

### **The effect of challenge-based gamification on learning: An experiment in the context of statistics education**

Gamification is increasingly employed in learning environments as a way to increase student motivation and consequent learning outcomes. However, while the research on the effectiveness of gamification in the context of education has been growing, there are blind spots regarding which types of gamification may be suitable for different educational contexts. This study investigates the effects of the challenge-based gamification on learning in the area of statistics education. We developed a gamification approach, called Horses for Courses, which is composed of main game design patterns related to the challenge-based gamification; points, levels, challenges and a leaderboard. Having conducted a 2 (read: yes vs. no) x 2 (gamification: yes vs. no) between-subject experiment, we present a quantitative analysis of the performance of 365 students from two different academic majors: Electrical and Computer Engineering (n=279), and Business Administration (n=86). The results of our experiments show that the challenge-based gamification had a positive impact on student learning compared to traditional teaching methods (compared to having no treatment and treatment involving reading exercises). The effect was larger for females or for students at the School of Electrical and Computer Engineering.

#### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Computing Sciences, National Technical University of Athens, Tampere University, Gamification Group

Contributors: Legaki, N. Z., Xi, N., Hamari, J., Karpouzis, K., Assimakopoulos, V.

Publication date: 1 Dec 2020

Peer-reviewed: Yes

#### **Publication information**

Journal: International Journal of Human Computer Studies

Volume: 144

Article number: 102496

ISSN (Print): 1071-5819

Original language: English

ASJC Scopus subject areas: Software, Human Factors and Ergonomics, Education, Engineering(all), Human-Computer Interaction, Hardware and Architecture

Keywords: Applications in education, Gamification, Human-Computer interface, Statistics education, Teaching forecasting

Electronic versions:

1-s2.0-S1071581920300987-main

DOIs:

10.1016/j.ijhcs.2020.102496

URLs:

<http://urn.fi/URN:NBN:fi:tuni-202007036315>

Source: Scopus

Source ID: 85086641706

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

### **Soft robotic gripper with compliant cell stacks for industrial part handling**

Robot object grasping and handling requires accurate grasp pose estimation and gripper/end-effector design, tailored to individual objects. When object shape is unknown, cannot be estimated, or is highly complex, parallel grippers can provide insufficient grip. Compliant grippers can circumvent these issues through the use of soft or flexible materials that adapt to the shape of the object. This letter proposes a 3D printable soft gripper design for handling complex shapes. The compliant properties of the gripper enable contour conformation, yet offer tunable mechanical properties (i.e., directional stiffness). Objects that have complex shape, such as non-constant curvature, convex and/or concave shape can be grasped blind (i.e., without grasp pose estimation). The motivation behind the gripper design is handling of industrial parts, such as jet and Diesel engine components. (Dis)assembly, cleaning and inspection of such engines is a complex, manual task that can benefit from (semi-)automated robotic handling. The complex shape of each component, however, limits where and how it can be grasped. The proposed soft gripper design is tunable by compliant cell stacks that deform to the shape of the handled object. Individual compliant cells and cell stacks are characterized and a detailed experimental analysis of more than 600 grasps with seven different industrial parts evaluates the approach.

#### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Automation Technology and Mechanical Engineering, Research group: Robotics and Automation

Contributors: Netzev, M., Angleraud, A., Pieters, R.

Number of pages: 8

Pages: 6821-6828

Publication date: 1 Oct 2020

Peer-reviewed: Yes

#### **Publication information**

Journal: IEEE Robotics and Automation Letters

Volume: 5

Issue number: 4

ISSN (Print): 2377-3766

Original language: English

ASJC Scopus subject areas: Control and Systems Engineering, Biomedical Engineering, Human-Computer Interaction, Mechanical Engineering, Computer Vision and Pattern Recognition, Computer Science Applications, Control and Optimization, Artificial Intelligence

Keywords: grasping, grippers and other end-effectors, Soft robotics

Electronic versions:

Soft Robotic Gripper With Compliant 2020

DOIs:

10.1109/LRA.2020.3020546

URLs:

<http://urn.fi/URN:NBN:fi:tuni-202009287146>

Source: Scopus

Source ID: 85091134388

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

### **Avatar capital: The relationships between player orientation and their avatar's social, symbolic, economic and cultural capital**

Our everyday lives are increasingly digitized, virtualized and gamified. People increasingly live and act through a collection of various digital personas and avatars. However, the question of how peoples' psychological traits may predict the traits and features of their virtual avatars is still relatively unexplored. In this study investigates the relationship between the traits related to gaming preferences and forms of capital (economic, cultural, social and symbolic) their avatar commands. The data was gathered through an online survey (n = 905) amidst the players of a MMORPG Final Fantasy XIV. The results indicate that avatar's cultural capital is associated player's orientation towards achievement-mechanics, immersion and social aspects of games. Economic capital is associated with player's orientation towards achievement and relationship sides of games. Social capital is associated with players' orientation towards immersion and social parts of games, and in-game interests of the player. Symbolic capital is associated with player's orientation towards achievement and social orientations and one's tenure in the game.

#### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Computing Sciences, Gamification Group, Turku University of Applied Science

Contributors: Korkeila, H., Hamari, J.

Number of pages: 8

Pages: 14-21

Publication date: 2020

Peer-reviewed: Yes

#### **Publication information**

Journal: Computers in Human Behavior

Volume: 102

ISSN (Print): 0747-5632

Original language: English

ASJC Scopus subject areas: Arts and Humanities (miscellaneous), Human-Computer Interaction, Psychology(all)

Keywords: Avatar, Capital, Digitalization, MMORPG, Video games, Virtualization

DOIs:

10.1016/j.chb.2019.07.036

Source: Scopus

Source ID: 85070617810

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

### **From Chance to Serendipity: Knowledge Workers' Experiences of Serendipitous Social Encounters**

Serendipity refers to uncontrolled circumstances that lead to unexpected yet fortunate discoveries. The phenomenon has been studied extensively in relation to information retrieval. However, serendipity in the context of social encounters has been the subject of few empirical studies. In professional life, social serendipity might result in benefits such as fruitful collaboration, successful recruitment, discovery of novel information, and acquisition of crucial new perspectives from peers. Despite the potential significance of serendipity, particularly for knowledge work, there is a lack of empirical understanding of related subjective experiences and the role of technology within the process of encountering unsought findings. This qualitative study investigates knowledge workers' detailed narratives of serendipitous social encounters and the related factors through an analysis of 37 responses to an international online survey. We provide a detailed account of the experiential characteristics and contextual qualities of the reported instances of social serendipity. Finally, we discuss

the seemingly minor role of technology in social serendipity and research avenues to computationally enhance social serendipity.

#### General information

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Computing Sciences, Information and Knowledge Management, Research group: Business Data Research Group

Contributors: Olshannikova, E., Olsson, T., Huhtamäki, J., Paasovaara, S., Kärkkäinen, H.

Publication date: 2020

Peer-reviewed: Yes

#### Publication information

Journal: Advances in Human-Computer Interaction

Volume: 2020

Article number: 1827107

ISSN (Print): 1687-5893

Original language: English

ASJC Scopus subject areas: Human-Computer Interaction

Electronic versions:

1827107

DOIs:

10.1155/2020/1827107

URLs:

<http://urn.fi/URN:NBN:fi:tuni-202004203386>

#### Bibliographical note

dupl=52528077

Source: Scopus

Source ID: 85082016624

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

#### Development of measurement instrument for visual qualities of graphical user interface elements (VISQUAL): a test in the context of mobile game icons

Graphical user interfaces are widely common and present in everyday human-computer interaction, dominantly in computers and smartphones. Today, various actions are performed via graphical user interface elements, e.g., windows, menus and icons. An attractive user interface that adapts to user needs and preferences is progressively important as it often allows personalized information processing that facilitates interaction. However, practitioners and scholars have lacked an instrument for measuring user perception of aesthetics within graphical user interface elements to aid in creating successful graphical assets. Therefore, we studied dimensionality of ratings of different perceived aesthetic qualities in GUI elements as the foundation for the measurement instrument. First, we devised a semantic differential scale of 22 adjective pairs by combining prior scattered measures. We then conducted a vignette experiment with random participant (n = 569) assignment to evaluate 4 icons from a total of pre-selected 68 game app icons across 4 categories (concrete, abstract, character and text) using the semantic scales. This resulted in a total of 2276 individual icon evaluations. Through exploratory factor analyses, the observations converged into 5 dimensions of perceived visual quality: Excellence/Inferiority, Graciousness/Harshness, Idleness/Liveliness, Normalness/Bizarreness and Complexity/Simplicity. We then proceeded to conduct confirmatory factor analyses to test the model fit of the 5-factor model with all 22 adjective pairs as well as with an adjusted version of 15 adjective pairs. Overall, this study developed, validated, and consequently presents a measurement instrument for perceptions of visual qualities of graphical user interfaces and/or singular interface elements (VISQUAL) that can be used in multiple ways in several contexts related to visual human-computer interaction, interfaces and their adaption.

#### General information

Publication status: E-pub ahead of print

MoE publication type: A1 Journal article-refereed

Organisations: Computing Sciences, Gamification Group

Contributors: Jylhä, H., Hamari, J.

Publication date: 2020

Peer-reviewed: Yes

#### Publication information

Journal: User Modeling and User-Adapted Interaction

ISSN (Print): 0924-1868

Original language: English

ASJC Scopus subject areas: Education, Human-Computer Interaction, Computer Science Applications

Keywords: Adaptive user interfaces, Aesthetics, Design guidelines, Graphical user interface, Measurement instrument, Questionnaire

Electronic versions:

Jylhä-Hamari2020\_Article\_DevelopmentOfMeasurementInstru

DOIs:

10.1007/s11257-020-09263-7

URLs:

<http://urn.fi/URN:NBN:fi:tuni-202007026309>

Source: Scopus

Source ID: 85085161179

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

### **Does esports spectating influence game consumption?**

Contemporary digital technologies have facilitated practices related to games whereby users often produce and consume content for free. To date, research into consumer interactions has largely focused on in-game factors, however, the intention to both play the game and to make in-game purchases are influenced by outside factors, including game streams and game-centred communities. In particular, the growth of competitive gaming, known as esports, offers a new channel for consumer engagement. This research explores the potential for esports to be a significant factor in understanding both intentions to play and spend money on games. Our study draws from Motivations Scale of Sports Consumption to empirically investigate the relationship between esports spectating motivations and game consumption: Watching Intention, Gaming Intention, and Purchasing Intention. This survey uses structural equation modelling (SEM) to analyse data collected from a sample of video game players ( $n = 194$ ). This research contributes empirical evidence of the relationship between esports spectating and game consumption, with the relationship between Watching Intention and Gaming Intention found to be particularly strong. Finally, while the MSSC is an adequate measure for esports spectating, additional aspects specific to esports require further investigation, consequently, there may be more optimal measures which can be developed.

#### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Computing Sciences, Information and Knowledge Management, Research group: Business Data Research Group, Research group: TUT Game Lab

Contributors: Macey, J., Tyrväinen, V., Pirkkalainen, H., Hamari, J.

Number of pages: 17

Publication date: 2020

Peer-reviewed: Yes

#### **Publication information**

Journal: Behaviour and Information Technology

ISSN (Print): 0144-929X

Original language: English

ASJC Scopus subject areas: Developmental and Educational Psychology, Arts and Humanities (miscellaneous), Social Sciences(all), Human-Computer Interaction

Keywords: Esports, free-to-play, game consumption, purchase intention, video games, watching intention

Electronic versions:

Does esports spectating influence 2020

DOIs:

10.1080/0144929X.2020.1797876

URLs:

<http://urn.fi/URN:NBN:fi:tuni-202008216589>

#### **Bibliographical note**

INT=ikma,"Tyrväinen, Ville"

dupl=55234949

Source: Scopus

Source ID: 85088953744

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

### **ClothFace: A Passive RFID-Based Human-Technology Interface on a Shirtsleeve**

This paper introduces ClothFace, a shirtsleeve-integrated human-technology interface platform, which comprises two wrist antennas and three radio frequency identification (RFID) integrated circuits (ICs), each with a unique ID. The platform prototype, which is created on a shirtsleeve by cutting the antennas and antenna-IC interconnections from copper tape, can be used for push button and swipe controlling. Each IC can be activated, i.e., electrically connected to the two antennas, by touching the IC. These ICs can act as wireless input buttons to the technology around us. Due to the used

passive ultrahigh-frequency (UHF) RFID technology, there is no need for clothing-integrated energy sources, but the interface platform gets all the needed energy from an external RFID reader. The platform prototype was found to be readable with an external RFID reader from all directions at distances of 70-80 cm. Further, seven people giving altogether 1400 inputs tested the prototype sleeves on a table and on body. In these first tests, 96-100% (table) and 92-100% (on-body) success rates were achieved in a gamelike testing setup. Further, the platform was proved to be readable with an off-the-shelf handheld RFID reader from a distance of 40 cm. Based on these initial results, this implementation holds the potential to be used as a touch interface blended into daily clothing, as well as a modular touch-based interaction platform that can be integrated into the surfaces of electronic devices, such as home appliances.

### General information

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: BioMediTech, Computing Sciences, Research group: Wireless Identification and Sensing Systems Research Group, Tampere University

Contributors: Mehmood, A., He, H., Chen, X., Vianto, A., Vianto, V., Buruk, O. ', Virkki, J.

Number of pages: 8

Publication date: 2020

Peer-reviewed: Yes

### Publication information

Journal: Advances in Human-Computer Interaction

Volume: 2020

Article number: 8854042

ISSN (Print): 1687-5893

Original language: English

ASJC Scopus subject areas: Human-Computer Interaction

Electronic versions:

8854042

DOIs:

10.1155/2020/8854042

URLs:

<http://urn.fi/URN:NBN:fi:tuni-202009016818>

### Bibliographical note

INT=comp,"Vianto, Aleks"i

INT=comp,"Vianto, Ville"

Source: Scopus

Source ID: 85089777453

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

### Probabilistic approach to physical object disentangling

Physically disentangling entangled objects from each other is a problem encountered in waste segregation or in any task that requires disassembly of structures. Often there are no object models, and especially with cluttered irregularly shaped objects, the robot cannot create a model of the scene due to occlusion. One of our key insights is that based on previous sensory input we are only interested in moving an object out of the disentanglement around obstacles. That is, we only need to know where the robot can successfully move in order to plan the disentangling. Due to the uncertainty we integrate information about blocked movements into a probability map. The map defines the probability of the robot successfully moving to a specific configuration. Using as cost the failure probability of a sequence of movements we can then plan and execute disentangling iteratively. Since our approach circumvents only previously encountered obstacles, new movements will yield information about unknown obstacles that block movement until the robot has learned to circumvent all obstacles and disentangling succeeds. In the experiments, we use a special probabilistic version of the Rapidly exploring Random Tree (RRT) algorithm for planning and demonstrate successful disentanglement of objects both in 2-D and 3-D simulation, and, on a KUKA LBR 7-DOF robot. Moreover, our approach outperforms baseline methods.

### General information

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Computing Sciences, Technical University Darmstadt, University of Lincoln, Max Planck Institute for Intelligent Systems

Contributors: Pajarinen, J., Arenz, O., Peters, J., Neumann, G.

Number of pages: 8

Pages: 5510-5517

Publication date: 2020

Peer-reviewed: Yes

### Publication information

Journal: IEEE Robotics and Automation Letters

Volume: 5

Issue number: 4

ISSN (Print): 2377-3766

Original language: English

ASJC Scopus subject areas: Control and Systems Engineering, Biomedical Engineering, Human-Computer Interaction, Mechanical Engineering, Computer Vision and Pattern Recognition, Computer Science Applications, Control and Optimization, Artificial Intelligence

Keywords: Autonomous systems, collision avoidance, intelligent robots, path planning, probabilistic computing, waste recovery

DOIs:

10.1109/LRA.2020.3006789

Source: Scopus

Source ID: 85090290264

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

### Multi-sensor next-best-view planning as matroid-constrained submodular maximization

3D scene models are useful in robotics for tasks such as path planning, object manipulation, and structural inspection. We consider the problem of creating a 3D model using depth images captured by a team of multiple robots. Each robot selects a viewpoint and captures a depth image from it, and the images are fused to update the scene model. The process is repeated until a scene model of desired quality is obtained. Next-best-view planning uses the current scene model to select the next viewpoints. The objective is to select viewpoints so that the images captured using them improve the quality of the scene model the most. In this letter, we address next-best-view planning for multiple depth cameras. We propose a utility function that scores sets of viewpoints and avoids overlap between multiple sensors. We show that multi-sensor next-best-view planning with this utility function is an instance of submodular maximization under a matroid constraint. This allows the planning problem to be solved by a polynomial-Time greedy algorithm that yields a solution within a constant factor from the optimal. We evaluate the performance of our planning algorithm in simulated experiments with up to 8 sensors, and in real-world experiments using two robot arms equipped with depth cameras.

### General information

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Computing Sciences, Technical University Darmstadt, Max Planck Institute for Intelligent Systems, University of Hamburg

Contributors: Lauri, M., Pajarinen, J., Peters, J., Frintrop, S.

Number of pages: 8

Pages: 5323-5330

Publication date: 2020

Peer-reviewed: Yes

### Publication information

Journal: IEEE Robotics and Automation Letters

Volume: 5

Issue number: 4

ISSN (Print): 2377-3766

Original language: English

ASJC Scopus subject areas: Control and Systems Engineering, Biomedical Engineering, Human-Computer Interaction, Mechanical Engineering, Computer Vision and Pattern Recognition, Computer Science Applications, Control and Optimization, Artificial Intelligence

Keywords: multi-robot systems, Reactive and sensor-based planning, RGB-D perception

DOIs:

10.1109/LRA.2020.3007445

### Bibliographical note

EXT="Lauri, Mikko"

Source: Scopus

Source ID: 85090245712

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

### Understanding decision-making in recruitment: Opportunities and challenges for information technology

Although the composition of individuals can strongly affect the success of professional collaboration, organizations often struggle with their so-called social matching decisions. For example, when recruiting new people to an organization, the decision-making is often reduced to intuitively matching individuals based on vague descriptions of projects or positions. The role of technology in recruiting is typically confined to gathering and presenting simple candidate profiles. We argue

that many issues in recruitment boil down to lack of understanding the process of decision-making from social matching perspective, covering aspects like identification of relevant selection criteria and choice of the most suitable candidate. To better understand the appropriate roles of information technology (IT) in this domain, we interviewed 21 expert matchmakers, such as HR specialists and headhunters. Based on qualitative analysis of their experiences, we provide a bottom-up framework of the decision-making stages in recruitment, focusing on the pertinent challenges from the perspective of social matching. The findings indicate that, particularly, the epistemic asymmetry between the recruiter and candidates regarding the expected qualities calls for deliberation throughout the decision-making process. Matchmakers also struggle between contradictory ideals of agility and holistic decision-making. Based on the findings and relevant literature, we propose six roles that IT could play in social matching decisions in recruitment.

### General information

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Computing Sciences, Tampere University, Tampere University of Applied Sciences

Contributors: Koivunen, S., Olsson, T., Olshannikova, E., Lindberg, A.

Number of pages: 22

Publication date: 1 Dec 2019

Peer-reviewed: Yes

### Publication information

Journal: Proceedings of the ACM on Human-Computer Interaction

Volume: 3

Issue number: GROUP

Article number: 242

ISSN (Print): 2573-0142

Ratings:

Scopus rating (2019): CiteScore 2.7 SJR 0.508 SNIP 1.267

Original language: English

ASJC Scopus subject areas: Social Sciences (miscellaneous), Human-Computer Interaction, Computer Networks and Communications

Keywords: Collaboration, Decision-making, Head hunting, Human resources, People recommender systems, Recruitment, Social matching, Talent acquisition, Working life

DOIs:

10.1145/3361123

URLs:

<http://urn.fi/URN:NBN:fi:tuni-202001201410>

### Bibliographical note

dupl=51241988

Source: Scopus

Source ID: 85076699509

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

### An icon that everyone wants to click: How perceived aesthetic qualities predict app icon successfulness

Mobile app markets have been touted as fastest growing marketplaces in the world. Every day thousands of apps are published to join millions of others on app stores. The competition for top grossing apps and market visibility is fierce. The way an app is visually represented can greatly contribute to the amount of attention an icon receives and to its consequent commercial performance. Therefore, the icon of the app is of crucial importance as it is the first point of contact with the potential user/customer amidst the flood of information. Those apps that fail to arouse attention through their icons danger their commercial performance in the market where consumers browse past hundreds of icons daily. Using semantic differential scale (22 adjective pairs), we investigate the relationship between consumer perceptions of app icons and icon successfulness, measured by 1) overall evaluation of the icon, 2) willingness to click the icon, 3) willingness to download the imagined app and, 4) willingness to purchase the app. The study design was a vignette study with random participant (n = 569) assignment to evaluate 4 icons (n = 2276) from a total of pre-selected 68 game app icons across 4 categories (concrete, abstract, character and text). Results show that consumers are more likely to interact with app icons that are aesthetically pleasing and convey good quality. Particularly, app icons that are perceived unique, realistic and stimulating lead to more clicks, downloads and purchases.

### General information

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Computing Sciences, Gamification Group, Tampere University, University of Turku

Contributors: Jylhä, H., Hamari, J.

Number of pages: 13

Pages: 73-85

Publication date: 1 Oct 2019

Peer-reviewed: Yes

### Publication information

Journal: International Journal of Human Computer Studies

Volume: 130

ISSN (Print): 1071-5819

Ratings:

Scopus rating (2019): CiteScore 5.8 SJR 0.756 SNIP 2.163

Original language: English

ASJC Scopus subject areas: Software, Human Factors and Ergonomics, Education, Engineering(all), Human-Computer Interaction, Hardware and Architecture

Keywords: Aesthetics, Digital marketing, Graphical user interfaces, Iconography, Mobile apps, Semantic differential  
Electronic versions:

1-s2.0-S1071581918301794-main

DOIs:

10.1016/j.ijhcs.2019.04.004

URLs:

<http://urn.fi/URN:NBN:fi:tty-201907081945>

Source: Scopus

Source ID: 85067993498

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

### Diffusion of innovation: Case of co-design of cabins in mobile work machine industry

This paper describes the development of using virtual reality for work content in one application area over a decade. Virtual reality technology has developed rapidly; from walk-in CAVE-like virtual environments to head-mounted displays within a decade. In this paper, the development is studied through the lens of diffusion of innovation theory, which focuses not only on innovation itself, but also on the social system. The development of virtual technology is studied by one case, which is cabin design in the mobile work machine industry. This design process has been especially suitable for using virtual reality technology.

### General information

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Automation Technology and Mechanical Engineering, Tampere University

Contributors: Ellman, A., Tiainen, T.

Publication date: 1 Jun 2019

Peer-reviewed: Yes

### Publication information

Journal: Computers

Volume: 8

Issue number: 2

Article number: 39

ISSN (Print): 2073-431X

Ratings:

Scopus rating (2019): CiteScore 2.5 SJR 0.361 SNIP 1.25

Original language: English

ASJC Scopus subject areas: Human-Computer Interaction, Computer Networks and Communications

Keywords: Cabin design, Diffusion of innovation, Virtual reality

Electronic versions:

computers-08-00039

DOIs:

10.3390/computers8020039

URLs:

<http://urn.fi/URN:NBN:fi:tty-201909062077>

Source: Scopus

Source ID: 85069801135

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

### Performance evaluation of bandwidth reservation for mmWave 5G NR systems

Introduction: In 3GPP New Radio (NR) systems, frequent radio propagation path blockages can lead to the disconnection of ongoing sessions already accepted into the system, reducing the quality of service in the network. Controlling access to system resource by prioritizing for the ongoing sessions can increase the session continuity. In this paper, we propose



resource allocation with a reservation mechanism. Purpose: Development of a mathematical model for analyzing the effect of this mechanism on other system performance indicators - dropping probabilities for new and ongoing sessions and system utilization. The model takes into account the key features of the 3GPP NR technology, including the height of the interacting objects, the spatial distribution and mobility of the blockers, as well as the line-of-sight propagation properties between the transceivers for mmWave NR technology. Results: We analyzed the reservation mechanism with the help of a developed model in the form of a resource queueing system with signals, where the base station bandwidth corresponds to the resource, and the signals model a change in the line-of-sight conditions between the receiving and transmitting devices. Creating a priority for ongoing sessions whose service has not yet been completed provides a considerable flexibility for balancing the session continuity and dropping of a new session, with a slight decrease in the efficiency of the radio resource utility. With the developed model, we showed that reserving even a small bandwidth (less than 10% of the total resources) to maintain the ongoing sessions has a positive effect on their continuity, as it increases the probability of their successful completion. Practical relevance: The proposed mechanism works more efficiently in overload conditions and with sessions which have a high data transfer rate requirements. This increases the demand for the proposed mechanism in 5G NR communication systems.

### General information

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Electrical Engineering, Research group: Emerging Technologies for Nano-Bio-Info-Cogno, Peoples' Friendship University of Russia, Federal Research Center Computer Science and Control of the Russian Academy of Sciences

Contributors: Begishev, V. O., Sopin, E. S., Molchanov, D. A., Samouylov, A. K., Gaidamaka, Y. V., Samouylov, K. E.

Number of pages: 13

Pages: 51-63

Publication date: 1 Jan 2019

Peer-reviewed: Yes

### Publication information

Journal: Informatsionno-Upravliaiushchie Sistemy

Issue number: 5

ISSN (Print): 1684-8853

Ratings:

Scopus rating (2019): CiteScore 0.5 SJR 0.201 SNIP 0.507

Original language: English

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

Keywords: 5G networks, Bandwidth reservation, Millimeter wave, New Radio, New session drop probability, Ongoing session drop probability, Session continuity, System resource utilization

DOIs:

10.31799/1684-8853-2019-5-51-63

Source: Scopus

Source ID: 85082424315

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

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

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

### General information

Publication status: Published

MoE publication type: A1 Journal article-refereed

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

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

Publication date: 2019

Peer-reviewed: Yes  
Early online date: 2018

### Publication information

Journal: International Journal of Human-Computer Interaction

Volume: 35

Issue number: 9

ISSN (Print): 1044-7318

Ratings:

Scopus rating (2019): CiteScore 3.5 SJR 0.52 SNIP 1.536

Original language: English

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

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

DOIs:

10.1080/10447318.2018.1497115

Source: Scopus

Source ID: 85050562939

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

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

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

### General information

Publication status: E-pub ahead of print

MoE publication type: A1 Journal article-refereed

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

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

Publication date: 2019

Peer-reviewed: Yes

### Publication information

Journal: IEEE Transactions on Emerging Topics in Computing

ISSN (Print): 2168-6750

Ratings:

Scopus rating (2019): CiteScore 8.5 SJR 0.807 SNIP 1.764

Original language: English

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

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

DOIs:

10.1109/TETC.2019.2932685

Source: Scopus

Source ID: 85070665316

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

### Teaching semantics and skills for human-robot collaboration

Recent advances in robotics allow for collaboration between humans and machines in performing tasks at home or in industrial settings without harming the life of the user. While humans can easily adapt to each other and work in team, it is not as trivial for robots. In their case, interaction skills typically come at the cost of extensive programming and teaching. Besides, understanding the semantics of a task is necessary to work efficiently and react to changes in the task execution process. As a result, in order to achieve seamless collaboration, appropriate reasoning, learning skills and interaction capabilities are needed. For us humans, a cornerstone of our communication is language that we use to teach, coordinate

and communicate. In this paper we thus propose a system allowing (i) to teach new action semantics based on the already available knowledge and (ii) to use natural language communication to resolve ambiguities that could arise while giving commands to the robot. Reasoning then allows new skills to be performed either autonomously or in collaboration with a human. Teaching occurs through a web application and motions are learned with physical demonstration of the robotic arm. We demonstrate the utility of our system in two scenarios and reflect upon the challenges that it introduces.

#### General information

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Automation Technology and Mechanical Engineering, Research group: Robotics and Automation

Contributors: Angleraud, A., Houbre, Q., Pieters, R.

Number of pages: 12

Pages: 318-329

Publication date: 2019

Peer-reviewed: Yes

#### Publication information

Journal: Paladyn

Volume: 10

Issue number: 1

ISSN (Print): 2081-4836

Ratings:

Scopus rating (2019): CiteScore 1.4 SJR 0.332 SNIP 0.96

Original language: English

ASJC Scopus subject areas: Human-Computer Interaction, Developmental Neuroscience, Cognitive Neuroscience,

Artificial Intelligence, Behavioral Neuroscience

Keywords: cognitive architecture, human-robot interaction, knowledge representation and reasoning, semiotics, symbol grounding

Electronic versions:

[Paladyn Journal of Behavioral Robotics] Teaching semantics and skills for human-robot collaboration

DOIs:

10.1515/pjbr-2019-0025

URLs:

<http://urn.fi/URN:NBN:fi:tuni-201910234030>

Source: Scopus

Source ID: 85072921192

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

#### Characterization of the anisotropic deformation of the right ventricle during open heart surgery

Digital Image Correlation (DIC) was used for studying the anisotropic behavior of the thin walled right ventricle of the human heart. Strains measured with Speckle Tracking Echocardiography (STE) were compared with the DIC data. Both DIC and STE were used to measure longitudinal strains of the right ventricle in the beginning of an open-heart surgery as well as after the cardiopulmonary bypass. Based on the results, the maximum end-systolic strains obtained with the DIC and STE change similarly during the surgery with less than 10% difference. The difference is largely due to the errors in matching the longitudinal direction in the two methods, sensitivity of the measurement to the positioning of the virtual extensometer of in both STE and DIC, and physiological difference of the measurements as the DIC measures the top surface of the heart whereas the STE obtains the data from below. The anisotropy of the RV was measured using full field principal strains acquired from the DIC displacement fields. The full field principal strains cover the entire region of interest instead of just two points as the virtual extensometer approach used by the STE. The principal strains are not direction dependent measures, and therefore are more independent of the anatomy of the patient and the exact positioning of the virtual strain gage or the STE probe. The results show that the longitudinal strains alone are not enough to fully characterize the behavior of the heart, as the deformation of the heart can be very anisotropic, and the anisotropy changes during the surgery, and from patient to patient.

#### General information

Publication status: E-pub ahead of print

MoE publication type: A1 Journal article-refereed

Organisations: Materials Science and Environmental Engineering, Research group: Materials Characterization, Hospital Heart Center, Tampere University

Contributors: Soltani, A., Lahti, J., Järvelä, K., Laurikka, J., Kuokkala, V. T., Hokka, M.

Number of pages: 12

Publication date: 2019

Peer-reviewed: Yes

#### Publication information

Journal: COMPUTER METHODS IN BIOMECHANICS AND BIOMEDICAL ENGINEERING

ISSN (Print): 1025-5842

Ratings:

Scopus rating (2019): CiteScore 2.6 SJR 0.451 SNIP 0.695

Original language: English

ASJC Scopus subject areas: Bioengineering, Biomedical Engineering, Human-Computer Interaction, Computer Science Applications

Keywords: anisotropy, biomaterial characterization, deformation, digital image correlation, heart muscle, Human biomechanics, motion

DOIs:

10.1080/10255842.2019.1703133

#### **Bibliographical note**

dupl=51243005

Source: Scopus

Source ID: 85076903988

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

#### **Investigating relationships between video gaming, spectating esports, and gambling**

An established body of research exists in which playing video games has been associated with potentially problematic behaviours, such as gambling. An issue highlighted by the recent emergence of game-based gambling practices such as loot boxes, social network casinos, free-to-play game mechanics, and gambling using virtual goods and skins. This study investigates relationships between a range of gambling activities and the consumption of video games in general, and the newly emergent phenomenon of esports in particular. In addition, these practices are considered in relation to established measures assessing game addiction and problematic gambling. The study employs Partial Least Squares modelling to investigate data gathered via an international online survey (N = 613). Video game addiction was found to be negatively associated with offline gambling, online gambling, and problem gambling. Video game consumption had only small, positive association with video game-related gambling and problem gambling. Consumption of esports had small to moderate association with video game-related gambling, online gambling, and problem gambling. The primary findings of this study are that contemporary video games are not, in themselves, associated with increased potential for problematic gambling, indeed, the position that problem gaming and problem gambling are fundamentally connected is questioned.

#### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Research group: TUT Game Lab, Pervasive Computing, Gamification Group, School of Management (JKK)

Contributors: Macey, J., Hamari, J.

Number of pages: 10

Pages: 344-353

Publication date: Mar 2018

Peer-reviewed: Yes

Early online date: 20 Nov 2017

#### **Publication information**

Journal: Computers in Human Behavior

Volume: 80

ISSN (Print): 0747-5632

Ratings:

Scopus rating (2018): CiteScore 9.4 SJR 1.711 SNIP 2.418

Original language: English

ASJC Scopus subject areas: Arts and Humanities (miscellaneous), Human-Computer Interaction, Psychology(all)

Keywords: Addiction, Esports, Free-to-play, Gambling, Games, Virtual Goods

DOIs:

10.1016/j.chb.2017.11.027

URLs:

<http://urn.fi/URN:NBN:fi:uta-201803261454>

#### **Bibliographical note**

DUPL=40410108

Source: Scopus

Source ID: 85035771336

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

### **Social motivations of live-streaming viewer engagement on Twitch**

Little is known about the motivations underlying viewer engagement in the rapidly growing live-streaming multimedia phenomenon. This study trialled an eight-factor socio-motivational model, based on Uses and Gratifications Theory, to explain four aspects of live-stream viewer engagement. Cross-sectional data was collected through an international, online self-report survey of Twitch users (N = 2227). Multiple and ordinal linear regression analyses identified six motivations which helped to explain live-stream engagement: social interaction, sense of community, meeting new people, entertainment, information seeking, and a lack of external support in real life. Compared to mass media, viewer motivations to engage in live-stream entertainment appear to have a stronger social and community basis. Furthermore, live-stream viewers who preferred smaller channels (<500 viewers) were more motivated by social engagement than viewers who preferred larger channels. These findings offer insight into the motivations for live-stream engagement, and help to lay a foundation for further research.

#### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Pervasive Computing, Vision and Sensing, ESTeM, University of Canberra, Gamification Group, School of Science, Aalto University

Contributors: Hilvert-Bruce, Z., Neill, J. T., Sjöblom, M., Hamari, J.

Number of pages: 10

Pages: 58-67

Publication date: 14 Feb 2018

Peer-reviewed: Yes

#### **Publication information**

Journal: Computers in Human Behavior

Volume: 84

ISSN (Print): 0747-5632

Ratings:

Scopus rating (2018): CiteScore 9.4 SJR 1.711 SNIP 2.418

Original language: English

ASJC Scopus subject areas: Arts and Humanities (miscellaneous), Human-Computer Interaction, Psychology(all)

Keywords: eSports, Motivation, Social media, Streaming, Twitch, Uses and gratification

DOIs:

10.1016/j.chb.2018.02.013

Source: Scopus

Source ID: 85042386608

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

### **Gamification, quantified-self or social networking? Matching users' goals with motivational technology**

Systems and services we employ in our daily life have increasingly been augmented with motivational designs which fall under the classes of (1) gamification, (2) quantified-self and (3) social networking features that aim to help users reach their goals via motivational enforcement. However, users differ in terms of their orientation and focus toward goals and in terms of the attributes of their goals. Therefore, different classes of motivational design may have a differential fit for users. Being able to distinguish the goal profiles of users, motivational design could be better tailored. Therefore, in this study we investigate how different goal foci (outcome and focus), goals orientation (mastery, proving, and avoiding), and goal attributes (specificity and difficulty) are associated with perceived importance of gamification, social networking and quantified-self features. We employ survey data ((Formula presented.)) from users of HeiaHeia; a popular exercise encouragement app. Results indicate that goal-setting related factors of users and attributes of goals are connected with users' preference over motivational design classes. In particular, the results reveal that being outcome-focused is associated with positive evaluations of gamification and quantified-self design classes. Users with higher proving-orientation perceived gamification and social networking design classes as more important, users with lower goal avoidance-orientation perceived social networking design as more important, whereas users with higher mastery-orientation perceived quantified-self design more important. Users with difficult goals were less likely to perceive gamification and social networking design important, whereas for users with high goal specificity quantified-self features were important. The findings provide insights for the automatic adaptation of motivational designs to users' goals. However, more research is naturally needed to further investigate generalizability of the results.

#### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Pervasive Computing, Swedish School of Economics and Business Administration, Aalto University

Contributors: Hamari, J., Hassan, L., Dias, A.

