1.406 SNIP 1.453
Original language: English
ASJC Scopus subject areas: Electronic, Optical and Magnetic Materials, Instrumentation, Condensed Matter Physics, Surfaces, Coatings and Films, Metals and Alloys, Materials Chemistry, Electrical and Electronic Engineering
Keywords: Biodegradable polymers, Passive resonance sensor, Poly(lactide-co-glycolide), Telemetry, Wireless monitoring
Electronic versions:

non_destructive_and_wireless_2018. Embargo ended: 25/07/19
DOIs:

10.1016/j.snb.2017.05.116
URLs:

http://urn.fi/URN:NBN:fi:tuni-201910234047
Source: Scopus
Source ID: 85020132649
Research output: Contribution to journal › Article › Scientific › peer-review

Optimal emission enhancement in orthogonal double-pulse laser-induced breakdown spectroscopy

Abstract Orthogonal double-pulse (DP) laser-induced breakdown spectroscopy (LIBS) was performed using reheating and pre-ablative configurations. The ablation pulse power density was varied by two orders of magnitude and the DP experiments were carried out for a wide range of interpulse delays. For both DP-LIBS schemes, the signal enhancement was evaluated with respect to the corresponding single-pulse (SP) LIBS as a function of the interpulse delay. The reheating scheme shows a sharp maximum signal enhancement of up to 200-fold for low ablative power densities (0.4 GW cm^{- 2}); however, for power densities larger than 10 GW cm^{- 2} this configuration did not improve the SP outcome. On the other hand, a more uniform signal enhancement of about 4-6 was obtained for the pre-ablative scheme nearly independently of the used ablative power density. In terms of the signal-to-noise ratio (SNR) the pre-ablative scheme shows a monotonic increment with the ablative power density. Whereas the reheating configuration reaches a maximum at 2.2 GW cm^{- 2}, its enhancement effect collapses markedly for fluencies above 10 GW cm^{- 2}.

General information

Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Physics, Research area: Optics, Research group: Applied Optics, Centro de Ciencias Aplicadas y Desarrollo Tecnológico, Universidad Nacional Autónoma de México (CCADET-UNAM), Cátedra CONACyT, Centro de Nanociencias y Nanotecnología, Universidad Nacional Autónoma de México, Universidad Autónoma Metropolitana-Unidad Azcapotzalco
Contributors: Sanginés, R., Contreras, V., Sobral, H., Robledo-Martinez, A.
Number of pages: 7
Pages: 139-145

Publication date: 6 Jul 2015
Peer-reviewed: Yes

Publication information
Journal: Spectrochimica Acta Part B: Atomic Spectroscopy
Volume: 110
Article number: 4935
ISSN (Print): 0584-8547
Ratings:

Scopus rating (2015): CiteScore 2.94 SJR 0.999 SNIP 1.414
Original language: English
ASJC Scopus subject areas: Instrumentation, Atomic and Molecular Physics, and Optics, Analytical Chemistry, Spectroscopy
Keywords: Double-pulse, Emission enhancement, LIBS
DOIs:

10.1016/j.sab.2015.06.012
URLs:

http://www.scopus.com/inward/record.url?scp=84934759672&partnerID=8YFLogxK (Link to publication in Scopus)
Source: Scopus
Source ID: 84934759672
Research output: Contribution to journal › Article › Scientific › peer-review

Piezoresistive natural rubber-multiwall carbon nanotube nanocomposite for sensor applications
We explore, both experimentally and theoretically, the possibility to use a composite of natural rubber (NR) and multiwall carbon nanotubes (MWCNT) as a piezoresistive tensile sensor. As an essentially new feature relative to the previous work, we have performed a systematic study of the mechanism of the piezoresistance at large deformations in a wide range of MWCNT concentrations and crosslinking degrees of the host rubber material. In qualitative agreement with the previous work, the conductivity of the unstrained NR/MWCNT nanocomposite is shown to be adequately described by the percolation theory with the critical exponent evaluated to ~2.31. Varying tensile stress-induced strains in the composite has been shown to results in a non-linear electrical response that cannot be described by simple modifications of the percolation theory. In order to explain the observed non-linear dependence of the resistance R of the composite on the strain ε, we have developed a scaling theory that relates this resistance to the structural changes in the conducting MWCNT network caused by deforming the host NR. Based on the obtained results, we discuss the ways of using the highly stretchable conductive elastomer composites as an efficient piezoresistive tensile sensor.

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Materials Science, Rubber Technology Centre, Indian Institute of Technology Kharagpur, Vodafone Department of Mobile Communications Systems, University of Münster, Leibniz-Institut für Polymerforschung Dresden E.V.
Contributors: Selvan, N. T., Eshwaran, S. B., Das, A., Stöckelhuber, K. W., Wießner, S., Pötschke, P., Nando, G. B., Chervanyov, A. I., Heinrich, G.
Number of pages: 12
Pages: 102-113
Publication date: 1 Mar 2016
Peer-reviewed: Yes

Publication information
Journal: Sensors and Actuators, A: Physical
Volume: 239
ISSN (Print): 0924-4247
Ratings:

Scopus rating (2016): CiteScore 2.79 SJR 0.787 SNIP 1.609
Original language: English
ASJC Scopus subject areas: Electronic, Optical and Magnetic Materials, Instrumentation, Condensed Matter Physics, Surfaces, Coatings and Films, Metals and Alloys, Electrical and Electronic Engineering
Keywords: Sensor rubber filler strain nano-composite conductivity
DOIs:

10.1016/j.sna.2016.01.004
Source: Scopus
Source ID: 84955467512
Research output: Contribution to journal › Article › Scientific › peer-review

Path Loss Characterization for Intra-Vehicle Wearable Deployments at 60 GHz

In this work, we present the results of a wide-band measurement campaign at 60 GHz conducted inside a Linkker electric city bus. Targeting prospective millimeter-wave (mmWave) public transportation wearable scenarios, we mimic a typical deployment of mobile high-end consumer devices in a dense environment. Specifically, our intra-vehicle deployment includes one receiver and multiple transmitters corresponding to a mmWave access point and passengers' wearable and handheld devices. While the receiver is located in the front part of the bus, the transmitters repeat realistic locations of personal devices (i) at the seat level (e.g., a hand-held device) and (ii) at a height 70 cm above the seat (e.g., a wearable device: augmented reality glasses or a head-mounted display). Based on the measured received power, we construct a logarithmic model for the distance-dependent path loss. The parametrized models developed in the course of this study have the potential to become an attractive ground for the link budget estimation and interference footprint studies in crowded public transportation scenarios.

General information

Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Electrical Engineering, Université catholique de Louvain, Aalto University
Contributors: Semkin, V., Ponomarenko-Timofeev, A., Karttunen, A., Galinina, O., Andreev, S., Koucheryavy, Y.
Publication date: 1 Mar 2019

Host publication information

Title of host publication: 13th European Conference on Antennas and Propagation, EuCAP 2019
Publisher: IEEE
ISBN (Electronic): 9788890701887
ASJC Scopus subject areas: Computer Networks and Communications, Instrumentation
Keywords: 60 GHz, intra-vehicle deployment, millimeter-wave, public transportation, wearable devices
Source: Scopus
Source ID: 85068464424
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Ambient rf energy harvesting sensor device with capacitor-leakage-aware duty cycle control

In this paper, we present a software control method that maximizes the sensing rate of wireless sensor networks (WSNs) that are solely powered by ambient RF power. Unlike all other energy harvesting WSN systems, RF-powered systems present new challenges for energy management. A WSN node repeatedly charges and discharges at short intervals, depending on the energy intake. Typically in energy harvesting systems, a capacitor is used for energy storage because of its efficient charge and discharge performance and infinite recharge cycles. When the charging time is too short, a node is more likely to experience an energy shortage. On the contrary, if it is too long, more energy is lost because of leakage in the capacitor. In this paper, we introduce an adaptive duty cycle control scheme optimized for RF energy harvesting. This method maximizes the sensing rate by taking into account the leakage problem, a factor that has never been previously studied in this context. Our control scheme improves the efficiency by aggregate evaluation of operation reliability and leakage reduction.

General information

Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Sensing Systems for Wireless Medicine (MediSense), University of Tokyo, Graduate School of Information Science and Technology, Georgia Institute of Technology, School of Electrical and Computer Engineering
Contributors: Shigeta, R., Sasaki, T., Quan, D. M., Kawahara, Y., Vyas, R. J., Tentzeris, M. M., Asami, T.
Number of pages: 11
Pages: 2973-2983
Publication date: 2013
Peer-reviewed: Yes

Publication information

Journal: IEEE Sensors Journal
Volume: 13
Issue number: 8
Article number: 6521342
ISSN (Print): 1530-437X
Ratings:

Scopus rating (2013): CiteScore 2.6 SJR 0.663 SNIP 1.764
Original language: English
ASJC Scopus subject areas: Instrumentation, Electrical and Electronic Engineering
Keywords: Ambient RF energy harvesting, capacitor, digital TV, duty cycle control, wireless sensor networks
DOIs:

10.1109/JSEN.2013.2264931
URLs:

http://www.scopus.com/inward/record.url?scp=84880683308&partnerID=8YFLogxK (Link to publication in Scopus)
Source: Scopus
Source ID: 84880683308
Research output: Contribution to journal › Article › Scientific › peer-review

Round Robin computer simulation of ejection probability in sputtering

We have studied the ejection of a copper atom through a planar copper surface as a function of recoil velocity and depth of origin. Results were obtained from six molecular dynamics codes, four binary collision lattice simulation codes, and eight Monte Carlo codes. Most results were found with a Born-Mayer interaction potential between the atoms with Gibson 2 parameters and a planar surface barrier, but variations on this standard were allowed for, as well as differences in the adopted cutoff radius for the interaction potential, electronic stopping, and target temperature. Large differences were found between the predictions of the various codes, but the cause of these differences could be determined in most cases. A fairly clear picture emerges from all three types of codes for the depth range and the angular range for ejection at energies relevant to sputter ejection, although a quantitative discussion would have to include an analysis of replacement collision events which has been left out here.

General information

Publication status: Published
MoE publication type: Not Eligible
Organisations: University of Southern Denmark, Oak Ridge National Laboratory, Sandia National Laboratories, California, Yliopisto-lehti: Helsingin yliopiston tiedelehti, Tsinghua University, Max-Planck-Institut für Plasmaphysik, Okayama University of Science, Hitachi Ltd., Moscow State University, Naval Postgraduate School, Institute of Electronics Bulgarian Academy of Sciences, Osaka University, Jyväskylän yliopisto, TU Vienna, California State University, Fullerton, Technische Universität Braunschweig
Contributors: Sigmund, P., Robinson, M. T., Baskes, M. I., Hautala, M., Cui, F. Z., Eckstein, W., Yamamura, Y., Hosaka, S., Ishitani, T., Shulga, V. I., Harrison, D. E., Chakarov, I. R., Karpuzo, D. S., Kawatoh, E., Shimizu, R., Valkealahti, S., Nieminen, R. M., Betz, G., Husinsky, W., Shapiro, M. H., Vicanek, M., Urbassek, H. M.
Number of pages: 14
Pages: 110-123
Publication date: 1 Feb 1989
Peer-reviewed: Yes

Publication information

Journal: Nuclear Inst. and Methods in Physics Research, B
Volume: 36
Issue number: 2
ISSN (Print): 0168-583X
Original language: English
ASJC Scopus subject areas: Nuclear and High Energy Physics, Instrumentation
DOIs:

10.1016/0168-583X(89)90573-9
Source: Scopus
Source ID: 0008335191
Research output: Contribution to journal › Article › Scientific › peer-review

Inertial Odometry on Handheld Smartphones

Building a complete inertial navigation system using the limited quality data provided by current smartphones has been regarded challenging, if not impossible. This paper shows that by careful crafting and accounting for the weak information in the sensor samples, smartphones are capable of pure inertial navigation. We present a probabilistic approach for orientation and use-case free inertial odometry, which is based on double-integrating rotated accelerations. The strength of the model is in learning additive and multiplicative IMU biases online. We are able to track the phone position, velocity, and pose in realtime and in a computationally lightweight fashion by solving the inference with an extended Kalman filter. The information fusion is completed with zero-velocity updates (if the phone remains stationary), altitude correction from barometric pressure readings (if available), and pseudo-updates constraining the momentary speed. We demonstrate our approach using an iPad and iPhone in several indoor dead-reckoning applications and in a measurement tool setup.