Number of pages: 40

Pages: 35-74

Publication date: 2018

Peer-reviewed: Yes  
Early online date: 24 Jan 2018

### Publication information

Journal: User Modeling and User-Adapted Interaction

Volume: 28

Issue number: 1

ISSN (Print): 0924-1868

Ratings:

Scopus rating (2018): CiteScore 9.7 SJR 0.907 SNIP 3.544

Original language: English

ASJC Scopus subject areas: Education, Human-Computer Interaction, Computer Science Applications

Keywords: Gamification, Goal orientation, Goal-setting, Motivational information system, Quantified-self, Social networking

DOIs:

10.1007/s11257-018-9200-2

Source: Scopus

Source ID: 85040920827

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

### How games induce cooperation? A study on the relationship between game features and we-intentions in an augmented reality game

Seamless cooperation between individuals is essentially a crucial aspect of any successful endeavor. A host of literature has been published in the academic realm about how cooperation could be cultivated. However, true cooperation often forms organically without external enforcement. Recently, there has been one special example of a context where cooperation seemed to have effortlessly sprung up between people who might not even have had previous connections. The context is video/online games; games such as Ingress, Pokémon Go, and World of Warcraft bind people together to work against insurmountable odds and to overcome jointly held challenges. Organizations of many types have recently begun to gamify their structures and services in order to cultivate such seamless cooperation. However, before this potential of games can be successfully wielded outside video games, we need to understand better how games are able to cultivate such cooperation. Therefore, in this study we investigate how games can induce and cultivate we-intention of working as a group. Specifically, we investigate how cooperative game features affect different forms of group dynamics and how they further translate into we-intentions. We employ data from users of the augmented reality game Ingress (N = 206). The results show that cooperative game features induce we-intentions via positively increasing group norms, social identity, joint commitment, attitudes toward cooperation, and anticipated positive emotions. The findings imply that practitioners who are looking to increase cooperation should find that gamification inspired by cooperative game design is beneficial and preferable over individual-based gamification efforts.

### General information

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Pervasive Computing, Karlsruhe Institute of Technology, Insitute for Technical Physics, Germany, Robert Bosch GmbH, University of Mannheim, Gamification Group

Contributors: Morschheuser, B., Riar, M., Hamari, J., Maedche, A.

Number of pages: 15

Pages: 169-183

Publication date: 1 Dec 2017

Peer-reviewed: Yes

### Publication information

Journal: Computers in Human Behavior

Volume: 77

ISSN (Print): 0747-5632

Ratings:

Scopus rating (2017): CiteScore 7.4 SJR 1.555 SNIP 2.182

Original language: English

ASJC Scopus subject areas: Arts and Humanities (miscellaneous), Human-Computer Interaction, Psychology(all)

Keywords: Augmented reality, Cooperation, Gamification, Location-based games, Online games, We-intention

DOIs:

10.1016/j.chb.2017.08.026

Source: Scopus

Source ID: 85028695881

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

### **Gamified crowdsourcing: Conceptualization, literature review, and future agenda**

Two parallel phenomena are gaining attention in human–computer interaction research: gamification and crowdsourcing. Because crowdsourcing's success depends on a mass of motivated crowdsourcees, crowdsourcing platforms have increasingly been imbued with motivational design features borrowed from games; a practice often called gamification. While the body of literature and knowledge of the phenomenon have begun to accumulate, we still lack a comprehensive and systematic understanding of conceptual foundations, knowledge of how gamification is used in crowdsourcing, and whether it is effective. We first provide a conceptual framework for gamified crowdsourcing systems in order to understand and conceptualize the key aspects of the phenomenon. The paper's main contributions are derived through a systematic literature review that investigates how gamification has been examined in different types of crowdsourcing in a variety of domains. This meticulous mapping, which focuses on all aspects in our framework, enables us to infer what kinds of gamification efforts are effective in different crowdsourcing approaches as well as to point to a number of research gaps and lay out future research directions for gamified crowdsourcing systems. Overall, the results indicate that gamification has been an effective approach for increasing crowdsourcing participation and the quality of the crowdsourced work; however, differences exist between different types of crowdsourcing: the research conducted in the context of crowdsourcing of homogenous tasks has most commonly used simple gamification implementations, such as points and leaderboards, whereas crowdsourcing implementations that seek diverse and creative contributions employ gamification with a richer set of mechanics.

#### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Research group: TUT Game Lab, Pervasive Computing, Robert Bosch GmbH, Karlsruhe Institute of Technology, Insitute for Technical Physics, Germany, Gamification Group

Contributors: Morschheuser, B., Hamari, J., Koivisto, J., Maedche, A.

Number of pages: 18

Pages: 26-43

Publication date: 1 Oct 2017

Peer-reviewed: Yes

#### **Publication information**

Journal: International Journal of Human-Computer Studies

Volume: 106

ISSN (Print): 1071-5819

Ratings:

Scopus rating (2017): CiteScore 5.9 SJR 0.605 SNIP 2.146

Original language: English

ASJC Scopus subject areas: Human Factors and Ergonomics, Software, Education, Engineering(all), Human-Computer Interaction, Hardware and Architecture

Keywords: Crowdsourcing, Gamification, Human computation, Literature review, Persuasive technology, Research agenda

DOIs:

10.1016/j.ijhcs.2017.04.005

Source: Scopus

Source ID: 85019568466

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

### **Content structure is king: An empirical study on gratifications, game genres and content type on Twitch**

While video games have been widely investigated from the perspective of play, an emerging online media phenomenon is the spectating of video game play, captivating millions of users daily. This study investigates the relationship of video game genres, content type and viewer gratification in the context of live gaming. To study this phenomenon, we employ an online questionnaire study (N = 1097) to investigate six categories of gratifications: affective, information seeking, learning to play, personal integrative, social integrative & tension release motivations and their relationship with game genres and stream types. The results of this study demonstrate that "the medium is the message", highlight the importance of archetypal structure (i.e. the type of streamed content) over content topic (i.e. the genre of games being streamed), and help to build a better understanding of user generated content and the democratization of media.

#### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Research group: TUT Game Lab, Pervasive Computing, Aalto University

Contributors: Sjöblom, M., Törhönen, M., Hamari, J., Macey, J.

Number of pages: 11

Pages: 161-171

Publication date: 1 Aug 2017

Peer-reviewed: Yes

### Publication information

Journal: Computers in Human Behavior

Volume: 73

ISSN (Print): 0747-5632

Ratings:

Scopus rating (2017): CiteScore 7.4 SJR 1.555 SNIP 2.182

Original language: English

ASJC Scopus subject areas: Arts and Humanities (miscellaneous), Human-Computer Interaction, Psychology(all)

Keywords: Genres, New media, Social media, Streaming, User-generated content, Uses and gratifications, Video games

DOIs:

10.1016/j.chb.2017.03.036

Source: Scopus

Source ID: 85015997285

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

### Do badges increase user activity? A field experiment on the effects of gamification

During recent years, the practice of adding game design to non-game services has gained a relatively large amount of attention. Popular discussion connects gamification to increased user engagement, service profitability, goal commitment and the overall betterment of various behavioral outcomes. However, there is still an absence of a coherent and ample body of empirical evidence that would confirm such expectations. To this end, this paper reports the results of a 2 year (1 + 1 year – between-group) field experiment in gamifying a service by implementing a game mechanic called 'badges'. During the experiment a pre-implementation group (N = 1410) was monitored for 1 year. After the implementation, the post-implementation (the gamified condition) group (N = 1579) was monitored for another full year. Results show that users in the gamified condition were significantly more likely to post trade proposals, carry out transactions, comment on proposals and generally use the service in a more active way.

### General information

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Mathematical modelling with wide societal impact (MathImpact), University of Tampere

Contributors: Hamari, J.

Number of pages: 10

Pages: 469-478

Publication date: 1 Jun 2017

Peer-reviewed: Yes

### Publication information

Journal: Computers in Human Behavior

Volume: 71

ISSN (Print): 0747-5632

Ratings:

Scopus rating (2017): CiteScore 7.4 SJR 1.555 SNIP 2.182

Original language: English

ASJC Scopus subject areas: Arts and Humanities (miscellaneous), Human-Computer Interaction, Psychology(all)

Keywords: Achievements, Badges, Engagement, Game design, Gamification, Persuasive technology

DOIs:

10.1016/j.chb.2015.03.036

URLs:

<http://www.scopus.com/inward/record.url?scp=84961291905&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84961291905

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

### Assessing fraction knowledge by a digital game

Serious or educational games gain increasing research interest as tools to augment traditional instructional approaches on scholastic learning, especially in mathematics education. In this study, we investigated whether game-based approaches may not only be useful to foster numerical learning but may also be valid as an assessment tool. To measure their conceptual knowledge of fractions eleven-year-old students played a math game on tablet computers using tilt-control to navigate an avatar along a number line for a total of 30 min. Findings indicated that hallmark effects of fraction magnitude processing typically observed in basic research, such as the numerical distance effect, were successfully replicated using the game-based assessment. Moreover, fraction comparison performance as well as fraction estimation accuracy correlated significantly with students' math grades. Therefore, the results of the current study suggest that game-based learning environments for fraction education (even using tilt-control) may also allow for a valid assessment of students' fraction knowledge.



### General information

Publication status: Published  
MoE publication type: A1 Journal article-refereed  
Organisations: Research group: TUT Game Lab, Pervasive Computing, University of Tübingen  
Contributors: Ninaus, M., Kiili, K., McMullen, J., Moeller, K.  
Number of pages: 10  
Pages: 197-206  
Publication date: 1 May 2017  
Peer-reviewed: Yes

### Publication information

Journal: Computers in Human Behavior  
Volume: 70  
ISSN (Print): 0747-5632  
Ratings:  
Scopus rating (2017): CiteScore 7.4 SJR 1.555 SNIP 2.182  
Original language: English  
ASJC Scopus subject areas: Arts and Humanities (miscellaneous), Human-Computer Interaction, Psychology(all)  
Keywords: Alternative assessment, Digital game, Fractions, Mathematics, Serious game  
DOIs:  
10.1016/j.chb.2017.01.004  
Source: Scopus  
Source ID: 85008958389  
Research output: Contribution to journal › Article › Scientific › peer-review

### Emotional Reactions to Point-Light Display Animations

Emotional reactions to basic, artificial, yet carefully controllable point-light displays (PLDs) were investigated with ratings of valence, arousal, approachability and dominance. PLDs were varied by movement location (upper and lower) and intensity (10°, 20° and 30° angular change) for angular upward and downward movements. Half of participants (N =28) were told that PLDs were related to face while to other half nothing was hinted. Results showed that 20° and 30° angle lower location upward movements were rated as significantly more pleasant, relaxing and approachable than corresponding upper location downward movements. Informed participants rated 20° and 30° angle lower movements as significantly more controllable than corresponding upper movements. Results are important from many perspectives, like for understanding human perceptual mechanisms. When using PLDs only a small amount of information needs to be transmitted. This enables low bandwidth requirements. As PLD visualizations are simple, there is no need for high-definition displays.

### General information

Publication status: Published  
MoE publication type: A1 Journal article-refereed  
Organisations: Department of Automation Science and Engineering, Nokia  
Contributors: Venesvirta, H., Surakka, V., Gizatdinova, Y., Lylykangas, J., Špakov, O., Verho, J., Vetek, A., Lekkala, J.  
Number of pages: 11  
Pages: 521-531  
Publication date: 16 Jun 2016  
Peer-reviewed: Yes

### Publication information

Journal: Interacting with Computers  
Volume: 28  
Issue number: 4  
ISSN (Print): 0953-5438  
Ratings:  
Scopus rating (2016): CiteScore 3.5 SJR 0.374 SNIP 1.128  
Original language: English  
ASJC Scopus subject areas: Human-Computer Interaction, Software  
Keywords: biological movement, emotions, face perception, information visualization, point-light displays, psychology  
DOIs:  
10.1093/iwc/iwv028  
Source: Scopus  
Source ID: 84976499522  
Research output: Contribution to journal › Article › Scientific › peer-review

### **Exploring the role of ten universal values in using products and services**

The aim of this research was to explore the role of Schwartz's ten universal human values in the context of using products and services. Seventy-five participants were asked to qualitatively describe a product or service especially well in line with their values and a product or service in conflict with their values, and to evaluate them on a number of rating scales. The scales included 30 statements (three statements per universal value) probing the presence of each value in user experiences related to products and services and 10 statements studying the perceived importance of each value. The results showed that all the ten universal values were relevant in the evaluations of products and services both in line with the users' values and in conflict with the users' values. In the current sample, hedonism and self-direction were rated as the values most frequently present and most important in the evaluations of products and services in line with values. Power was rated as a moderately important value for products in conflict with values, but significantly less important for products in line with values. Achievement values were frequently reported in the qualitative descriptions, but they were less prominent in the quantitative data. The results suggest that the model of ten universal values is promising in understanding the role of users' value preferences in using products and services, and it seems to have potential for complementing the psychological needs approach in understanding user experience.

#### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Department of Pervasive Computing, Department of Computer Science, Aalto University

Contributors: Partala, T., Kujala, S.

Number of pages: 21

Pages: 311-331

Publication date: 1 May 2016

Peer-reviewed: Yes

#### **Publication information**

Journal: Interacting with Computers

Volume: 28

Issue number: 3

ISSN (Print): 0953-5438

Ratings:

Scopus rating (2016): CiteScore 3.5 SJR 0.374 SNIP 1.128

Original language: English

ASJC Scopus subject areas: Human-Computer Interaction, Software

Keywords: empirical studies in HCI, HCI design and evaluation methods, user experience, user values, value-sensitive design

DOIs:

10.1093/iwc/iwv007

Source: Scopus

Source ID: 84966359109

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

### **Graph Embedded Extreme Learning Machine**

In this paper, we propose a novel extension of the extreme learning machine (ELM) algorithm for single-hidden layer feedforward neural network training that is able to incorporate subspace learning (SL) criteria on the optimization process followed for the calculation of the network's output weights. The proposed graph embedded ELM (GEELM) algorithm is able to naturally exploit both intrinsic and penalty SL criteria that have been (or will be) designed under the graph embedding framework. In addition, we extend the proposed GEELM algorithm in order to be able to exploit SL criteria in arbitrary (even infinite) dimensional ELM spaces. We evaluate the proposed approach on eight standard classification problems and nine publicly available datasets designed for three problems related to human behavior analysis, i.e., the recognition of human face, facial expression, and activity. Experimental results denote the effectiveness of the proposed approach, since it outperforms other ELM-based classification schemes in all the cases.

#### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Aristotle University of Thessaloniki, Department of Informatics

Contributors: Iosifidis, A., Tefas, A., Pitas, I.

Pages: 311 - 324

Publication date: 2016

Peer-reviewed: Yes

#### **Publication information**

Journal: IEEE Transactions on Cybernetics

Volume: 46

Issue number: 1  
ISSN (Print): 2168-2267  
Ratings:

Scopus rating (2016): CiteScore 12 SJR 2.927 SNIP 3.301

Original language: English

ASJC Scopus subject areas: Computer Science Applications, Human-Computer Interaction, Information Systems, Software, Control and Systems Engineering, Electrical and Electronic Engineering

DOIs:

10.1109/TCYB.2015.2401973

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

### **Defining user experience goals to guide the design of industrial systems**

The key prerequisite for experience-driven design is to define what experience to design for. User experience (UX) goals concretise the intended experience. Based on our own case studies from industrial environments and a literature study, we propose five different approaches to acquiring insight and inspiration for UX goal setting: Brand, Theory, Empathy, Technology, and Vision. Each approach brings in a different viewpoint, thus supporting the multidisciplinary character of UX. The Brand approach ensures that the UX goals are in line with the company's brand promise. The Theory approach utilises the available scientific knowledge of human behaviour. The Empathy approach focuses on knowing the actual users and stepping into their shoes. The Technology approach considers the new technologies that are being introduced and their positive or negative influence on UX. Finally, the Vision approach focuses on renewal, introducing new kinds of UXs. In the design of industrial systems, several stakeholders are involved and they should share common design goals. Using the different UX goal-setting approaches together brings in the viewpoints of different stakeholders, thus committing them to UX goal setting and emphasising UX as a strategic design decision.

### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Augmented Human Activities (AHA), VTT Technical Research Centre of Finland, School of Arts, Aalto University, Jyväskylän yliopisto

Contributors: Kaasinen, E., Roto, V., Hakulinen, J., Heimonen, T., Jokinen, J. P. P., Karvonen, H., Keskinen, T., Koskinen, H., Lu, Y., Saariluoma, P., Tokkonen, H., Turunen, M.

Number of pages: 16

Pages: 976-991

Publication date: 3 Oct 2015

Peer-reviewed: Yes

### **Publication information**

Journal: Behaviour and Information Technology

Volume: 34

Issue number: 10

ISSN (Print): 0144-929X

Ratings:

Scopus rating (2015): CiteScore 2.9 SJR 0.637 SNIP 1.083

Original language: English

ASJC Scopus subject areas: Developmental and Educational Psychology, Arts and Humanities (miscellaneous), Social Sciences(all), Human-Computer Interaction

Keywords: experience-driven design, industrial systems, user experience, user experience goal

DOIs:

10.1080/0144929X.2015.1035335

URLs:

<http://www.scopus.com/inward/record.url?scp=84938972446&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84938972446

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

### **Exploring co-learning behavior of conference participants with visual network analysis of Twitter data**

Knowledge management has acknowledged organizational learning as a key factor for creating competitive advantage for companies already from early 1990. However, the studies of co-learning in this connection are in their infancy. This article contributes to an emerging field of 'smart data' research on Twitter by presenting a case study of how community managers in Finland used this social media platform to construct a co-learning environment around an annually organized conference. In this empirical study we explore the co-learning behavior in project contexts especially by analyzing and visualizing co-learning behavior from conference participants Twitter data.

### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Pori Department, Research group: Business Ecosystems, Networks and Innovations, Department of Information Management and Logistics, Research group: Novi, Department of Mathematics, Research group: MAT Intelligent Information Systems Laboratory, Managing digital industrial transformation (mDIT)

Contributors: Aramo-Immonen, H., Jussila, J., Huhtamäki, J.

Number of pages: 9

Pages: 1154–1162

Publication date: Oct 2015

Peer-reviewed: Yes

### Publication information

Journal: Computers in Human Behavior

Volume: 51

Issue number: Part B

ISSN (Print): 0747-5632

Ratings:

Scopus rating (2015): CiteScore 5.5 SJR 1.583 SNIP 2.184

Original language: English

ASJC Scopus subject areas: Human-Computer Interaction, Psychology (miscellaneous), Education

Keywords: Learning, Co-learning, Memory aids, Communities of Practice, Social network analysis, Twitter

Electronic versions:

Exploring Co-Learning Behavior of Conference Participants with Visual Network Analysis of Twitter Data. Embargo ended: 1/11/17

DOIs:

10.1016/j.chb.2015.02.033

URLs:

<http://urn.fi/URN:NBN:fi:tty-201703291238>. Embargo ended: 1/11/17

### Bibliographical note

ORG=pla,0.34

ORG=tlo,0.33

ORG=mat,0.33

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

### "Working out for likes": An empirical study on social influence in exercise gamification

Today, people use a variety of social and gameful (mobile) applications in order to motivate themselves and others to maintain difficult habits such as exercise, sustainable consumption and healthy eating. However, we have yet lacked understanding of how social influence affects willingness to maintain these difficult habits with the help of gamification services. In order to investigate this phenomenon, we measured how social influence predicts attitudes, use and further exercise in the context of gamification of exercise. Our results show that people indeed do "work out for likes", or in other words, social influence, positive recognition and reciprocity have a positive impact on how much people are willing to exercise as well as their attitudes and willingness to use gamification services. Moreover, we found that the more friends a user has in the service, the larger the effects are. Furthermore, the findings of the empirical study further provide new understanding on the phenomenon of social influence in technology adoption/use continuance in general by showing, in addition to subjective norms, how getting recognized, receiving reciprocal benefits and network effects contribute to use continuance.

### General information

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Research group: TUT Game Lab, Pori, Mathematical modelling with wide societal impact (MathImpact)

Contributors: Hamari, J., Koivisto, J.

Number of pages: 15

Pages: 333-347

Publication date: 1 Sep 2015

Peer-reviewed: Yes

### Publication information

Journal: Computers in Human Behavior

Volume: 50

ISSN (Print): 0747-5632

Ratings:

Scopus rating (2015): CiteScore 5.5 SJR 1.583 SNIP 2.184

Original language: English

ASJC Scopus subject areas: Arts and Humanities (miscellaneous), Human-Computer Interaction, Psychology(all)

Keywords: Continued use, eHealth, Gamification, mHealth, Social influence, Social networking

DOIs:

10.1016/j.chb.2015.04.018

URLs:

<http://www.scopus.com/inward/record.url?scp=84928503372&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84928503372

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

### **Understanding the most influential user experiences in successful and unsuccessful technology adoptions**

Abstract Understanding processes underlying technology adoption or non-adoption is an important research theme often addressed using the technology acceptance model (TAM) approach. The objective of this research was to investigate most influential user experiences in successful and unsuccessful technology adoptions using user experience related concepts and methods in conjunction with the TAM. Participants (N = 76) described their most influential user experiences related to one successful and one unsuccessful technology adoption process and evaluated both experiences using rating scales, including the central TAM related scales and user experience related scales probing emotions, psychological needs, user values, task load, and the impact of technology on the user's well-being. The results suggested that user experience and technology acceptance related viewpoints can complement each other in order to gain a more holistic understanding of the factors affecting the success or failure of technology adoptions, and the results showed how these variables typically behave in both contexts. The overall valence of user experience was significantly affected by perceived usefulness, the fulfillment of psychological needs, and the salience of negative emotions in the most influential user experiences of successful adoptions, and by perceived usefulness, output quality, and the salience of negative emotions in the unsuccessful adoptions.

#### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Department of Pervasive Computing, Research area: User experience

Contributors: Partala, T., Saari, T.

Number of pages: 15

Pages: 381-395

Publication date: 25 Jul 2015

Peer-reviewed: Yes

#### **Publication information**

Journal: Computers in Human Behavior

Volume: 53

ISSN (Print): 0747-5632

Ratings:

Scopus rating (2015): CiteScore 5.5 SJR 1.583 SNIP 2.184

Original language: English

ASJC Scopus subject areas: Human-Computer Interaction, Psychology(all), Arts and Humanities (miscellaneous)

Keywords: Emotions, Technology acceptance, Technology adoption, User experience, User needs, Well-being

DOIs:

10.1016/j.chb.2015.07.012

Source: Scopus

Source ID: 84937879051

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

### **Railway fastener inspection by real-time machine vision**

In this paper, a real-time railway fastener detection system using a high-speed laser range finder camera is presented. First, an extensive analysis of various methods based on pixel-wise and histogram similarities are conducted on a specific railway route. Then, a fusing stage is introduced which combines least correlated approaches also considering the performance upgrade after fusing. Then, the resulting method is tested on a larger database collected from a different railway route. After observing repeated successes, the method is implemented on NI LabVIEW and run real-time with a high-speed 3-D camera placed under a railway carriage designed for railway quality inspection.

#### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Department of Signal Processing, Research group: Video, Middle East Technical University, Electrical and Electronics Engineering Department

Contributors: Aytekin, C., Rezaeitabar, Y., Dogru, S., Ulusoy, I.  
Number of pages: 7  
Pages: 1101-1107  
Publication date: 1 Jul 2015  
Peer-reviewed: Yes

#### **Publication information**

Journal: IEEE Transactions on Systems, Man, and Cybernetics: Systems  
Volume: 45  
Issue number: 7  
ISSN (Print): 1083-4427  
Ratings:

Scopus rating (2015): CiteScore 6.1 SJR 1.273 SNIP 2.189

Original language: English

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

Keywords: High-speed laser range finder, railway fastener detection, railway inspection

DOIs:

10.1109/TSMC.2014.2388435

URLs:

<http://www.scopus.com/inward/record.url?scp=84932638036&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84932638036

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

#### **Quality measures for improving technology trees**

The quality of technology trees in digital games can be improved by adjusting their structural and quantitative properties. Therefore, there is a demand for recognizing and measuring such properties. Part of the process can be automated; there are properties measurable by computers, and analyses based on the results (and visualizations of them) may help to produce significantly better technology trees, even practically without extra workload for humans. In this paper, we introduce useful technology tree properties and novel measuring features implemented into our software tool for manipulating technology trees.

#### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Department of Mathematics, Research group: MAT Computer Science and Applied Logics

Contributors: Heinimäki, T. J., Elomaa, T.

Number of pages: 10

Publication date: 2015

Peer-reviewed: Yes

#### **Publication information**

Journal: International Journal of Computer Games Technology

Volume: 2015

Article number: 975371

ISSN (Print): 1687-7047

Ratings:

Scopus rating (2015): CiteScore 1 SJR 0.204 SNIP 0.366

Original language: English

ASJC Scopus subject areas: Human-Computer Interaction, Software, Computer Graphics and Computer-Aided Design

DOIs:

10.1155/2015/975371

URLs:

<http://www.scopus.com/inward/record.url?scp=84929378426&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84929378426

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

#### **Vibrotactile Stimulation as an Instructor for Mimicry-Based Physical Exercise**

The present aim was to investigate functionality of vibrotactile stimulation in mimicry-based behavioral regulation during physical exercise. Vibrotactile stimuli communicated instructions from an instructor to an exerciser to perform lower extremity movements. A wireless prototype was tested first in controlled laboratory conditions (Study 1) and was followed by a user study (Study 2) that was conducted in a group exercise situation for elderly participants with a new version of the

system with improved construction and extended functionality. The results of Study 1 showed that vibrotactile instructions were successful in both supplementing and substituting visual knee lift instructions. Vibrotactile stimuli were accurately recognized, and exercise with the device received affirmative ratings. Interestingly, tactile stimulation appeared to stabilize acceleration magnitude of the knee lifts in comparison to visual instructions. In Study 2 it was found that user experience of the system was mainly positive by both the exercisers and their instructors. For example, exercise with vibrotactile instructions was experienced as more motivating than conventional exercise session. Together the results indicate that tactile instructions could increase possibilities for people having difficulties in following visual and auditory instructions to take part in mimicry-based group training. Both studies also revealed development areas that were primarily related to a slight delay in triggering the vibrotactile stimulation.

#### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Department of Pervasive Computing, Augmented Human Activities (AHA), University of Tampere, Audio Riders, Ltd.

Contributors: Lylykangas, J., Heikkinen, J., Surakka, V., Raisamo, R., Myllymaa, K., Laitinen, A.

Publication date: 2015

Peer-reviewed: Yes

#### **Publication information**

Journal: Advances in Human Computer Interaction

Article number: 953794

ISSN (Print): 1687-5893

Ratings:

Scopus rating (2015): CiteScore 3.7 SJR 0.501 SNIP 1.251

Original language: English

ASJC Scopus subject areas: Human-Computer Interaction

DOIs:

10.1155/2015/953794

URLs:

<http://www.scopus.com/inward/record.url?scp=84947260991&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84947260991

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

#### **A Barrier framework for open e-learning in public administrations**

E-Learning and openness in education are receiving ever increasing attention in businesses as well as in academia. However, these practices have only to small extent been introduced in public administrations. The study addresses this gap by presenting a literature review on Open Educational Resources [OER] and E-Learning in the public sector. The main goal of the article is to identify challenges to open E-Learning in public administrations. Experiences will be conceptualized as barriers which need to be considered when introducing open E-Learning systems and programs in administrations. The main outcome is a systematic review of lessons learned, presented as a contextualized Barrier Framework which is suitable to analyze requirements when introducing E-Learning and OER in public administrations.

#### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Managing digital industrial transformation (mDIT), Ruhr West University of Applied Sciences, Jyväskylän yliopisto

Contributors: Stoffregen, J., Pawlowski, J. M., Pirkkalainen, H.

Number of pages: 11

Pages: 674-684

Publication date: 2015

Peer-reviewed: Yes

#### **Publication information**

Journal: Computers in Human Behavior

Volume: 51

Issue number: B

ISSN (Print): 0747-5632

Ratings:

Scopus rating (2015): CiteScore 5.5 SJR 1.583 SNIP 2.184

Original language: English

ASJC Scopus subject areas: Human-Computer Interaction, Psychology(all), Arts and Humanities (miscellaneous)

Keywords: E-Learning, Open education, Open Educational Resources, Public Administrations

DOIs:

10.1016/j.chb.2014.12.024

Source: Scopus

Source ID: 84920915233

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

### **Dynamic text presentation in print interpreting - An eye movement study of reading behaviour**

Print interpreting supports people with a hearing disability by giving them access to spoken language. In print interpreting, the interpreter types the spoken text in real time for the hard-of-hearing client to read. This results in dynamic text presentation. An eye movement study was conducted to compare two types of dynamic text presentation formats in print interpreting: letter-by-letter and word-by-word. Gaze path analysis with 20 hearing participants showed different types of reading behaviour during reading of two pieces of text in these two presentation formats. Our analysis revealed that the text presentation format has a significant effect on reading behaviour. Rereading and regressions occurred significantly more often with the word-by-word format than with the letter-by-letter format. We also found a significant difference between the number of regressions starting at the words that end a sentence and that of regressions starting at all other words. The frequency of rereading was significantly higher for incorrectly typed or abbreviated words than for the other words. Analysis of the post-test questionnaire found almost equal acceptance of the word-by-word and letter-by-letter formats by the participants. A follow-up study with 18 hard-of-hearing participants showed a similar trend in results. The findings of this study highlight the importance of developing print interpreting tools that allow the interpreter and the client to choose the options that best facilitate the communication. They also bring up the need to develop new eye movement metrics for analysing the reading of dynamic text, and provide first results on a new dynamic presentation context.

#### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Augmented Human Activities (AHA), School of Management (JKK)

Contributors: Sharmin, S., Špakov, O., Rähkä, K. J.

Number of pages: 14

Pages: 17-30

Publication date: 2015

Peer-reviewed: Yes

#### **Publication information**

Journal: International Journal of Human-Computer Studies

Volume: 78

ISSN (Print): 1071-5819

Ratings:

Scopus rating (2015): CiteScore 4.4 SJR 0.666 SNIP 1.739

Original language: English

ASJC Scopus subject areas: Human Factors and Ergonomics, Software, Education, Engineering(all), Human-Computer Interaction, Hardware and Architecture

Keywords: Dynamic text presentation, Eye movements, Print interpreting, Reading, Regressions

DOIs:

10.1016/j.ijhcs.2015.01.010

URLs:

<http://www.scopus.com/inward/record.url?scp=84923618729&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84923618729

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

### **Class-Specific Reference Discriminant Analysis With Application in Human Behavior Analysis**

In this paper, a novel nonlinear subspace learning technique for class-specific data representation is proposed. A novel data representation is obtained by applying nonlinear class-specific data projection to a discriminant feature space, where the data belonging to the class under consideration are enforced to be close to their class representation, while the data belonging to the remaining classes are enforced to be as far as possible from it. A class is represented by an optimized class vector, enhancing class discrimination in the resulting feature space. An iterative optimization scheme is proposed to this end, where both the optimal nonlinear data projection and the optimal class representation are determined in each optimization step. The proposed approach is tested on three problems relating to human behavior analysis: Face recognition, facial expression recognition, and human action recognition. Experimental results denote the effectiveness of the proposed approach, since the proposed class-specific reference discriminant analysis outperforms kernel discriminant analysis, kernel spectral regression, and class-specific kernel discriminant analysis, as well as support vector machine-based classification, in most cases.

#### **General information**



Publication status: Published  
MoE publication type: A1 Journal article-refereed  
Organisations: Research Community on Data-to-Decision (D2D), Aristotle University of Thessaloniki, Department of Informatics  
Contributors: Iosifidis, A., Tefas, A., Pitas, I.  
Pages: 315-326  
Publication date: 25 Dec 2014  
Peer-reviewed: Yes

#### Publication information

Journal: IEEE Transactions on Human-Machine Systems  
Volume: 45  
Issue number: 3  
ISSN (Print): 2168-2291  
Ratings:  
Scopus rating (2014): CiteScore 7.3 SJR 1.28 SNIP 3.026  
Original language: English  
ASJC Scopus subject areas: Artificial Intelligence, Signal Processing, Human Factors and Ergonomics, Computer Networks and Communications, Computer Science Applications, Human-Computer Interaction, Control and Systems Engineering  
DOIs:  
10.1109/THMS.2014.2379274  
Research output: Contribution to journal › Article › Scientific › peer-review

#### Schoolchildren's user experiences on a physical exercise game utilizing lighting and audio

Motivated by the troubling news on decreased exercise amount and increased obesity among children and adolescents, we investigated the possibilities of interactive lighting technology in encouraging children to participate in physical exercise in schools. We have created a story-driven physical exercise game based on light and sound utilizing a reasonably priced technological setup. The game has been evaluated with several groups of schoolchildren during physical education classes. The results show that a physical exercise game enhanced with lighting and audio keeps schoolchildren motivated both mentally and physically even after several playtimes. In subjective evaluations, participants still found the story of the game interesting after three playtimes, and were eager to exercise this way again.

#### General information

Publication status: Published  
MoE publication type: A1 Journal article-refereed  
Organisations: Augmented Human Activities (AHA), Mathematical modelling with wide societal impact (MathImpact), University of Tampere  
Contributors: Keskinen, T., Hakulinen, J., Turunen, M., Heimonen, T., Sand, A., Paavilainen, J., Parviainen, J., Yrjänäinen, S., Mäyrä, F., Okkonen, J., Raisamo, R.  
Number of pages: 10  
Pages: 475-484  
Publication date: 1 Dec 2014  
Peer-reviewed: Yes

#### Publication information

Journal: Entertainment Computing  
Volume: 5  
Issue number: 4  
ISSN (Print): 1875-9521  
Ratings:  
Scopus rating (2014): CiteScore 2.2 SJR 0.404 SNIP 1.424  
Original language: English  
ASJC Scopus subject areas: Software, Human-Computer Interaction  
Keywords: Exergaming, Interactive lighting, Physical education, Schoolchildren, Storytelling, User experience  
DOIs:  
10.1016/j.entcom.2014.08.009  
URLs:  
<http://www.scopus.com/inward/record.url?scp=84912526011&partnerID=8YFLogxK> (Link to publication in Scopus)  
Source: Scopus  
Source ID: 84912526011  
Research output: Contribution to journal › Article › Scientific › peer-review

### **Global social knowledge management - Understanding barriers for global workers utilizing social software**

Utilizing social software as a part of a global knowledge management strategy has raised increasing interest in enterprises as well as in the educational domain. Rather than being proactive, organizations tend to face barriers related to knowledge management after the problems occur. When dealing with social technologies in a distributed setting, organizations and individuals face a variety of barriers currently unrecognized in knowledge management literature. Within the study, we analyze knowledge management literature extending the body of knowledge with barrier analysis regarding global challenges as well as social software. Our focus is especially on knowledge exchange and globally distributed collaboration activities in organizations. We argue for contextualized understanding of the barriers, recognizing the challenges studied in similar activities. The paper concludes with a synthesis of these interrelated components, proposing a Global Social Knowledge Management-barrier framework that demonstrates the wide spectrum of possible challenges in globally distributed, social software supported knowledge management activities.

#### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Managing digital industrial transformation (mDIT), Jyväskylän yliopisto

Contributors: Pirkkalainen, H., Pawlowski, J. M.

Number of pages: 11

Pages: 637-647

Publication date: Jan 2014

Peer-reviewed: Yes

#### **Publication information**

Journal: Computers in Human Behavior

Volume: 30

ISSN (Print): 0747-5632

Ratings:

Scopus rating (2014): CiteScore 5.1 SJR 1.536 SNIP 2.377

Original language: English

ASJC Scopus subject areas: Arts and Humanities (miscellaneous), Human-Computer Interaction, Psychology(all)

Keywords: Barriers, Global collaboration, Knowledge management, Knowledge sharing, Social software

DOIs:

10.1016/j.chb.2013.07.041

URLs:

<http://www.scopus.com/inward/record.url?scp=84889083844&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84889083844

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

### **Head movement and facial expressions as game input**

This study aimed to develop and test a hands-free video game that utilizes information on the player's real-time face position and facial expressions as intrinsic elements of a gameplay. Special focus was given to investigating the user's subjective experiences in utilizing computer vision input in the game interaction. The player's goal was to steer a drunken character home as quickly as possible by moving their head. Additionally, the player could influence the behavior of game characters by using the facial expressions of frowning and smiling. The participants played the game with computer vision and a conventional joystick and rated the functionality of the control methods and their emotional and game experiences. The results showed that although the functionality of the joystick steering was rated higher than that of the computer vision method, the use of head movements and facial expressions enhanced the experiences of game playing in many ways. The participants rated playing with the computer vision technique as more entertaining, interesting, challenging, immersive, and arousing than doing so with a joystick. The results suggested that a high level of experienced arousal in the case of computer vision-based interaction may be a key factor for better experiences of game playing.

#### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Augmented Human Activities (AHA)

Contributors: Ilves, M., Gizatdinova, Y., Surakka, V., Vankka, E.

Number of pages: 10

Pages: 147-156

Publication date: 2014

Peer-reviewed: Yes

#### **Publication information**

Journal: Entertainment Computing

Volume: 5

Issue number: 3  
ISSN (Print): 1875-9521  
Ratings:

Scopus rating (2014): CiteScore 2.2 SJR 0.404 SNIP 1.424  
Original language: English

ASJC Scopus subject areas: Software, Human-Computer Interaction

Keywords: Camera-based video game, Computer vision, Emotion, Face detection and tracking, Facial expression classification, Gameplay experience

DOIs:

10.1016/j.entcom.2014.04.005

URLs:

<http://www.scopus.com/inward/record.url?scp=84901983211&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84901983211

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

### **Demographic differences in perceived benefits from gamification**

In recent years, "gamification" has been proposed as a solution for engaging people in individually and socially sustainable behaviors, such as exercise, sustainable consumption, and education. This paper studies demographic differences in perceived benefits from gamification in the context of exercise. On the basis of data gathered via an online survey (N = 195) from an exercise gamification service Fitocracy, we examine the effects of gender, age, and time using the service on social, hedonic, and utilitarian benefits and facilitating features of gamifying exercise. The results indicate that perceived enjoyment and usefulness of the gamification decline with use, suggesting that users might experience novelty effects from the service. The findings show that women report greater social benefits from the use of gamification. Further, ease of use of gamification is shown to decline with age. The implications of the findings are discussed.

### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Research group: TUT Game Lab, Mathematical modelling with wide societal impact (MathImpact)

Contributors: Koivisto, J., Hamari, J.

Number of pages: 10

Pages: 179-188

Publication date: 2014

Peer-reviewed: Yes

### **Publication information**

Journal: Computers in Human Behavior

Volume: 35

ISSN (Print): 0747-5632

Ratings:

Scopus rating (2014): CiteScore 5.1 SJR 1.536 SNIP 2.377

Original language: English

ASJC Scopus subject areas: Arts and Humanities (miscellaneous), Human-Computer Interaction, Psychology(all)

Keywords: Demographics, Games for health, Gamification, Gender, Persuasive technology, Social networking

DOIs:

10.1016/j.chb.2014.03.007

URLs:

<http://www.scopus.com/inward/record.url?scp=84897395804&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84897395804

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

### **Transparency of intentions decreases privacy concerns in ubiquitous surveillance**

An online experiment (n=1,897) was carried out to understand how data disclosure practices in ubiquitous surveillance affect users' privacy concerns. Information about the identity and intentions of a data collector was manipulated in hypothetical surveillance scenarios. Privacy concerns were found to differ across the scenarios and moderated by knowledge about the collector's identity and intentions. Knowledge about intentions exhibited a stronger effect. When no information about intentions was disclosed, the respondents postulated negative intentions. A positive effect was found for disclosing neutral intentions of an organization or unknown data collector, but not for a private data collector. The findings underline the importance of disclosing intentions of data use to users in an easily understandable manner.

### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Mathematical modelling with wide societal impact (MathImpact), Cluster of Excellence on Multimodal Computing and Interaction, Saarland University, Aalto University, Helsinki Institute for Information Technology HIIT, Department of Information and Service Economy

Contributors: Oulasvirta, A., Suomalainen, T., Hamari, J., Lampinen, A., Karvonen, K.

Publication date: 2014

Peer-reviewed: Yes

### Publication information

Journal: CYBERPSYCHOLOGY BEHAVIOR AND SOCIAL NETWORKING

Volume: 17

Issue number: 10

ISSN (Print): 2152-2715

Ratings:

Scopus rating (2014): CiteScore 5.7 SJR 1.712 SNIP 1.795

Original language: English

ASJC Scopus subject areas: Human-Computer Interaction, Applied Psychology, Communication, Computer Science Applications, Social Psychology, Medicine(all)

DOIs:

10.1089/cyber.2013.0585

URLs:

<http://www.scopus.com/inward/record.url?scp=84907285570&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84907285570

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

### Measuring flow in gamification: Dispositional Flow Scale-2

This paper measures flow in the context of gamification and investigates the psychometric properties of the Dispositional Flow Scale-2 (DFS-2). We employ data gathered from users of an exercise gamification service (N = 200). The results show that the original DFS-2 factorial structure does result in a similar model fit as the original work. However, we also present a factorial respecification that satisfies more recent model fit thresholds. Beyond validating the original DFS-2 instrument in the context of gamification, the psychometric analysis and the respecifications suggest that the components of flow divide into highly correlated conditions of flow (which were also found to be more salient in the context of gamification: autotelic experience, balance of skill and challenge, control, clear goals, and feedback) and into possible outcomes (merging action-awareness, concentration, loss of sense of time, and loss of self-consciousness) from achieving flow.

### General information

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Research group: TUT Game Lab, Mathematical modelling with wide societal impact (MathImpact), Department of Information and Service Economy, Aalto University

Contributors: Hamari, J., Koivisto, J.

Number of pages: 11

Pages: 133-143

Publication date: 2014

Peer-reviewed: Yes

### Publication information

Journal: Computers in Human Behavior

Volume: 40

ISSN (Print): 0747-5632

Ratings:

Scopus rating (2014): CiteScore 5.1 SJR 1.536 SNIP 2.377

Original language: English

ASJC Scopus subject areas: Arts and Humanities (miscellaneous), Human-Computer Interaction, Psychology(all)

Keywords: DFS-2, Exergames, Flow, Games for health, Gamification, Persuasive technology

DOIs:

10.1016/j.chb.2014.07.048

URLs:

<http://www.scopus.com/inward/record.url?scp=84906832723&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84906832723

### **Comparison of Saltation, Amplitude Modulation, and a Hybrid Method of Vibrotactile Stimulation**

Illusory vibrotactile movement can be used to provide directional tactile information on the skin. Our research question was how the presentation method affects the perception of vibrotactile movement. Illusion of vibrotactile mediolateral movement was elicited to a left dorsal forearm to investigate cognitive and emotional experiences to vibrotactile stimulation. Eighteen participants were presented with stimuli delivered to a linearly aligned row of three vibrotactile actuators. Three presentation methods were used-saltation, amplitude modulation, and a hybrid method-to form 12 distinct patterns of movement. First, the stimuli were compared pairwise using a two-alternative forced-choice procedure (same-different judgments). Second, the stimuli were rated using three nine-point bipolar scales measuring the continuity, pleasantness, and arousal of each stimulus. The stimuli presented with the amplitude modulation method were rated significantly more continuous and pleasant, and less arousing. Strong correlations between the cognition-related scale of continuity and the emotion-related scales of pleasantness and arousal were found: More continuous stimuli were rated more pleasant and less arousing.

#### **General information**

Publication status: Published  
MoE publication type: A1 Journal article-refereed  
Organisations: Augmented Human Activities (AHA)  
Contributors: Raisamo, J., Raisamo, R., Surakka, V.  
Number of pages: 5  
Pages: 517-521  
Publication date: Oct 2013  
Peer-reviewed: Yes

#### **Publication information**

Journal: IEEE Transactions on Haptics  
Volume: 6  
Issue number: 4  
Article number: 6517847  
ISSN (Print): 1939-1412  
Ratings:  
Scopus rating (2013): CiteScore 5 SJR 0.754 SNIP 2.34  
Original language: English  
ASJC Scopus subject areas: Human-Computer Interaction, Computer Science Applications, Medicine(all)  
Keywords: evaluation/methodology, haptic I/O, Information interfaces and representation (HCI), user interfaces  
DOIs:  
10.1109/TOH.2013.25  
URLs:  
<http://www.scopus.com/inward/record.url?scp=84890532189&partnerID=8YFLogxK> (Link to publication in Scopus)  
Source: Scopus  
Source ID: 84890532189

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

### **An evaluation of the virtual curvature with the StickGrip haptic device: A case study**

Dynamic simulation of distance to the physical surface could promote the development of new inexpensive tools for blind and visually impaired users. The StickGrip is a haptic device comprised of the Wacom pen input device added with a motorized penholder. The goal of the research presented in this paper was to assess the accuracy and usefulness of the new pen-based interaction technique when the position and displacement of the penholder in relation to the pen tip provided haptic feedback to the user about the distance to the physical or virtual surface of interaction. The aim was to examine how accurately people are able (1) to align the randomly deformed virtual surfaces to the flat surface and (2) to adjust the number of surface samples having a randomly assigned curvature to the template having the given curvature and kept fixed. These questions were approached by measuring both the values of the adjusted parameters and the parameters of the human performance, such as a ratio between inspection time and control time spent by the participants to complete the matching task with the use of the StickGrip device. The test of the pen-based interaction technique was conducted in the absence of visual feedback when the subject could rely on the proprioception and kinesthetic sense. The results are expected to be useful for alternative visualization and interaction with complex topographic and mathematical surfaces, artwork, and modeling.

#### **General information**

Publication status: Published  
MoE publication type: A1 Journal article-refereed  
Organisations: Augmented Human Activities (AHA)  
Contributors: Evreinova, T. V., Evreinov, G., Raisamo, R.

Number of pages: 13  
Pages: 161-173  
Publication date: Jun 2013  
Peer-reviewed: Yes

#### **Publication information**

Journal: Universal Access in the Information Society

Volume: 12

Issue number: 2

ISSN (Print): 1615-5289

Ratings:

Scopus rating (2013): CiteScore 2.6 SJR 0.513 SNIP 1.516

Original language: English

ASJC Scopus subject areas: Software, Information Systems, Computer Networks and Communications, Human-Computer Interaction

Keywords: Curved surface, Kinesthetic feedback, Pen-based interaction, StickGrip haptic device

DOIs:

10.1007/s10209-012-0273-0

URLs:

<http://www.scopus.com/inward/record.url?scp=84878407340&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84878407340

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

#### **Virtual sectioning and haptic exploration of volumetric shapes in the absence of visual feedback**

The reduced behavior for exploration of volumetric data based on the virtual sectioning concept was compared with the free scanning at the use of the StickGrip linkage-free haptic device. Profiles of the virtual surface were simulated through the penholder displacements in relation to the pen tip of the stylus. One or two geometric shapes (cylinder, trapezoidal prism, ball, and torus) or their halves and the ripple surface were explored in the absence of visual feedback. In the free scanning, the person physically moved the stylus. In the parallel scanning, cross-sectional profiles were generated automatically starting from the location indicated by the stylus. Analysis of the performance of 18 subjects demonstrated that the new haptic visualization and exploration technique allowed to create accurate mental images, to recognize and identify virtual shapes. The mean number of errors was about 2.5% in the free scanning mode and 1.9% and 1.5% in the parallel scanning mode at the playback velocity of 28 mm/s and 42 mm/s, respectively. All participants agreed that the haptic visualization of the 3D virtual surface presented as the cross-sectional slices of the workspace was robust and easy to use. The method was developed for visualization of spatially distributed data collected by sensors.

#### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Augmented Human Activities (AHA)

Contributors: Evreinova, T. V., Evreinov, G., Raisamo, R.

Publication date: 2013

Peer-reviewed: Yes

#### **Publication information**

Journal: Advances in Human Computer Interaction

Volume: 2013

Article number: 740324

ISSN (Print): 1687-5893

Ratings:

Scopus rating (2013): CiteScore 2.3 SJR 0.253 SNIP 1.073

Original language: English

ASJC Scopus subject areas: Human-Computer Interaction

DOIs:

10.1155/2013/740324

URLs:

<http://www.scopus.com/inward/record.url?scp=84881494392&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84881494392

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

### **Touch gestures in communicating emotional intention via vibrotactile stimulation**

Remote communication between people typically relies on audio and vision although current mobile devices are increasingly based on detecting different touch gestures such as swiping. These gestures could be adapted to interpersonal communication by using tactile technology capable of producing touch stimulation to a user's hand. It has been suggested that such mediated social touch would allow for new forms of emotional communication. The aim was to study whether vibrotactile stimulation that imitates human touch can convey intended emotions from one person to another. For this purpose, devices were used that converted touch gestures of squeeze and finger touch to vibrotactile stimulation. When one user squeezed his device or touched it with finger(s), another user felt corresponding vibrotactile stimulation on her device via four vibrating actuators. In an experiment, participant dyads comprising a sender and receiver were to communicate variations in the affective dimensions of valence and arousal using the devices. The sender's task was to create stimulation that would convey unpleasant, pleasant, relaxed, or aroused emotional intention to the receiver. Both the sender and receiver rated the stimulation using scales for valence and arousal so that the match between sender's intended emotions and receiver's interpretations could be measured. The results showed that squeeze was better at communicating unpleasant and aroused emotional intention, while finger touch was better at communicating pleasant and relaxed emotional intention. The results can be used in developing technology that enables people to communicate via touch by choosing touch gesture that matches the desired emotion.

#### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Augmented Human Activities (AHA), Field robotics for efficient work sites (FIRE)

Contributors: Rantala, J., Salminen, K., Raisamo, R., Surakka, V.

Number of pages: 12

Pages: 679-690

Publication date: 2013

Peer-reviewed: Yes

#### **Publication information**

Journal: International Journal of Human-Computer Studies

Volume: 71

Issue number: 6

ISSN (Print): 1071-5819

Ratings:

Scopus rating (2013): CiteScore 4.6 SJR 0.861 SNIP 2.378

Original language: English

ASJC Scopus subject areas: Human Factors and Ergonomics, Software, Education, Engineering(all), Human-Computer Interaction, Hardware and Architecture

Keywords: Affective interaction, Emotions, Haptics, Mediated social touch, Mobile devices, Tactile communication

DOIs:

10.1016/j.ijhcs.2013.02.004

URLs:

<http://www.scopus.com/inward/record.url?scp=84876589281&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84876589281

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

### **SymbolChat: A flexible picture-based communication platform for users with intellectual disabilities**

Persons with intellectual disabilities benefit from participating in the modern information society, especially the World Wide Web, social media and Internet-mediated communication services. Although several computer-based prototypes and commercial systems have been introduced for accessible in-person communication, currently few applications and services exist to support synchronous remote communication for this user group. We introduce SymbolChat, a software platform that supports the creation of multimodal communication applications utilizing picture-based instant messaging. End users and their support personnel can customize the input and output features of the application based on their individual needs and abilities. The interaction is based on touchscreen input and speech output using speech synthesis technology. The SymbolChat platform was developed together with the prospective end users and practitioners in the field of special needs care. We evaluated the prototype application in a field study with nine users with varying degrees of intellectual and other disabilities. The results clearly indicate that the participants were able to express themselves in spontaneous communication using a large-scale picture-based vocabulary (around 2000 symbols) even without prior training in the use of symbols. This finding was supported in the constructive feedback gathered from professionals working in the area. We also successfully applied methodology from other settings, such as child-computer interaction to evaluate interaction in this challenging context. Overall, the results show that social inclusion for people with intellectual disabilities can be improved with customizable communication tools. The implemented communication platform forms a solid basis for further improvements and new communication services. In addition, we found that users with motor impairments would greatly benefit from alternative input and output methods for symbol browsing and selection.

### General information

Publication status: Published  
MoE publication type: A1 Journal article-refereed  
Organisations: Augmented Human Activities (AHA), Laurea University of Applied Sciences  
Contributors: Keskinen, T., Heimonen, T., Turunen, M., Rajaniemi, J. P., Kauppinen, S.  
Number of pages: 13  
Pages: 374-386  
Publication date: Sep 2012  
Peer-reviewed: Yes

### Publication information

Journal: Interacting with Computers  
Volume: 24  
Issue number: 5  
ISSN (Print): 0953-5438  
Ratings:  
Scopus rating (2012): CiteScore 4.9 SJR 0.669 SNIP 1.982  
Original language: English  
ASJC Scopus subject areas: Human-Computer Interaction, Software  
Keywords: Augmentative and alternative communication, Instant messaging, Picture-based communication, User-centered design  
DOIs:  
10.1016/j.intcom.2012.06.003  
URLs:  
<http://www.scopus.com/inward/record.url?scp=84866739334&partnerID=8YFLogxK> (Link to publication in Scopus)  
Source: Scopus  
Source ID: 84866739334  
Research output: Contribution to journal › Article › Scientific › peer-review

### Barriers to task-based information access in molecular medicine

We analyze barriers to task-based information access in molecular medicine, focusing on research tasks, which provide task performance sessions of varying complexity. Molecular medicine is a relevant domain because it offers thousands of digital resources as the information environment. Data were collected through shadowing of real work tasks. Thirty work task sessions were analyzed and barriers in these identified. The barriers were classified by their character (conceptual, syntactic, and technological) and by their context of appearance (work task, system integration, or system). Also, work task sessions were grouped into three complexity classes and the frequency of barriers of varying types across task complexity levels were analyzed. Our findings indicate that although most of the barriers are on system level, there is a quantum of barriers in integration and work task contexts. These barriers might be overcome through attention to the integrated use of multiple systems at least for the most frequent uses. This can be done by means of standardization and harmonization of the data and by taking the requirements of the work tasks into account in system design and development, because information access is seldom an end itself, but rather serves to reach the goals of work tasks.

### General information

Publication status: Published  
MoE publication type: A1 Journal article-refereed  
Organisations: Tampere Research Center for Information and Media  
Contributors: Kumpulainen, S., Järvelin, K.  
Number of pages: 12  
Pages: 86-97  
Publication date: Jan 2012  
Peer-reviewed: Yes

### Publication information

Journal: JOURNAL OF THE ASSOCIATION FOR INFORMATION SCIENCE AND TECHNOLOGY  
Volume: 63  
Issue number: 1  
ISSN (Print): 2330-1635  
Ratings:  
Scopus rating (2012): CiteScore 5.5 SJR 1.398 SNIP 2.283  
Original language: English  
ASJC Scopus subject areas: Software, Artificial Intelligence, Information Systems, Human-Computer Interaction, Computer Networks and Communications  
DOIs:  
10.1002/asi.21672



Source: Scopus

Source ID: 83655163751

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

### **Tactile modulation of emotional speech samples**

Traditionally only speech communicates emotions via mobile phone. However, in daily communication the sense of touch mediates emotional information during conversation. The present aim was to study if tactile stimulation affects emotional ratings of speech when measured with scales of pleasantness, arousal, approachability, and dominance. In the Experiment 1 participants rated speech-only and speech-tactile stimuli. The tactile signal mimicked the amplitude changes of the speech. In the Experiment 2 the aim was to study whether the way the tactile signal was produced affected the ratings. The tactile signal either mimicked the amplitude changes of the speech sample in question, or the amplitude changes of another speech sample. Also, concurrent static vibration was included. The results showed that the speech-tactile stimuli were rated as more arousing and dominant than the speech-only stimuli. The speech-only stimuli were rated as more approachable than the speech-tactile stimuli, but only in the Experiment 1. Variations in tactile stimulation also affected the ratings. When the tactile stimulation was static vibration the speech-tactile stimuli were rated as more arousing than when the concurrent tactile stimulation was mimicking speech samples. The results suggest that tactile stimulation offers new ways of modulating and enriching the interpretation of speech.

### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Augmented Human Activities (AHA), Nokia

Contributors: Salminen, K., Surakka, V., Lylykangas, J., Rantala, J., Ahmaniemi, T., Raisamo, R., Trendafilov, D., Kildal, J.

Publication date: 2012

Peer-reviewed: Yes

### **Publication information**

Journal: Advances in Human Computer Interaction

Volume: 2012

Article number: 741304

ISSN (Print): 1687-5893

Ratings:

Scopus rating (2012): CiteScore 1.5 SJR 0.311 SNIP 1.753

Original language: English

ASJC Scopus subject areas: Human-Computer Interaction

DOIs:

10.1155/2012/741304

URLs:

<http://www.scopus.com/inward/record.url?scp=84867372792&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84867372792

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

### **Heart rate responses to synthesized affective spoken words**

The present study investigated the effects of brief synthesized spoken words with emotional content on the ratings of emotions and heart rate responses. Twenty participants' heart rate functioning was measured while they listened to a set of emotionally negative, neutral, and positive words produced by speech synthesizers. At the end of the experiment, ratings of emotional experiences were also collected. The results showed that the ratings of the words were in accordance with their valence. Heart rate deceleration was significantly the strongest and most prolonged to the negative stimuli. The findings are the first suggesting that brief spoken emotionally toned words evoke a similar heart rate response pattern found earlier for more sustained emotional stimuli.

### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Augmented Human Activities (AHA)

Contributors: Ilves, M., Surakka, V.

Publication date: 2012

Peer-reviewed: Yes

### **Publication information**

Journal: Advances in Human Computer Interaction

Volume: 2012

Article number: 158487

ISSN (Print): 1687-5893

Ratings:

Scopus rating (2012): CiteScore 1.5 SJR 0.311 SNIP 1.753

Original language: English

ASJC Scopus subject areas: Human-Computer Interaction

DOIs:

10.1155/2012/158487

URLs:

<http://www.scopus.com/inward/record.url?scp=84866156932&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84866156932

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

### **Novel approaches to crawling important pages early**

Web crawlers are essential to many Web applications, such as Web search engines, Web archives, and Web directories, which maintain Web pages in their local repositories. In this paper, we study the problem of crawl scheduling that biases crawl ordering toward important pages. We propose a set of crawling algorithms for effective and efficient crawl ordering by prioritizing important pages with the well-known PageRank as the importance metric. In order to score URLs, the proposed algorithms utilize various features, including partial link structure, inter-host links, page titles, and topic relevance. We conduct a large-scale experiment using publicly available data sets to examine the effect of each feature on crawl ordering and evaluate the performance of many algorithms. The experimental results verify the efficacy of our schemes. In particular, compared with the representative RankMass crawler, the FPR-title-host algorithm reduces computational overhead by a factor as great as three in running time while improving effectiveness by 5% in cumulative PageRank.

### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Research Community on Data-to-Decision (D2D), Korea University

Contributors: Alam, M. H., Ha, J. W., Lee, S. K.

Number of pages: 28

Pages: 707-734

Publication date: 2012

Peer-reviewed: Yes

### **Publication information**

Journal: Knowledge and Information Systems

Volume: 33

Issue number: 3

ISSN (Print): 0219-1377

Ratings:

Scopus rating (2012): CiteScore 4.2 SJR 1.111 SNIP 2.008

Original language: English

ASJC Scopus subject areas: Software, Information Systems, Human-Computer Interaction, Hardware and Architecture, Artificial Intelligence

Keywords: Crawl ordering, Fractional PageRank, PageRank, Web crawler

DOIs:

10.1007/s10115-012-0535-4

URLs:

<http://www.scopus.com/inward/record.url?scp=84869092092&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84869092092

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

### **Integrating discrete events and continuous head movements for video-based interaction techniques**

Human head gestures can potentially trigger different commands from the list of available options in graphical user interfaces or in virtual and smart environments. However, continuous tracking techniques are limited in generating discrete events which could be used to execute a predefined set of commands. In this article, we discuss a possibility to encode a set of discrete events by integrating continuous head movements and crossing-based interaction paradigm. A set of commands can be encoded through specific sequences of crossing points when a head-mouse cursor such as a scaled pointer interacts with a graphical object. The goal of the present experiment was testing the perceptual-motor performance of novices in target acquisition tasks using a subset of round head gestures and symbolic icons designating eight types of directional head movements. We have demonstrated that the novices can equally well execute round head gestures in clockwise and counter-clockwise directions by making two crossings for about 2 s or three crossings for about 3 s. None of

the participants reported neck strain or other problems after 360 trials performed during a 40-min test in each of 5 days.

#### **General information**

Publication status: Published  
MoE publication type: A1 Journal article-refereed  
Organisations: Augmented Human Activities (AHA)  
Contributors: Evreinova, T. V., Evreinov, G., Raisamo, R.  
Number of pages: 8  
Pages: 739-746  
Publication date: Nov 2011  
Peer-reviewed: Yes

#### **Publication information**

Journal: Behaviour and Information Technology  
Volume: 30  
Issue number: 6  
ISSN (Print): 0144-929X  
Ratings:  
Scopus rating (2011): CiteScore 1.9 SJR 0.516 SNIP 1.052  
Original language: English  
ASJC Scopus subject areas: Developmental and Educational Psychology, Arts and Humanities (miscellaneous), Social Sciences(all), Human-Computer Interaction  
Keywords: Continuous input, Crossing-based interaction, Dwell time, Gestures, Head tracking, Round head gestures  
DOIs:  
10.1080/01449290903353013  
URLs:  
<http://www.scopus.com/inward/record.url?scp=84855648205&partnerID=8YFLogxK> (Link to publication in Scopus)  
Source: Scopus  
Source ID: 84855648205  
Research output: Contribution to journal › Article › Scientific › peer-review

#### **Interaction strategies for an affective conversational agent**

The development of embodied conversational agents (ECA) as companions brings several challenges for both affective and conversational dialogue. These include challenges in generating appropriate affective responses, selecting the overall shape of the dialogue, providing prompt system response times, and handling interruptions. We present an implementation of such a companion showing the development of individual modules that attempt to address these challenges. Further, to resolve resulting conflicts, we present encompassing interaction strategies that attempt to balance the competing requirements along with dialogues from our working prototype to illustrate these interaction strategies in operation. Finally, we provide the results of an evaluation of the companion using an evaluation methodology created for conversational dialogue and including analysis using appropriateness annotation.

#### **General information**

Publication status: Published  
MoE publication type: A1 Journal article-refereed  
Organisations: Augmented Human Activities (AHA), School of Computing Teesside University Middlesbrough, University of Oxford, Telefonica, School of Management (JKK), School of Computing Edinburgh Napier University Edinburgh, SICS SE-164 29 Kista, ILS Institute SUNY Albany Albany  
Contributors: Smith, C., Crook, N., Dobnik, S., Charlton, D., Boye, J., Pulman, S., Santos de la Camara, R., Turunen, M., Benyon, D., Bradley, J., Gambäck, B., Hansen, P., Mival, O., Webb, N., Cavazza, M.  
Number of pages: 17  
Pages: 395-411  
Publication date: Oct 2011  
Peer-reviewed: Yes

#### **Publication information**

Journal: Presence: Teleoperators and Virtual Environments  
Volume: 20  
Issue number: 5  
ISSN (Print): 1054-7460  
Ratings:  
Scopus rating (2011): CiteScore 3 SJR 0.354 SNIP 1.141  
Original language: English  
ASJC Scopus subject areas: Control and Systems Engineering, Software, Human-Computer Interaction, Computer Vision and Pattern Recognition  
DOIs:

10.1162/PRES\_a\_00063

URLs:

<http://www.scopus.com/inward/record.url?scp=84863122938&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84863122938

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

### **Multimodal and mobile conversational Health and Fitness Companions**

Multimodal conversational spoken dialogues using physical and virtual agents provide a potential interface to motivate and support users in the domain of health and fitness. This paper describes how such multimodal conversational Companions can be implemented to support their owners in various pervasive and mobile settings. We present concrete system architectures, virtual, physical and mobile multimodal interfaces, and interaction management techniques for such Companions. In particular how knowledge representation and separation of low-level interaction modelling from high-level reasoning at the domain level makes it possible to implement distributed, but still coherent, interaction with Companions. The distribution is enabled by using a dialogue plan to communicate information from domain level planner to dialogue management and from there to a separate mobile interface. The model enables each part of the system to handle the same information from its own perspective without containing overlapping logic, and makes it possible to separate task-specific and conversational dialogue management from each other. In addition to technical descriptions, results from the first evaluations of the Companions interfaces are presented.

### **General information**

Publication status: Published

MoE publication type: A1 Journal article-refereed

Organisations: Augmented Human Activities (AHA), SICS, Norwegian Univ. of Sci. and Technol., Telefonica, School of Computing Teesside University Middlesbrough

Contributors: Turunen, M., Hakulinen, J., Ståhl, O., Gambäck, B., Hansen, P., Rodríguez Gancedo, M. C., De La Cámara, R. S., Smith, C., Charlton, D., Cavazza, M.

Number of pages: 18

Pages: 192-209

Publication date: Apr 2011

Peer-reviewed: Yes

### **Publication information**

Journal: Computer Speech and Language

Volume: 25

Issue number: 2

ISSN (Print): 0885-2308

Ratings:

Scopus rating (2011): CiteScore 4.2 SJR 0.586 SNIP 1.9

Original language: English

ASJC Scopus subject areas: Theoretical Computer Science, Software, Human-Computer Interaction

Keywords: Cognitive modelling, Companions, Conversational spoken dialogue systems, Dialogue management, Embodied conversational agents, Mobile interfaces

DOIs:

[10.1016/j.csl.2010.04.004](https://doi.org/10.1016/j.csl.2010.04.004)

URLs:

<http://www.scopus.com/inward/record.url?scp=78049527811&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 78049527811

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

### **Tailored gamification: A review of literature**

Gamification is increasingly becoming a pertinent aspect of any UI and UX design. However, a canonical dearth in research and application of gamification has been related to the role of individual differences in susceptibility to gamification and its varied designs. To address this gap, this study reviews the extant corpus of research on tailored gamification (42 studies). The findings of the review indicate that most studies on the field are mostly focused on user modeling for a future personalization, adaptation, or recommendation of game elements. This user model usually contains the users' preferences of play (i.e., player types), and is mostly applied in educational settings. The main contributions of this paper are a standardized terminology of the game elements used in tailored gamification, the discussion on the most suitable game elements for each users' characteristic, and a research agenda including dynamic modeling, exploring multiple characteristics simultaneously, and understanding the effects of other aspects of the interaction on user experience.

### **General information**

Publication status: Published

MoE publication type: A2 Review article in a scientific journal

Organisations: Computing Sciences, Tampere University, Federal University of Rio Grande do Sul, State University of Santa Catarina

Contributors: Klock, A. C. T., Gasparini, I., Pimenta, M. S., Hamari, J.

Publication date: 1 Dec 2020

Peer-reviewed: Yes

### Publication information

Journal: International Journal of Human Computer Studies

Volume: 144

Article number: 102495

ISSN (Print): 1071-5819

Original language: English

ASJC Scopus subject areas: Software, Human Factors and Ergonomics, Education, Engineering(all), Human-Computer Interaction, Hardware and Architecture

Keywords: Adaptation, Gamification, Personalization, Recommendation, Systematic review, Tailoring

Electronic versions:

1-s2.0-S1071581920300975-main

DOIs:

10.1016/j.ijhcs.2020.102495

URLs:

<http://urn.fi/URN:NBN:fi:tuni-202007036316>

Source: Scopus

Source ID: 85086582163

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

### Why do people buy virtual goods: A meta-analysis

During the last decade, virtual goods have become an important target of consumption online (especially in games, virtual worlds and social networking services) amongst physical and digital goods. In this study we investigate the question of why do people purchase virtual goods by conducting a meta-analysis (random effects model) of the existing quantitative body of literature (24 studies) on the topic. The meta-analysis revealed an important aspect of value of virtual goods: contrary to traditional goods, the reasons why people purchase virtual goods are tightly connected to the platform where they are sold in. These findings underline the significance of service design and its relationship to the formation of value of virtual goods: the value of virtual goods is context-bound, and therefore, bound to the environment where they are usable in. Most factors that were found to be significant predictors of purchase behavior (such as network effects, self-presentation, enjoyment, ease of use, flow and use of the platform) are directly related to the aspects and design of the platform beyond the general attitudes towards virtual goods themselves. Moreover, we found that enjoyment and prolonged use of the platform were more important predictors for purchases in virtual worlds than in games.

### General information

Publication status: Published

MoE publication type: A2 Review article in a scientific journal

Organisations: Pervasive Computing, Gamification Group, Turun Yliopisto/Turun Biomateriaalikeskus

Contributors: Hamari, J., Keronen, L.

Number of pages: 11

Pages: 59-69

Publication date: 1 Jun 2017

Peer-reviewed: Yes

### Publication information

Journal: Computers in Human Behavior

Volume: 71

ISSN (Print): 0747-5632

Ratings:

Scopus rating (2017): CiteScore 7.4 SJR 1.555 SNIP 2.182

Original language: English

ASJC Scopus subject areas: Arts and Humanities (miscellaneous), Human-Computer Interaction, Psychology(all)

Keywords: Free-to-play, Freemium, Online games, Social networking services, Virtual goods, Virtual worlds

DOIs:

10.1016/j.chb.2017.01.042

Source: Scopus

Source ID: 85012307873

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

### **Subjective responses to synthesised speech with lexical emotional content: The effect of the naturalness of the synthetic voice**

This study aimed to investigate how the degree of naturalness and lexical emotional content of synthesised speech affects the subjective ratings of emotional experiences and how the naturalness of the voice affects the ratings of voice quality. Twenty-four participants listened to a set of affective words produced by three different speech synthesis techniques: formant synthesis, diphone synthesis and unit selection synthesis. The participants task was to rate their experiences evoked by the speech samples using three emotion-related bipolar scales for valence, arousal and approachability. The pleasantness, naturalness and clarity of the voices were also rated. The results showed that the affective words produced by the synthesisers evoked congruent emotion-related ratings in the participants. The ratings of the experienced valence and approachability were statistically significantly stronger when the affective words were produced by the more humanlike voices as compared to the more machinelike voice. The more humanlike voices were also rated as statistically significantly more natural, pleasant and clear than the less humanlike voice. Thus, our findings suggest that even machinelike voices can be used to communicate affective messages but that increasing the level of naturalness enhances positive feelings about synthetic voices and strengthens emotional communication between computers and humans.

#### **General information**

Publication status: Published

MoE publication type: A2 Review article in a scientific journal

Organisations: Augmented Human Activities (AHA), Field robotics for efficient work sites (FIRE)

Contributors: Ilves, M., Surakka, V.

Number of pages: 15

Pages: 117-131

Publication date: 1 Feb 2013

Peer-reviewed: Yes

#### **Publication information**

Journal: Behaviour and Information Technology

Volume: 32

Issue number: 2

ISSN (Print): 0144-929X

Ratings:

Scopus rating (2013): CiteScore 2.5 SJR 0.705 SNIP 1.444

Original language: English

ASJC Scopus subject areas: Developmental and Educational Psychology, Arts and Humanities (miscellaneous), Social Sciences(all), Human-Computer Interaction

Keywords: emotion, naturalness, synthesised speech

DOIs:

10.1080/0144929X.2012.702285

URLs:

<http://www.scopus.com/inward/record.url?scp=84874406163&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84874406163

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

### **At least nine ways to play: Approaching gamer mentalities**

Do digital games and play mean the same things for different people? This article presents the results of a 3-year study in which we sought for new ways to approach digital games cultures and playing practices. First, the authors present the research process in brief and emphasize the importance of merging different kinds of methods and materials in the study of games cultures. Second, the authors introduce a gaming mentality heuristics that is not dedicated to a certain domain or genre of games, addressing light casual and light social gaming motivations as well as more dedicated ones in a joint framework. The analysis reveals that, in contrast to common belief, the majority of digital gaming takes place between "casual relaxing" and "committed entertaining," where the multiplicity of experiences, feelings, and understandings that people have about their playing and digital games is wide ranging. Digital gaming is thus found to be a multifaceted social and cultural phenomenon that can be understood, practiced, and used in various ways.

#### **General information**

Publication status: Published

MoE publication type: A2 Review article in a scientific journal

Organisations: Mathematical modelling with wide societal impact (MathImpact)

Contributors: Kallio, K. P., Mäyrä, F., Kaipainen, K.

Number of pages: 27

Pages: 327-353

Publication date: Jul 2011

Peer-reviewed: Yes

### Publication information

Journal: GAMES AND CULTURE: A JOURNAL OF INTERACTIVE MEDIA

Volume: 6

Issue number: 4

ISSN (Print): 1555-4120

Ratings:

Scopus rating (2011): CiteScore 2.4 SJR 0.695 SNIP 1.438

Original language: English

ASJC Scopus subject areas: Cultural Studies, Communication, Anthropology, Arts and Humanities (miscellaneous), Applied Psychology, Human-Computer Interaction

Keywords: digital games, game research methodology, games cultures, heuristics, playing mentalities

DOIs:

10.1177/1555412010391089

URLs:

<http://www.scopus.com/inward/record.url?scp=79959469332&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 79959469332

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

### Some background on dialogue management and conversational speech for dialogue systems

Several dialogue management (DM) architectures and conversational speech for dialogue systems are presented. Basic types of DM systems include dialogue grammars and frames, plan-based and collaborative systems, and conversational games theory. DM architectures include SmartKom, Trindi, WITAS, CONVERSE, COMIC, agent-based dialogue management, and DM and automatic speech recognition (ASR) language modeling. All data collection tasks should be tailored for the conversational scenario under consideration as each scenario can present different properties. It is shown in the multimodal dialogue system that turn taking can usually be achieved by a fusion of gesture, gaze, and intonation. Intonation within the speech signal informs the dialogue manager when new information is introduced into the current conversation. By placing established emotion detection methods within the recursive nature of conversation we can consider discourse as the exploitation of the shared set of interaction affordances.

### General information

Publication status: Published

MoE publication type: A2 Review article in a scientific journal

Organisations: Augmented Human Activities (AHA), University of Oxford, University of Sheffield

Contributors: Wilks, Y., Catizone, R., Worgan, S., Turunen, M.