General information

Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Signal Processing, Research group: Artificial Intelligence and Vision - AIV, Aalto University
Contributors: Solin, A., Cortes, S., Rahtu, E., Kannala, J.
Number of pages: 8

Pages: 1361-1368
Publication date: 5 Sep 2018

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Title of host publication: 2018 21st International Conference on Information Fusion, FUSION 2018
Publisher: IEEE
Article number: 8455482
ISBN (Print): 9780996452762
ASJC Scopus subject areas: Computer Vision and Pattern Recognition, Signal Processing, Statistics, Probability and Uncertainty, Instrumentation
DOIs:
10.23919/ICIF.2018.8455482
Source: Scopus
Source ID: 85054102788
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Detection of KC1 and KOH using collinear photofragmentation and atomic absorption spectroscopy

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Department of Physics, Photonics, Frontier Photonics, Optics Laboratory, Department of Physics, Tampere University of Technology
Contributors: Sorvajarvi, T., Rossi, J., Toivonen, J.
Publication date: 2013

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Title of host publication: The European Conference on Lasers and Electro-Optics, CLEO_Europe 2013
ISBN (Print): 9781479905942
ASJC Scopus subject areas: Instrumentation, Atomic and Molecular Physics, and Optics
URLs:
http://www.scopus.com/inward/record.url?scp=84898750873&partnerID=8YFLogxK (Link to publication in Scopus)
Source: Scopus
Source ID: 84898750873
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Inkjet-printed dual microfluidic-based sensor integrated system
Demonstrated is a novel method to the fabrication of microfluidic devices utilizing a dual-sensor approach. The fabrication incorporates the use of poly(methyl-methacrylate) (PMMA) and inkjet-printing techniques. PMMA, a low-cost, robust material with low dielectric loss, is ideal for sensor fabrication. In addition, inkjet-printing polymer (SU-8) as a bonding layer dramatically improves the bonding strength and pressure handling. Furthermore, this system integrates two independent sensors in the same circuit, enabling concurrent calibration of two fluids. Based on the reaction in one sensor, response in another sensor for the same fluid can be predicted. The two sensors both have a sensitivity over 21 %/log(r) and a good independence in calibrating fluids. The sensor system works at microwave frequency, enabling applications in wireless sensing including various chemical analysis.

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 Electrical and Computer Engineering, University of Perugia
Contributors: Su, W., Cooper, J. R., Cook, B. S., Tentzeris, M. M., Mariotti, C., Roselli, L.
Publication date: 31 Dec 2015

Host publication information
Title of host publication: 2015 IEEE SENSORS - Proceedings
Publisher: Institute of Electrical and Electronics Engineers Inc.
Article number: 7370300
ISBN (Electronic): 9781479982028
ASJC Scopus subject areas: Instrumentation, Electronic, Optical and Magnetic Materials, Spectroscopy, Electrical and Electronic Engineering
Keywords: additive manufacturing, inkjet printing, microfluidics
DOIs:
10.1109/ICSENS.2015.7370300

URLs:

http://www.scopus.com/inward/record.url?scp=84963626729&partnerID=8YFLogxK (Link to publication in Scopus)
Source: Scopus
Source ID: 84963626729
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Low-cost microfluidics-enabled tunable loop antenna using inkjet-printing technologies

A low-cost and disposable loop antenna is proposed, which consists of a microfluidics-enabled tunable square loop and a microfluidics-enabled tunable balun to guarantee a similar radiation pattern over a reconfigurable 'liquid-controlled' frequency range. By inserting different fluids over partial sections of the loop and the balun, the proposed antenna can achieve a frequency range of 2.28 GHz for water filled channel to 2.45 GHz for empty channel. The proposed antenna is fabricated in a low-cost and non-cleanroom process by integrating inkjet-printing with laser-etching techniques. This antenna can be used as a fluid sensor for biomedical or chemical assay, as well as a tunable antenna for communication applications. The microfluidics-enabled tunable embedded balun can be applied independently as a wideband balun for various communication, sensing and biomonitoring 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, School of Electrical and Computer Engineering
Contributors: Su, W., Cook, B. S., Tentzeris, M. M.
Publication date: 27 Aug 2015

Host publication information

Title of host publication: 2015 9th European Conference on Antennas and Propagation, EuCAP 2015
Publisher: Institute of Electrical and Electronics Engineers Inc.
Article number: 7228990
ISBN (Electronic): 9788890701856
ASJC Scopus subject areas: Instrumentation, Radiation, Computer Networks and Communications
Keywords: additive manufacturing, inkjet printing, loop antenna, microfluidics, tunable antenna, tunable balun
URLs:

http://www.scopus.com/inward/record.url?scp=84949664380&partnerID=8YFLogxK (Link to publication in Scopus)
Source: Scopus
Source ID: 84949664380
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

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

Design and development of a novel passive wireless ultrasensitive RF temperature transducer for remote sensing
A wireless, passive, and ultrasensitive temperature transducer is presented in this paper. The transducer consists of split ring resonators loaded with micro-bimorph cantilevers, which can potentially operate up to millimeter-wave frequencies (above 30 GHz). As the temperature changes, the bimorph cantilevers deflect and result in a shift of the resonant frequency of the split rings. A design is proposed, that has a maximum sensitivity of 2.62 GHz/μ m, in terms of frequency shift per deflection unit, corresponding to a sensitivity of 498 MHz/°C for an operating frequency around 30 GHz, i.e., a frequency shift of 1.6% per °C. Theoretically, it's about two orders of magnitude higher than the existing sensors observed in the same class. This sensor design also offers a high Q factor and is ultra-compact, enabling easy fabrication and integration in micro-electromechanical systems technology. Depending on the choice of materials, the proposed designs can also be utilized in harsh environments. As a proof of concept, a prototype is implemented around 4.7 GHz which exhibits a frequency shift of 0.05%/°C, i.e., 17 times more sensitive than the existing sensors.