Number of pages: 12

Pages: 128-139

Publication date: Apr 2011

Peer-reviewed: Yes

### Publication information

Journal: Computer Speech and Language

Volume: 25

Issue number: 2

ISSN (Print): 0885-2308

Ratings:

Scopus rating (2011): CiteScore 4.2 SJR 0.586 SNIP 1.9

Original language: English

ASJC Scopus subject areas: Theoretical Computer Science, Software, Human-Computer Interaction

Keywords: Dialogue architectures, Dialogue management, Dialogue systems, Emotion detection, Human-computer interaction

DOIs:

10.1016/j.csl.2010.03.001

URLs:

<http://www.scopus.com/inward/record.url?scp=78049527943&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 78049527943

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

### Mille-Oeille: An architectural response to zoos' obsolescence in post-anthropocentric times

### General information

Publication status: Submitted  
MoE publication type: A3 Part of a book or another research book  
Organisations: Architecture, Rensselaer Polytechnic Institute, USA  
Contributors: Rubio Hernandez, R., Pérez-Guembe, E.  
Publication date: 2019

### Host publication information

Title of host publication: DATA & DESIGN : Methods of Computational Design Strategies  
Publisher: Routledge  
Editors: Del Signore, M., Diniz, N.  
ISBN (Print): 9780367369132  
ASJC Scopus subject areas: Arts and Humanities(all), Architecture , Human-Computer Interaction  
Keywords: Virtual Reality, Augmented Reality, Architecture  
Research output: Chapter in Book/Report/Conference proceeding › Chapter › Scientific › peer-review

### Collaborative Writing and Knowledge Creation in a Social Media Online Community

This chapter deals with teaching and learning knowledge creation in higher-education institutions (HEI) via collaborative writing. The challenge of HEIs is that teaching should build capabilities that enable learners to make use of and advance academic knowledge while simultaneously developing skills relevant for the future work life. In practice, teaching at university is often disconnected from authentic work life and the tasks are far more simplified than those in the future jobs. Therefore, to address the challenge HEIs face, this chapter focusses on knowledge creation, expanding it from bounded-learning communities to online communities in social media. In online communities, it is intrinsic to act and think globally, as demanded by the new imperative. This chapter portrays the case of one knowledge management course at an HEI in which the syllabus included collaborative writing for both a bounded-learning community and the online community of Wikipedia. The student group was multidisciplinary and multicultural, with both classroom learning and distance learning options available. The research material, analysed with qualitative methods, consisted of pre-course and anonymous post-course feedback surveys, as well as learning diaries. The results show that although prior to the course many students held a prejudice and lacked knowledge about social media as part of knowledge management, they expressed they had had eye-opening learning experiences because of the expanded learning community from the traditional bounded to the online community. Based on the results of the study and the experience of teachers, recommendations are given for developing learning activities of knowledge creation in HEIs.

### General information

Publication status: Published  
MoE publication type: A3 Part of a book or another research book  
Organisations: Industrial and Information Management, Research group: Business Ecosystems, Networks and Innovations , HAMK University of Applied Sciences  
Contributors: Suominen, A., Jussila, J.  
Number of pages: 15  
Pages: 95-109  
Publication date: 17 Nov 2018

### Host publication information

Title of host publication: The Future of Innovation and Technology in Education: Policies and Practices for Teaching and Learning Excellence (Emerald Studies in Higher Education, Innovation and Technology)  
Publisher: Emerald Group Publishing Ltd.  
Editors: Visvizi, A., Lytras, M. D., Daniela, L.  
ISBN (Print): 978-1-78756-556-2  
ISBN (Electronic): 978-1-78756-555-5  
ASJC Scopus subject areas: Education, Human-Computer Interaction  
Keywords: Collaborative writing, knowledge creation, online community, bounded-learning community, higher-education institutions, social media  
URLs:  
<https://www.emeraldinsight.com/doi/pdfplus/10.1108/978-1-78756-555-520181008>  
Research output: Chapter in Book/Report/Conference proceeding › Chapter › Scientific › peer-review

### Mille-Oeille: Environmental Zoo

#### General information

Publication status: Published  
MoE publication type: A3 Part of a book or another research book  
Organisations: Architecture, Rensselaer Polytechnic Institute, USA  
Contributors: Rubio Hernandez, R., Pérez-Guembe, E.  
Pages: 410-413



Publication date: 2018

### Host publication information

Title of host publication: Time, Space, Existence

Publisher: GAA Foundation

ISBN (Print): 978-90-826559-3-3

ASJC Scopus subject areas: Architecture , Human-Computer Interaction

Keywords: Virtual Reality, Augmented Reality, Architecture

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

### Perceived Impacts as User Experience Components in Mobile News Making with Smartphones

This chapter discusses users' perceptions of system impacts as one of the user experience components. Findings from twelve case studies on mobile news making with smartphones are summarized, focusing on the perceived impacts of system use and system characteristics that can contribute to user's perception of system quality. The findings indicate that the perceived impacts of system, i.e., the benefits and costs, for the mobile user, activity, outcome (news and news content), and journalism are important for understanding user experience and therefore the overall evaluative judgments of the system.

### General information

Publication status: Published

MoE publication type: A3 Part of a book or another research book

Organisations: Department of Pervasive Computing, Research area: User experience, Augmented Human Activities (AHA)

Contributors: Väättäjä, H.

Number of pages: 21

Pages: 218-238

Publication date: 2015

### Host publication information

Title of host publication: Emerging Perspectives on the Design, Use, and Evaluation of Mobile and Handheld Devices

Publisher: IGI Global

Editor: Lumsden, J.

ISBN (Print): 9781466685833

ISBN (Electronic): 9781466685840

ASJC Scopus subject areas: Human-Computer Interaction, Information Systems, Organizational Behavior and Human Resource Management

Keywords: user experience, Impact, component, impression, perceived impact, benefit, cost, mobile work, mobile system, news making, mobile, work, outcome, news, content, work tool, smartphone, journalism

DOIs:

10.4018/978-1-4666-8583-3

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

### Kvazaar 2.0: Fast and efficient open-source HEVC inter encoder

High Efficiency Video Coding (HEVC) is the key to economic video transmission and storage in the current multimedia applications but tackling its inherent computational complexity requires powerful video codec implementations. This paper presents Kvazaar 2.0 HEVC encoder that is the new release of our academic open-source software ([github.com/ultravideo/kvazaar](https://github.com/ultravideo/kvazaar)). Kvazaar 2.0 introduces novel inter coding functionality that is built on advanced rate-distortion optimization (RDO) scheme and speeded up with several early termination mechanisms, SIMD-optimized coding tools, and parallelization strategies. Our experimental results show that the proposed coding scheme makes Kvazaar 125 times as fast as the HEVC reference software HM on the Intel Xeon E5-2699 v4 22-core processor at the additional coding cost of only 2.4% on average. In constant quantization parameter (QP) coding, Kvazaar is also 3 times as fast as the respective preset of the well-known practical x265 HEVC encoder and is still able to attain 10.7% lower average bit rate than x265 for the same objective visual quality. These results indicate that Kvazaar has become one of the leading open-source HEVC encoders in practical high-efficiency video coding.

### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Computing Sciences, Research area: Computer engineering

Contributors: Lemmetti, A., Viitanen, M., Mercat, A., Vanne, J.

Number of pages: 6

Pages: 237-242

Publication date: 27 May 2020

### Host publication information

Title of host publication: MMSys 2020 - Proceedings of the 2020 Multimedia Systems Conference

Publisher: ACM

ISBN (Electronic): 9781450368452

ASJC Scopus subject areas: Computer Graphics and Computer-Aided Design, Human-Computer Interaction, Software

Keywords: high efficiency video coding (HEVC), inter coding, Kvazaar HEVC encoder, open-source, rate-distortion optimization (RDO)

DOIs:

10.1145/3339825.3394927

Source: Scopus

Source ID: 85086766655

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

### **Deep audio-visual saliency: Baseline model and data**

This paper introduces a conceptually simple and effective Deep Audio-Visual Embedding for dynamic saliency prediction dubbed "DAVE" in conjunction with our efforts towards building an Audio-Visual Eye-tracking corpus named "AVE". Despite existing a strong relation between auditory and visual cues for guiding gaze during perception, video saliency models only consider visual cues and neglect the auditory information that is ubiquitous in dynamic scenes. Here, we propose a baseline deep audio-visual saliency model for multi-modal saliency prediction in the wild. Thus the proposed model is intentionally designed to be simple. A video baseline model is also developed on the same architecture to assess effectiveness of the audio-visual models on a fair basis. We demonstrate that audio-visual saliency model outperforms the video saliency models. The data and code are available at <https://hrtavakoli.github.io/AVE/> and <https://github.com/hrtavakoli/DAVE>.

### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Computing Sciences, Nokia, Aalto University

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

Publication date: 6 Feb 2020

### **Host publication information**

Title of host publication: Proceedings ETRA 2020 Short Papers - ACM Symposium on Eye Tracking Research and Applications, ETRA 2020

Publisher: ACM

Editor: Spencer, S. N.

Article number: 3

ISBN (Electronic): 9781450371346

ASJC Scopus subject areas: Computer Vision and Pattern Recognition, Human-Computer Interaction, Ophthalmology, Sensory Systems

Keywords: Audio-Visual Saliency, Deep Learning, Dynamic Visual Attention

DOIs:

10.1145/3379156.3391337

### **Bibliographical note**

EXT="Tavakoli, Hamed Rezazadegan"

Source: Scopus

Source ID: 85085734752

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

### **"The superhero of the university": Experience-driven design and field study of the university guidance robot**

Robots have recently gained popularity in customer service. Especially social robots are nowadays utilized in healthcare, elderly homes and schools. Although it is crucial to design social robots according to well-defined user experience goals, research related to experience-driven design of social robots is still scarce. Experience-Driven Design (EDD) is a framework to design interaction for technology based on certain goals, known as experience goals. In this paper, we present the design and evaluation of the university guidance robot based on the user experience goals defined in previous research. The experience goals are nurture, fellowship and recreation. We designed applications, interaction, and robot's behavior to support the fulfillment of the experience goals. The social robot Pepper served as a platform for the university guidance robot. The evaluation was conducted as a field study in a university campus with 32 university students during the orientation week. According to our findings, the university guide robot successfully evoked nurture, fellowship and recreation among participants.

### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Computing Sciences  
Contributors: Chowdhury, A., Ahtinen, A., Kaipainen, K.  
Number of pages: 9  
Pages: 1-9  
Publication date: 29 Jan 2020

#### Host publication information

Title of host publication: AcademicMindtrek 2020 - Proceedings of the 23rd International Academic Mindtrek Conference :  
January 2020, Tampere  
Publisher: ACM  
ISBN (Electronic): 9781450377744  
ASJC Scopus subject areas: Software, Human-Computer Interaction, Computer Vision and Pattern Recognition,  
Computer Networks and Communications  
Keywords: experience-driven design, social robots, user experience  
DOIs:  
10.1145/3377290.3377304  
URLs:  
<http://www.scopus.com/inward/record.url?scp=85080943314&partnerID=8YFLogxK> (Link to publication in Scopus)  
Source: Scopus  
Source ID: 85080943314  
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

#### A preliminary network analysis on steam game tags: Another way of understanding game genres

Video game genre classification has long been a focusing perspective in game studies domain. Despite the commonly acknowledged usefulness of genre classification, scholars in the game studies domain are yet to reach consensus on the game genre classification. On the other hand, Steam, a popular video game distribution platform, adopts the user-generated tag feature enabling players to describe and annotate video games based on their own understanding of genres. Despite the concern of the quality, the user-generated tags (game tags) provide an opportunity towards an alternative way of understanding video game genres based on the players' collective intelligence. Hence, in this study, we construct a network of game tags based on the co-occurrence of tags in games on Steam platform and analyze the structure of the network via centrality analysis and community detection. Such analysis shall provide an intuitive presentation on the distribution and connections of the game tags, which furthermore suggests a potential way of understanding the important tags that are commonly adopted and the main genres of video games.

#### General information

Publication status: Published  
MoE publication type: A4 Article in a conference publication  
Organisations: Communication Sciences  
Contributors: Li, X., Zhang, B.  
Number of pages: 9  
Pages: 65-73  
Publication date: 29 Jan 2020

#### Host publication information

Title of host publication: AcademicMindtrek 2020 - Proceedings of the 23rd International Academic Mindtrek Conference :  
January 29-30, 2020, Tampere, Finland  
Publisher: ACM  
ISBN (Electronic): 9781450377744  
ASJC Scopus subject areas: Software, Human-Computer Interaction, Computer Vision and Pattern Recognition,  
Computer Networks and Communications  
Keywords: centrality, community detection, game tag, genre, modularity, network, steam, video game  
DOIs:  
10.1145/3377290.3377300

#### Bibliographical note

INT=coms,"Li, Xiaozhou"  
Source: Scopus  
Source ID: 85080924784  
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

#### Color game: A collaborative social robotic game for icebreaking; Towards the design of robotic ambiances as part of smart building services

Social robots are entering our workplaces, homes, medical and educational systems in assistive and collaborative roles. In our research, we have investigated the use of a social robot Pepper as an interactive icebreaker host to create a positive atmosphere at events. This paper presents two user studies (total n=43) in which we evaluated two interactive prototypes

of playful applications on Pepper, with the overall aim of providing a personal and entertaining service for event attendees. Data about users' experiences and attitudes were collected with semi-structured interviews, surveys, and observations. The results of the studies suggest that the majority of the participants had pleasurable and positive experiences with the robot and its applications. Moreover, their positive encounters led them to accept social robots as icebreaker hosts to connect with strangers. Based on our findings, we present a list of design implications to help the future design of social robots used to facilitate social connectedness, and to aid in the development of social robots as intelligent agents performing tasks as integrated parts of smart spaces.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Computing Sciences, Civil Engineering, Research group: Digitalization in the real estate and construction sector

Contributors: Beheshtian, N., Kaipainen, K., Kähkönen, K., Ahtinen, A.

Number of pages: 10

Pages: 10-19

Publication date: 29 Jan 2020

#### **Host publication information**

Title of host publication: AcademicMindtrek 2020 - Proceedings of the 23rd International Academic Mindtrek Conference : January 2020, Tampere

Publisher: ACM

ISBN (Electronic): 9781450377744

ASJC Scopus subject areas: Software, Human-Computer Interaction, Computer Vision and Pattern Recognition, Computer Networks and Communications

Keywords: human robot interaction, ice breaking, smart building, social connectedness, social robots, user experience

DOIs:

10.1145/3377290.3377292

Source: Scopus

Source ID: 85080911326

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

#### **Demographic differences in accumulated types of capital in massively multiplayer online role-playing games**

This paper examines how the demographic attributes and extra-game habits of players of a Massively Multiplayer Online Role-Playing Game (MMORPG) predict the accumulated capital of their avatars. An online survey (N=905) was conducted amidst the players of Final Fantasy XIV (FFXIV). Four types of capital were measured to map out the concrete and intangible resources of the avatars; social, economic, cultural and symbolic. The results show that weekly time spent playing the game is the strongest predictor of avatar capital and was associated with all types of capital. Time subscribed to the game was associated with cultural, economic, symbolic and bonding social capital. Social capital was found to be highest amongst both young and female players. Forum activity was associated with symbolic capital.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Communication Sciences, Research group: TUT Game Lab, Computing Sciences, Turun yliopisto

Contributors: Korkeila, H., Koivisto, J., Hamari, J.

Number of pages: 9

Pages: 74-82

Publication date: 29 Jan 2020

#### **Host publication information**

Title of host publication: AcademicMindtrek 2020 - Proceedings of the 23rd International Academic Mindtrek Conference : January 2020, Tampere

Publisher: ACM

ISBN (Electronic): 9781450377744

ASJC Scopus subject areas: Software, Human-Computer Interaction, Computer Vision and Pattern Recognition, Computer Networks and Communications

Keywords: avatar, capital, demographics, MMORPG

DOIs:

10.1145/3377290.3377302

Source: Scopus

Source ID: 85080910780

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

## **Satisfaction and willingness to consume immersive journalism: Experiment of differences between VR, 360 video, and article**

Immersive journalism has been touted to revolutionize journalism due to its ability to afford a multi-modal engrossing experience. However, hardly any experiments have been conducted whether consumers' satisfaction and consequent intentions to use immersive journalistic media may differ from traditional forms of journalistic content. Therefore, in this study, we investigate the differences in satisfaction and continued use intentions between article, 360 video and VR-based interaction with content. The data was collected via a randomized controlled laboratory experiment with between-subjects design (N = 87). Participants were randomly assigned to reading a written article based on the video (article) and watching the video on a computer screen (2D 360) or in mobile VR (VR 360). The collected data consisted of demographics (age and gender) and reported satisfaction and intention to continue use. Results suggest that those who were assigned to VR 360 had higher intentions to continue use, but not greater satisfaction than those in the other two conditions. However, the intention was predicted to an extent by satisfaction as suggested by previous literature. Finally, age and gender did not predict continued use. These findings imply that users prefer the new media technology for consuming journalism content and support previous findings of the relationship between satisfaction and intention to continue use. Finally, avenues for further research are presented.

### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Computing Sciences, Research group: TUT Game Lab

Contributors: Bujic, M., Hamari, J.

Number of pages: 6

Pages: 120-125

Publication date: 29 Jan 2020

### **Host publication information**

Title of host publication: AcademicMindtrek 2020 - Proceedings of the 23rd International Academic Mindtrek Conference : January 2020, Tampere

Publisher: ACM

ISBN (Electronic): 9781450377744

ASJC Scopus subject areas: Software, Human-Computer Interaction, Computer Vision and Pattern Recognition, Computer Networks and Communications

Keywords: 360-degree video, age, gender, immersive journalism, intention to continue use, satisfaction, virtual reality  
DOIs:

10.1145/3377290.3377310

Source: Scopus

Source ID: 85080895604

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

## **Innovation challenges as a novel multidisciplinary learning platform**

Innovation Challenges is a new course offered for the whole Tampere university community by Y-kampus entrepreneurship and innovation services, for the first time in fall 2019. Innovation Challenges offers practice-based cases that allow students to develop their creativity and problem-solving skills in a team. Learning is anchored in team coaching pedagogy, learning-by-doing attitude and entrepreneurial mindset. In this paper, we first describe the evolution that created a course called Innovation Challenges. Then, we describe course organization and the six challenges that student teams are currently solving.

### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Information and Knowledge Management, Research group: Business Data Research Group, Tampere University of Applied Sci., Tampere University

Contributors: Jokiniemi, S., Myllärniemi, J., Poranen, T., Vuorenmaa, M.

Number of pages: 4

Pages: 145-148

Publication date: 29 Jan 2020

### **Host publication information**

Title of host publication: AcademicMindtrek 2020 - Proceedings of the 23rd International Academic Mindtrek Conference : January 2020, Tampere

Publisher: ACM

ISBN (Electronic): 9781450377744

ASJC Scopus subject areas: Software, Human-Computer Interaction, Computer Vision and Pattern Recognition, Computer Networks and Communications

Keywords: innovation, learning platform, multidisciplinary projects

DOIs:

10.1145/3377290.3377311

#### **Bibliographical note**

INT=comp,"Poranen, Timo"

Source: Scopus

Source ID: 85080863203

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

#### **User experience of stereo and spatial audio in 360° live music videos**

360° music videos are becoming prevalent in music entertainment. Still, academic studies of the 360° live music experience covering both audio and visual experience are scarce. In this paper, we present a study of user experience of stereo and spatial audio in a 360° live music video setting with two different display types. The research was conducted in the form of a laboratory experiment, in which 20 participants watched and evaluated stereo and spatial audio versions of the same music video using a flat computer display and a head-mounted display (HMD). Based on the results, spatial audio combined with HMD scored highest in the quantitative metrics of perceived audio quality, presence, and overall listening experience. However, qualitative findings reveal that this combination does not fit well with users' listening habits. While nine participants preferred to use headphones to listen to music, thirteen participants viewed music listening as a secondary task-making the use of HMDs less suitable.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Computing Sciences, Tampere University, Tampere University of Applied Sciences

Contributors: Holm, J., Väänänen, K., Battah, A.

Number of pages: 8

Pages: 134-141

Publication date: 2020

#### **Host publication information**

Title of host publication: AcademicMindtrek 2020 - Proceedings of the 23rd International Academic Mindtrek Conference : January 2020, Tampere

Publisher: ACM

ISBN (Electronic): 9781450377744

ASJC Scopus subject areas: Software, Human-Computer Interaction, Computer Vision and Pattern Recognition, Computer Networks and Communications

Keywords: 360° video, ambisonics, head-mounted display, music video, spatial audio, stereo, user experience, virtual reality

DOIs:

10.1145/3377290.3377291

#### **Bibliographical note**

EXT="Holm, Jukka"

INT=comp,"Battah, Anas"

Source: Scopus

Source ID: 85080964162

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

#### **Promoting local culture and enriching airport experiences through interactive storytelling**

Experiences in airports may shape future travel plans and contribute to tourism destination development. However, a chaotic environment and time-consuming procedural routines in airports may result in negative associations towards the host country and its culture. Despite the existence of assistive airport applications, little attention is given to facilitating travelers' engagement with cultural exploration. This paper introduces a concept of interactive personalized storytelling that provides both a cultural learning adventure and connection to local retailing. Our application generates an imaginative Finnish storyline unique to every user to guide them through local shops in the airport. A field evaluation was conducted with 15 travelers of different nationalities. Travelers perceived the interactive storytelling experience as an interesting and unique way to spend waiting time at the airport while increasing cultural exposure. Moreover, we found this method to be effective in persuading travelers to explore local products at the airport. Further, our results give insight to designing storytelling applications for large public places.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Computing Sciences, Lapland University of Applied Sciences, Tampere University, Tampere University, Tampere University

Contributors: Burova, A., Kelling, C., Keskinen, T., Hakulinen, J., Kallioniemi, P., Väättäjä, H., Turunen, M.

Number of pages: 7  
Publication date: 26 Nov 2019

#### Host publication information

Title of host publication: MUM 2019 - 18th International Conference on Mobile and Ubiquitous Multimedia, Proceedings  
Publisher: Association for Computing Machinery  
Editors: Jacucci, G., Paterno, F., Rohs, M., Santoro, C.  
Article number: 3365640  
ISBN (Electronic): 9781450376242

#### Publication series

Name: ACM International Conference Proceeding Series  
ASJC Scopus subject areas: Human-Computer Interaction, Computer Networks and Communications, Computer Vision and Pattern Recognition, Software  
Keywords: Airport experience, Digital storytelling, Field study, Mobile application  
DOIs:  
10.1145/3365610.3365640  
URLs:  
<http://urn.fi/URN:NBN:fi:tuni-202001101166>

#### Bibliographical note

EXT="Väätäjä, Heli"  
Source: Scopus  
Source ID: 85076809996  
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

#### Red Alert: Break-Glass Protocol to Access Encrypted Medical Records in the Cloud

Availability of medical records during an emergency situation is of paramount importance since it allows healthcare professionals to access patient's data on time and properly plan the next steps that need to be taken. Cloud storage has the potential to provide a solution to the problem of data unavailability during an emergency situation. However, sharing medical records raises several concerns about security and privacy. In this paper, we study the problem of how to share encrypted patients' data during an emergency situation. To this end, we propose a protocol through which a team of healthcare professionals can securely decrypt the medical records of a patient who is under an emergency situation (e.g. acute stroke). Furthermore, our protocol ensures that a team of healthcare professionals will only have access to the patient's data for the time needed to complete a specific process related to the patient's situation (e.g. transfer patient to the hospital). In our study, the dynamically granting and revoking data access during an emergency treatment is the main novelty.

#### General information

Publication status: Published  
MoE publication type: A4 Article in a conference publication  
Organisations: Computing Sciences, University of Amsterdam  
Contributors: De Oliveira, M. T., Michalas, A., Groot, A. E., Marquering, H. A., Olabarriaga, S. D.  
Publication date: 1 Oct 2019

#### Host publication information

Title of host publication: 2019 IEEE International Conference on E-Health Networking, Application and Services, HealthCom 2019  
Publisher: IEEE  
Article number: 9009598  
ISBN (Electronic): 9781728104027  
ASJC Scopus subject areas: Artificial Intelligence, Computer Networks and Communications, Computer Science Applications, Human-Computer Interaction, Health Informatics, Health(social science)  
Keywords: Attribute-Based Encryption, e-Health Privacy, Electronic Medical Records, Emergency care, Secure Cloud Storage  
DOIs:  
10.1109/HealthCom46333.2019.9009598  
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

#### Social features in hybrid board game marketing material

This paper identifies 7 key social features which appear in the marketing and promotional material of hybrid board games. The features are identified by exploring sources such as game websites and game boxes of 13 hybrid board game products. The material is analyzed in order to determine how social features related to hybrid game features are presented. As a result of the analysis, it became apparent that there are certain key social features which are presented as being important to players. The knowledge generated in this work acts as a view to how the industry sees hybridity in

games as a tool for supporting social interaction, and how the industry wants to message it to consumers when they explore promotional material. The identified key social features can also be used as design knowledge for developing new games, as they give insight into popular social features in hybrid board games.

#### General information

Publication status: Published  
MoE publication type: A4 Article in a conference publication  
Organisations: Computing Sciences, Tampere University  
Contributors: Nummenmaa, T., Kankainen, V.  
Publication date: 26 Aug 2019

#### Host publication information

Title of host publication: Proceedings of the 14th International Conference on the Foundations of Digital Games, FDG 2019  
Publisher: ACM  
Editors: Khosmood, F., Pirker, J., Apperley, T., Deterding, S.  
Article number: 67  
ISBN (Electronic): 9781450372176  
ASJC Scopus subject areas: Human-Computer Interaction, Computer Networks and Communications, Computer Vision and Pattern Recognition, Software  
Keywords: Board games, Design, Hybrid games, Marketing  
DOIs:  
10.1145/3337722.3341864

#### Bibliographical note

INT=comp,"Kankainen, Vill"  
Source: Scopus  
Source ID: 85072820010  
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

#### Game postmortems vs. developer Reddit AMAs: Computational analysis of developer communication

Postmortems and Reddit Ask Me Anything (AMA) threads represent communications of game developers through two different channels about their game development experiences, culture, processes, and practices. We carry out a quantitative text mining based comprehensive analysis of online available postmortems and AMA threads from game developers over multiple years. We find and analyze underlying topics from the postmortems and AMAs as well as their variation among the data sources and over time. The analysis is done based on structural topic modeling, a probabilistic modeling technique for text mining. The extracted topics reveal differing and common interests as well as their evolution of prevalence over time in the two text sources. We have found that postmortems put more emphasis on detail-oriented development aspects as well as technically-oriented game design problems whereas AMAs feature a wider variety of discussion topics that are related to a more general game development process, game-play and game-play experience related game design. The prevalences of the topics also evolve differently over time in postmortems versus AMAs.

#### General information

Publication status: Published  
MoE publication type: A4 Article in a conference publication  
Organisations: Computing Sciences, Tampere University  
Contributors: Lu, C., Peltonen, J., Nummenmaa, T.  
Publication date: 26 Aug 2019

#### Host publication information

Title of host publication: Proceedings of the 14th International Conference on the Foundations of Digital Games, FDG 2019  
Publisher: ACM  
Editors: Khosmood, F., Pirker, J., Apperley, T., Deterding, S.  
Article number: 22  
ISBN (Electronic): 9781450372176  
ASJC Scopus subject areas: Human-Computer Interaction, Computer Networks and Communications, Computer Vision and Pattern Recognition, Software  
Keywords: Game development, Literature analysis, Postmortem analysis, Reddit, Text mining  
DOIs:  
10.1145/3337722.3337727

#### Bibliographical note

INT=comp,"Peltonen, Jaakko"  
INT=comp,"Lu, Chien"  
Source: Scopus



Source ID: 85072819939

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

### **Real-time online drilling vibration analysis using data mining**

While the data mining intermediaries play a critical role in the rock drilling industry, they also tend to provide an optimized real-time model for the drilling systems. In addition, proper online tool condition monitoring (OTOM) methods can improve the drilling performance by accessing real-time data. Hence, OTOM methods assist depreciating error and detect unspecified faults at early stages. In this study, we proposed appropriate OTOM algorithms to develop and enhance the quality of real-time systems and provide a solution to detect and categorize various stages of drilling operation with the aid of vibration signals (especially in terms of acceleration or velocity). In particular, the proposed methods in this article perform based on statistical approaches. Therefore, in order to recognize the drilling stages, we measured the Root Mean Square (RMS) values corresponding to the acceleration signals. In the meantime, we also succeeded to distinguish the drilling stages by employing estimated power spectral density (PSD) in the frequency domain. The acquired results in this publication confirm the real-time prediction and classification potential of the proposed methods for the different drilling stages and especially for the rock drilling engineering.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Computing Sciences, Automation Technology and Mechanical Engineering, Research group: Innovative Hydraulic Automation, Research group: MMDM, Tamlink Oy, Sandvik Mining and Construction Oy

Contributors: Zare, M., Huova, M., Visa, A., Launis, S.

Number of pages: 6

Pages: 175-180

Publication date: 19 Jul 2019

#### **Host publication information**

Title of host publication: Proceedings of the 2019 2nd International Conference on Data Science and Information Technology, DSIT 2019

Publisher: ACM

ISBN (Electronic): 9781450371414

ASJC Scopus subject areas: Human-Computer Interaction, Computer Networks and Communications, Computer Vision and Pattern Recognition, Software

Keywords: Data mining, Drilling stages, Real-time, Statistical analysis

DOIs:

10.1145/3352411.3352439

Source: Scopus

Source ID: 85072810540

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

### **Public and open HEVC encoding service in the cloud**

The ability to record vast amounts of video content requires convenient and efficient video coding services with which users can tackle the limited storage and transmission capacities. This paper presents an open-source cloud service for encoding raw video formats and transcoding compressed videos to the latest HEVC/H.265 format. Respective commercial transcoding services are available on the Internet but they are behind a paywall. On the other hand, using command-line interfaces of existing open-source software solutions requires in-depth knowledge of the coding process to attain the best coding gain and speed. The proposed service is available online, it is free to use without any registration, and its easy-to-use web interface makes it feasible for non-technical users. It is built on the FFmpeg multimedia framework whose built-in decoders accept various input video formats that are then compressed to HEVC with a full-fledged Kvazaar open-source encoder.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Computing Sciences, Tampere University

Contributors: Altonen, A., Viitanen, M., Räsänen, J., Mercat, A., Vanne, J.

Number of pages: 4

Pages: 300-303

Publication date: 18 Jun 2019

#### **Host publication information**

Title of host publication: Proceedings of the 10th ACM Multimedia Systems Conference, MMSys 2019

Publisher: ACM

ISBN (Electronic): 9781450362979

ASJC Scopus subject areas: Computer Graphics and Computer-Aided Design, Human-Computer Interaction, Software

Keywords: Cloud en/transcoding, FFmpeg, High efficiency video coding (HEVC), Kvazaar HEVC encoder, Software as a service (SaaS)

Electronic versions:

MMSys2019\_Cloud\_Encoder\_Camera\_Ready

DOIs:

10.1145/3304109.3323834

URLs:

<http://urn.fi/URN:NBN:fi:tuni-201910013616>

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

### **Facilitating the first move: Exploring inspirational design patterns for aiding initiation of social encounters**

Actualizing positive social encounters remains both a key ends and means in many activities to foster a sense of community. Initiating encounters between strangers typically requires facilitative activities or artefacts, such as icebreakers or tickets-to-talk. However, there is little understanding of which designs are effective and why, and the broad design space remains largely underexplored. We address this challenge by presenting five candidates for inspirational design patterns on signaling social intentions and identifying impediments that deter commencement of encounters. The principles result from an extensive review of design cases and public art installations. Through focus groups and expert interviews, we assessed the perceived applicability and social acceptance of the proposed patterns. Three new design principles relating to the risks of initiating an encounter emerged through analyzing participant responses. These articulations of possible approaches and pitfalls for increasing conviviality may broaden the repertoire of, and support discussion between designers and others concerned with collocated social interaction.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Computing Sciences, University of Southern Denmark

Contributors: Mitchell, R., Olsson, T.

Number of pages: 12

Pages: 283-294

Publication date: 3 Jun 2019

#### **Host publication information**

Title of host publication: C&T 2019 - 9th International Conference on Communities and Technologies, Conference Proceedings

Publisher: ACM

Editors: Tellioglu, H., Cech, F.

ISBN (Electronic): 9781450371629

ASJC Scopus subject areas: Human-Computer Interaction, Computer Networks and Communications, Computer Vision and Pattern Recognition, Software

Keywords: Collocated interaction, Design patterns, Social encounters, Social encouragement, Social interaction design, Ticket-to-talk

DOIs:

10.1145/3328320.3328396

URLs:

<http://urn.fi/URN:NBN:fi:tuni-201908142894>

Source: Scopus

Source ID: 85067884637

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

### **Thin form-factor super multiview head-up display system**

We propose a virtual-image head-up display (HUD) based on the super multiview (SMV) display technology. Implementation-wise, the HUD provides a compact solution, consisting of a thin form-factor SMV display and a combiner placed on the windshield of the vehicle. Since the utilized display is at most few centimeters thick, it does not need extra installation space that is usually required by most of the existing virtual image HUDs. We analyze the capabilities of the proposed system in terms of several HUD related quality factors such as resolution, eyebox width, and target image depth. Subsequently, we verify the analysis results through experiments carried out using our SMV-HUD demonstrator. We show that the proposed system is capable of visualizing images at the typical virtual image HUD depths of 2 – 3m, in a reasonably large eyebox, which is slightly over 30cm in our demonstrator. For an image at the target virtual image depth of 2.5m, the field of view of the developed system is 11° x 16° and the spatial resolution is around 240x60 pixels in vertical and horizontal directions, respectively. There is, however, plenty of room for improvement regarding the resolution, as we actually utilize an LCD at moderate resolution (216 ppi) and off-the-shelf lenticular sheet in our demonstrator.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication  
Organisations: Computing Sciences  
Contributors: Akpinar, U., Sahin, E., Suominen, O., Gotchev, A.  
Publication date: 13 Jan 2019

### Host publication information

Title of host publication: Stereoscopic Displays and Applications XXX

### Publication series

Name: IS&T International Symposium on Electronic Imaging

ISSN (Electronic): 2470-1173

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

DOIs:

10.2352/ISSN.2470-1173.2019.3.SDA-631

### Bibliographical note

jufoid=84313

Source: Scopus

Source ID: 85081086336

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

### Additional lossless compression of JPEG images based on BPG

The task of additional lossless compression of JPEG images is considered. We propose to decode JPEG image and recompress it using lossy BPG (Better Portable Graphics) codec based on a subset of the HEVC open video compression standard. Then the decompressed and smoothed BPG image is used for calculation and quantization of DCT coefficients in 8x8 image blocks using quantization tables of the source JPEG image. A difference between obtained quantized DCT coefficients and quantized DCT coefficients of the source JPEG image (prediction error) is calculated. The difference is lossless compressed by a proposed context modeling and arithmetical coding. In this way the source JPEG image is replaced by two files: compressed BPG image and the compressed difference which needed for lossless restoration of the source JPEG image. It is shown that the proposed approach provides compression ratios comparable with state of the art PAQ8, WinZip and STUFFIT file archivers. At the same time BPG images may be used for fast preview of compressed JPEG images.

### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Computing Sciences, Kharkiv National Aerospace University

Contributors: Ponomarenko, M., Miroshnichenko, O., Lukin, V., Egiazarian, K.

Publication date: 13 Jan 2019

### Host publication information

Title of host publication: Image Processing: Algorithms and Systems XVII

### Publication series

Name: IS and T International Symposium on Electronic Imaging Science and Technology

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

Keywords: Context modelling, Discrete cosine transform, JPEG, JPEG additional compression

DOIs:

10.2352/ISSN.2470-1173.2019.11.IPAS-263

Source: Scopus

Source ID: 85080092000

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

### Phase masks optimization for broadband diffractive imaging

The task of optimization of phase masks for broadband diffractive imaging to minimize chromatic aberrations and to provide given value of Depth of Focus (DoF) is considered. Different schemes of multilevel phase mask (MPM) forming by combining pixels of two Fresnel lenses are analyzed. The Fresnel lenses are calculated for the same focal distance but for very different wavelengths. A possibility of adding to the optimized mask a cubic component is taking into account as well as usage of discrete phase masks with optimized number of levels. It is shown that the proposed approach in the combination with inverse imaging allows to significantly increase image quality for a focus distance in comparison to refractive lens-based optical systems. Moreover, it is shown that by changing of aforementioned parameters it is possible to increase or decrease DoF value depending from a given goal of optimization. It is demonstrated by numerical analysis that the proposed approach significantly increases robustness of designed MPM to Gaussian additive noise in MPM introduced due to fabrication errors.

### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

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

Contributors: Ponomarenko, M., Katkovnik, V., Egiazarian, K.

Publication date: 13 Jan 2019

### Host publication information

Title of host publication: Image Processing: Algorithms and Systems XVII

### Publication series

Name: IS and T International Symposium on Electronic Imaging Science and Technology

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

Keywords: Diffractive optical elements, Inverse imaging, Lensless imaging, Multilevel phase mask design

DOIs:

10.2352/ISSN.2470-1173.2019.11.IPAS-258

Source: Scopus

Source ID: 85080039777

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

### Combined no-reference IQA metric and its performance analysis

The problem of increasing efficiency of blind image quality assessment is considered. No-reference image quality metrics both independently and as components of complex image processing systems are employed in various application areas where images are the main carriers of information. Meanwhile, existing no-reference metrics have a significant drawback characterized by a low adequacy to image perception by human visual system (HVS). Many well-known no-reference metrics are analyzed in our paper for several image databases. A method of combining several no-reference metrics based on artificial neural networks is proposed based on multi-database verification approach. The effectiveness of the proposed approach is confirmed by extensive experiments.

### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Computing Sciences, Kharkiv National Aerospace University

Contributors: Ieremeiev, O., Lukin, V., Ponomarenko, N., Egiazarian, K.

Publication date: 13 Jan 2019

### Host publication information

Title of host publication: Image Processing: Algorithms and Systems XVII

### Publication series

Name: IS and T International Symposium on Electronic Imaging Science and Technology

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

Keywords: Combined metrics, Full-reference metrics, Image visual quality assessment, Robust metrics

DOIs:

10.2352/ISSN.2470-1173.2019.11.IPAS-260

Source: Scopus

Source ID: 85080028392

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

### Log analysis of 360-degree video users via MQTT

Analyzing 360-degree video users is beneficial for 360-degree video application development. The analysis can be done with logged user data. In this paper, we argue that MQTT is a conventional technology for distributed logging of mobile 360-degree video users. MQTT not only saves resources also allows communication from the logging server to mobile clients in various networking conditions relatively easy. We constructed a proof of concept to show the feasibility of the approach. As log analysis examples, the proof of concept visualizes results of the most popular region of interest analysis and k-means clustering. The used research method is design science.

### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Computing Sciences

Contributors: Luoto, A.

Number of pages: 8

Pages: 130-137  
Publication date: 2019

#### Host publication information

Title of host publication: ICGDA 2019 : Proceedings of the 2019 2nd International Conference on Geoinformatics and Data Analysis

Publisher: ACM

ISBN (Electronic): 978-1-4503-6245-0

ASJC Scopus subject areas: Human-Computer Interaction, Computer Networks and Communications, Computer Vision and Pattern Recognition, Software

Keywords: 360-degree video, Component, Log Analysis, MQTT

Electronic versions:

ICSSE\_2019\_paper\_5

DOIs:

10.1145/3318236.3318248

URLs:

<http://urn.fi/URN:NBN:fi:tuni-202009116968>

Source: Scopus

Source ID: 85066837109

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

#### Human-robot interactive learning architecture using ontologies and symbol manipulation

Robotic systems developed for support can provide assistance in various ways. However, regardless of the service provided, the quality of user interaction is key to adoption by the general public. Simple communication difficulties, such as terminological differences, can make or break the acceptance of robots. In this work we take into account these difficulties in communication between a human and a robot. We propose a system that allows to handle unknown concepts through symbol manipulation based on natural language interactions. In addition, ontologies are used as a convenient way to store the knowledge and reason about it. To demonstrate the use of our system, two scenarios are described and tested with a Care-O-Bot 4. The experiments show that confusions and difficulties in communication can effectively be resolved through symbol manipulation.

#### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Automation Technology and Mechanical Engineering, Aalto University

Contributors: Angleraud, A., Houbre, Q., Kyrki, V., Pieters, R.

Number of pages: 6

Pages: 384-389

Publication date: 6 Nov 2018

#### Host publication information

Title of host publication: RO-MAN 2018 - 27th IEEE International Symposium on Robot and Human Interactive Communication : August 27-31, 2018, Nanjing, China.

Publisher: IEEE

ISBN (Print): 978-1-5386-7981-4

ISBN (Electronic): 9781538679807

#### Publication series

Name: IEEE RO-MAN

ISSN (Print): 1944-9445

ISSN (Electronic): 1944-9437

ASJC Scopus subject areas: Human-Computer Interaction, Cognitive Neuroscience, Communication, Artificial Intelligence

Electronic versions:

roman2018\_Angleraud

DOIs:

10.1109/ROMAN.2018.8525580

URLs:

<http://urn.fi/URN:NBN:fi:tuni-201912136859>

#### Bibliographical note

jufoid=72047

Source: Scopus

Source ID: 85058077478

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

### **Systematic literature review on user logging in virtual reality**

In this systematic literature review, we study the role of user logging in virtual reality research. By categorizing literature according to data collection methods and identifying reasons for data collection, we aim to find out how popular user logging is in virtual reality research. In addition, we identify publications with detailed descriptions about logging solutions. Our results suggest that virtual reality logging solutions are relatively seldom described in detail despite that many studies gather data by body tracking. Most of the papers gather data to witness something about a novel functionality or to compare different technologies without discussing logging details. The results can be used for scoping future virtual reality research.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Pervasive Computing, Research area: Software engineering

Contributors: Luoto, A.

Number of pages: 8

Pages: 110-117

Publication date: 10 Oct 2018

#### **Host publication information**

Title of host publication: Mindtrek 2018 - Proceedings of the 22nd International Academic Mindtrek Conference

Publisher: ACM

ISBN (Electronic): 9781450365895

ASJC Scopus subject areas: Human-Computer Interaction, Computer Networks and Communications, Computer Vision and Pattern Recognition, Software

Keywords: Systematic Literature Review, User Logging

Electronic versions:

Mindtrek\_2018\_Paper\_PDF\_file\_14

DOIs:

10.1145/3275116.3275123

Source: Scopus

Source ID: 85056744675

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

### **Robotic process automation - Creating value by digitalizing work in the private healthcare?**

Organizations are applying digitalization to the constantly increasing amounts of different organizational processes [2]. The healthcare sector is also changing and actively seeking better ways to enhance performance, especially in the private healthcare sector [7]. Automation of workflow processes, e.g., Robotic Process Automation (RPA), in organizations has been emerging as a solution to this demand [3, 4]. To meet this clear demand, automation of workflow processes in organizations has been a rising trend during the past few years [3]. We analyze the value creating functions of the RPA potential in the private healthcare industry sector, using modified Walter et al.'s function-oriented value analysis as our theoretical lens for identifying the potential of RPA.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Industrial and Information Management

Contributors: Ratia, M., Myllärniemi, J., Helander, N.

Number of pages: 6

Pages: 222-227

Publication date: 10 Oct 2018

#### **Host publication information**

Title of host publication: Mindtrek 2018 - Proceedings of the 22nd International Academic Mindtrek Conference

Publisher: ACM

ISBN (Electronic): 9781450365895

ASJC Scopus subject areas: Human-Computer Interaction, Computer Networks and Communications, Computer Vision and Pattern Recognition, Software

Keywords: Digitalization of knowledge work, Healthcare, Robotic Process Automation, Value creation

DOIs:

10.1145/3275116.3275129

Source: Scopus

Source ID: 85056714767

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

### **The Finnish you – An interactive storytelling application for an airport environment**

Traveling should be full of excitement and new experiences. However, a chaotic airport environment and constant waiting often halt these pleasurable feelings. Although passengers can spend their time shopping, they are unlikely to connect personally to the products. Furthermore, airport services seldom highlight the local culture that passengers miss by being confined to the airport. To address these shortcomings, we present a mobile web-application, called "The Finnish You". Utilizing the elements of interactive storytelling and gamification, the application guides users through shops and brands in the airport while teaching about the local culture in a personalized way. The application was tested in a user study with nine participants in a controlled office environment and was seen as a satisfactory way to spend time waiting in the airport. Our findings show how a personalized storytelling approach may convert ordinary shopping activity into a culture-learning adventure. We further suggest implications for the design of storytelling applications regarding the airport context of use.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Faculty of Computing and Electrical Engineering, Pervasive Computing, Research area: User experience, Human-Centered Technology (IHTE)

Contributors: Burova, A., Kelling, C., Hakulinen, J., Kallioniemi, P., Keskinen, T., Turunen, M., Väättäjä, H.

Number of pages: 10

Pages: 182-191

Publication date: 10 Oct 2018

#### **Host publication information**

Title of host publication: Mindtrek 2018 - Proceedings of the 22nd International Academic Mindtrek Conference

Publisher: ACM

ISBN (Electronic): 9781450365895

ASJC Scopus subject areas: Human-Computer Interaction, Computer Networks and Communications, Computer Vision and Pattern Recognition, Software

Keywords: Airport Environment, Digital Storytelling, Gamification, Mobile Web-Application, User Experience

DOIs:

10.1145/3275116.3275142

Source: Scopus

Source ID: 85056694022

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

### **Implications of audio and narration in the user experience design of virtual reality**

Virtual reality (VR) is quickly gaining momentum as an immersive medium; however, there is much to learn about the design elements needed to create a positive experience. In this paper, we present the second wave of user testing of a journalistic and cultural VR experience that tells the story of a well-known artist through his art. The storytelling elements narration and ambient music were added to the initial prototype and tested in the field with 32 participants. Our results showed that the improvements produced a mostly positive user experience and shed light on what could be further improved in the case of our prototype, the field of immersive journalism, and VR used in the cultural context.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Pervasive Computing, Research area: User experience, Sanoma

Contributors: Kelling, C., Karhu, J., Kauhanen, O., Turunen, M., Väättäjä, H., Lindqvist, V.

Number of pages: 4

Pages: 258-261

Publication date: 10 Oct 2018

#### **Host publication information**

Title of host publication: Mindtrek 2018 - Proceedings of the 22nd International Academic Mindtrek Conference

Publisher: ACM

ISBN (Electronic): 9781450365895

ASJC Scopus subject areas: Human-Computer Interaction, Computer Networks and Communications, Computer Vision and Pattern Recognition, Software

Keywords: Cultural VR, Immersive Journalism, Museum, Storytelling

DOIs:

10.1145/3275116.3275153

#### **Bibliographical note**

INT=tie,"Kauhanen, Otto"

Source: Scopus

Source ID: 85056721502

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

### **Guidelines for development and evaluation of usage data analytics tools for human-machine interactions with industrial manufacturing systems**

We present the lessons learned during the development and evaluation process for UX-sensors, a visual data analytics tool for inspecting logged usage data from flexible manufacturing systems (FMS). Based on the experiences during a collaborative development process with practitioners from one FMS supplier company, we propose guidelines to support other developers of visual data analytics tools for usage data logging in context of complex industrial systems. For instance, involving stakeholders with different roles can help to identify user requirements and generate valuable development ideas. Tool developers should confirm early access to real usage data from customers' systems and familiarize themselves with the log data structure. We argue that combining expert evaluations with field study methods can provide a more diverse set of usability issues to address. For future research, we encourage studies on insights emerging from usage data analytics and their impact on the viewpoints of the supplier and customer.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Pervasive Computing, Research area: User experience, University of Wisconsin-Stevens Point, Fastems

Contributors: Varsaluoma, J., Väättäjä, H., Heimonen, T., Tiitinen, K., Hakulinen, J., Turunen, M., Nieminen, H.

Number of pages: 10

Pages: 172-181

Publication date: 10 Oct 2018

#### **Host publication information**

Title of host publication: Mindtrek 2018 - Proceedings of the 22nd International Academic Mindtrek Conference

Publisher: ACM

ISBN (Electronic): 9781450365895

ASJC Scopus subject areas: Human-Computer Interaction, Computer Networks and Communications, Computer Vision and Pattern Recognition, Software

DOIs:

10.1145/3275116.3275138

#### **Bibliographical note**

EXT="Nieminen, Harri"

Source: Scopus

Source ID: 85056717713

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

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

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

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

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

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

Number of pages: 5

Pages: 73-77

Publication date: 2 Oct 2018

#### **Host publication information**

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

Publisher: ACM

ISBN (Electronic): 9781450356923

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

Keywords: Emotions, Multimodal interaction, Olfaction



Electronic versions:

olfactory-display-prototype

DOIs:

10.1145/3242969.3242999

URLs:

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

#### **Bibliographical note**

INT=tut-bmt,"Nieminen, Ville"

Source: Scopus

Source ID: 85056660798

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

#### **Analysis of accommodation cues in holographic stereograms**

The simplicity of the holographic stereogram (HS) makes it an attractive option in comparison to the more complex coherent computer generated hologram (CGH) methods. The cost of its simplicity is that the HS cannot accurately reconstruct deep scenes due to the lack of correct accommodation cues. The exact nature of the accommodation cues present in HSs, however, has not been investigated. In this paper, we provide analysis of the relation between the hologram sampling properties and the perceived accommodation response. The HS can be considered as a generator of a discrete light field (LF) and can thus be examined by considering the light ray oriented nature of the hologram diffracted light. We further support the analysis by employing a numerical reconstruction tool simulating the viewing process of the human eye. The simulation results demonstrate that HSs can provide accommodation cues depending on the choice of hologram segmentation size. It is further demonstrated that the accommodation response can be enhanced at the expense of loss in perceived spatial resolution.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Signal Processing, Research group: 3D MEDIA

Contributors: Mäkinen, J., Sahin, E., Gotchev, A.

Publication date: 1 Oct 2018

#### **Host publication information**

Title of host publication: 2018 - 3DTV-Conference : The True Vision - Capture, Transmission and Display of 3D Video, 3DTV-CON 2018

Publisher: IEEE

Article number: 8478586

ISBN (Electronic): 9781538661253

ASJC Scopus subject areas: Computer Graphics and Computer-Aided Design, Computer Networks and Communications, Computer Vision and Pattern Recognition, Human-Computer Interaction, Electrical and Electronic Engineering

Keywords: Accommodation, Holographic stereogram, Light field

Electronic versions:

3DTV-Con2018

DOIs:

10.1109/3DTV.2018.8478586

URLs:

<http://urn.fi/URN:NBN:fi:tuni-202003042531>

#### **Bibliographical note**

jufoid=50006

Source: Scopus

Source ID: 85056207484

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

#### **Viewing simulation of integral imaging display based on wave optics**

We present an accurate model of integral imaging display based on wave optics. The model enables accurate characterization of the display through simulated perceived images by the human visual system. Thus, it is useful to investigate the capabilities of the display in terms of various quality factors such as depth of field and resolution, as well as delivering visual cues such as focus. Furthermore, due to the adopted wave optics formalism, simulation and analysis of more advanced techniques such as wavefront coding for increased depth of field are also possible.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Signal Processing  
Contributors: Akpinar, U., Sahin, E., Gotchev, A.  
Publication date: 1 Oct 2018

#### Host publication information

Title of host publication: 2018 - 3DTV-Conference : The True Vision - Capture, Transmission and Display of 3D Video, 3DTV-CON 2018  
Publisher: IEEE  
Article number: 8478568  
ISBN (Electronic): 9781538661253  
ASJC Scopus subject areas: Computer Graphics and Computer-Aided Design, Computer Networks and Communications, Computer Vision and Pattern Recognition, Human-Computer Interaction, Electrical and Electronic Engineering  
Keywords: Integral imaging, Point spread function, Simulation, Wave optics  
DOIs:  
10.1109/3DTV.2018.8478568

#### Bibliographical note

jufoid=50006  
Source: Scopus  
Source ID: 85056164335  
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

#### Understanding animals: A critical challenge in ACI

We present a qualitative content analysis of visual-verbal social media posts, where ordinary dog owners pretend to be their canine, to identify meaningful facets in their dogs' life-worlds, e.g. pleasures of human-dog relation, dog-dog relations, food etc. We use this knowledge to inform design of "quantified pets". The study targets a general problem in Animal-Computer Interaction (ACI), i.e. to understand animals when designing "for" them, although lacking a common language. Several approaches, e.g. ethnography and participatory design, have been appropriated from HCI without exhausting the issue. We argue for a methodological creativity and pluralism by suggesting an additional approach drawing on "kinesthetic empathy". It implies to understand animals by empathizing with their bodily movements over time and decoding the realities of their life-worlds. This, and other related approaches, has inspired animal researchers to conduct more or less radical participant observations during extensive duration to understand the perspective of the other. We suggest that dog owners whom share their lives with their dogs already possess a similar understanding as these experts, and thus uphold important experiences of canine life that could be used to understand individual dogs and inspire design.

#### General information

Publication status: Published  
MoE publication type: A4 Article in a conference publication  
Organisations: Pervasive Computing, Research area: User experience, Stockholm University  
Contributors: Aspling, F., Juhlin, O., Väättäjä, H.  
Number of pages: 13  
Pages: 148-160  
Publication date: 29 Sep 2018

#### Host publication information

Title of host publication: NordiCHI 2018 : Revisiting the Life Cycle - Proceedings of the 10th Nordic Conference on Human-Computer Interaction  
Publisher: ACM  
ISBN (Electronic): 9781450364379  
ASJC Scopus subject areas: Human-Computer Interaction, Computer Networks and Communications, Computer Vision and Pattern Recognition, Software  
Keywords: Animal-Computer Interaction, Dog Blogs, Kinesthetic Empathy, Pet Dogs, Quantified Pets, Social Media  
DOIs:  
10.1145/3240167.3240226  
Source: Scopus  
Source ID: 85056568856  
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

#### Designing for experiences with socially interactive robots

Socially interactive technologies are emerging as one of the predominant technologies of the future. In this workshop, we aim to discuss the emerging field of Social Robotic technologies with a particular focus on interaction design methodologies used in the design process. The workshop will investigate how researchers have approached designing social robots and what we can learn from the interaction design field for future designs. The main activities of the workshop will encompass two interactive sessions and a discussion panel on approaches to inspire the design of socially

interactive robots. In particular, we focus on experience-driven design methods involving rituals and memorable experiences with social robots.

#### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Pervasive Computing, Research area: User experience, Uppsala University, Strate School of Design

Contributors: Obaid, M., Kaipainen, K., Ocnareescu, I., Ahtinen, A.

Number of pages: 4

Pages: 948-951

Publication date: 29 Sep 2018

#### Host publication information

Title of host publication: NordiCHI 2018 : Revisiting the Life Cycle - Proceedings of the 10th Nordic Conference on Human-Computer Interaction

Publisher: ACM

ISBN (Electronic): 9781450364379

ASJC Scopus subject areas: Human-Computer Interaction, Computer Networks and Communications, Computer Vision and Pattern Recognition, Software

Keywords: Design, Social, Social Robot, Technology, User Experience

Electronic versions:

Obaid-et-al\_NordiCHI2018\_Designing-experiences\_accepted-version (002)

DOIs:

10.1145/3240167.3240257

URLs:

<http://urn.fi/URN:NBN:fi:tuni-201910033689>

Source: Scopus

Source ID: 85056571102

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

#### Liking the game: How can spectating motivations influence social media usage at live esports events?

There is no doubt that various social media services shape the ways in which we approach our daily lives. The ubiquitous nature of these services, afforded by mobile devices, means that we can take them with us wherever we go — including when we attend live events. Uncovering why individuals use social media during live events can help improve event organization, marketing, and the experiences of attendees. Our understanding of the motivations for using social media during live events is, however, still lacking in depth, especially in regard to emerging live events such as esports. This study aims to answer the question: what motivates the use of social media during live esports events? Data was gathered via a survey (N=255) at the 'Assembly 2016' LAN-event, a major live esports event. We examine the relationships between using various social media services and the motivations for esports spectating, through the Motivation Scale for Sports Consumption. While the results indicate that using social media services while attending Assembly 2016 was quite popular, it seemed that in many cases social media usage was a distraction from esports spectating, a core activity of the event. The results provide implications as to how marketers of live esports events should encourage or control usage of social media by attendees.

#### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Pervasive Computing, Gamification Group, Gamification Group

Contributors: Sjöblom, M., Hassan, L., Macey, J., Törhönen, M., Hamari, J.

Number of pages: 8

Pages: 160-167

Publication date: 18 Jul 2018

#### Host publication information

Title of host publication: Proceedings of the 9th International Conference on Social Media and Society, SMSociety 2018

Publisher: ACM

ISBN (Print): 9781450363341

ASJC Scopus subject areas: Human-Computer Interaction, Computer Networks and Communications, Computer Vision and Pattern Recognition, Software

Keywords: Esports, Live events, Motivation, Social media, Sports consumption

Electronic versions:

ACCEPTED\_VERSION\_Liking\_the\_game

DOIs:

10.1145/3217804.3217908

URLs:

<http://urn.fi/URN:NBN:fi:tuni-201912237103>

#### **Bibliographical note**

EXT="Törhönen, Maria"

DUPL=44481582

Source: Scopus

Source ID: 85051509297

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

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

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

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

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

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

Number of pages: 5

Pages: 1-5

Publication date: 29 Jun 2018

#### **Host publication information**

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

Publisher: IEEE

ISBN (Electronic): 9781538662984

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

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

DOIs:

10.1109/SeGAH.2018.8401351

#### **Bibliographical note**

EXT="Merilampi, Sari"

Source: Scopus

Source ID: 85050242350

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

#### **Code notes: Designing a low-cost tangible coding tool for/with children**

Programming has become an essential subject for today's education curriculum and as a result, the importance of creating the right environments to teach is increasing. For such environments, featuring tangible tools enhances creativity and collaboration. However, due to their high prices, current tangible tools are not reachable by most of the students. We developed Code Notes as a low-cost, attainable and tangible tool aimed to motivate children to support programming education. Code Notes is comprised of an Android app and code-cardboards to teach the basic concepts in programming. We continue to develop the platform with insights gained from children. This paper shares the design phases of Code Notes and observations from our two-month programming project. We also presented some future concepts of Code Notes that offer an active and embodied interaction with the teaching material.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Pervasive Computing, Koç University

Contributors: Sabuncuoğlu, A., Erkaya, M., Buruk, O. T., Göksun, T.

Number of pages: 6  
Pages: 644-649  
Publication date: 19 Jun 2018

#### Host publication information

Title of host publication: IDC 2018 - Proceedings of the 2018 ACM Conference on Interaction Design and Children  
Publisher: ACM

ISBN (Electronic): 9781450351522

ASJC Scopus subject areas: Developmental and Educational Psychology, Education, Software, Human-Computer Interaction

Keywords: Affordable systems for education, Collaborative learning environments, Mobile learning, Tangible blocks.

DOIs:

10.1145/3202185.3210791

Source: Scopus

Source ID: 85051492885

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

#### Optimized viewport dependent streaming of stereoscopic omnidirectional video

Streaming the whole omnidirectional video at high quality is less efficient in terms of bandwidth requirements and decoding complexity, since only a small part of the 360-degree horizontal field of view can be seen by a user at a given point in time. In Viewport Dependent Streaming (VDS) only the current user viewport is streamed at high quality, while the remaining parts are streamed at lower quality. This technology may save streaming bandwidth considerably, especially when it is associated to other techniques. Among the others, asymmetric stereoscopic video, has been studied in the past for traditional video and displays. We focused our research on the usage of asymmetric stereoscopic video for omnidirectional streams watched with a Head Mounted Display (HMD) in VDS. We conducted two subjective quality experiments with the main goal of reducing the streaming bandwidth, while keeping the subjective video quality at the highest level. We assessed asymmetric video applied separately to the foreground and background views of omnidirectional VDS sessions. We show that for VDS, applying asymmetric stereoscopic streaming delivery on the foreground view can save up to 41% bit rate, and using the same technique on the background view can save approximately up to 15% bit rate. Furthermore, eye dominance was seen not to be relevant in our experiments.

#### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Signal Processing, Nokia Technologies

Contributors: Naik, D., Curcio, I. D., Toukoma, H.

Number of pages: 6

Pages: 37-42

Publication date: 12 Jun 2018

#### Host publication information

Title of host publication: Proceedings of the 23th ACM Workshop on Packet Video, PV 2018

Publisher: ACM

ISBN (Electronic): 9781450357739

ASJC Scopus subject areas: Human-Computer Interaction, Software

Keywords: 360 degrees video, Asymmetric video, Omnidirectional video, Streaming adaptation, Subjective quality evaluation, Virtual reality streaming

DOIs:

10.1145/3210424.3210437

#### Bibliographical note

EXT="Curcio, Igor D.D."

Source: Scopus

Source ID: 85050644603

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

#### Fast and easy live video service setup using lightweight virtualization

The service broker provides service providers with virtualized services that can be initialized rapidly and scaled up or down on demand. This demonstration paper describes how a service provider can set up a new video distribution service to end users with a diminutive effort. Our proposal makes use of Docker lightweight virtualization technologies that pack services in containers. This makes it possible to implement video coding and content delivery networks that are scalable and consume resources only when needed. The demonstration showcases a scenario where a video service provider sets up a new live video distribution service to end users. After the setup, live 720p30 video camera feed is encoded in real-time, streamed in HEVC MPEG-DASH format over CDN network, and accessed with a HbbTV compatible set-top-box. This end-to-end system illustrates that virtualization causes no significant resource or performance overhead but is a perfect

match for online video services.

#### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Pervasive Computing, VTT Technical Research Centre of Finland, Sofia Digital, VESTEL Elektronik

Contributors: Heikkinen, A., Pääkkönen, P., Viitanen, M., Vanne, J., Riikonen, T., Bakanoglu, K.

Number of pages: 3

Pages: 487-489

Publication date: 12 Jun 2018

#### Host publication information

Title of host publication: Proceedings of the 9th ACM Multimedia Systems Conference, MMSys 2018

Publisher: ACM

ISBN (Electronic): 9781450351928

ASJC Scopus subject areas: Computer Graphics and Computer-Aided Design, Software, Human-Computer Interaction

Keywords: Content Delivery Network (CDN), Docker, Dynamic adaptive streaming over HTTP (DASH), High Efficiency Video Coding (HEVC), Hybrid broadcast broadband TV (HbbTV), Virtualization

Electronic versions:

Fast and Easy Live Video Service Setup Using Lightweight Virtualization

DOIs:

10.1145/3204949.3208112

URLs:

<http://urn.fi/URN:NBN:fi:tuni-202001171375>

Source: Scopus

Source ID: 85050667891

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

#### Looking for a five-legged sheep: Identifying enterprise architects' skills and competencies

Enterprise architecture (EA) is a holistic approach to comprehend the organization's business objectives and processes, data resources, information systems and information technologies. To advance EA activities, organizations need a myriad of different skills and competences both from individual enterprise architects and from architect teams. However, research on these skills and competences is scarce. Not knowing what skills are actually needed might be one of the reasons why public sector EA endeavors have been very problematic. In this paper, we conduct a qualitative survey among enterprise architects themselves to identify which skills they consider essential for EA work. Our results indicate that the range of skills is great, and finding an expert with all appropriate competencies is like looking for a fivelegged sheep.

#### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Industrial and Information Management

Contributors: Ylinen, M., Pekkola, S.

Publication date: 30 May 2018

#### Host publication information

Title of host publication: Proceedings of the 19th Annual International Conference on Digital Government Research :

Governance in the Data Age, DG.O 2018

Publisher: ACM

Article number: a58

ISBN (Electronic): 9781450365260

ASJC Scopus subject areas: Human-Computer Interaction, Computer Networks and Communications, Computer Vision and Pattern Recognition, Software

DOIs:

10.1145/3209281.3209353

Source: Scopus

Source ID: 85049050136

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

#### Investigating the effects of legacy bias: User elicited gestures from the end users perspective

User elicitation studies are commonly used for designing gestures by putting the users in the designers' seat. One of the most encountered phenomenon during these studies is legacy bias. It refers to users' tendency to transfer gestures from the existing technologies to their designs. The literature presents varying views on the topic; some studies asserted that legacy bias should be diminished, whereas other stated that it should be preserved. Yet, to the best of our knowledge, none of the elicitation studies tested their designs with the end users. In our study, 36 participants compared two gesture sets with and without legacy. Initial findings showed that legacy gesture set had higher scores. However, the interviews

uncovered that some non-legacy gestures were also favored due to their practicality and affordances. We contribute to the legacy bias literature by providing new insights from the end users' perspective.

#### General information

Publication status: Published  
MoE publication type: A4 Article in a conference publication  
Organisations: Pervasive Computing, Koç University-  
Contributors: Erkaya, M., Özcan, O., Beşevli, C., Buruk, O. T.  
Number of pages: 5  
Pages: 277-281  
Publication date: 30 May 2018

#### Host publication information

Title of host publication: DIS 2018 - Companion Publication of the 2018 Designing Interactive Systems Conference  
Publisher: ACM  
ISBN (Print): 9781450356312  
ASJC Scopus subject areas: Human-Computer Interaction, Computer Networks and Communications  
Keywords: Embodied Interaction, Gesture Control, Legacy bias, User Elicitation  
DOIs:  
10.1145/3197391.3205449  
URLs:  
<http://www.scopus.com/inward/record.url?scp=85054195211&partnerID=8YFLogxK> (Link to publication in Scopus)  
Source: Scopus  
Source ID: 85054195211  
Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

#### Ripple thermostat: Affecting the emotional experience through interactive force feedback and shape change

Force feedback and shape change are modalities with a growing application potential beyond the more traditional GUIs. We present two studies that explored the effect of these modalities on the emotional experience when interacting with an intelligent thermostat. The first study compared visual feedback, force feedback, and a combination of force feedback and shape change. Results indicate that force feedback correlates to experienced dominance during interaction, while shape change mainly affects experienced arousal. The second study explored how force feedback and shape change could communicate affective meaning during interaction with the thermostat through a co-design study. Participants designed the thermostat behavior for three scenarios supporting energy savings. Results suggest that despite their abstractness, force feedback and shape change convey affective meaning during the user-system dialogue. The findings contribute to the design of intelligible and intuitive feedback.

#### General information

Publication status: Published  
MoE publication type: A4 Article in a conference publication  
Organisations: Pervasive Computing, Aarhus Universitet, Eindhoven University of Technology, Vincit  
Contributors: Van Oosterhout, A., Alonso, M. B., Jumisko-Pyykkö, S.  
Publication date: 20 Apr 2018

#### Host publication information

Title of host publication: Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems  
Publisher: ACM  
Article number: 655  
ISBN (Electronic): 9781450356206  
ASJC Scopus subject areas: Human-Computer Interaction, Computer Graphics and Computer-Aided Design, Software  
Keywords: Actuated interfaces, Affective computing, Haptic force feedback, Shape-changing interfaces  
DOIs:  
10.1145/3173574.3174229  
Source: Scopus  
Source ID: 85046938728  
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

URLs:

<http://urn.fi/URN:NBN:fi:ty-201809252338>

Source: Scopus

Source ID: 85049665171

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

#### **The use of advanced imaging technology in welfare technology solutions - Some ethical aspects**

Advanced imaging technology with properties like a more realistic picture with extremely high resolution and new applications and branches like welfare technology where these properties are used also involves certain ethical challenges. The protection of vulnerable patients and the privacy of employees and third parties have not yet been discussed to any great extent but should be taken into account in designing, manufacturing and implementing the applications.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Signal Processing, Satakunta University of Applied Sciences

Contributors: Lilja, K. K., Palomäki, J.

Number of pages: 4

Pages: 1-4

Publication date: 2 Feb 2018

#### **Host publication information**

Title of host publication: 3DTV-CON 2017 - 3D True Vision v2 : Research and Applications in Future 3D Media

Publisher: IEEE

ISBN (Electronic): 9781538616352

ASJC Scopus subject areas: Computer Graphics and Computer-Aided Design, Computer Networks and Communications, Computer Vision and Pattern Recognition, Human-Computer Interaction, Electrical and Electronic Engineering

Keywords: 3D imaging, ethical, welfare technology

DOIs:

10.1109/3DTV.2017.8280396

#### **Bibliographical note**

jufoid=50006

Source: Scopus

Source ID: 85046368759

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



### **Viewport-dependent delivery schemes for stereoscopic panoramic video**

Stereoscopic panoramic or omnidirectional video is a key ingredient for an immersive experience in virtual reality applications. The user views only a portion of the omnidirectional scene at each time instant, hence streaming the whole stereoscopic panoramic or omnidirectional video in high quality is not necessary and will consume an unnecessary high bandwidth usage. In order to alleviate the problem of bandwidth wastage, viewport-dependent delivery schemes have been proposed, in which the part of the captured scene that is within the viewer's field of view is delivered at highest quality while the rest of the scene in lower quality. The low quality content is visible only after fast head movements for a short period, until the next periodic intra-coded picture that can be used for switching viewpoints is available. This paper proposes viewport-dependent delivery schemes for streaming of stereoscopic panoramic or omnidirectional video by using region-of-interest coding methods of MV-HEVC and SHVC standards. The proposed schemes avoid the need for frequent intra-coded pictures, and consequently in the performed experiments the streaming bitrate is reduced by more than 50% on average for the best schemes compared to a simulcast delivery method.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Signal Processing, Nokia

Contributors: Ghaznavi-Youvalari, R., Hannuksela, M. M., Aminlou, A., Gabbouj, M.

Number of pages: 4

Pages: 1-4

Publication date: 2 Feb 2018

#### **Host publication information**

Title of host publication: 3DTV-CON 2017 - 3D True Vision v2 : Research and Applications in Future 3D Media

Publisher: IEEE

ISBN (Electronic): 9781538616352

ASJC Scopus subject areas: Computer Graphics and Computer-Aided Design, Computer Networks and Communications, Computer Vision and Pattern Recognition, Human-Computer Interaction, Electrical and Electronic Engineering

Keywords: HEVC, MV-HEVC, panoramic video streaming, SHVC, video coding, Virtual reality

DOIs:

10.1109/3DTV.2017.8280404

#### **Bibliographical note**

EXT="Ghaznavi-Youvalari, Ramin"

EXT="Aminlou, Alireza"

Source: Scopus

Source ID: 85046375176

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

### **Methods and tools for denoising of complex-valued images based on block-matching and high order singular value decomposition**

Noise suppression in complex-valued data is an important task for a wide class of applications, in particular concerning the phase retrieval in coherent imaging. The approaches based on BM3D techniques are ones of the most successful in the field. In this paper, we propose and develop a new class of BM3Dstyle algorithms, which use high order (3D and 4D) singular value decomposition (HOSVD) for transform design in complex domain. This set of the novel algorithms is implemented as a toolbox In Matlab. This development is produced for various types of the complex-domain sparsity: directly in complex domain, real/imaginary and phase/ amplitude parts of complexvalued variables. The group-wise transform design is combined with the different kinds of thresholding including multivariable Wiener filtering. The toolbox includes iterative and non-iterative novel complex-domain algorithms (filters). The efficiency of the developed algorithms is demonstrated on denoising problems with an additive Gaussian complex-valued noise. A special set of the complex-valued test-images was developed with spatially varying correlated phase and amplitudes imitating data typical for optical interferometry and holography. It is shown that for this class of the test-images the developed algorithms demonstrate the stateof- the-art performance.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Signal Processing

Contributors: Ponomarenko, M., Katkovnik, V., Egiazarian, K.

Publication date: 2018

#### **Host publication information**

Title of host publication: Electronic Imaging : Image Processing: Algorithms and Systems XVI

Publisher: Society for Imaging Science and Technology

ASJC Scopus subject areas: Computer Graphics and Computer-Aided Design, Computer Science Applications, Human-Computer Interaction, Software, Electrical and Electronic Engineering, Atomic and Molecular Physics, and Optics  
Keywords: Block matching, Complex domain, Higher-order singular value decomposition, Image denoising, Phase imaging, Sparsity

DOIs:

10.2352/ISSN.2470-1173.2018.13.IPAS-306

#### **Bibliographical note**

jufoid=84313

Source: Scopus

Source ID: 85052877244

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

#### **Deep p-Fibonacci scattering networks**

Recently, the use of neural networks for image classification has become widely spread. Thanks to the availability of increased computational power, better performing architectures have been designed, such as the Deep Neural networks. In this work, we propose a novel image representation framework exploiting the Deep p- Fibonacci scattering network. The architecture is based on the structured p-Fibonacci scattering over graph data. This approach allows to provide good accuracy in classification while reducing the computational complexity. Experimental results demonstrate that the performance of the proposed method is comparable to state-of-the-art unsupervised methods while being computationally more efficient.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Signal Processing, University "Roma Tre"

Contributors: Battisti, F., Carli, M., De Paola, E., Egiazarian, K.

Publication date: 2018

#### **Host publication information**

Title of host publication: Electronic Imaging : Image Processing: Algorithms and Systems XVI

Publisher: Society for Imaging Science and Technology

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

DOIs:

10.2352/ISSN.2470-1173.2018.13.IPAS-193

#### **Bibliographical note**

jufoid=84313

EXT="Battisti, F."

EXT="Carli, M."

Source: Scopus

Source ID: 85052873638

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

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

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

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Signal Processing, Don State Technical University

Contributors: Ponomarenko, M., Gapon, N., Voronin, V., Egiazarian, K.

Publication date: 2018

#### **Host publication information**

Title of host publication: Electronic Imaging : Image Processing: Algorithms and Systems XVI

Publisher: Society for Imaging Science and Technology

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

Keywords: Blind estimation of noise characteristics, Discrete cosine transform (DCT), Noise free test image database

DOIs:

10.2352/ISSN.2470-1173.2018.13.IPAS-382

### **Bibliographical note**

jufoid=84313

Source: Scopus

Source ID: 85052856410

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

### **Robust linearized combined metrics of image visual quality**

Existing full-reference metrics still do not provide a desirable degree of adequacy to a human visual perception, for evaluation of images with different types and levels of distortions. One reason for this is that it is difficult to incorporate the peculiarities of human visual system in the metrics design. In this paper, a robust approach to full-reference metrics' design is proposed, based on a combination of several existing full-reference metrics. A preliminary linearization (fitting) of the dependence of MOS with respect to the components metrics is performed in order to compensate shortcomings of each component. The proposed method is tested on several known databases, and demonstrate better performance than existing metrics.

### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Signal Processing, Kharkiv National Aerospace University

Contributors: Ieremeiev, O., Lukin, V., Ponomarenko, N., Egiazarian, K.

Publication date: 2018

### **Host publication information**

Title of host publication: Electronic Imaging : Image Processing: Algorithms and Systems XVI

Publisher: Society for Imaging Science and Technology

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

Keywords: Combined metrics, Full-reference metrics, Image visual quality assessment, Robust metrics

DOIs:

10.2352/ISSN.2470-1173.2018.13.IPAS-260

### **Bibliographical note**

jufoid=84313

EXT="Ponomarenko, Nikolay"

EXT="Lukin, Vladimir"

Source: Scopus

Source ID: 85052901571

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

### **Combined local and global image enhancement algorithm**

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

### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Signal Processing, Don State Technical University, College of Staten Island

Contributors: Voronin, V., Semenishchev, E., Ponomarenko, M., Agaian, S.