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Sensing Systems for Wireless Medicine (MediSense), Microsoft Research, LAAS-CNRS, University of Toulouse, INP, LAAS-CNRS, Georgia Institute of Technology
Contributors: Thai, T. T., Mehdi, J. M., Chebila, F., Aubert, H., Pons, P., Dejean, G. R., Tentzeris, M. M., Plana, R.
Number of pages: 11
Pages: 2756-2766
Publication date: 2012
Peer-reviewed: Yes

Publication information
Journal: IEEE Sensors Journal
Volume: 12
Issue number: 9
Article number: 6208808
ISSN (Print): 1530-437X
Ratings:

Scopus rating (2012): CiteScore 2.09 SJR 0.663 SNIP 1.608
Original language: English
ASJC Scopus subject areas: Electrical and Electronic Engineering, Instrumentation
Keywords: Micro-electromechanical systems (MEMS) cantilevers, passive remote sensing, radar cross section (RCS), radio frequency transducer, split ring resonators (SRRs), temperature sensor, wireless sensor
DOIs:

10.1109/JSEN.2012.2201463
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http://www.scopus.com/inward/record.url?scp=84864561259&partnerID=8YFLogxK (Link to publication in Scopus)
Source: Scopus
Source ID: 84864561259
Research output: Contribution to journal › Article › Scientific › peer-review

Statistical evaluation of barkhausen noise testing (BNT) for ground samples
Barkhausen noise testing (BNT) is a nondestructive method for investigating many properties of ferromagnetic materials. The most common application is the monitoring of grinding burns caused by introducing locally high temperatures while grinding. Other features, such as microstructure, residual stress changes, hardening depth, and so forth, can be monitored as well. Nevertheless, because BNT is a method based on a complex magnetoelectric phenomenon, it is not yet standardized. Therefore, there is a need to study the traceability and stability of the measurement method. This study

aimed to carry out a statistical analysis of ferromagnetic samples after grinding processes by the use of BNT. The first part of the experiment was to grind samples in different facilities (Sweden and Finland) with similar grinding parameters, different grinding wheels, and different hardness values. The second part was to evaluate measured BNT parameters to determine significant factors affecting BNT signal value. The measurement data from the samples were divided into two different batches according to where they were manufactured. Both grinding batches contained measurement data from three different participants. The main feature for calculation was the root-mean-square (RMS) value. The first processing step was to normalize the RMS values for all the measurements. A standard analysis of variance (ANOVA) was applied for the normalized dataset. The ANOVA showed that the grinding parameters had a significant impact on the BNT signal value, while the other investigated factors (e.g., participant) were negligible. The reasons for this are discussed at the end of the paper.

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Materials Science and Environmental Engineering, Univ of Oulu, Schlumpf Scandinavia AB, Kungliga Tekniska Högskolan KTH
Contributors: Tomkowski, R., Sorsa, A., Santa-Aho, S., Lundin, P., Vippola, M.
Publication date: 1 Nov 2019
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Volume: 19
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Article number: 4716
ISSN (Print): 1424-8220
Original language: English
ASJC Scopus subject areas: Analytical Chemistry, Biochemistry, Atomic and Molecular Physics, and Optics, Instrumentation, Electrical and Electronic Engineering
Keywords: ANOVA, Barkhausen noise testing (BNT), Proficiency test, Uncertainty
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http://urn.fi/URN:NBN:fi:tuni-201911135926
Source: Scopus
Source ID: 85074321480
Research output: Contribution to journal › Article › Scientific › peer-review

160W single-frequency laser based on active tapered double-clad fiber amplifier

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Tampere University of Technology, Frontier Photonics, A. M. Prokhorov General Physics Institute, Russian Academy of Sciences, Moscow State University, Tampere University of Technology, Institute of Radio Engineering and Electronics of the Russian Academy of Sciences
Contributors: Trikshev, A. I., Kurkov, A. S., Tsvetkov, V. B., Filatova, S. A., Kertulla, J., Filippov, V., Chamorovskiy, Y. K., Okhotnikov, O. G.
Publication date: 2013

Host publication information
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ISBN (Print): 9781479905942
ASJC Scopus subject areas: Instrumentation, Atomic and Molecular Physics, and Optics
URLs:

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Source: Scopus
Source ID: 84898722786
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Development of a constant dilution sampling system for particulate and gaseous pollutant measurements

This paper presents a new concept of a partial flow sampling system (PFSS), involving a two-stage diluter which operates on the principle of underpressure, while exhaust is sampled through a capillary. Due to the low flowrate through the

capillary, the diluter may be sampling from a freely exhausting tailpipe and is not prone to pressure variations in the exhaust line. In addition, the PFSS operates at constant pressure conditions even upstream of diesel particle filters that increase the backpressure in the tailpipe. As a result, the PFSS offers a constant dilution ratio (DR) over any engine or vehicle operation condition. This study presents the diluter concept and a straightforward model developed to calculate the DR, depending on the dilution air flowrate and the diluter underpressure. The model is validated using CO_2 as a trace gas, and very good agreement is demonstrated between the calculated and the measured DR values. Following validation, the PFSS is combined with aerosol measurement instruments to measure the exhaust particle concentration of a diesel engine operating at different steady-state modes. For demonstrating the stability of the DR and applicability of the PFSS, measurements are conducted with both heavy duty and light duty diesel exhaust gases. Future applications of this device include gas and particle exhaust measurements both in laboratory environments and on-board vehicles.

General information
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MoE publication type: A1 Journal article-refereed
Organisations: Urban circular bioeconomy (UrCirBio), Aristotle University of Thessaloniki, Laboratory of Applied Thermodynamics, Dekati Ltd
Contributors: Tzamkiozis, T., Ntziachristos, L., Amanatidis, S., Niemelä, V., Ukkonen, A., Samaras, Z.
Publication date: Aug 2013
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Article number: 085801
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Original language: English
ASJC Scopus subject areas: Applied Mathematics, Instrumentation
DOIs:

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Source: Scopus
Source ID: 84880789628
Research output: Contribution to journal › Article › Scientific › peer-review

New Evidence for the Mechanism of Action of a Type-2 Diabetes Drug Using a Magnetic Bead-Based Automated Biosensing Platform

The mechanism of action (MOA) of the first line type-2 diabetes drug metformin remains unclear despite its widespread usage. However, recent evidence suggests that the mitochondrial copper (Cu)-binding action of metformin may contribute toward the drug's MOA. Here, we present a novel biosensing platform for investigating the MOA of metformin using a magnetic microbead-based agglutination assay which has allowed us to demonstrate for the first time the interaction between Cu and metformin at clinically relevant low micromolar concentrations of the drug, thus suggesting a potential pathway of metformin's blood-glucose lowering action. In this assay, cysteine-functionalized magnetic beadswere agglutinated in the presence of Cu due to cysteine's Cu-chelation property. Addition of clinically relevant doses of metformin resulted in disaggregation of Cu-bridged bead-clusters, whereas the effect of adding a closely related but blood-glucose neutral drug propanediimidamide (PDI) showed completely different responses to the clusters. The entire assay was integrated in an automated microfluidics platform with an advanced optical imaging unit by which we investigated these aggregation-disaggregation phenomena in a reliable, automated, and user-friendly fashion with total assay time of 17 min requiring a sample (metformin/PDI) volume of 30 μL. The marked difference of Cu-binding action between the blood-glucose lowering drug metformin and its inactive analogue PDI thus suggests that metformin's distinctive Cu-binding properties may be required for its effect on glucose homeostasis. The novel automated platform demonstrating this novel investigation thus holds the potential to be utilized for investigating significant and sensitive molecular interactions via magnetic bead-based agglutination assay.