Publication date: 2018

### **Host publication information**

Title of host publication: Electronic Imaging : Image Processing: Algorithms and Systems XVI

Publisher: Society for Imaging Science and Technology

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

10.2352/ISSN.2470-1173.2018.13.IPAS-220

#### **Bibliographical note**

jufoid=84313

Source: Scopus

Source ID: 85052861928

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

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

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

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Signal Processing, Kharkiv National Aerospace University

Contributors: Miroshnichenko, O., Ponomarenko, M., Lukin, V., Egiazarian, K.

Publication date: 2018

#### **Host publication information**

Title of host publication: Electronic Imaging : Image Processing: Algorithms and Systems XVI

Publisher: Society for Imaging Science and Technology

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

Keywords: Discrete cosine transform, JPEG, JPEG additional compression, Sign compression

DOIs:

10.2352/ISSN.2470-1173.2018.13.IPAS-385

#### **Bibliographical note**

jufoid=84313

EXT="Lukin, Vladimir"

Source: Scopus

Source ID: 85052859716

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

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

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

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

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

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

Number of pages: 5

Pages: 1441-1445  
Publication date: 2018

#### Host publication information

Title of host publication: Electronic Imaging : Stereoscopic Displays and Applications XXIX  
Publisher: Society for Imaging Science and Technology  
ASJC Scopus subject areas: Computer Graphics and Computer-Aided Design, Computer Science Applications, Human-Computer Interaction, Software, Electrical and Electronic Engineering, Atomic and Molecular Physics, and Optics  
DOIs:  
10.2352/ISSN.2470-1173.2018.04.SDA-144

#### Bibliographical note

jufoid=84313  
Source: Scopus  
Source ID: 85052854954  
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

#### Multi-factor authentication for wearables: Configuring system parameters with risk function

The users of today are already about to enter the era of highly integrated modern wearable devices-the time when smart accessories will, in turn, push aside regular Smartphones and Tablets bringing a variety of new security challenges. The number of simultaneously used bio-sensors, both integrated into smart wearables and connected over wireless interfaces, allows novel opportunities for Multi-factor Authentication (MFA) of the user. This manuscript proposes a solution for configuring the MFA based on the averaged direct and indirect losses risk analysis. The example application of Bayesian function for MFA presents the applicability of the proposed framework for the utilization with wearables.

#### General information

Publication status: Published  
MoE publication type: A4 Article in a conference publication  
Organisations: Electronics and Communications Engineering, ITMO University, St. Petersburg State University of Aerospace Instrumentation  
Contributors: Bezzateev, S., Afanasyeva, A., Voloshina, N., Ometov, A.  
Publication date: 13 Nov 2017

#### Host publication information

Title of host publication: Proceedings of the 2nd International Conference on Advanced Wireless Information, Data, and Communication Technologies, AWICT 2017  
Publisher: ACM  
ISBN (Electronic): 9781450353106  
ASJC Scopus subject areas: Human-Computer Interaction, Computer Networks and Communications, Computer Vision and Pattern Recognition, Software  
Keywords: Information security, Multi-factor authentication, Risk function, Wearables  
Electronic versions:  
Multi-factor authentication for wearables 2017  
DOIs:  
10.1145/3231830.3231834  
URLs:  
<http://urn.fi/URN:NBN:fi:tuni-202002262382>  
Source: Scopus  
Source ID: 85045304145  
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

#### Bandwidth reduction of omnidirectional viewport-dependent video streaming via subjective quality assessment

Omnidirectional video is more and more widespread in consumer electronics and professional capture devices, as well over Internet via novel streaming services. Omnidirectional video requires a large streaming bandwidth. To date there is little knowledge about the subjective experience of streaming services of omnidirectional video. The aim of this paper is to present subjective assessment results of experiments using a tile-based streaming system for omnidirectional video with the goal of reducing the streaming bandwidth. The results we present show that it is possible to reduce streaming bit rates by an average of 44% for a subjective DMOS value of 4.5 for different content genres.

#### General information

Publication status: Published  
MoE publication type: A4 Article in a conference publication  
Organisations: Signal Processing, Digital Media Laboratory, Nokia  
Contributors: Curcio, I. D., Toukoma, H., Naik, D.

Number of pages: 6  
Pages: 9-14  
Publication date: 27 Oct 2017

#### Host publication information

Title of host publication: AltMM 2017 - Proceedings of the 2nd International Workshop on Multimedia Alternate Realities, co-located with MM 2017  
Publisher: ACM  
ISBN (Electronic): 9781450355070  
ASJC Scopus subject areas: Computer Graphics and Computer-Aided Design, Computer Vision and Pattern Recognition, Human-Computer Interaction  
Keywords: 360 degrees video, Omnidirectional video, Streaming bandwidth optimization, Subjective assessment, Subjective quality evaluation, Virtual reality streaming  
DOIs:  
10.1145/3132361.3132364

#### Bibliographical note

EXT="Curcio, Igor D.D."  
INT=sgn,"Naik, Deepa"  
Source: Scopus  
Source ID: 85036610778  
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

#### Novel D2D-based relaying method for multicast services over 3GPP LTE-A systems

The fast proliferation of 'smart' devices with enhanced capabilities and, at the same time, new multimedia streaming services (i.e., providing high-resolution video and audio content) push the network operator to handle a tremendous increase in the traffic load that is difficult to cope with the current wireless/cellular infrastructures. For that reason, in this paper we consider a novel method based on multi-hop Device-to-Device (D2D) communications, where direct links are established among User Equipments (UEs) in proximity within a Long Term Evolution-Advanced (LTE-A)-based network. The aim of the proposed mechanism is to improve the multimedia multicast sessions and transmissions in terms of throughput and mean download time per user by delivering ubiquitous and reliable connectivity to the larger number of UEs. Our system-level analysis highlights that via proximity-based transmissions among the users, it is possible to provide multimedia content with higher data rates and lower delays w.r.t. The legacy cellular solutions.

#### General information

Publication status: Published  
MoE publication type: A4 Article in a conference publication  
Organisations: Electronics and Communications Engineering, University Mediterranea of Reggio  
Contributors: Araniti, G., Orsino, A., Militano, L., Putrino, G., Andreev, S., Koucheryavy, Y., Iera, A.  
Publication date: 19 Jul 2017

#### Host publication information

Title of host publication: 2017 IEEE International Symposium on Broadband Multimedia Systems and Broadcasting, BMSB 2017  
Publisher: IEEE  
ISBN (Electronic): 9781509049370  
ASJC Scopus subject areas: Computer Graphics and Computer-Aided Design, Computer Networks and Communications, Computer Science Applications, Human-Computer Interaction, Electrical and Electronic Engineering, Media Technology, Communication  
Keywords: 5G, D2D, LTE, MBMS, Multicast services, Networking and QoS, Performance evaluation  
DOIs:  
10.1109/BMSB.2017.7986137

#### Bibliographical note

jufoid=72046  
INT=elt,"Orsino, A."  
Source: Scopus  
Source ID: 85027253110  
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

#### Mobility aware eMBMS management in urban 5G-oriented systems

The demand for video services in mobile networks is rapidly increasing. In fact, is expected that video transmissions will account for more than 69% of mobile data traffic by 2018[1]. Along these lines, the challenging requirements of such multimedia applications and, at the same time, the centralized organization typical of current cellular technologies motivate the investigation of enhanced advanced driver assistance systems (ADAS) for supporting the driver experience in terms of safety driving comfort. In this context, in this paper we focus our attention of a new realistic scenario, in which all users

share video contents from the surrounding environment with the aim to create a global 3D video content useful for ADAS systems. Once that such video content is created, we assume that the LTE eNodeB may come in help for making it available through streaming transmissions towards all vehicles in that area with the use of Multimedia Broadcast Multicast Services (MBMS). Obtained results, show that multicast transmissions based on subgrouping techniques are able to overcome the legacy solutions where conservative and opportunistic schemes are used.

#### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Electronics and Communications Engineering, Dept. of Electrical and Electronic Engineering, Università degli Studi di Reggio Calabria, Peoples' Friendship University of Russia

Contributors: Desogus, C., Fadda, M., Murrioni, M., Araniti, G., Orsino, A.

Publication date: 19 Jul 2017

#### Host publication information

Title of host publication: 2017 IEEE International Symposium on Broadband Multimedia Systems and Broadcasting, BMSB 2017

Publisher: IEEE

ISBN (Electronic): 9781509049370

ASJC Scopus subject areas: Computer Graphics and Computer-Aided Design, Computer Networks and Communications, Computer Science Applications, Human-Computer Interaction, Electrical and Electronic Engineering, Media Technology, Communication

Keywords: LTE, MBMS, Multicast Grouping, V2X, Video Streaming

DOIs:

10.1109/BMSB.2017.7986140

#### Bibliographical note

jufoid=72046

INT=ELT, "Orsino, A."

Source: Scopus

Source ID: 85027268444

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

#### Optimal subgroup configuration for multicast services over 5G-satellite systems

The fast spreading of new multimedia services and applications is pushing telco operator to identify candidate technologies for handling the increasing traffic load expected in the coming years. Along this line, satellite communications integrated with terrestrial systems is gaining momentum as a possible solution to overcome the aforementioned challenges. In this paper, we analyze a multicast subgroup configuration problem for providing multimedia services over 5G satellite systems. In particular, an optimization problem is considered in order to maximize the aggregate data rate (ADR) with an execution time that is sensibly smaller compared to other solutions available in literature. Obtained results, demonstrated as the proposed approach, hereafter named as Optimal Multicast Subgroup Configuration (OMSC), is able to overcome the limitation of sub-optimal subgrouping solutions by providing higher performance and, at the same time, low complexity operations.

#### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Electronics and Communications Engineering, Università degli Studi di Reggio Calabria, Peoples' Friendship University of Russia

Contributors: Orsino, A., Araniti, G., Scopelliti, P., Gudkova, I. A., Samouylov, K. E., Iera, A.

Publication date: 19 Jul 2017

#### Host publication information

Title of host publication: 2017 IEEE International Symposium on Broadband Multimedia Systems and Broadcasting, BMSB 2017

Publisher: IEEE

ISBN (Electronic): 9781509049370

ASJC Scopus subject areas: Computer Graphics and Computer-Aided Design, Computer Networks and Communications, Computer Science Applications, Human-Computer Interaction, Electrical and Electronic Engineering, Media Technology, Communication

Keywords: 5G-Satellite, Multicast, Networking and QoS, Performance Evaluation, Satellite-LTE

DOIs:

10.1109/BMSB.2017.7986134

#### Bibliographical note

jufoid=72046

INT=elt,"Orsino, A."

Source: Scopus

Source ID: 85027270587

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

### **Children designing videos: Tools, pedagogical models, and best practices for digital storytelling and media-making in the classroom**

Although video sharing is common among youth, schools are only beginning to apply digital videos and digital storytelling to formal learning. This paper presents pedagogical models, examples, best practices, and outcomes that illustrate how teachers and students design and use digital stories in knowledge creation in cross-cultural settings. The results are based on the empirical data and findings from several international pilot studies. On the one hand, working with digital video stories drove engagement. However, on the other hand, technical issues significantly lowered engagement. In addition, the video inquiry pedagogy supported inquiry learning. Students began to pose scientifically oriented questions and seek answers together.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Research group: TUT Game Lab, Pervasive Computing, University of Helsinki, Pepperdine University

Contributors: Multisilta, J., Niemi, H., Hamilton, E.

Number of pages: 4

Pages: 693-696

Publication date: 27 Jun 2017

#### **Host publication information**

Title of host publication: IDC 2017 - Proceedings of the 2017 ACM Conference on Interaction Design and Children

Publisher: ACM

ISBN (Electronic): 9781450349215

ASJC Scopus subject areas: Software, Education, Human-Computer Interaction, Developmental and Educational Psychology

Keywords: Children, Media-making, Pedagogical models, STEM, Storytelling, Video

DOIs:

10.1145/3078072.3091982

Source: Scopus

Source ID: 85026309191

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

### **Barriers for bridging interpersonal gaps: Three inspirational design patterns for increasing collocated social interaction**

Positive face-to-face social encounters between strangers can strengthen the sense of community in modern urban environments. However, it is not always easy to initiate friendly encounters due to various inhibiting social norms. We present three inspirational design patterns for reducing inhibitions to interact with unfamiliar others. These abstractions are based on a broad design space review of concepts, encompassing examples across a range of scales, fields, media and forms. Each inspirational pattern is formulated as a response to a different challenge to initiating social interaction but all share an underlying similarity in offering varieties of barriers and filters that paradoxically also separate people. The patterns are "Closer Through Not Seeing"; "Closer Through Not Touching"; and "Minimize Encounter Duration". We believe these patterns can support designers, in understanding, articulating, and generating approaches to creating embodied interventions and systems that enable unacquainted people to interact.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Pervasive Computing, Research area: User experience, University of Southern Denmark

Contributors: Mitchell, R., Olsson, T.

Number of pages: 9

Pages: 2-10

Publication date: 26 Jun 2017

#### **Host publication information**

Title of host publication: C&T 2017 - 8th International Conference on Communities and Technologies, Conference Proceedings

Publisher: ACM

ISBN (Electronic): 9781450348546

ASJC Scopus subject areas: Human-Computer Interaction, Computer Networks and Communications, Computer Vision and Pattern Recognition, Software

Keywords: Collocated interaction, Face-to-face interaction, Social interaction design, pattern languages, embodied interaction



DOIs:

10.1145/3083671.3083697

Source: Scopus

Source ID: 85025125983

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

### **Operationalizing the experience factory for effort estimation in agile processes**

[Background] The effort required to systematically collect historical data is not always allocable in agile processes and historical data management is usually delegated to the developers' experience, who need to remember previous project details. However, even if well trained, developers cannot precisely remember a huge number of details, resulting in wrong decisions being made during the development process. [Aims] The goal of this paper is to operationalize the Experience Factory in an agile way, i.e., defining a strategy for collecting historical project data using an agile approach. [Method] We provide a mechanism for understanding whether a measure must be collected or not, based on the Return on Invested Time (ROIT). In order to validate this approach, we instantiated the factory with an exploratory case study, comparing four projects that did not use our approach with one project that used it after 12 weeks out of 37 and two projects that used it from the beginning. [Results] The proposed approach helps developers to constantly improve their estimation accuracy with a very positive ROIT of the collected measure. [Conclusions] From this first experience, we can conclude that the Experience Factory can be applied effectively to agile processes, supporting developers in improving their performance and reducing potential decision mistakes.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Fraunhofer IESE, University of Cagliari, Former organisation of the author

Contributors: Taibi, D., Lenarduzzi, V., Diebold, P., Lunesu, I.

Number of pages: 10

Pages: 31-40

Publication date: 15 Jun 2017

#### **Host publication information**

Title of host publication: Proceedings of the 21st International Conference on Evaluation and Assessment in Software Engineering, EASE 2017

Volume: Part F128635

Publisher: Association for Computing Machinery

ISBN (Electronic): 9781450348041

ASJC Scopus subject areas: Human-Computer Interaction, Computer Networks and Communications, Computer Vision and Pattern Recognition, Software

Keywords: Agile software development, Experience factory, Knowledge management

DOIs:

10.1145/3084226.3084240

Source: Scopus

Source ID: 85025449243

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

### **Comparing communication effort within the scrum, scrum with Kanban, XP, and Banana development processes**

[Context]: Communication plays an important role in any development process. However, communication overhead has been rarely compared among development processes. [Objective]: The goal of this work is to compare the communication overhead and the different channels applied in three agile processes (XP, Scrum, Scrum with Kanban) and in an unstructured process. [Method]: We designed an empirical study asking four teams to develop the same application with the four development processes, and we compare the communication overhead among them. [Results]: As expected, face-to-face communication is most frequently employed in the teams. Scrum with Kanban turned out to be the process that requires the least communication. Unexpectedly, despite requiring much more time to develop the same application, the unstructured process required comparable communication overhead (25% of the total development time) as the agile processes.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: University of Oulu, Former organisation of the author

Contributors: Taibi, D., Lenarduzzi, V., Ahmad, M. O., Liukkunen, K.

Number of pages: 6

Pages: 258-263

Publication date: 15 Jun 2017

### Host publication information

Title of host publication: Proceedings of the 21st International Conference on Evaluation and Assessment in Software Engineering, EASE 2017

Volume: Part F128635

Publisher: Association for Computing Machinery

ISBN (Electronic): 9781450348041

ASJC Scopus subject areas: Human-Computer Interaction, Computer Networks and Communications, Computer Vision and Pattern Recognition, Software

Keywords: Agile processes, Case study, Communication, Empirical software engineering

DOIs:

10.1145/3084226.3084270

Source: Scopus

Source ID: 85025468824

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

### Microservices in agile software development: A workshop-based study into issues, advantages, and disadvantages

In the last years, cloud-native architectures have emerged as a target platform for the deployment of microservice architectures. The migration of existing monoliths into cloud-native applications is still in the early phase, and only few companies already started their migrations. Therefore, success and failure stories about different approaches are not available in the literature. This context connects also to the recently discussed DevOps context where development and continuous deployment are closely linked.

### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Free University of Bolzano-Bozen, Former organisation of the author

Contributors: Taibi, D., Lenarduzzi, V., Pahl, C., Janes, A.

Publication date: 22 May 2017

### Host publication information

Title of host publication: Proceedings of the XP2017 Scientific Workshops, XP 2017

Volume: Part F129907

Publisher: Association for Computing Machinery

Article number: a23

ISBN (Electronic): 9781450352642

ASJC Scopus subject areas: Human-Computer Interaction, Computer Networks and Communications, Computer Vision and Pattern Recognition, Software

Keywords: Cloud software, Microservices, SOA, Software architecture

DOIs:

10.1145/3120459.3120483

Source: Scopus

Source ID: 85029863670

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

### Effects of extrinsic noise are promoter kinetics dependent

Studies in *Escherichia coli* using in vivo single-RNA detection and time-lapse confocal microscopy showed that transcription is a multiple rate-limiting steps process, in agreement with previous in vitro measurements. Here, from simulations of a stochastic model of transcription validated empirically that accounts for cell-to-cell variability in RNA polymerase (RNAP) numbers, we investigate the hypothesis that the cell-to-cell variability in RNA numbers due to RNAP variability differs with the promoter rate-limiting steps dynamics. We find that increasing the cell-to-cell variability in RNAP numbers increases the cell-to-cell diversity in RNA numbers, but the degree with which it increases is promoter kinetics dependent. Namely, promoters whose open complex formation is relatively longer lasting dampen more efficiently this noise propagation phenomenon. We conclude that cell-to-cell variability in RNA numbers due to variability in RNAP numbers is promoter-sequence dependent and, thus, evolvable.

### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: BioMediTech, Faculty of Biomedical Sciences and Engineering, Research group: Laboratory of Biosystem Dynamics-LBD

Contributors: Bahrudeen, M. N., Startceva, S., Ribeiro, A. S.

Number of pages: 4

Pages: 44-47

Publication date: 14 May 2017

### Host publication information

Title of host publication: Proceedings of the 2017 9th International Conference on Bioinformatics and Biomedical Technology, ICBBT 2017

Publisher: ACM

ISBN (Electronic): 9781450348799

ASJC Scopus subject areas: Human-Computer Interaction, Computer Networks and Communications, Computer Vision and Pattern Recognition, Software

Keywords: Extrinsic noise, Gene expression, Phenotypic diversity, Rate-limiting steps, Stochastic models, Transcription initiation

Electronic versions:

Effects\_of\_extrinsic\_noise\_are\_promoter\_kinetics\_dependent

DOIs:

10.1145/3093293.3093295

URLs:

<http://urn.fi/URN:NBN:fi:tuni-201911186013>

Source: Scopus

Source ID: 85025117782

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

### Modular audio story platform for museums

Museums are seeking different ways to attract and engage audiences. Digital stories in various forms have been utilized as one approach to increase audience experience. This paper presents how to bring audio stories as a part of museum's activities by developing a modular audio story platform. Most of the functionality is included in Android applications, which allow visitors to attach stories with emotions to artifacts, share stories with other visitors and enrich existing stories with sounds. All the audio files, linking of the artifacts and related audio files are managed by audio digital asset management system. Our platform supports curated audio stories, but the main emphasis is in the visitors' audio stories. We differentiate from the other digital storytelling systems by attaching emotions onto the visitor stories, and combining the soundscapes and audio stories as visitor modified audio stories. Copyright is held by the owner/author(s).

### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Pervasive Computing, Helsinki Metropolia University of Applied Sciences, University of Helsinki

Contributors: Salo, K., Zinin, V., Bauters, M., Mikkonen, T.

Number of pages: 4

Pages: 113-116

Publication date: 7 Mar 2017

### Host publication information

Title of host publication: IUI 2017 - Companion of the 22nd International Conference on Intelligent User Interfaces

Publisher: ACM

ISBN (Electronic): 9781450348935

ASJC Scopus subject areas: Software, Human-Computer Interaction

Keywords: Android, Audio story, Emotions, Mobile Sound mixing, Museum, Soundscape, User generated content

DOIs:

10.1145/3030024.3040975

Source: Scopus

Source ID: 85016642268

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

### Towards a conceptual framework for privacy protection in the use of interactive 360° video surveillance

Interactive 360° video technology has not been embraced for surveillance purposes despite its ability to eliminate blind spots, which is an important attribute of video surveillance. Further, privacy invasion due to video surveillance has a negative impact, and this urges for attention. Hence, the paper authors considered these two aspects and proposed a conceptual design framework with its rationale for privacy protection in use within the infrastructure of the interactive 360° video surveillance system. This conceptual integration framework takes into account the next essential factors: i) the utilization of the positive characteristics of 360° video to improve surveillance; ii) the protection of people's privacy; iii) the assistance needed in crime investigation and forensics; and iv) the ease and cost-effectiveness for deployment. These are factors of paramount significance for public safety and social order and they can be guaranteed with proactive approaches of design, based on the latest developments of Internet of Things technology and digital watermarking advancements.

### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Pervasive Computing, Research area: Information security, University of Tampere, Monash University  
Contributors: Chaudhary, S., Berki, E., Nykänen, P., Zolotavkin, Y., Helenius, M., Kela, J.  
Publication date: 23 Feb 2017

#### Host publication information

Title of host publication: 2016 22nd International Conference on Virtual System & Multimedia (VSMM)  
Publisher: IEEE  
ISBN (Electronic): 9781467389938  
ASJC Scopus subject areas: Computer Science Applications, Human-Computer Interaction, Media Technology, Radiology Nuclear Medicine and imaging  
Keywords: conceptual framework, Interactive 360° video surveillance, Internet of Things, literature review, privacy and safety, security, steganography and digital watermarking  
DOIs:  
10.1109/VSMM.2016.7863179

#### Bibliographical note

EXT="Chaudhary, Sunil"  
Source: Scopus  
Source ID: 85016023783  
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

#### From theories to game mechanics: Developing a game for training rational numbers

The paper reports the results from an ongoing project that aims to develop an engaging and effective digital game for training conceptual rational number knowledge. The overall research approach is design science. In the paper we report the results of an iteration in which we studied how students used a Semideus School game prototype and how they experienced the core mechanics of the game. 20 fourth graders and 32 sixth graders played Semideus School game for approximately 2.5 hours. Students were allowed to freely play the game with their iPads. Playing experience was studied with a digital questionnaire that included items about flow experience (Flow Short Scale), perceived playability, and acceptance of game-based math training. Additionally, a researcher observed the playing sessions and discussed with the students about the implementation of the game. Students experienced reasonable high flow experience while playing the game. The results revealed that 4th graders would be more willing to study rational numbers with a game and they also appreciated the playability of the game more than sixth graders. Moreover, sixth graders demanded more complex game mechanics, but 4th graders were happy with the core mechanics. We redesigned the game mechanics based on the findings. The paper describes the new mechanics and the theoretical basis of the new design.

#### General information

Publication status: Published  
MoE publication type: A4 Article in a conference publication  
Organisations: Pervasive Computing  
Contributors: Kiili, K.  
Number of pages: 7  
Pages: 328-334  
Publication date: 2017

#### Host publication information

Title of host publication: Proceedings of the 11th European Conference on Games Based Learning, ECGBL 2017  
Publisher: Academic Conferences and Publishing International Limited  
ISBN (Electronic): 9781911218562  
ASJC Scopus subject areas: Software, Computer Graphics and Computer-Aided Design, Computer Networks and Communications, Artificial Intelligence, Human-Computer Interaction, Control and Systems Engineering, Education  
Keywords: Game design, Game mechanic, Game-based learning, Mathematics, Playing experience, Rational numbers  
Source: Scopus  
Source ID: 85036471818  
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

#### Full-reference metrics multidistortional analysis

This paper is devoted to analysis and further improvement of full-reference metrics of image visual quality. The effectiveness of a metric is characterized by the rank correlation factors between the obtained array of mean opinion scores (MOS) and the corresponding array of given metric values. This allows to determine the correspondence of a considered metric to a human visual system (HVS). Results obtained on the database TID2013 show that Spearman correlation for the best existing metrics (PSNRHMA, FSIM, SFF, etc.) does not exceed 0.85. In this paper, extended verification tools that allow to detect the shortcomings of the metrics taking into account combined distortions is proposed. An example for further improvement of the PSNRHMA metric is presented.

#### General information

Publication status: Published  
MoE publication type: A4 Article in a conference publication  
Organisations: Signal Processing, Kharkiv National Aerospace University  
Contributors: Ieremeiev, O., Lukin, V., Ponomarenko, N., Egiazarian, K.  
Number of pages: 9  
Pages: 27-35  
Publication date: 2017

#### Host publication information

Title of host publication: Image Processing: Algorithms and Systems XV

#### Publication series

Name: Electronic Imaging  
ISSN (Print): 2470-1173  
ASJC Scopus subject areas: Computer Graphics and Computer-Aided Design, Computer Science Applications, Human-Computer Interaction, Software, Electrical and Electronic Engineering, Atomic and Molecular Physics, and Optics  
Keywords: Full-reference metrics, Image visual quality assessment, Metrics analysis, Metrics verification, Multiple distortions  
DOIs:  
10.2352/ISSN.2470-1173.2017.13.IPAS-202

#### Bibliographical note

jufoid=84313  
EXT="Ponomarenko, Nikolay"  
EXT="Lukin, Vladimir"  
Source: Scopus  
Source ID: 85040625876  
Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

#### BM3D-HVS: Content-Adaptive denoising for improved visual quality

We introduce a content-Adaptive approach to image denoising where the filter design is based on mean opinion scores (MOSs) from preliminary experiments with volunteers who evaluated the quality of denoised image fragments. This allows to tune the filter parameters so to improve the perceptual quality of the output image, implicitly accounting for the peculiarities of the human visual system (HVS). A modification of the BM3D image denoising filter (Dabov et al., IEEE TIP, 2007), namely BM3DHVS, is proposed based on this framework. We show that it yields a higher visual quality than the conventional BM3D. Further, we have also analyzed the MOSs against popular full-reference visual quality metrics such as SSIM (Wang et al., IEEE TIP, 2004), its extension FSIM (Zhang et al., IEEE TIP, 2011), and the noreference IL-NIQE (Zhang et al., IEEE TIP, 2015) over each image fragment. Both the Spearman and the Kendall rank order correlation show that these metrics do not correspond well to the human perception. This calls for new visual quality metrics tailored for the benchmarking and optimization of image denoising methods.

#### General information

Publication status: Published  
MoE publication type: A4 Article in a conference publication  
Organisations: Signal Processing, Kharkiv National Aerospace University, Noiseless Imaging Ltd  
Contributors: Egiazarian, K., Danielyan, A., Ponomarenko, N., Foia, A., Ieremeiev, O., Lukin, V.  
Number of pages: 8  
Pages: 48-55  
Publication date: 2017

#### Host publication information

Title of host publication: Image Processing: Algorithms and Systems XV

#### Publication series

Name: Electronic Imaging  
ISSN (Print): 2470-1173  
ASJC Scopus subject areas: Computer Graphics and Computer-Aided Design, Computer Science Applications, Human-Computer Interaction, Software, Electrical and Electronic Engineering, Atomic and Molecular Physics, and Optics  
DOIs:  
10.2352/ISSN.2470-1173.2017.13.DPMI-083

#### Bibliographical note

EXT="Danielyan, Aram"  
EXT="Lukin, Vladimir"  
jufoid=84313  
Source: Scopus

Source ID: 85040604686

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

### **Can e-government solutions enhance the work in municipalities?: empirical evidence from case lupapiste**

Digitalization and increasing demand of e-government services are not changing only the way the citizens can use public services, but also the nature of work of many municipality employees. At best this kind of digitalization can offer added value in the form of enhancing the work of the municipality personnel. In this paper, we study the effects of adopting an e-government service on work in municipalities. Based on an empirical investigation of five municipalities we propose flow efficiency as a key metric to grasp the added value of digitalization of a public service, as it reveals the most valuable activities as well as the potential bottlenecks. Flow efficiency measurement gives therefore a better indicator to be used in e-government process development than e.g. simple throughput time especially when evaluating the effects of digitalization on knowledge work productivity.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Department of Information Management and Logistics, Research group: Novi, Managing digital industrial transformation (mDIT), Solita Oy

Contributors: Jussila, J., Helander, N., Lehtonen, T., Kallio, J., Sillanpää, V.

Number of pages: 6

Pages: 20-25

Publication date: 17 Oct 2016

#### **Host publication information**

Title of host publication: AcademicMindtrek '16: Proceedings of the 20th International Academic Mindtrek Conference : Oct. 17th-19th, 2016

Publisher: ACM

ISBN (Electronic): 978-1-4503-4367-1

ASJC Scopus subject areas: Public Administration, Information Systems, Human-Computer Interaction

Keywords: E-Government, Efficiency, value assessment

Electronic versions:

p20-jussila

DOIs:

10.1145/2994310.2994357

URLs:

<http://urn.fi/URN:NBN:fi:tty-201611024678>

URLs:

<http://www.mindtrek.org/2016/academic/>

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

### **The 5C categorization of social media tools**

Social media can offer potential business benefits in the company context. However, successful social media initiative calls for careful strategic planning and approaching social media tools as enablers for reaching a purpose. A categorization of social media tools is called for to help the strategic choices and evaluation between the tools. To date, no coherent classification exists, and those suggested approach social media tools from a substantial perspective of what a tool is. From strategical planning viewpoint it is more practical to take the functional perspective of what a tool does. In this paper, we present a framework for categorizing social media tools by the actions they enable. The 5C categorization is based on the actions enabled by the social media tools: communicating, collaborating, connecting, completing, and combining. In order to demonstrate how the 5C categorization can be used as a framework to assess social media tools we conducted an empirical study of social media based crowdsourcing platforms in business-to-business setting. The 5C categorization can be utilized in planning a social media strategy as it forwards the understanding of which tools are suitable for certain purpose and provides a scheme to evaluate and compare different social media tools and applications.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Department of Information Management and Logistics, Research group: Novi, Managing digital industrial transformation (mDIT), University of Vaasa (UVA)

Contributors: Vuori, V., Jussila, J.

Number of pages: 8

Pages: 26-33

Publication date: 17 Oct 2016

#### **Host publication information**

Title of host publication: Proceedings of the 20th International Academic Mindtrek Conference : Oct. 17th-19th, 2016, Tampere, Finland  
Publisher: ACM  
ISBN (Electronic): 978-1-4503-4367-1  
ASJC Scopus subject areas: Human-Computer Interaction  
Keywords: Social Media  
DOIs:  
10.1145/2994310.2994367  
URLs:  
<http://www.mindtrek.org/2016/>  
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

### **Temporal dimensions of affect in user experience of digital news in the field**

This paper examines temporal dimensions of affective experiences as part of user experience of digital news reading in field conditions in two case studies. The first study focused on user experience of novel browser optimized versions of news for tablet computers. The second study examined the experience of digital replicas. The participants were active readers of newspapers studied. The daily reporting of affect was done over the usage period of one week. The results of both studies showed that there are differences between positive and negative affect, in their dynamism over time and individual differences they captured. The amount of negative emotions was very low with small individual differences and it reduced over time. In contrast, positive affect indicated slightly positive user experience with larger amount of individual differences. Its main dynamism was expressed at the beginning of study.

#### **General information**

Publication status: Published  
MoE publication type: A4 Article in a conference publication  
Organisations: Department of Pervasive Computing, Research area: User experience, Eindhoven University of Technology  
Contributors: Jumisko-Pyykkö, S., Pesonen, E., Vääätäjä, H.  
Pages: 192-197  
Publication date: 17 Oct 2016

#### **Host publication information**

Title of host publication: AcademicMindtrek 2016 - Proceedings of the 20th International Academic Mindtrek Conference  
Publisher: ACM  
ISBN (Electronic): 9781450343671  
ASJC Scopus subject areas: Human-Computer Interaction, Software, Computer Science Applications  
Keywords: Authentication, Browser, Digital news, Digital replica, Emotion, Reading, Tablet, User experience  
DOIs:  
10.1145/2994310.2994370  
Source: Scopus  
Source ID: 84994817765  
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

### **Software visualization today - Systematic literature review**

Software visualization means visualizing various aspects and artifacts related to software. By this definition a wide range of different software engineering aspects from program comprehension to understanding software process and usage are covered. This paper presents the results of systematic literature review spanning six years of software visualization literature. The main result shows that the most studied topics in the past six years are related to software structure, behavior and evolution. Software process and usage are addressed only in few studies. In the future studying the adoption of software visualization tools in industry context would be beneficial.

#### **General information**

Publication status: Published  
MoE publication type: A4 Article in a conference publication  
Organisations: Department of Pervasive Computing, Research area: Software engineering, Research area: User experience  
Contributors: Mattila, A., Ihantola, P., Kilamo, T., Luoto, A., Nurminen, M., Vääätäjä, H.  
Number of pages: 10  
Pages: 262-271  
Publication date: 17 Oct 2016

#### **Host publication information**

Title of host publication: AcademicMindtrek 2016 - Proceedings of the 20th International Academic Mindtrek Conference  
Publisher: ACM

ISBN (Electronic): 9781450343671

ASJC Scopus subject areas: Human-Computer Interaction, Software, Computer Science Applications

Keywords: Human-centered computing, Software visualization, Systematic literature review

DOIs:

10.1145/2994310.2994327

Source: Scopus

Source ID: 84994910745

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

### **Participatory development of user experience design guidelines for a B2B company**

As business success is increasingly dependent on an organization's ability to provide a pleasant user experiences (UX) for its products, companies need to find ways to harness every employee to think about UX in their daily work. To support this goal, we present a participatory development process to create user experience design guidelines for a company developing materials-handling equipment for warehouses. The guidelines were developed to steer the work of all R&D designers and developers towards experience-driven design of the products in business-to-business context. The participatory process includes six steps: Spreading awareness of UX within the company, providing information on UX, supporting understanding of UX, co-creation of guidelines, reviewing the outcome, and implementing the guidelines. This paper concentrates on describing the first five phases. The participatory approach is applicable by other organizations to support the change towards experience-driven design. The process and outcome aims to support employees' everyday work aiming for products with pleasant UX.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Department of Pervasive Computing, Research area: User experience, Rocla Oy, Aalto University

Contributors: Hildén, E., Väättäjä, H., Roto, V., Uusitalo, K.

Number of pages: 10

Pages: 49-58

Publication date: 17 Oct 2016

#### **Host publication information**

Title of host publication: AcademicMindtrek '16 Proceedings of the 20th International Academic Mindtrek Conference

Publisher: ACM

ISBN (Electronic): 978-1-4503-4367-1

ASJC Scopus subject areas: Human-Computer Interaction, Software, Computer Science Applications

Keywords: B2B, Design, Guideline, Mindset, Organizational change, Participatory Design, User experience

DOIs:

10.1145/2994310.2994355

#### **Bibliographical note**

EXT="Roto, Virpi"

Source: Scopus

Source ID: 84994834980

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

### **Focusing on user experience and business models in startups: Investigation of two-dimensional value creation**

While good user experience (UX) can be seen to provide competitive advantage for the company and added value to users, resources for achieving UX may often be lacking in software startups. Furthermore, in different phases of business and product development process, concentrating on the focal things can be challenging. In this study, we investigated the factors affecting UX work in startups as well as UX goals startups set for their products. Furthermore, we reviewed the goals in terms of the Minimum Viable UX framework as well as value creation aspects. We present qualitative results of a survey study with 20 software startups as well as findings of a literature review. Our study suggests that while startups aim to provide products with good usability, the lack of a more comprehensive approach to UX can hinder their value creation; affecting both user satisfaction and business success. As a result, this may affect the successful implementation of startup's business model.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Research area: User experience, Department of Pervasive Computing, University of Oulu

Contributors: Hokkanen, L., Xu, Y., Väänänen, K.

Number of pages: 9

Pages: 59-67

Publication date: 17 Oct 2016



### Host publication information

Title of host publication: AcademicMindtrek 2016 - Proceedings of the 20th International Academic Mindtrek Conference  
Publisher: ACM  
ISBN (Electronic): 9781450343671  
ASJC Scopus subject areas: Human-Computer Interaction, Software, Computer Science Applications  
Keywords: Business model, Software, Startup, User experience, Value  
DOIs:  
10.1145/2994310.2994371  
Source: Scopus  
Source ID: 84994831715  
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

### Casual immersive viewing with smartphones

In this paper, we explore how to better integrate virtual reality viewing to a smartphone. We present novel designs for casual (short-term) immersive viewing of spatial and 3D content, such as augmented and virtual reality, with smartphones. Our goal is to create a simple and low-cost casual-viewing design which could be retrofitted and eventually be embedded into smartphones, instead of using larger spatial viewing accessories. We explore different designs and implemented several prototypes. One prototype uses thin and light near-to-eye optics with a smartphone display, thus providing the user with the functionality of a large, high-resolution virtual display. Our designs also enable 3D user interfaces. Easy interaction through various gestures and other modalities is possible by using the inertial and other sensors and camera of the smartphone. Our preliminary concepts are a starting point for exploring useful constructions and designs for such usage.

### General information

Publication status: Published  
MoE publication type: A4 Article in a conference publication  
Organisations: Department of Electronics and Communications Engineering, Research group: Personal Electronics Group, University of California, Santa Barbara  
Contributors: Rakkolainen, I., Raisamo, R., Turk, M., Höllerer, T., Palovuori, K.  
Number of pages: 4  
Pages: 449-452  
Publication date: 17 Oct 2016

### Host publication information

Title of host publication: AcademicMindtrek 2016 - Proceedings of the 20th International Academic Mindtrek Conference  
Publisher: ACM  
ISBN (Electronic): 978-1-4503-4367-1  
ASJC Scopus subject areas: Human-Computer Interaction, Software, Computer Science Applications  
Keywords: 3D interaction, Augmented reality, Mobile computing, Near-to-eye display, Virtual reality  
DOIs:  
10.1145/2994310.2994314

### Bibliographical note

EXT="Rakkolainen, Ismo"  
Source: Scopus  
Source ID: 84994852921  
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

### Challenges and capabilities of conductive polymeric materials for electromechanical stimulation of stem cells: A case study

Cell cultivation devices that mimic the complex microenvironment of cells in the human body are of high importance for the future of stem cell research. This paper introduces a prototype of an electromechanical stimulation platform as a modular expansion of an earlier developed mechanical stimulation device for stem cell research. A solution processable ink from PEDOT:PSS and graphene is studied as a suitable material for fabrication of transparent stretchable electrodes. Challenges of electrode integration on a flexible membrane using this material are critically discussed.

### General information

Publication status: Published  
MoE publication type: A4 Article in a conference publication  
Organisations: Department of Automation Science and Engineering  
Contributors: Viehrig, M., Tuukkanen, S., Kallio, P.  
Number of pages: 5  
Publication date: 6 Sep 2016

### Host publication information

Title of host publication: 2016 International Conference on Manipulation, Automation and Robotics at Small Scales, MARSS 2016  
Publisher: Institute of Electrical and Electronics Engineers Inc.  
ISBN (Electronic): 9781509015108  
ASJC Scopus subject areas: Artificial Intelligence, Human-Computer Interaction, Computer Science Applications  
Keywords: Conductive Polymer, Electromechanical Stimulation, graphene/PEDOT:PSS ink, PEDOT: PSS, Stem Cells  
Electronic versions:  
Viehrig\_2016\_MASRSS\_Self-archive  
DOIs:  
10.1109/MARSS.2016.7561744  
URLs:  
<http://urn.fi/URN:NBN:fi:tty-201802021188>

#### **Bibliographical note**

INT=ase,"Viehrig, Marlitt"  
Source: Scopus  
Source ID: 84988946977  
Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

#### **Using elicitation studies to generate collocated interaction methods**

Elicitation studies allow collecting interaction methods directly from end-users by presenting the users with the end effect of an operation and then asking them to perform the action that caused it. Applying elicitation studies in the domain of collocated interaction might enable designing more intuitive and natural group interaction methods. However, in the past elicitation studies have primarily been conducted with individual users - they have rarely been applied to groups. In this paper, we report our initial experiences in using the elicitation study methodology to generate interaction methods for groups of collocated users with wearable devices.

#### **General information**

Publication status: Published  
MoE publication type: A4 Article in a conference publication  
Organisations: Department of Pervasive Computing, Research area: User experience, Nokia, Unit of Human-Centered Technology (IHTE)  
Contributors: Jokela, T., Rezaei, P. P., Väänänen, K.  
Number of pages: 5  
Pages: 1129-1133  
Publication date: 6 Sep 2016

#### **Host publication information**

Title of host publication: Proceedings of the 18th International Conference on Human-Computer Interaction with Mobile Devices and Services Adjunct, MobileHCI 2016  
Publisher: ACM  
ISBN (Electronic): 9781450344135  
ASJC Scopus subject areas: Information Systems, Computer Networks and Communications, Human-Computer Interaction, Software  
Keywords: Collocated interaction, Elicitation study, Guessability study, Multi-device user interfaces, Wearable devices  
Electronic versions:  
UsingElicitationStudiesToGenerateCollocatedInteractionMethods\_14  
DOIs:  
10.1145/2957265.2962654  
URLs:  
<http://urn.fi/URN:NBN:fi:tty-201903291362>  
Source: Scopus  
Source ID: 84991110295  
Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

#### **Sparse modelling and predictive coding of subaperture images for lossless plenoptic image compression**

This paper studies the lossless compression of rectified light-field images captured by plenoptic cameras, exploiting the high similarity existing between the subaperture images, or views, composing the light-field image. The encoding is predictive, where one sparse predictor is designed for every region of a view, using as regressors the pixels from the already transmitted views. As a first step, consistent segmentations for all subaperture images are constructed, defining the regions as connected components in the quantized depth map of the central view, and then propagating them to all side views. The sparse predictors are able to take into account the small horizontal and vertical disparities between regions in corresponding close-by views and perform optimal least squares interpolation accounting implicitly for fractional disparities. The optimal structure of the sparse predictor is selected for each region based on an implementable

description length. The encoding of the views is done sequentially starting from the central view and the scheme produces results better than standard lossless compression methods utilized directly on the full lightfield image or applied to the views in a similar sequential order as our method.

#### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Department of Signal Processing, Research group: Algebraic and Algorithmic Methods in Signal Processing AAMSP, Research group: Signal Interpretation and Compression-SIC, Signal Processing Research Community (SPRC), University of California San Diego

Contributors: Helin, P., Astola, P., Rao, B., Tabus, I.

Publication date: 22 Aug 2016

#### Host publication information

Title of host publication: 2016 3DTV-Conference: The True Vision - Capture, Transmission and Display of 3D Video, 3DTV-CON 2016

Publisher: IEEE COMPUTER SOCIETY PRESS

ISBN (Electronic): 9781509033133

ASJC Scopus subject areas: Computer Graphics and Computer-Aided Design, Computer Networks and Communications, Computer Vision and Pattern Recognition, Human-Computer Interaction, Electrical and Electronic Engineering

Keywords: depth map warping, light-field coding, lossless compression, plenoptics, sparse prediction

DOIs:

10.1109/3DTV.2016.7548953

Source: Scopus

Source ID: 84987803027

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

#### Decoding complexity reduction in projection-based light-field 3D displays using self-contained HEVC tiles

The goal of this work is to provide a low complexity video decoding solution for High Efficiency Video Coding (HEVC) streams in applications where only a region of the video frames is needed to be decoded. This paper studies the problem of creating self-contained (i.e., independently decodable) partitions in the HEVC streams. Further, the requirements for building self-contained regions are described, and an encoder-side solution is proposed based on HEVC tile feature. A particular application of self-contained tiles targets the type of light-field 3D displays, which employ a dense set of optical engines to recreate the light field. Correspondingly, such 3D displays require a dense set of input views and therefore the partial decoding of bitstreams helps providing less complex and consequently real-time decoding and processing. The simulation results show a significant increase in decoding speed at the cost of a minor increase in storage capacity.

#### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Department of Signal Processing, Research group: 3D MEDIA, Nokia

Contributors: Zare, A., Kovacs, P. T., Aminlou, A., Hannuksela, M. M., Gotchev, A.

Publication date: 22 Aug 2016

#### Host publication information

Title of host publication: 2016 3DTV-Conference: The True Vision - Capture, Transmission and Display of 3D Video, 3DTV-CON 2016

Publisher: IEEE COMPUTER SOCIETY PRESS

ISBN (Electronic): 9781509033133

ASJC Scopus subject areas: Computer Graphics and Computer-Aided Design, Computer Networks and Communications, Computer Vision and Pattern Recognition, Human-Computer Interaction, Electrical and Electronic Engineering

Keywords: HEVC, light-field 3D displays, partial decoding, random access, slice, tile, video partitioning

DOIs:

10.1109/3DTV.2016.7548965

#### Bibliographical note

INT=sgn,"Zare, Alireza"

Source: Scopus

Source ID: 84987792281

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

#### An evaluation framework for cross-platform mobile app development tools: A case analysis of adobe PhoneGap framework

The 'App economy' is a highly lucrative and competitive market for independent software vendors as it potentially offers an easy highway to reach millions of users. However, the mobile application landscape is scattered and an application developer has to publish the software for several different platforms to be able to serve a majority of smartphone users.

Therefore, a bunch of cross-development tools have been offered to simplify this workload. In this paper, we present an evaluation framework for comparing different cross-development tools. We use this framework to evaluate Adobe PhoneGap tool against native development in Android and Windows Phone platforms. The results of a case study reveal that while the cross-platform technique was easy to use, the appearance and usability of the app was mediocre at its best. The business impacts of these are also discussed.

#### **General information**

Publication status: Published  
MoE publication type: A4 Article in a conference publication  
Organisations: Turun Yliopisto/Turun Biomateriaalikeskus  
Contributors: Ahti, V., Hyrynsalmi, S., Nevalainen, O.  
Number of pages: 8  
Pages: 41-48  
Publication date: 23 Jun 2016

#### **Host publication information**

Title of host publication: Computer Systems and Technologies 17th International Conference, CompSysTech 2016 - Proceedings  
Volume: 1164  
Publisher: Association for Computing Machinery  
ISBN (Electronic): 9781450341820  
ASJC Scopus subject areas: Human-Computer Interaction, Computer Networks and Communications, Computer Vision and Pattern Recognition, Software  
Keywords: Cross-platform development, Hybrid mobile app, Mobile application, Multi-platform  
DOIs:  
10.1145/2983468.2983484  
URLs:  
<http://www.scopus.com/inward/record.url?scp=85001085934&partnerID=8YFLogxK> (Link to publication in Scopus)  
Source: Scopus  
Source ID: 85001085934  
Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

#### **A survey on aims and environments of diversification and obfuscation in software security**

Diversification and obfuscation methods are promising approaches used to secure software and prevent malware from functioning. Diversification makes each software instance unique so that malware attacks cannot rely on the knowledge of the program's execution environment and/or internal structure anymore. We present a systematic literature review on the state-of-the-art of diversification and obfuscation research aiming to improve software security between 1993 and 2014. As the result of systematic search, in the final phase, 209 related papers were included in this study. In this study we focus on two specific research questions: what are the aims of diversification and obfuscation techniques and what are the environments they are applied to. The former question includes the languages and the execution environments that can benefit from these two techniques, while the second question presents the goals of the techniques and also the type of attacks they mitigate. is held by the owner/author(s). Publication rights licensed to ACM.

#### **General information**

Publication status: Published  
MoE publication type: A4 Article in a conference publication  
Organisations: Turun Yliopisto/Turun Biomateriaalikeskus  
Contributors: Hosseinzadeh, S., Rauti, S., Laurén, S., Mäkelä, J. M., Holvitie, J., Hyrynsalmi, S., Leppänen, V.  
Number of pages: 8  
Pages: 113-120  
Publication date: 23 Jun 2016

#### **Host publication information**

Title of host publication: Computer Systems and Technologies 17th International Conference, CompSysTech 2016 - Proceedings  
Volume: 1164  
Publisher: Association for Computing Machinery  
ISBN (Electronic): 9781450341820  
ASJC Scopus subject areas: Human-Computer Interaction, Computer Networks and Communications, Computer Vision and Pattern Recognition, Software  
Keywords: Diversification, Obfuscation, Software security, Systematic literature review (SLR)  
DOIs:  
10.1145/2983468.2983479  
URLs:  
<http://www.scopus.com/inward/record.url?scp=85000983786&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 85000983786

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

### **Exploring the use of deprecated PHP releases in the wild internet: Still a LAMP issue?**

Many web sites utilize deprecated software products that are no longer maintained by the associated software producers. This paper explores the question of whether an existing big data collection can be used to predict the likelihood of deprecated PHP releases based on different abstract components in modern web deployment stacks. Building on web intelligence, software security, and data-based industry rationales, the question is examined by focusing on the most popular domains in the contemporary web-facing Internet. Logistic regression is used for classification. Although statistical classification performance is modest, the results indicate that deprecated PHP releases are associated with Linux and other open source software components. Geographical variation is small. Besides these results, the paper contributes to the web intelligence research by evaluating the feasibility of existing big data collections for mass-scale fingerprinting.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: University of Turku, Department of Information Technology

Contributors: Ruohonen, J., Hyrynsalmi, S., Leppänen, V.

Publication date: 13 Jun 2016

#### **Host publication information**

Title of host publication: 6th International Conference on Web Intelligence, Mining and Semantics, WIMS 2016

Publisher: Association for Computing Machinery

Article number: 26

ISBN (Electronic): 9781450340564

ASJC Scopus subject areas: Human-Computer Interaction, Computer Networks and Communications, Computer Vision and Pattern Recognition, Software

Keywords: Cyber security, Patching, Release engineering, Web crawling

DOIs:

10.1145/2912845.2912851

Source: Scopus

Source ID: 84978522051

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

### **Feasibility characterization of cryptographic primitives for constrained (wearable) IoT devices**

The Internet of Things (IoT) employs smart devices as its building blocks for developing a ubiquitous communication framework. It thus supports a wide variety of application domains, including public safety, healthcare, education, and public transportation. While offering a novel communication paradigm, IoT finds its requirements closely connected to the security issues. The role of security following the fact that a new type of devices known as wearables constitute an emerging area. This paper delivers an applicability study of the state-of-the-art cryptographic primitives for wearable IoT devices, including the pairing-based cryptography. Pairing-based schemes are well-recognized as fundamental enablers for many advanced cryptographic applications, such as privacy protection and identity-based encryption. To deliver a comprehensive view on the computational power of modern wearable devices (smart phones, watches, and embedded devices), we perform an evaluation of a variety of them utilizing bilinear pairing for real-time communication. In order to deliver a complete picture, the obtained bilinear pairing results are complemented with performance figures for classical cryptography (such as block ciphers, digital signatures, and hash functions). Our findings show that wearable devices of today have the needed potential to efficiently operate with cryptographic primitives in real time. Therefore, we believe that the data provided during this research would shed light on what devices are more suitable for certain cryptographic operations.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Department of Electronics and Communications Engineering, Research group: Emerging Technologies for Nano-Bio-Info-Cogno

Contributors: Ometov, A., Masek, P., Malina, L., Florea, R., Hosek, J., Andreev, S., Hajny, J., Niutananen, J., Koucheryavy, Y.

Publication date: 19 Apr 2016

#### **Host publication information**

Title of host publication: IEEE International Conference on Pervasive Computing and Communication Workshops, PerCom Workshops 2016

Publisher: IEEE

ISBN (Print): 9781509019410

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

Keywords: Bilinear Pairing, Cryptography, Group Signatures, IoT, Performance evaluation, Wearables

Electronic versions:

Feasibility characterization of cryptographic primitives 2016

DOIs:

10.1109/PERCOMW.2016.7457161

URLs:

<http://urn.fi/URN:NBN:fi:tuni-202003092613>

### **Bibliographical note**

INT=elt,"Florea, Roman"

EXT="Niutanen, Jussi"

Source: Scopus

Source ID: 84966546696

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

### **Patterns for subsidiaries as innovation tools**

In this paper, we describe two patterns for fostering innovative ideas in a company. The patterns originate from experiences in real companies. Innovations are crucial in opening up new business vistas for a company. Old business models for any company will wither as times change and, continuous innovation is needed. However, companies are geared for efficient execution of their current business, not for fostering new ideas. One way for innovation incubation is a subsidiary. A subsidiary typically has more freedom and risk-based incentives than an internal startup. To run a successful subsidiary, one must first decide when to Spin Off, then, how to run the Subsidiary and, finally, Merge and Scale the business, if feasible.

### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Pervasive Computing, Research area: User experience

Contributors: Leppänen, M., Hokkanen, L.

Publication date: 7 Apr 2016

### **Host publication information**

Title of host publication: Proceedings of the 10th Travelling Conference on Pattern Languages of Programs, VikingPLOP 2016

Publisher: ACM

Article number: a7

ISBN (Electronic): 9781450342001

ASJC Scopus subject areas: Human-Computer Interaction, Computer Networks and Communications, Computer Vision and Pattern Recognition, Software

Keywords: Innovation, Internal startup, Lean, Startups

DOIs:

10.1145/3022636.3022643

Source: Scopus

Source ID: 85015703961

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

### **Patterns for safety system bus architecture**

Traditionally safety and controls systems have been strictly separated from each other. There are both benefits and liabilities in this approach. Thus, modern system employing control and safety system parts do not necessarily make a strict separation between these two elements of the system. Regardless of the degree of separation, the nodes belonging to either control or safety system may need to communicate with each other to implement the desired functionality. An increasing number of systems nowadays utilize a fieldbus to connect the distributed nodes of the system together. A time comes in the design process, when one needs to select the architecture of the physical fieldbus. That is, how and which nodes are connected? In this paper, two patterns to organize the fieldbus architecture are illustrated. In short, one either can separate the fieldbus between the safety and control system nodes or use a shared fieldbus between the nodes.

### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Research area: Information Systems in Automation, Automation and Hydraulic Engineering

Contributors: Rauhamäki, J.

Publication date: 7 Apr 2016

### Host publication information

Title of host publication: Proceedings of the 10th Travelling Conference on Pattern Languages of Programs, VikingPLoP 2016

Publisher: ACM

Article number: a4

ISBN (Electronic): 9781450342001

ASJC Scopus subject areas: Human-Computer Interaction, Computer Networks and Communications, Computer Vision and Pattern Recognition, Software

Keywords: Communication, Control system, Fieldbus, Safety system, Separated, Shared

DOIs:

10.1145/3022636.3022640

Source: Scopus

Source ID: 85015687535

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

### Learnings from the Finnish game industry

The motivation behind our research was the rapid growth and business wins of world-class Finnish game companies, like Supercell, as well as the success of other game companies in Finland. In particular, Supercell's growth is something that has not been heard of before and this raised the interest to research what game companies have been doing right. Supercell is not the only Finnish success. Rovio is also well known and has the roots for success from few years before. There are also other game companies in Finland that have succeeded and this motivated us to investigate what is happening behind the game industry and what could be learned from there that could be applied to other software industry as well. In order to explore and explain the different success factors, we interviewed the following eight Finnish game companies: Rovio Entertainment, Fingersoft, TicBits, Boomlagoon, 10tons, Tribeflame, Star Arcade and Mountain Sheep. In addition, we investigated public sources, like interviews given to newspapers and books written about companies. These sources cover well Supercell as they have given numerous public interviews to journalists. Similarly, Remedy was analysed based on public sources. Based on the results we recognised some 30 patterns that, depending on the context, could be used in other organisations as well. The patterns include the applicable context where they can be used, driving forces (and counterforces) that should be recognised, the problem they are solving and the solution to the problem coupled with the key enablers. Furthermore, narrative stories based on the interviews and public sources are included.

### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Pervasive Computing, Research area: Information security, University of Helsinki, Jyväskylän yliopisto

Contributors: Helenius, M., Kettunen, P., Frank, L.

Publication date: 7 Apr 2016

### Host publication information

Title of host publication: Proceedings of the 10th Travelling Conference on Pattern Languages of Programs, VikingPLoP 2016

Publisher: ACM

Article number: a12

ISBN (Electronic): 9781450342001

ASJC Scopus subject areas: Human-Computer Interaction, Computer Networks and Communications, Computer Vision and Pattern Recognition, Software

DOIs:

10.1145/3022636.3022648

### Bibliographical note

EXT="Frank, Lauri"

Source: Scopus

Source ID: 85015616047

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

### Increasing collocated people's awareness of the mobile user's activities: A field trial of social displays

Many activities that have traditionally been performed with different dedicated physical artifacts are now done with personal mobile devices. Consequently, the privacy of mobile interfaces has hampered social observability and chances for serendipitous interactions. For example, reading an electronic newspaper with a mobile device does not allow the surrounding people to be similarly aware of the reader's activity as traditional newspapers. Social displays are additional displays on mobile devices providing the surrounding people with light-weight cues about the activities of the device user. We implemented a prototype that reveals the user's current active application and presents its name on an e-ink display on the backside of a mobile device. We conducted a ten-day field trial with 13 participants using the prototype. The results show that the prototype was able to increase awareness of users' mobile activities and occasionally triggered interactions with others, without significantly violating the sense of privacy.

### General information

Publication status: Published  
MoE publication type: A4 Article in a conference publication  
Organisations: Department of Pervasive Computing, Research area: User experience  
Contributors: Jarusriboonchai, P., Malapaschas, A., Olsson, T., Väänänen, K.  
Number of pages: 12  
Pages: 1691-1702  
Publication date: 27 Feb 2016

### Host publication information

Title of host publication: CSCW '16 - Proceedings of the 19th ACM Conference on Computer-Supported Cooperative Work & Social Computing  
Publisher: ACM  
ISBN (Print): 9781450335928  
ASJC Scopus subject areas: Software, Computer Networks and Communications, Human-Computer Interaction  
Keywords: Activity awareness, Backside display, Collocated interaction, Face-to-face interaction, Field study, Personal interface, Social display, Social interaction, User trial  
DOIs:  
10.1145/2818048.2819990

### Bibliographical note

Kysytty rt-versiosta 8.9.2020 EJ  
Source: Scopus  
Source ID: 84963542098  
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

### Social display...We can see what you are doing on your mobile device

Mobile devices have become powerful in terms of computing and supporting various human activities. People have moved some of their activities that earlier have been done with dedicated artifacts to mobile devices. However, due to the rather private and personal interfaces of mobile devices, activities that earlier were easily observable by surrounding others have become private, decreasing the surroundings people's awareness of a mobile user's activity and thus the possibilities for serendipitous interactions. We developed a prototype called social display; it provides light-weight visual cues about mobile user's current activity with the device. The cues are displayed on a display attached to the backside of the user's mobile device. We present the concept, explain the design decisions and briefly report key findings from, first, a focus group study and, second, a field trial study.

### General information

Publication status: Published  
MoE publication type: A4 Article in a conference publication  
Organisations: Department of Pervasive Computing, Research area: User experience  
Contributors: Jarusriboonchai, P., Malapaschas, A., Olsson, T., Väänänen, K.  
Number of pages: 4  
Pages: 53-56  
Publication date: 27 Feb 2016

### Host publication information

Title of host publication: CSCW '16 Proceedings of the 19th ACM Conference on Computer-Supported Cooperative Work & Social Computing  
Publisher: ACM  
ISBN (Print): 9781450339506  
ASJC Scopus subject areas: Software, Computer Networks and Communications, Human-Computer Interaction  
Keywords: Activity awareness, Backside display, Collocated interaction, Face-to-face interaction, Field study, Personal interface, Social display, Social interaction, User trial  
Electronic versions:  
Social Display...We Can See What You Are Doing\_CSCW\_2016  
DOIs:  
10.1145/2818052.2874323  
URLs:  
<http://urn.fi/URN:NBN:fi:tuni-202004033063>  
Source: Scopus  
Source ID: 84963574828  
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review



### **Who is moving - User or device? Experienced quality of mobile 3D video in vehicles**

'Viewing while commuting' is a typical use case for mobile video. However, experimental and behavioral influences of watching three-dimensional (3D) video in vibrating vehicles have not been widely researched. The goal of this study is 1) to explore the influence of video presentation modes (two-dimensional and stereoscopic 3D) on the quality of experience and 2) to understand the nature of the movement patterns that users perform to maintain an optimal viewing position while viewing videos on a mobile device in three commuting contexts and in a controlled laboratory environment. A hybrid method for quality evaluation was used for combining quantitative preference ratings, qualitative descriptions of quality, situational audio/video data-collection, and sensors. The high-quality and heterogeneous audiovisual stimuli were viewed on a mobile device equipped with a parallax barrier display. The results showed that the stereoscopic 3D (S3D) video presentation mode provided more satisfying quality of experience than the two-dimensional presentation mode in all studied contexts. To maintain an optimal viewing position in the vehicles, the users moved the device in their hands to the directions around the vertical and the horizontal axes in a leaned sitting position. This movement behavior was guided by the contexts but not by the quality, indicating the general importance of these results for mobile video viewing in vibrating vehicles.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Department of Pervasive Computing, Research area: User experience, Eindhoven University of Technology, Nokia

Contributors: Jumisko-Pyykkö, S., Markopoulos, P., Hannuksela, M. M.

Publication date: 16 Nov 2015

#### **Host publication information**

Title of host publication: ACE 2015 - 12th Advances in Computer Entertainment Technology Conference, Proceedings

Publisher: ACM

Article number: 13

ISBN (Electronic): 9781450338523

ASJC Scopus subject areas: Human-Computer Interaction, Computer Networks and Communications, Computer Vision and Pattern Recognition, Software

Keywords: 3D, Experienced quality, Mobile video, Movement, Perception, Quasi-experiments

DOIs:

10.1145/2832932.2832948

Source: Scopus

Source ID: 84979759186

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

### **Need to touch, wonder of discovery, and social capital: Experiences with interactive playful seats**

In this article we present findings from a design experiment of MurMur Moderators, talking playful seats facilitating playful atmosphere and creativity at office environments. The article describes the design and technological composition of our two prototypes, and our experiences exposing the concept to audiences at science fairs and an office environment. This research has served as an exploratory design study, directing our focus to the seats as primary and secondary play objects with a distinct narrative. Our goal with the initial exposure was to first investigate preliminary audience reactions for the high level concept and how people interact with the prototype. This was then supplemented by testing the concept in an office environment. The data we have collected gives us insight on the seats as primary and secondary play objects and how users touch, discover and socialize.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Mathematical modelling with wide societal impact (MathImpact), RMIT University

Contributors: Nummenmaa, T., Tyni, H., Kultima, A., Alha, K., Holopainen, J.

Publication date: 16 Nov 2015

#### **Host publication information**

Title of host publication: ACE 2015 - 12th Advances in Computer Entertainment Technology Conference, Proceedings

Volume: 16-19-November-2015

Publisher: Association for Computing Machinery

Article number: 10

ISBN (Electronic): 9781450338523

ASJC Scopus subject areas: Human-Computer Interaction, Computer Networks and Communications, Computer Vision and Pattern Recognition, Software

Keywords: Arduino, Audio feedback, Design research, DIY, Game studies, Internet of things, Office play, Playful furniture, Raspberry Pi

DOIs:

10.1145/2832932.2832959

URLs:

<http://www.scopus.com/inward/record.url?scp=84979747766&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84979747766

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

### **Antroposeeni - A mixed reality game**

In this paper, we describe Antroposeeni, a mixed reality game designed and developed for mobile devices. Antroposeeni utilizes location-based services, GPS for tracking users and augmented reality techniques for displaying captivating audiovisual content and creating rich experiences. Our demonstration will introduce a pilot version of the game, which encompasses narrative elements of the game mediated through developed media technologies. The goal for the demonstration is to give the conference visitors a chance to test the game in a specifically tailored route close to the conference site. After conducting the pilot we plan to organize a short review regarding the user experience.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Augmented Human Activities (AHA), Metaria Ry

Contributors: Luhtala, M., Karvonen, T., Pylväs, J., Ala-Kokko, A., Magica, R., Takeda, Y., Turunen, M.

Number of pages: 3

Pages: 211-213

Publication date: 22 Sep 2015

#### **Host publication information**

Title of host publication: ACADEMICMINDTREK 2015 - Proceedings of the 19th International Academic Mindtrek Conference

Publisher: Association for Computing Machinery, Inc

ISBN (Electronic): 9781450339483

ASJC Scopus subject areas: Human-Computer Interaction, Software, Computer Science Applications

Keywords: Aesthetics, Art, Augmented reality, Design, Games, Mixed reality, Software design, Theatre, User experience

DOIs:

10.1145/2818187.2818287

URLs:

<http://www.scopus.com/inward/record.url?scp=84962875980&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84962875980

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

### **OASIS deck of cards - House of colleagues: A playful**

A research experiment to facilitate playful interaction and community learning within an academic organization of about 170 employees was conducted. A 2-player card game including 61 'staff character cards' and 39 question cards was implemented to be played by the relatively new community. The game period, including supporting events, ran for 5 weeks. After the experiment 59 staff members responded to an online survey on play experiences. The results showed that ways of participation and means of play are more diverse in a work community context than as they are specified in the game rules. More emphasis should be set on framing the game and supporting it as a continuous activity to become a playful practice in the work community. An academic community has inherent contextual prerequisites that need to be addressed in order for a playful practice to gain traction as a means for community building.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Mathematical modelling with wide societal impact (MathImpact)

Contributors: Nummenmaa, T., Kultima, A., Kankainen, V., Savolainen, S., Syvänen, A., Alha, K., Mäyrä, F.

Number of pages: 8

Pages: 2-9

Publication date: 22 Sep 2015

#### **Host publication information**

Title of host publication: ACADEMICMINDTREK 2015 - Proceedings of the 19th International Academic Mindtrek Conference

Publisher: Association for Computing Machinery, Inc

ISBN (Electronic): 9781450339483

ASJC Scopus subject areas: Human-Computer Interaction, Software, Computer Science Applications

Keywords: Academia, Adult play, Attitudes towards play, Card game, Community, Design, Play at work, Playfulness, University

DOIs:

10.1145/2818187.2818296

URLs:

<http://www.scopus.com/inward/record.url?scp=84962803762&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84962803762

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

### **Mobiscool: 1<sup>st</sup> workshop on mobile, social and culturally oriented learning**

There are two simultaneous transformative changes occurring in Education: the use of mobile and tablet devices for accessing educational content, and the rise of the MOOCs. Happening independently and in parallel are significant advances in interaction technologies through smartphones and tablets, and the rise in the use of social-media and social-network analytics in several domains. Given the extent of personal context that is available on the mobile device, how can the education experience be personalised, made social, and tailored to the cultural context of the learner? The goal of this proposal is twofold: (a) To understand the usage, and student behaviour in this new environment (MOOCs and mobile devices) and (b) To design experiments and implement them to make these new tools more effective by tailoring them to the individual student's personal, social and cultural settings and preferences.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Augmented Human Activities (AHA), IBM Research, Aalborg University

Contributors: Nanavati, A. A., Rajput, N., Turunen, M., Knoche, H., Rehm, M.

Number of pages: 4

Pages: 1187-1190

Publication date: 24 Aug 2015

#### **Host publication information**

Title of host publication: MobileHCI 2015 - Proceedings of the 17th International Conference on Human-Computer Interaction with Mobile Devices and Services Adjunct

Publisher: Association for Computing Machinery, Inc

ISBN (Electronic): 9781450336536

ASJC Scopus subject areas: Human-Computer Interaction, Computer Networks and Communications, Information Systems, Software

Keywords: Augmented reality, Behaviour, Culture, Education, MOOCs, Multimedia, Social media, Social network analysis, User experience

DOIs:

10.1145/2786567.2795402

URLs:

<http://www.scopus.com/inward/record.url?scp=84962791832&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84962791832

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

### **Delivering directional haptic cues through eyeglasses and a seat**

Navigation systems usually require visual or auditory attention. Providing the user with haptic cues could potentially decrease cognitive demand in navigation. This study is investigating the use of haptic eyeglasses in navigation. We conducted an experiment comparing directional haptic cues to visual cueing in a car navigation task. Participants (N=12) drove the Lane Change Test simulator with visual text cues, haptic cues given by the eyeglasses and haptic cues given by a car seat. The participants were asked to confirm the recognition of a directional cue (left or right) by pressing an arrow on a tablet screen and by navigating to the corresponding lane. Reaction times and errors were measured. The participants filled in the NASA-TLX questionnaire and were also interviewed about the different cues. The results showed that in comparison to the visual text cues the haptic cues were reacted to significantly faster. Haptic cueing was also evaluated as less frustrating than visual cueing. The haptic eyeglasses fared slightly, although not significantly, better than the haptic seat in subjective and objective evaluations. The paper suggests that haptic eyeglasses can decrease cognitive demand in navigation and have many possible applications.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Augmented Human Activities (AHA)

Contributors: Nukarinen, T., Rantala, J., Farooq, A., Raisamo, R.

Number of pages: 6  
Pages: 345-350  
Publication date: 4 Aug 2015

#### Host publication information

Title of host publication: IEEE World Haptics Conference, WHC 2015  
Publisher: Institute of Electrical and Electronics Engineers Inc.  
Article number: 7177736  
ISBN (Electronic): 9781479966240  
ASJC Scopus subject areas: Artificial Intelligence, Human-Computer Interaction  
DOIs:  
10.1109/WHC.2015.7177736  
URLs:  
<http://www.scopus.com/inward/record.url?scp=84947104478&partnerID=8YFLogxK> (Link to publication in Scopus)  
Source: Scopus  
Source ID: 84947104478  
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

#### Sequential and simultaneous tactile stimulation with multiple actuators on head, neck and back for gaze cuing

Interacting with the environment using mobile eye-tracking is accompanied with challenges in providing non-visual feedback related to gaze events and monitoring the gaze vector estimation quality. Recent studies point to haptic stimulation as a promising feedback channel in this context. In this work we focused on applying haptic stimulation to inform users of pointing inaccuracies by cuing their gaze in the direction of nearby interactive objects. To decrease the cognitive load, short repetitive vibrations from four actuators were applied to the head and neck of the user. The head area stimulation was compared to the back that has often been used in earlier studies. The results showed that the haptic stimulation on the head and neck cued users as efficiently as the stimulation of the back, although smaller stimulation signal amplitude would be desirable. Another important implication refers to the design of the stimulation signal pattern: if multiple actuators are used in stimulation, then they should be activated sequentially and not simultaneously.

#### General information

Publication status: Published  
MoE publication type: A4 Article in a conference publication  
Organisations: Augmented Human Activities (AHA)  
Contributors: Spakov, O., Rantala, J., Isokoski, P.  
Number of pages: 6  
Pages: 333-338  
Publication date: 4 Aug 2015

#### Host publication information

Title of host publication: IEEE World Haptics Conference, WHC 2015  
Publisher: Institute of Electrical and Electronics Engineers Inc.  
Article number: 7177734  
ISBN (Electronic): 9781479966240  
ASJC Scopus subject areas: Artificial Intelligence, Human-Computer Interaction  
DOIs:  
10.1109/WHC.2015.7177734  
URLs:  
<http://www.scopus.com/inward/record.url?scp=84947080913&partnerID=8YFLogxK> (Link to publication in Scopus)  
Source: Scopus  
Source ID: 84947080913  
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

#### Three patterns for user involvement in startups

Creating products in software startups consists of a great deal of uncertainty combined with little resources. Rapid validation of created solutions with the potential customers is essential to startups. However, often startups lack people with skills needed for the validation. We present three patterns that help in involving users to gain meaningful feedback and learning. First, the feedback has to be gotten from the right people and the right questions have to be asked. Furthermore, if the feedback is collected with a prototype, often called a Minimum Viable Product, users should be able to give feedback of the actual idea, not to any roughness caused by the immaturity and the prototypishness of the product.

#### General information

Publication status: Published  
MoE publication type: A4 Article in a conference publication  
Organisations: Department of Pervasive Computing, Research area: Software engineering

Contributors: Hokkanen, L., Leppänen, M.  
Publication date: 8 Jul 2015

#### Host publication information

Title of host publication: Proceedings of the 20th European Conference on Pattern Languages of Programs, EuroPLoP 2015  
Publisher: ACM  
Article number: a51  
ISBN (Electronic): 9781450338479  
ASJC Scopus subject areas: Human-Computer Interaction, Computer Networks and Communications, Computer Vision and Pattern Recognition, Software  
Keywords: Lean, Startups, User experience  
DOIs:  
10.1145/2855321.2855373  
Source: Scopus  
Source ID: 84982794686  
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

#### Four patterns for internal startups

In this paper, we describe patterns that are meant for founding internal startups in a larger company. The patterns are part of a larger pattern language for software startup companies. The patterns presented here cover four main parts of an internal startup's life cycle starting from idea creation by enabling innovation with 20 Rule. The second pattern introduces an incubator phase, where the idea is validated to have a sensible problem and solution. This optimally leads to the creation of an internal startup, where resources are allocated to concretize the idea. With restricted resources such as a limited time, the internal startup may find a new Product-Market fit and offer a validated business opportunity for the parent company. This is concluded by the Exit decision by the parent company and ends the internal startup's life cycle.