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Chemistry and Bioengineering, Danmarks Tekniske Universitet, DTU Informatik, University of Dundee, Academia Sinica Taiwan
Contributors: Uddin, R., Nur-E-Habiba, N., Rena, G., Hwu, E. T., Boisen, A.
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Pages: 1329-1336

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Peer-reviewed: Yes

Publication information
Journal: ACS Sensors
Volume: 2
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ISSN (Print): 1424-8220
Ratings:

Scopus rating (2017): CiteScore 3.23 SJR 0.584 SNIP 1.567
Original language: English
ASJC Scopus subject areas: Bioengineering, Fluid Flow and Transfer Processes, Process Chemistry and Technology, Instrumentation
Keywords: agglutination assay, biosensor, magnetic beads, metformin, molecular interactions, optical imaging, type-2 diabetes
DOIs:

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Bibliographical note
INT=keb,"Nur-E-Habiba, N."
Source: Scopus
Source ID: 85029817525
Research output: Contribution to journal › Article › Scientific › peer-review

Fluorimetric oxygen sensor with an efficient optical read-out for in vitro cell models
This paper presents a phase fluorimetric sensor for the monitoring of the oxygen concentration in in vitro cell models. The sensing surface of the sensor consists of oxygen sensitive fluorescent dyes (platinum(II) octaethylporphyrinketone) embedded in a thin polystyrene film. In order to optimize the optical read-out scheme of the sensor, we carried out electromagnetic simulations of a fluorescently doped polystyrene film deposited on a glass-water interface. The simulation results showed highly anisotropic angular emission distribution with the maximum irradiance being at super critical angles, which attracts tailored optical designs to maximize the fluorescence collection efficiency. For this purpose, we applied an efficient optical read-out scheme based on an in-contact parabolic lens. The use of parabolic lens also facilitates confocal total internal reflection excitation from the substrate side. This makes the excitation effective and insensitive to biofouling or other optical changes in the sensing surface and, more importantly, greatly reduces the amount of excitation power radiated into the cell culture chamber. Experimental results show that when applied together with phase fluorimetric lifetime sensing, this optical scheme allows one to use thin films (

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: BioMediTech, Faculty of Biomedical Sciences and Engineering, Research group: Micro and Nanosystems Research Group, Research area: Microsystems, Research group: Sensor Technology and Biomeasurements (STB), VTT Technical Research Centre of Finland, BioMediTech Institute and Faculty of Biomedical Sciences and Engineering
Contributors: Välimäki, H., Verho, J., Kreutzer, J., Kattipparambil Rajan, D., Ryynänen, T., Pekkanen-Mattila, M., Ahola, A. , Tappura, K., Kallio, P., Lekkala, J.
Number of pages: 9
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Publication date: 1 Oct 2017
Peer-reviewed: Yes

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Journal: Sensors and Actuators B: Chemical
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ISSN (Print): 0925-4005
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Scopus rating (2017): CiteScore 5.67 SJR 1.406 SNIP 1.453
Original language: English
ASJC Scopus subject areas: Electronic, Optical and Magnetic Materials, Instrumentation, Condensed Matter Physics, Surfaces, Coatings and Films, Metals and Alloys, Materials Chemistry, Electrical and Electronic Engineering
Keywords: Cardiac cells, Enhanced optical read-out, Fluorimetric oxygen sensor, in vitro cell models, PtOEPK, Thin film fluorescence
DOIs:

10.1016/j.snb.2017.04.182
Source: Scopus
Source ID: 85019164799

Ranges and stopping power of KeV electrons in the solid hydrogens

1-3 keV electron ranges and stopping power in the solid hydrogens have been investigated by the Monte Carlo simulation method on the basis of experimental thin film measurements. In the simulation, elastic scattering cross sections are calculated exactly using the single-atom crystalline potentials. Inelastic processes for gold are treated by modifying Gryziński's semiempirical expression for each core and valence electron excitation. For H_2 the ionization cross section from Green and Sawada is applied together with the gas phase stopping power from Parks et al. Simulations of electron penetration in a layer of solid hydrogen on a gold substrate with normal incidence and reflection from bulk hydrogen with different angles of incidence are fitted to experimental measurements by adjusting the stopping power of electrons in solid hydrogen. It is found to be 0.75 times the stopping power for the gas phase. The mean path length and mean penetration depth of electrons in solid hydrogen are determined from the simulations with this modified stopping power. Also the full penetration depth distributions are presented as well as their Gaussian parametrizations. The previously determined measured projected range is almost equal to the calculated mean path length.

General information

Publication status: Published
MoE publication type: Not Eligible
Organisations: Association EURATOM - Risø National Laboratory, Risø Campus, Aalto University
Contributors: Valkealahti, S., Schou, J., Sørensen, H., Nieminen, R. M.
Number of pages: 11
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Publication date: 1 Jan 1988
Peer-reviewed: Yes

Publication information

Journal: Nuclear Inst. and Methods in Physics Research, B
Volume: 34
Issue number: 3
ISSN (Print): 0168-583X
Original language: English
ASJC Scopus subject areas: Nuclear and High Energy Physics, Instrumentation
DOIs:
10.1016/0168-583X(88)90052-3
Source: Scopus
Source ID: 0024082640
Research output: Contribution to journal › Article › Scientific › peer-review

Molecular dynamics simulation of the damage production in Al (110) surface with slow argon ions

We have developed a molecular dynamics simulation program to gain more insight into the sputtering process, especially the damage produced by it. We have studied the sputtering of aluminium (110) surface with argon ions. The Morse pair potentail was used for Al-Al interaction, the Lennard-Jones potential for Ar-Ar interaction and both the Molière potential and the universal potential of Ziegler et al. for Ar-Al interaction. An electronic friction term proportional to the particle velocities was also used. The studied incident argon ion energies and angles were 200 and 400 eV and 0° (normal), 25°, 45° and 75°, respectively. The calculated sputtering yield and the overall shape and the mean depth of the vacancy profiles agree with the experimental results. The obtained profiles contain a narrow peak within the topmost atomic layers, followed by a weak tail deeper in the material. The intersitial and argon ion distributions are much more spread out at larger depths. The total number of vacancies per incident Ar^+ ion varies from 0 to 7, increasing as function of Ar^+ ion energy.

General information

Publication status: Published
MoE publication type: Not Eligible
Organisations: Jyväskylän yliopisto
Contributors: Valkealahti, S., Nieminen, R. M.
Number of pages: 5
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Volume: 18
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ISSN (Print): 0168-583X

Original language: English
ASJC Scopus subject areas: Nuclear and High Energy Physics, Instrumentation
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10.1016/S0168-583X(86)80060-X
Source: Scopus
Source ID: 0022664315
Research output: Contribution to journal › Article › Scientific › peer-review

Self-assembled monolayers (SAMs) of porphyrin deposited inside solid-core photonic crystal fibre (SCPCF)
Photochemical and physical properties of solid-core photonic crystal fibre (SCPCF) modified inside with porphyrin films attached via self-assembled monolayer (SAM) technique are reported. Porphyrins can be utilized to develop different gas sensors.

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Department of Chemistry and Bioengineering, Chemistry and Bioengineering, Optoelectronics Research Centre, Frontier Photonics, Russian Academy of Sciences
Contributors: Veselov, A., Efimov, A., Chamorovskiy, A., Okhotnikov, O., Kosolapov, A., Levchenko, A., Lemmetyinen, H., Tkachenko, N.
Publication date: 2011

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Title of host publication: Access Networks and In-house Communications, ANIC 2011
ISBN (Print): 9781557529138
ASJC Scopus subject areas: Instrumentation, Atomic and Molecular Physics, and Optics
URLs:
http://www.scopus.com/inward/record.url?scp=84893608733&partnerID=8YFLogxK (Link to publication in Scopus)
Source: Scopus
Source ID: 84893608733
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Joint-Space Kinematic Model for Gravity-Referenced Joint Angle Estimation of Heavy-Duty Manipulators
A gravity-referenced joint angle estimation, which acts in joint space, is proposed for multiple-degree-of-freedom hydraulic manipulators. As a novelty, the estimation pairs up inertial units across a section of an open kinematic chain. In this way, the three-axis linear accelerometers and the three-axis rate gyros provide a drift-free solution for observing the motion state of a rotary joint connecting two links without relying on the full forward kinematics. For a low-noise, low-delay estimate, the linear accelerations acting on the paired inertial units are modeled and robustly combined with the principles of complementary and Kalman filtering. In pick-and-place experiments with a serial-link manipulator on a multiton, off-road forestry vehicle, joint angle sensing error of less than ±1° was achieved in spite of the dynamic interaction between the vehicle base and the terrain. Furthermore, the kinematic modeling's ability to compensate for the nonplanar, coupled 3-D linkage motion is studied for one- and two-axis rate measurements along with Cartesian path tracking. This gives new insights from the typical planar kinematic models and heavy-duty control viewpoints.

General information
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MoE publication type: A1 Journal article-refereed
Organisations: Signal Processing, Automation and Hydraulic Engineering, Research group: Mobile manipulation, Research group: MMDM
Contributors: Vihonen, J., Mattila, J., Visa, A.
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Volume: 66
Issue number: 12
ISSN (Print): 0018-9456
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Original language: English
ASJC Scopus subject areas: Instrumentation, Electrical and Electronic Engineering
Keywords: Acceleration, Accelerometers, Couplings, Estimation, gyroscopes, Kinematics, kinematics, Manipulators, manipulators, microelectromechanical devices., Robot sensing systems

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Source: Scopus
Source ID: 85030782867
Research output: Contribution to journal › Article › Scientific › peer-review

Cysteine-tagged chimeric avidin forms high binding capacity layers directly on gold

Cysteine-tagged, genetically engineered avidin named ChiAvd-Cys and wild-type avidin form monolayers or bilayer structures when immobilised directly on gold. Non-specific binding can be reduced by a post-treatment of the avidin layers with a N-[tris(hydroxymethyl)methyl]-acrylamide (pTHMMAA) polymer. ChiAvd-Cys showed excellent activity when immobilised on gold. About 70% of the ChiAvd-Cys molecules were able to bind two biotinylated green fluorescent proteins (per avidin tetramer). Amino-biotinylated antibody $F(ab')_2$ fragments could be bound to every 4th and 8th ChiAvd-Cys and wild-type avidin molecule, respectively, whereas on average one thiol-biotinylated antibody Fab′-fragment was bound to every ChiAvd-Cys. Antigen binding to the thiol-biotinylated Fab′-fragment bound to the ChiAvd-Cys/pTHMMAA layer was almost twice compared to that of the amino-biotinylated $F(ab')_2$-fragments. The high antigen binding was due to a site-directed orientation of the thiol-biotinylated fragments. The ChiAvd-Cys/pTHMMAA layers offer high capacity that may be used to couple biotinylated compounds on biosensor surfaces.

General information

Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Multi-scaled biodata analysis and modelling (MultiBAM), VTT Technical Research Centre of Finland, School of Management (JKK), Adult Stem Cells, Tampere University Hospital
Contributors: Vikholm-Lundin, I., Auer, S., Paakkunainen, M., Määttä, J. A. E., Munter, T., Leppiniemi, J., Hytönen, V. P., Tappura, K.
Number of pages: 9
Pages: 440-448
Publication date: Aug 2012
Peer-reviewed: Yes

Publication information

Journal: Sensors and Actuators B: Chemical
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Original language: English
ASJC Scopus subject areas: Instrumentation, Materials Chemistry, Surfaces, Coatings and Films, Metals and Alloys, Electronic, Optical and Magnetic Materials, Condensed Matter Physics, Electrical and Electronic Engineering
Keywords: Avidin, Biotin, Cysteine tagged, Non-specific binding, Self-assembled monolayer
DOIs:
10.1016/j.snb.2012.05.008
URLs:
http://www.scopus.com/inward/record.url?scp=84864284365&partnerID=8YFLogxK (Link to publication in Scopus)
Source: Scopus
Source ID: 84864284365
Research output: Contribution to journal › Article › Scientific › peer-review

Detection of 3,4-methylenedioxymethamphetamine (MDMA, ecstasy) by displacement of antibodies

A molecular layer with low non-specific binding enabling determination of low concentrations of 3,4-methylenedioxymethamphetamine (MDMA) by the displacement of antibodies has been developed. Antibody Fab′-fragments at various concentrations have been site-directly immobilised on gold and intercalated with a hydrophilic non-ionic polymer that reduces non-specific binding. Bovine serum albumin conjugated with MDMA and various concentrations of anti-MDMA antibodies were bound to the layer. The amount of conjugates and antibodies bound was dependent on the amount of Fab′-fragments in the layer. Antibodies were also bound to the conjugates physisorbed directly onto the gold surface and in mixtures with the polymer or with a lipoamide. A high displacement of antibodies was observed by surface plasmon resonance (SPR) on interaction of MDMA with the different layers in buffer solution. No displacement could, however, be observed in saliva with the pure conjugate layer because of a high non-specific binding of proteins. When the conjugates were coupled to the surface through the antibody Fab-fragment/polymer layer, MDMA concentrations as low as 0.02 ng mL^{-1} (0.14 nM) could easily be detected in buffer. In diluted saliva the lowest limit of detection was 0.4 ng mL^{-1} enabling determination of drugs from saliva with a cut-off concentration of 2 ng mL^{-1}. The molecular layer of antibody Fab′-fragments and polymer thus shows great potential for binding conjugates and antibodies that can be displaced on the interaction with very low concentrations of small-sized molecules. A low non-specific binding is guaranteed by the presence of the hydrophilic polymer.

General information
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MoE publication type: A1 Journal article-refereed
Organisations: Multi-scaled biodata analysis and modelling (MultiBAM), VTT Technical Research Centre of Finland, Biosensors Applications AB
Contributors: Vikholm-Lundin, I., Auer, S., Hellgren, A. C.
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Publication date: 10 Aug 2011
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Issue number: 1
ISSN (Print): 0925-4005
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Original language: English
ASJC Scopus subject areas: Electronic, Optical and Magnetic Materials, Instrumentation, Condensed Matter Physics, Surfaces, Coatings and Films, Metals and Alloys, Materials Chemistry, Electrical and Electronic Engineering
Keywords: Antibody displacement, Drugs of abuse, Ecstasy, Immobilisation, MDMA, Surface plasmon resonance
DOIs:

10.1016/j.snb.2011.03.069
URLs:

http://www.scopus.com/inward/record.url?scp=79957806721&partnerID=8YFLogxK (Link to publication in Scopus)
Source: Scopus
Source ID: 79957806721
Research output: Contribution to journal › Article › Scientific › peer-review

Microwave assisted laser-induced breakdown spectroscopy at ambient conditions
Signal enhancements in laser-induced breakdown spectroscopy (LIBS) using external microwave power are demonstrated in ambient air. Pulsed microwave at 2.45 GHz and of 1 millisecond duration was delivered via a simple near field applicator (NFA), with which an external electric field is generated and coupled into laser induced plasma. The external microwave power can significantly increase the signal lifetime from a few microseconds to hundreds of microseconds, resulting in a great enhancement on LIBS signals with the use of a long integration time. The dependence of signal enhancement on laser energy and microwave power is experimentally assessed. With the assistance of microwave source, a significant enhancement of ~ 100 was achieved at relatively low laser energy that is only slightly above the ablation threshold. A limit of detection (LOD) of 8.1 ppm was estimated for copper detection in Cu/Al_2O_3 solid samples. This LOD corresponds to a 93-fold improvement compared with conventional single-pulse LIBS. Additionally, in the microwave assisted LIBS, the self-reversal effect was greatly reduced, which is beneficial in measuring elements of high concentration. Temporal measurements have been performed and the results revealed the evolution of the emission process in microwave-enhanced LIBS. The optimal position of the NFA related to the ablation point has also been investigated.

General information
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MoE publication type: A1 Journal article-refereed
Organisations: Department of Physics, Research area: Optics, Research group: Applied Optics, Optics Laboratory, Department of Physics, Tampere University of Technology, University of Adelaide
Contributors: Viljanen, J., Sun, Z., Alwahabi, Z. T.
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Volume: 118
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Original language: English
ASJC Scopus subject areas: Instrumentation, Atomic and Molecular Physics, and Optics, Analytical Chemistry, Spectroscopy

Keywords: Copper Detection, Laser-induced breakdown spectroscopy, Microwave signal enhancement
DOIs:

10.1016/j.sab.2016.02.002
Source: Scopus
Source ID: 84962861465
Research output: Contribution to journal › Article › Scientific › peer-review

Evaluation of dry electrodes in canine heart rate monitoring

The functionality of three dry electrocardiogram electrode constructions was evaluated by measuring canine heart rate during four different behaviors: Standing, sitting, lying and walking. The testing was repeated (n = 9) in each of the 36 scenarios with three dogs. Two of the electrodes were constructed with spring-loaded test pins while the third electrode was a molded polymer electrode with Ag/AgCl coating. During the measurement, a specifically designed harness was used to attach the electrodes to the dogs. The performance of the electrodes was evaluated and compared in terms of heartbeat detection coverage. The effect on the respective heart rate coverage was studied by computing the heart rate coverage from the measured electrocardiogram signal using a pattern-matching algorithm to extract the R-peaks and further the beat-to-beat heart rate. The results show that the overall coverage ratios regarding the electrodes varied between 45-95% in four different activity modes. The lowest coverage was for lying and walking and the highest was for standing and sitting.

General information

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MoE publication type: A1 Journal article-refereed
Organisations: Faculty of Biomedical Sciences and Engineering, Pervasive Computing, Research group: Sensor Technology and Biomeasurements (STB), University of Helsinki, Institute of Biomedical Engineering and Informatics, University of Tampere (UTA), Research Group for Emotions
Contributors: Virtanen, J., Somppi, S., Törnqvist, H., Jeyhani, V., Fiedler, P., Gizatdinova, Y., Majaranta, P., Väätäjä, H., Cardó, A. V., Lekkala, J., Tuukkanen, S., Surakka, V., Vainio, O., Vehkaoja, A.
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Research output: Contribution to journal › Article › Scientific › peer-review

Inkjet printed, self powered, wireless sensors for environmental, gas, and authentication-based sensing

In this paper, inkjet-printed flexible sensors fabricated on paper substrates are introduced as a system-level solution for ultra-low-cost mass production of UHF Radio Frequency Identification (RFID) Tags and wireless sensor nodes in a green approach that could be easily extended to other microwave and wireless applications. The authors briefly touch up the state-of-the-art area of fully integrated wireless sensor modules on paper and show several active and power scavenging platforms to power on wireless sensors that could potentially set the foundation for the truly convergent wireless sensor ad hoc networks of the future. Plus, the authors address the integration of carbon-nanotubes on paper substrates for the realization of ultra sensitive (parts per billion) gas sensors and present benchmarking results for various scavenging approaches involving solar and charge transfer-based mechanisms. Various challenges of packaging, passives, antennas, sensors and power sources integration are investigated in terms of ruggedness, reliability and flexibility performance for space, automotive, "smart-skin" and wearable applications.

General information
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Organisations: Sensing Systems for Wireless Medicine (MediSense), Georgia Institute of Technology, University of Waterloo, Texas Instruments, University of Perugia
Contributors: Vyas, R., Lakafosis, V., Lee, H., Shaker, G., Yang, L., Orecchini, G., Traille, A., Tentzeris, M. M., Roselli, L.
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Scopus rating (2011): CiteScore 2.13 SJR 0.693 SNIP 1.636
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ASJC Scopus subject areas: Instrumentation, Electrical and Electronic Engineering
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Research output: Contribution to journal › Article › Scientific › peer-review

Location-based beamforming architecture for efficient farming applications with drones
This paper proposes a drone-based architecture with location-based beamforming (LBBF)and edge computing support for efficient crop harvesting and management in order to reduce the food waste in the food chain in farming applications. Monitoring the crop is a crucial part in the food chain. In this work, for monitoring purpose we consider synthetic aperture radar (SAR)mounted on the unmanned aerial vehicles (UAVs). In order to provide the edge computing information with good reliability, small latency and good throughput, we introduce a LBBF technique for the uplink connectivity. Firstly, the LBBF algorithm is proposed for the scenario where a single user is connected to the base station under analog beamforming scheme. Secondly, in the context of LBBF, we apply an optimization of the antenna size under the uniform rectangular array (URA)assumption. Thirdly, we implement a numerical analysis to compare LBBF with the traditional channel state information (CSI)-based beamforming. We show that the LBBF outperforms the CSI-based beamforming in the noisy environments according to the investigated performance metrics, namely the reliability of the connectivity and the capacity. In addition, the LBBF also has smaller latency than CSI-based beamforming.

General information
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Organisations: Electrical Engineering, Research group: Wireless Communications and Positioning
Contributors: Wang, W., Okati, N., Tanash, I., Riihonen, T., Lohan, E.
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ASJC Scopus subject areas: Computer Networks and Communications, Aerospace Engineering, Instrumentation
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Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Sensitivity modeling of an RFID-based strain-sensing antenna with dielectric constant change

An radiofrequency identification (RFID)-based folded patch antenna has been developed as a novel passive wireless sensor to measure surface strain and crack, for the structural health monitoring of metallic structures. Up to 2.5 m of read range is achieved by a proof-of-concept prototype patch antenna sensor with a strain sensitivity around -760 Hz/μ ε, which is equivalent to a normalized strain sensitivity of -0.74 ppm/μ ε. In this paper, we propose to consider the change of the substrate dielectric constant due to strain when modeling the antenna sensor. An enhanced strain sensitivity model is introduced for more accurately estimating the strain sensing performance of the hereby introduced smart skin antenna sensor. Laboratory experiments are carried out to quantify the dielectric constant change under strain. The measurement results are incorporated into a mechanics-electromagnetics coupled simulation model. Accuracy of the multi-physics coupled simulation is improved by integrating dielectric constant change in the model.

General information

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Organisations: Sensing Systems for Wireless Medicine (MediSense), ExxonMobil Upstream Research Company, DirecTV , Georgia Institute of Technology, Georgia Institute of Technology, School of Electrical and Computer Engineering
Contributors: Yi, X., Wu, T., Wang, Y., Tentzeris, M. M.
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Source ID: 84941557336
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Energy Detection-Based Spectrum Sensing over Fisher-Snedecor F Fading Channels

This paper investigates the performance of energy detection-based spectrum sensing over Fisher-Snedecor F fading channels. To this end, an analytical expression for the corre- sponding average detection probability is firstly derived and then this is extended to account for collaborative spectrum sensing. The complementary receiver operating characteristics (ROC) are analyzed for different conditions of the average signal-to- noise ratio (SNR), time-bandwidth product, multipath fading, shadowing and number of collaborating users. It is shown that the energy detection performance is strongly linked to the severity of the multipath fading and amount of shadowing, whereby even small variations in either of these physical phenomena significantly impact the detection probability. Also, the versatile modeling capability of the Fisher-Snedecor F distribution is veridfied in the context of energy detection based spectrum sensing as it provides considerably more accurate characterization than the conventional Rayleigh fading model. To confirm the validity of the analytical results presented in this paper, we compare them with the results of some simulations.

General information

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Organisations: Research group: Wireless Communications and Positioning, Electrical Engineering, Queen's University, Belfast, Northern Ireland, Centre for Wireless Innovation, Khalifa University, Department of Chemistry and Bioengineering , University of Surrey, German Jordanian University, Aristotle University of Thessaloniki
Contributors: Yoo, S. K., Cotton, S. L., Sofotasios, P. C., Muhaidat, S., Badarneh, O. S., Karagiannidis, G. K.
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Noncontact Respiration Monitoring during Sleep with Microwave Doppler Radar

This paper demonstrates the measurement of respiration waveform during sleep with a noncontact radar sensor. Instead of measuring only the respiration rate, the methods that allow monitoring the absolute respiration displacement were studied. Absolute respiration displacement can in theory be measured with a quadrature microwave Doppler radar sensor and using the nonlinear demodulation as the channel combining method. However, in this paper, relative respiration displacement measures were used as a reference. This is the first time that longer data sets have been analyzed successfully with the nonlinear demodulation method. This paper consists of whole-night recordings of three patients in an uncontrolled environment. The reference respiration data were obtained from a full polysomnography recorded simultaneously. The feasibility of the nonlinear demodulation in a real-life setting has been unclear. However, this paper shows that it is successful most of the time. The coverage of successfully demodulated radar data was ~ 58 %-78%. The use of the nonlinear demodulation is not possible in the following cases: 1) if the chest wall displacement is too small compared with the wavelength of the radar; 2) if the radar data do not form an arc-like shape in the IQ -plot; or 3) if there are large movement artifacts present in the data. Both in academic literature and in commercial radar devices, the data are processed based on the presumption that it forms either an arc or a line in the IQ -plot. Our measurements show that the presumption is not always valid.

General information

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Contributors: Zakrzewski, M., Vehkaoja, A., Joutsen, A. S., Palovuori, K. T., Vanhala, J. J.
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ORG=ase,0.25

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