#### General information

Publication status: Published  
MoE publication type: A4 Article in a conference publication  
Organisations: Department of Pervasive Computing, Research area: Software engineering  
Contributors: Leppänen, M., Hokkanen, L.  
Publication date: 8 Jul 2015

#### Host publication information

Title of host publication: Proceedings of the 20th European Conference on Pattern Languages of Programs, EuroPLoP 2015  
Publisher: ACM  
Article number: a5  
ISBN (Electronic): 9781450338479  
ASJC Scopus subject areas: Human-Computer Interaction, Computer Networks and Communications, Computer Vision and Pattern Recognition, Software  
Keywords: Internal startup, Lean startup, Organization, Organizational patterns, Patterns  
DOIs:  
10.1145/2855321.2855327  
Source: Scopus  
Source ID: 84982784052  
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

#### A comparison of security assurance support of agile software development methods

Agile methods increase the speed and reduce the cost of software projects; however, they have been criticized for lack of documentation, traditional quality control, and, most importantly, lack of security assurance - mostly due to their informal and self-organizing approach to software development. This paper clarifies the requirements for security assurance by using an evaluation framework to analyze the compatibility of established agile security development methods: XP, Scrum and Kanban, combined with Microsoft SDL security framework, against Finland's established national security regulation (Vahti). We also analyze the selected methods based on their role definitions, and provide some avenues for future research.

#### General information

Publication status: Published  
MoE publication type: A4 Article in a conference publication  
Organisations: Managing digital industrial transformation (mDIT), University of Turku, Department of Information Technology  
Contributors: Rindell, K., Hyrynsalmi, S., Leppänen, V.

Number of pages: 8  
Pages: 61-68  
Publication date: 25 Jun 2015

#### Host publication information

Title of host publication: Computer Systems and Technologies - 16th International Conference, CompSysTech 2015: Proceedings  
Volume: 1008  
Publisher: Association for Computing Machinery  
ISBN (Electronic): 9781450333573  
ASJC Scopus subject areas: Human-Computer Interaction, Computer Networks and Communications, Computer Vision and Pattern Recognition, Software  
Keywords: DESMET, Kanban, Scrum, SDL, Secure agile development, Security assurance, Vahti, XP  
DOIs:  
10.1145/2812428.2812431  
Source: Scopus  
Source ID: 84957689583  
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

#### Glance awareness and gaze interaction in smartwatches

Smartwatches are widely available and increasingly adopted by consumers. The most common way of interacting with smartwatches is either touching a screen or pressing buttons on the sides. However, such techniques require using both hands. We propose glance awareness and active gaze interaction as alternative techniques to interact with smartwatches. We will describe an experiment conducted to understand the user preferences for visual and haptic feedback on a "glance" at the wristwatch. Following the glance, the users interacted with the watch using gaze gestures. Our results showed that user preferences differed depending on the complexity of the interaction. No clear preference emerged for complex interaction. For simple interaction, haptics was the preferred glance feedback modality. Copyright is held by the author/owner(s).

#### General information

Publication status: Published  
MoE publication type: A4 Article in a conference publication  
Organisations: Augmented Human Activities (AHA), Tampere Unit for Computer-Human Interaction (TAUCHI)  
Contributors: Akkil, D., Kangas, J., Rantala, J., Isokoski, P., Špakov, O., Raisamo, R.  
Number of pages: 6  
Pages: 1271-1276  
Publication date: 18 Apr 2015

#### Host publication information

Title of host publication: CHI 2015 - Extended Abstracts Publication of the 33rd Annual CHI Conference on Human Factors in Computing Systems: Crossings  
Volume: 18  
Publisher: Association for Computing Machinery  
ISBN (Electronic): 9781450331463  
ASJC Scopus subject areas: Human-Computer Interaction, Computer Graphics and Computer-Aided Design, Software  
Keywords: Gaze input, Haptic feedback, Wearable computing  
DOIs:  
10.1145/2702613.2732816  
URLs:  
<http://www.scopus.com/inward/record.url?scp=84954204642&partnerID=8YFLogxK> (Link to publication in Scopus)  
Source: Scopus  
Source ID: 84954204642  
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

#### Intentstreams: Smart parallel search streams for branching exploratory search

The user's understanding of information needs and the information available in the data collection can evolve during an exploratory search session. Search systems tailored for well-defined narrow search tasks may be suboptimal for exploratory search where the user can sequentially refine the expressions of her information needs and explore alternative search directions. A major challenge for exploratory search systems design is how to support such behavior and expose the user to relevant yet novel information that can be difficult to discover by using conventional query formulation techniques. We introduce IntentStreams, a system for exploratory search that provides interactive query refinement mechanisms and parallel visualization of search streams. The system models each search stream via an intent model allowing rapid user feedback. The user interface allows swift initiation of alternative and parallel search streams by direct manipulation that does not require typing. A study with 13 participants shows that IntentStreams provides better support for branching behavior compared to a conventional search system.

### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Research Community on Data-to-Decision (D2D), University of Helsinki, Aalto University, School of Management (JKK)

Contributors: Andolina, S., Klouche, K., Peltonen, J., Hoque, M., Ruotsalo, T., Cabral, D., Klami, A., Głowacka, D., Floréen, P., Jacucci, G.

Number of pages: 6

Pages: 300-305

Publication date: 18 Mar 2015

### Host publication information

Title of host publication: IUI 2015 - Proceedings of the 20th ACM International Conference on Intelligent User Interfaces

Volume: 2015-January

Publisher: Association for Computing Machinery

ISBN (Electronic): 9781450333061

ASJC Scopus subject areas: Software, Human-Computer Interaction

Keywords: Information exploration, Parallel browsing, User interface design

DOIs:

10.1145/2678025.2701401

URLs:

<http://www.scopus.com/inward/record.url?scp=84939638219&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84939638219

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

### Adaptive spatial resolution selection for stereoscopic video compression with MV-HEVC: A frequency based approach

One approach for stereoscopic video compression is to down sample the content prior to encoding and up sample it to the original spatial resolution after decoding. In this study it is shown that the ratio by which the content should be rescaled is sequence dependent. Hence, a frequency based method is introduced enabling fast and accurate estimation of the best down sampling ratio for different stereoscopic video clips. It is shown that exploiting this approach can bring 3.38% delta bitrate reduction over five camera-captured sequences.

### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Department of Signal Processing, Research group: Video, Research Community on Data-to-Decision (D2D), Nokia

Contributors: Aflaki, P., Hannuksela, M. M., Gabbouj, M.

Number of pages: 4

Pages: 267-270

Publication date: 5 Feb 2015

### Host publication information

Title of host publication: 2014 IEEE International Symposium on Multimedia, ISM 2014, 10-12 Dec. 2014, Taichung

Publisher: The Institute of Electrical and Electronics Engineers, Inc.

ISBN (Print): 9781479943111

ASJC Scopus subject areas: Computer Graphics and Computer-Aided Design, Computer Vision and Pattern Recognition, Human-Computer Interaction, Software, Media Technology

Keywords: frequency power spectrum, MVC, objective quality metrics, resolution adjustment

DOIs:

10.1109/ISM.2014.11

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

### Salient event detection in basketball mobile videos

Modern smartphones have become the most popular means for recording videos. In fact, thanks to their portability, smartphones allow for recording anything and at any moment of our everyday life. One common occasion is represented by sport happenings, where people often record their favourite team or players. Automatic analysis of such videos is important for enabling applications such as automatic organization, browsing and summarization of the content. This paper proposes novel algorithms for the detection of salient events in videos recorded at basketball games. The novel approach consists of jointly analyzing visual data and magnetometer data. The magnetometer data provides information about the horizontal orientation of the camera. The proposed joint analysis allows for a reduced number of false positives and for a reduced computational complexity. The algorithms are tested on data captured during real basketball games. The experimental results clearly show the advantages of the proposed approach.

### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Department of Signal Processing, Research group: Video, Research Community on Data-to-Decision (D2D), Nokia Technologies

Contributors: Cricri, F., Mate, S., Curcio, I. D. D., Gabbouj, M.

Number of pages: 8

Pages: 63-70

Publication date: 5 Feb 2015

### Host publication information

Title of host publication: Proceedings - 2014 IEEE International Symposium on Multimedia, ISM 2014

Publisher: The Institute of Electrical and Electronics Engineers, Inc.

Article number: 7032995

ISBN (Print): 978-1-4799-4312-8

ASJC Scopus subject areas: Computer Graphics and Computer-Aided Design, Computer Vision and Pattern Recognition, Human-Computer Interaction, Software, Media Technology

Keywords: Basketball, detection, event, mobile, video

DOIs:

10.1109/ISM.2014.67

### Bibliographical note

EXT="Curcio, Igor D D"

EXT="Mate, Sujeet"

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

### Stereoscopic video description for human action recognition

In this paper, a stereoscopic video description method is proposed that indirectly incorporates scene geometry information derived from stereo disparity, through the manipulation of video interest points. This approach is flexible and able to cooperate with any monocular low-level feature descriptor. The method is evaluated on the problem of recognizing complex human actions in natural settings, using a publicly available action recognition database of unconstrained stereoscopic 3D videos, coming from Hollywood movies. It is compared both against competing depth-aware approaches and a state-of-the-art monocular algorithm. Experimental results denote that the proposed approach outperforms them and achieves state-of-the-art performance.

### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Research Community on Data-to-Decision (D2D), Aristotle University of Thessaloniki, Department of Informatics

Contributors: Mademlis, I., Iosifidis, A., Tefas, A., Nikolaidis, N., Pitas, I.

Publication date: 16 Jan 2015

### Host publication information

Title of host publication: IEEE SSCI 2014 - 2014 IEEE Symposium Series on Computational Intelligence - CIMSIVP 2014: 2014 IEEE Symposium on Computational Intelligence for Multimedia, Signal and Vision Processing, Proceedings

Publisher: The Institute of Electrical and Electronics Engineers, Inc.

ISBN (Print): 9781479945047

ASJC Scopus subject areas: Artificial Intelligence, Computer Graphics and Computer-Aided Design, Computer Vision and Pattern Recognition, Human-Computer Interaction

DOIs:

10.1109/CIMSIVP.2014.7013263

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

### The Fuzzy Front End of Experience Design: Eliciting and Communicating Experience Goals

When starting an experience design process, designers should first determine the experience to aim for. In the fuzzy front end of the experience design process, there are often several alternative sources for gaining insight and inspiration in defining this experience. In this paper, we describe the results of a survey where we studied experience design practitioners' views of experience goal setting and approaches to communicate about these goals with stakeholders. The results from 9 different design cases suggest that "empathic understanding of the users' world" is the most used source of insight and inspiration in defining experience goals. As an end result, we propose an initial model for an Experience Goal Elicitation Process to clarify the fuzzy front end of experience design. Also, instructions to support designers in defining and evaluating experience goals are presented.

### General information



Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Department of Pervasive Computing, Research area: User experience, Augmented Human Activities (AHA), VTT Technical Research Centre of Finland, School of Arts, Design and Architecture, Aalto University

Contributors: Varsaluoma, J., Väättäjä, H., Kaasinen, E., Karvonen, H., Lu, Y.

Number of pages: 9

Pages: 324-332

Publication date: 2015

#### Host publication information

Title of host publication: OzCHI '15 - Proceedings of the Annual Meeting of the Australian Special Interest Group for Computer Human Interaction

Publisher: ACM

ISBN (Print): 978-1-4503-3673-4

ASJC Scopus subject areas: Human-Computer Interaction, Information Systems

Keywords: experience goal, UX goal, experience design, fuzzy front end, survey study, Experience Goal Elicitation Process, experience-driven design, user experience, requirements engineering, user-centered design

Electronic versions:

Fuzzy front-end of experience design

DOIs:

10.1145/2838739.2838761

URLs:

<http://urn.fi/URN:NBN:fi:tty-201603183704>

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

#### User Experience of Digital News: Two Semi-long Term Field Studies

Reading of digital news on personal devices has dramatically increased. Parallel to new devices, novel service or even content types are created forming new habits and experiences for readers. However, previous research is limited in understanding temporal aspects of such users' experiences (UX). The goal of this study is to understand user experience of mobile news reading in a real context of use over one week in two different case studies. UX of digital replicas, browser optimized versions of digital news, and novel media authentication method for news reading and ordering were explored with actual news readers (N=36) in field using their own tablets and personal computers. Data-collection included in daily diaries with the UX questionnaires and the retrospective interviews. The results showed that the studied forms of digital news and authentication methods provided positive user experience and they were appealing for future digital news. UX also showed a tendency of improving over a time. In addition, the user's habits of reading digital news reflected the conventions of reading a print newspaper.

#### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Department of Pervasive Computing, Research area: User experience, Augmented Human Activities (AHA)

Contributors: Pesonen, E., Jumisko-Pyykkö, S., Väättäjä, H.

Number of pages: 13

Pages: 51-63

Publication date: 2015

#### Host publication information

Title of host publication: 14th International Conference on Mobile and Ubiquitous Multimedia (MUM 2015)

Publisher: ACM

ISBN (Print): 978-1-4503-3605-5

ASJC Scopus subject areas: Human-Computer Interaction, Information Systems

Keywords: digital news, user experience, reading, browser, digital replica, authentication, tablet computer, tablet, news, long-term, longitudinal study

Electronic versions:

UX of digital news - two semi-long term field studies

DOIs:

10.1145/2836041.2836046

URLs:

<http://urn.fi/URN:NBN:fi:tty-201605033928>

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

## Supplier's Expectations on Usage Data Analytics of Complex Industrial Systems

### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Department of Pervasive Computing, Research area: User experience, University of Tampere

Contributors: Väättäjä, H., Heimonen, T., Tiitinen, K., Hakulinen, J., Turunen, M.

Publication date: 2015

### Host publication information

Title of host publication: ISPIM Innovation Summit 2015

Publisher: International Society for Professional Innovation Management ISPIM

Editors: Huizingh, E., Conn, S., Bitran, I.

ISBN (Electronic): 9781911136002

ASJC Scopus subject areas: Human-Computer Interaction, Information Systems, Management of Technology and Innovation

Keywords: data analytics, user, usage data analytics, user experience, logging, user interaction, human-technology interaction, human-computer interaction, metals and engineering industry, manufacturing, MMS

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

### Design principles for collaboration platforms for open education

Increasing the current low uptake of Open Education Resources (OER) is a key challenge for researchers and practitioners in the field. User studies have shown that collaboration is a main success factor for successful open educational activities. However, effective collaboration in open educational contexts requires well planned processes and platforms supporting collaboration, in particular in physically distributed settings. We have been investigating the value of such platforms, their main features and user requirements to enable collaboration from immature ideas to completed resources. We used quantitative and qualitative research methods to collect insights from potential users of such collaboration platforms to validate our approach. Based on these insights, we developed a collaboration platform for open education. We validated our platform using observation groups and focus groups to identify the key design principles of powerful collaboration platforms for Open Education. Examples are the need for a simple tool, use of a common terminology, and considering Intellectual Property Rights. In this paper, we present our findings from an initial validation of our collaboration platform and give recommendations towards powerful collaboration platforms for open educational contexts.

### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Managing digital industrial transformation (mDIT), Department of Business Information Systems, ESCP Europe, Jyväskylän yliopisto, Ruhr West University of Applied Sciences, Vytautas Magnus University, Duale Hochschule Baden Württemberg, NCSR

Contributors: AbuJarour, S., Pirkkalainen, H., Pawlowski, J., Bick, M., Bagucanskyte, M., Frankenberg, A., Hudak, R., Makropoulos, C., Pappa, D., Pitsilis, V., Tannhauser, A. C., Trepule, E., Vidalis, A., Volungeviciene, A.

Number of pages: 11

Pages: 349-359

Publication date: 2015

### Host publication information

Title of host publication: CSEDU 2015 - 7th International Conference on Computer Supported Education, Proceedings

Volume: 1

Publisher: SCITEPRESS

ISBN (Electronic): 978-989758107-6

ASJC Scopus subject areas: Human-Computer Interaction, Education

Keywords: Collaboration, Collaboration platforms, OER, Open education, Open educational resources

URLs:

<http://www.scopus.com/inward/record.url?scp=84943397466&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84943397466

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

### Embroidered ground plane implementation for wearable UHF RFID patch tag antennas

Wireless body-centric sensing systems hold an enormous potential to revolutionize wearable intelligence by extending the functionality of advanced garments. Wireless sensor networks integrated with garments allow inexpensive and continuous health state and environmental parameter monitoring with real-time updates of recorded bio-signals and parameters.

Wearable antennas play a key role in establishing an efficient and reliable wireless communication link between body-worn electronics and the surrounding environment. Electrically conductive textiles (electro-textiles) are widely used as wearable antenna materials thanks to their excellent radio frequency (RF) performance, flexibility, and durability. Wearable

passive UHF (860-960 MHz) radio frequency identification (RFID) patch tag antennas are of particular interest due to their low-cost, easy integration with garments, and large reading ranges. They play a key role in the development toward an intelligent environment, where tag antennas will be seamlessly integrated with daily garments to enable wireless communication everywhere and at any time.

#### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Research group: Wireless Identification and Sensing Systems Research Group, Department of Electronics and Communications Engineering, Sensing Systems for Wireless Medicine (MediSense), Electrical Engineering Department, University of California, Los Angeles (UCLA)

Contributors: Koski, K., Ukkonen, L., Sydanheimo, L., Rahmat-Samii, Y.

Number of pages: 1

Pages: 274

Publication date: 12 Nov 2014

#### Host publication information

Title of host publication: 2014 USNC-URSI Radio Science Meeting (Joint with AP-S Symposium), USNC-URSI 2014 - Proceedings

Publisher: Institute of Electrical and Electronics Engineers Inc.

Article number: 6955657

ISBN (Electronic): 9781479937462

ASJC Scopus subject areas: Artificial Intelligence, Human-Computer Interaction, Electrical and Electronic Engineering DOIs:

10.1109/USNC-URSI.2014.6955657

URLs:

<http://www.scopus.com/inward/record.url?scp=84916227610&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84916227610

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

#### Information wall: Evaluation of a gesture-controlled public display

Public displays that allow users to interact with them through mid-air gestures are still relatively rare, as many applications rely on touch-based interaction. This paper introduces Information Wall, a gesture-controlled public information display that provides multi-user access to contextually relevant local information using remote pointing and mid-air gestures. The application has been studied in two settings: a lab-based user study and several short-term deployments. Based on our results, we present practical guidelines for gesture-controlled public display design.

#### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Augmented Human Activities (AHA)

Contributors: Mäkelä, V., Heimonen, T., Luhtala, M., Turunen, M.

Number of pages: 4

Pages: 228-231

Publication date: 11 Nov 2014

#### Host publication information

Title of host publication: ACE 2014 - 11th Advances in Computer Entertainment Technology Conference, Proceedings

Volume: 2014-November

Publisher: Association for Computing Machinery

ISBN (Electronic): 9781450329453, 9781450331852, 9781450333047

ASJC Scopus subject areas: Human-Computer Interaction, Computer Networks and Communications, Computer Vision and Pattern Recognition, Software

Keywords: Gestures, Mid-air pointing, Pervasive displays, Public displays, User study

DOIs:

10.1145/2677972.2677998

URLs:

<http://www.scopus.com/inward/record.url?scp=84943142256&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84943142256

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

### **Goofy Mus, grumpy Mur and dirty Muf: Talking playful seats with personalities**

The article discusses the concept of MurMur Moderators, talking playful seats designed to facilitate playful atmosphere and creativity at office environments. The concept of MurMur Moderators consists of five different personalities, grumpy Mur, goofy Mus, mellow Muh, sensitive Mut and shy Mum. The article describes the experiences and reactions to two personalities, Mus and Mur. Further, a sixth personality, Muf, consisting of rejected, provocative features is detailed. Consequently, the paper discusses play preferences, affordances and thresholds in connection to adult play. These will be the focus of future research by the authors.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Mathematical modelling with wide societal impact (MathImpact)

Contributors: Kultima, A., Nummenmaa, T., Tyni, H., Alha, K., Mayra, F.

Publication date: 11 Nov 2014

#### **Host publication information**

Title of host publication: ACE 2014 - 11th Advances in Computer Entertainment Technology Conference, Workshops Proceedings

Volume: 11-14-November-2014

Publisher: Association for Computing Machinery

Article number: a9

ISBN (Electronic): 9781450333146

ASJC Scopus subject areas: Human-Computer Interaction, Computer Networks and Communications, Computer Vision and Pattern Recognition, Software

Keywords: Adult play, Interactive furniture, Narrative, Personas, Playful office

DOIs:

10.1145/2693787.2693790

URLs:

<http://www.scopus.com/inward/record.url?scp=84962580216&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84962580216

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

### **DYNAMO sound engine - Exploring the aesthetics of dynamic sound interactions**

This paper outlines the design and development process of the Dynamic Audio Motion (Dynamo) concept. The Dynamo audio engine was developed for driving dynamic sound interaction states via custom made finite state machine. Further, a generative sound design approach was employed for creating sonic and musical structures. Designed dynamic sound interactions were tested in an embodied information wall application with endusers. During the testing situation, end-users engaged in a reflective creation process providing valuable insight of their experiences of using the system. In this paper we present key questions driving the research, theoretical background, research approach, an audio engine development process, and end-user research activities. The results indicate that dynamic sound interactions supported people's personal, emotional, and creative needs in the design context.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Augmented Human Activities (AHA)

Contributors: Luhtala, M., Heimonen, T., Mäkelä, V., Keskinen, T., Turunen, M., Saarinen, S.

Number of pages: 8

Pages: 159-166

Publication date: 4 Nov 2014

#### **Host publication information**

Title of host publication: MINDTREK 2014 - Proceedings of the 18th International Academic MindTrek Conference: "Media Business, Management, Content and Services"

Publisher: Association for Computing Machinery, Inc

ISBN (Electronic): 9781450330060

ASJC Scopus subject areas: Computer Science Applications, Human-Computer Interaction, Software

Keywords: Aesthetic experience, Artistic interfaces, Dynamic sound interaction, Multimodal interaction, Musicalization, Procedural sound design, Sonic interaction design

DOIs:

10.1145/2676467.2676522

URLs:

<http://www.scopus.com/inward/record.url?scp=84963995207&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84963995207

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

### **Body-touching: An embodied interaction technique for health information systems in developing regions**

We present a study of using embodied health information system for developing regions focusing on users not familiar with technology. We designed and developed a health information system with two gesture-based selection techniques: pointing to a screen and touching one's own body part. We evaluated the prototype in user study with 37 semi-literate and literate participants. Our results indicate a clear preference (76%) for touching in the healthcare domain. Based on our observations and user feedback, we present four design guidelines for developing embodied systems for the developing world: designing bodycentric interaction to overcome literacy and technological proficiency barriers, addressing the misconceptions of system behaviors with users not familiar with technology, understanding effects of cultural constraints on interaction, and utilizing interactive virtual avatars to connect with the users.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Augmented Human Activities (AHA), IBM Research, Indian Institute of Technology

Contributors: Sharma, S., Srivastava, S., Sorathia, K., Hakulinen, J., Heimonen, T., Turunen, M., Rajput, N.

Number of pages: 8

Pages: 49-56

Publication date: 4 Nov 2014

#### **Host publication information**

Title of host publication: MINDTREK 2014 - Proceedings of the 18th International Academic MindTrek Conference: "Media Business, Management, Content and Services"

Publisher: Association for Computing Machinery, Inc

ISBN (Electronic): 9781450330060

ASJC Scopus subject areas: Computer Science Applications, Human-Computer Interaction, Software

Keywords: Body-centric interaction, Embodied interaction, gesture-based interaction, HCI4D, Health information systems, Information access

DOIs:

10.1145/2676467.2676514

URLs:

<http://www.scopus.com/inward/record.url?scp=84964053943&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84964053943

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

### **Email intensity, productivity and control in the knowledge worker's performance on the desktop**

Experiencing stress, disturbing interruptions, loss of ability to concentrate, hurry and challenges to meet tight deadlines at work are very common in working life. At the same time, while variety of digital communication channels like instant messaging, video calls and social networking sites are getting more popular in working life, email is still intensively utilized work communication media. The goal of the empirical field study analyzing daily desktop computing of knowledge workers was to analyze association between email intensity in work time spending and subjectively experienced quality of work performance. It was found that while intensive email use does not impair subjectively experienced productivity, it may harm ability to concentrate, may increase forgetfulness and inability to solve problems at work effectively. Copyright is held by the owner/author(s). Publication rights licensed to ACM.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Augmented Human Activities (AHA), University of Tampere

Contributors: Franssila, H., Okkonen, J., Savolainen, R.

Number of pages: 4

Pages: 19-22

Publication date: 4 Nov 2014

#### **Host publication information**

Title of host publication: MINDTREK 2014 - Proceedings of the 18th International Academic MindTrek Conference: "Media Business, Management, Content and Services"

Publisher: Association for Computing Machinery, Inc

ISBN (Electronic): 9781450330060

ASJC Scopus subject areas: Computer Science Applications, Human-Computer Interaction, Software

Keywords: Email intensity, Knowledge work, Measurement, Productivity, Work performance

DOIs:

10.1145/2676467.2676513

URLs:

<http://www.scopus.com/inward/record.url?scp=84964078815&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84964078815

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

### **Games and energy: Profiling power usage during play**

Computer gaming is a globally growing industry, with hundreds of millions of gaming-capable computers consuming an ever increasing amount of energy. Several of the world's most popular computer games tend to make a heavy use of computers' central processing units and/or graphics processing units. When such games execute on typical computers, for much of the time those components are kept in high energy-consuming states, regardless of what is happening in the game. We analyze this pattern of energy usage and we assess the scope for economizing on energy. The results presented also give insight into the energy implications of the hardware platform and operating systems used for hosting such games. We use the results to provide practical suggestions to both the industry and the gamers. Copyright is held by the owner/author(s). Publication rights licensed to ACM.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Mathematical modelling with wide societal impact (MathImpact), European Organization for Nuclear Research

Contributors: Salmela, J. M., Thanisch, P., Sotamaa, O., Niemi, T.

Number of pages: 8

Pages: 192-199

Publication date: 4 Nov 2014

#### **Host publication information**

Title of host publication: MINDTREK 2014 - Proceedings of the 18th International Academic MindTrek Conference: "Media Business, Management, Content and Services"

Publisher: Association for Computing Machinery, Inc

ISBN (Electronic): 9781450330060

ASJC Scopus subject areas: Computer Science Applications, Human-Computer Interaction, Software

Keywords: Computer games, Energy measurement

DOIs:

10.1145/2676467.2676488

URLs:

<http://www.scopus.com/inward/record.url?scp=84963995284&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84963995284

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

### **MurMur Moderators, the talking playful seats**

In this article we present the concept of MurMur Moderators, talking playful seats facilitating playful atmosphere and creativity at office environments. The article describes the design and technological composition of our first prototype, and our experiences exposing the concept to audiences at two science fairs in Italy (2013) and Finland (2014). This research has served as an informative pilot study, consequently directing our focus to the ways the accompanying narrative brings additional design value to the interactive seats. Our goal with the fairs was to investigate what are the preliminary audience reactions for the high level concept and how people interact with the initial prototype. The feedback was used for generating further ideas for ambient play and furniture-as-a-service, some of which carries on to future research and second prototype of the seat.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Mathematical modelling with wide societal impact (MathImpact)

Contributors: Nummenmaa, T., Kultima, A., Tyni, H., Alha, K.

Number of pages: 7

Pages: 231-237

Publication date: 4 Nov 2014

#### **Host publication information**

Title of host publication: MINDTREK 2014 - Proceedings of the 18th International Academic MindTrek Conference: "Media Business, Management, Content and Services"  
Publisher: Association for Computing Machinery, Inc  
ISBN (Electronic): 9781450330060  
ASJC Scopus subject areas: Computer Science Applications, Human-Computer Interaction, Software  
Keywords: Arduino, Audio feedback, Design research, Diy, Game studies, Internet of things, Playful furniture, Raspberry pi  
DOIs:  
10.1145/2676467.2676505  
URLs:  
<http://www.scopus.com/inward/record.url?scp=84964027379&partnerID=8YFLogxK> (Link to publication in Scopus)  
Source: Scopus  
Source ID: 84964027379  
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

### **The fuzzy front end of experience design**

The basic idea behind Experience Design approach is that before ideating the solution, you define what experience to design for. This is a critical point in a design process, because the experience goal needs to be appropriate for the target context of use, in line with the brand experience, and meaningful to truly engage users. In the early phases of the experience design process, in the fuzzy front end, there are several sources that can guide experience goal setting. One important way is empathic understanding of the users' world and stepping into the users' shoes, but there are also other sources of insight and inspiration for setting the experiential goals such as brand promise, technology and societal trends as well as mere vision of renewal. In this workshop, we aim to collect examples of the fuzzy front end of the experience design process and analyze how the different sources of insight and inspiration influence experience goal setting. Copyright is held by the owner/author(s).

### **General information**

Publication status: Published  
MoE publication type: A4 Article in a conference publication  
Organisations: Department of Pervasive Computing, Research area: User experience, Augmented Human Activities (AHA), Aalto University, VTT Technical Research Centre of Finland, School of Arts, Design and Architecture  
Contributors: Kaasinen, E., Väättäjä, H., Karvonen, H., Lu, Y.  
Number of pages: 4  
Pages: 797-800  
Publication date: 26 Oct 2014

### **Host publication information**

Title of host publication: Proceedings of the NordiCHI 2014: The 8th Nordic Conference on Human-Computer Interaction: Fun, Fast, Foundational  
Place of publication: New York, NY  
Publisher: ACM  
ISBN (Print): 978-1-4503-2542-4

### **Publication series**

Name: Nordic conference on human-computer interaction  
ASJC Scopus subject areas: Human-Computer Interaction, Software  
Keywords: Experience design, User experience, UX goals  
DOIs:  
10.1145/2639189.2654829  
URLs:  
<http://www.scopus.com/inward/record.url?scp=84911441640&partnerID=8YFLogxK> (Link to publication in Scopus)

### **Bibliographical note**

Contribution: organisation=tie,FACT1=1<br/>Portfolio EDEND: 2014-12-31<br/>Publisher name: ACM  
Source: researchoutputwizard  
Source ID: 632  
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

### **Gaze-contingent scrolling and reading patterns**

An automatic technique that scrolls the window content while the user is reading the text in the window has been implemented. Scrolling is triggered by gaze moving outside the reader's preferred reading zone. The reading patterns instigated by automatic scrolling are analyzed both quantitatively and using gaze path visualizations. Automatic scrolling is shown to result in smooth reading activity.

### **General information**

Publication status: Published  
MoE publication type: A4 Article in a conference publication  
Organisations: Augmented Human Activities (AHA)  
Contributors: Rähkä, K. J., Sharmin, S.  
Number of pages: 4  
Pages: 65-68  
Publication date: 26 Oct 2014

#### Host publication information

Title of host publication: Proceedings of the NordiCHI 2014: The 8th Nordic Conference on Human-Computer Interaction: Fun, Fast, Foundational  
Publisher: Association for Computing Machinery, Inc  
ISBN (Electronic): 1595930361, 9781450325424  
ASJC Scopus subject areas: Human-Computer Interaction, Software  
Keywords: Analysis of reading, Gaze-based scrolling  
DOIs:  
10.1145/2639189.2639242  
URLs:  
<http://www.scopus.com/inward/record.url?scp=84911385620&partnerID=8YFLogxK> (Link to publication in Scopus)  
Source: Scopus  
Source ID: 84911385620  
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

#### Using gaze gestures with haptic feedback on glasses

Wearable computing devices are gradually becoming common, and head-mounted devices such as Google Glass are already available. These devices present new interaction challenges as the devices are usually small in size, and also the usage environment sets limitations on the available interaction modalities. One potential interaction method could be to use gaze for input and haptics for output with a head-worn device. We built a demonstration system to show how gaze gestures could be used to control a simple information application together with head area haptic feedback for gesture confirmation. The demonstration and experiences of early user studies have shown that users perceive such an input-output combination useful. Copyright is held by the owner/author(s).

#### General information

Publication status: Published  
MoE publication type: A4 Article in a conference publication  
Organisations: Augmented Human Activities (AHA), School of Management (JKK)  
Contributors: Kangas, J., Akkil, D., Rantala, J., Isokoski, P., Majaranta, P., Raisamo, R.  
Number of pages: 4  
Pages: 1047-1050  
Publication date: 26 Oct 2014

#### Host publication information

Title of host publication: Proceedings of the NordiCHI 2014: The 8th Nordic Conference on Human-Computer Interaction: Fun, Fast, Foundational  
Publisher: Association for Computing Machinery, Inc  
ISBN (Electronic): 1595930361, 9781450325424  
ASJC Scopus subject areas: Human-Computer Interaction, Software  
Keywords: Gaze gestures, Gaze input, Haptics, Vibrotactile feedback, Wearable computing  
DOIs:  
10.1145/2639189.2670272  
URLs:  
<http://www.scopus.com/inward/record.url?scp=84911444165&partnerID=8YFLogxK> (Link to publication in Scopus)  
Source: Scopus  
Source ID: 84911444165  
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

#### Effects of haptic feedback on gaze based auto scrolling

Eye tracking enables automatic scrolling based on natural viewing behavior. We were interested in the effects of haptic feedback on gaze behavior and user experience. We conducted an experiment where haptic feedback was used to forewarn the reader that their gaze had entered an active scrolling area. Results show no statistical differences between conditions with or without haptic feedback on task time or gaze behavior. However, user experience varied a lot. Some participants were not able to associate the haptics and the scrolling. Those who understood the connection found the haptic feedback useful. Further research is required to find out a delay between the forewarning and the start of scrolling that is short enough to make the association but yet long enough to support the feeling of control and enjoyable user experience. Copyright is held by the owner/author(s).



### General information

Publication status: Published  
MoE publication type: A4 Article in a conference publication  
Organisations: Augmented Human Activities (AHA), School of Management (JKK)  
Contributors: Käksi, K., Špakov, O., Majaranta, P., Kangas, J.  
Number of pages: 4  
Pages: 947-950  
Publication date: 26 Oct 2014

### Host publication information

Title of host publication: Proceedings of the NordiCHI 2014: The 8th Nordic Conference on Human-Computer Interaction: Fun, Fast, Foundational  
Publisher: Association for Computing Machinery, Inc  
ISBN (Electronic): 1595930361, 9781450325424  
ASJC Scopus subject areas: Human-Computer Interaction, Software  
Keywords: Eye tracking, Gaze input, Haptics, Vibrotactile feedback  
DOIs:  
10.1145/2639189.2670247  
URLs:  
<http://www.scopus.com/inward/record.url?scp=84911380351&partnerID=8YFLogxK> (Link to publication in Scopus)  
Source: Scopus  
Source ID: 84911380351  
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

### Human-technology choreographies: Re-thinking body, movement and space in interaction design

Bodily movements have traditionally had mostly instrumental value in interaction design. However, movements can also be given a central role in understanding behaviour and in designing technology for humans. This workshop is aiming at taking a fresh, movement-oriented look at the design and evaluation of technology in a wide variety of contexts. Copyright is held by the owner/author(s).

### General information

Publication status: Published  
MoE publication type: A4 Article in a conference publication  
Organisations: Augmented Human Activities (AHA), Jyväskylän yliopisto, School of Management (JKK)  
Contributors: Pirhonen, A., Parviainen, J., Tuuri, K., Turunen, M., Heimonen, T.  
Number of pages: 4  
Pages: 841-844  
Publication date: 26 Oct 2014

### Host publication information

Title of host publication: Proceedings of the NordiCHI 2014: The 8th Nordic Conference on Human-Computer Interaction: Fun, Fast, Foundational  
Publisher: Association for Computing Machinery, Inc  
ISBN (Electronic): 1595930361, 9781450325424  
ASJC Scopus subject areas: Human-Computer Interaction, Software  
Keywords: Choreography, Embodiment, Interaction design, Lived space  
DOIs:  
10.1145/2639189.2654843  
URLs:  
<http://www.scopus.com/inward/record.url?scp=84911381050&partnerID=8YFLogxK> (Link to publication in Scopus)  
Source: Scopus  
Source ID: 84911381050  
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

### Seniors and text messaging on mobile touchscreen phones

We studied how senior citizens write and send text messages on their own mobile phone and two touchscreen smartphones. Each participant participated in three training sessions and wrote messages with three phones. We found that the range of text entry performance among seniors is large. Average text entry rate in entering a 34 character test phrase was only 3.5 wpm. Further work to improve text messaging user interfaces for older un-skilled users is clearly needed. Copyright is held by the owner/author(s).

### General information

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

Organisations: Augmented Human Activities (AHA), Korea Advanced Institute of Science and Technology (KAIST)  
Contributors: Övermark, R., Isokoski, P., Ovaska, S.  
Number of pages: 4  
Pages: 967-970  
Publication date: 26 Oct 2014

#### Host publication information

Title of host publication: Proceedings of the NordiCHI 2014: The 8th Nordic Conference on Human-Computer Interaction: Fun, Fast, Foundational

Publisher: Association for Computing Machinery, Inc

ISBN (Electronic): 1595930361, 9781450325424

ASJC Scopus subject areas: Human-Computer Interaction, Software

Keywords: Learning, Mobile phone, Older adult, Text messaging, Touchscreen

DOIs:

10.1145/2639189.2670252

URLs:

<http://www.scopus.com/inward/record.url?scp=84911409889&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84911409889

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

#### Effects of directional haptic and non-speech audio cues in a cognitively demanding navigation task

Existing car navigation systems require visual or auditory attention. Providing the driver with directional cues could potentially increase safety. We conducted an experiment comparing directional haptic and non-speech audio cues to visual cueing in a navigation task. Participants (N=16) drove the Lane Change Test simulator with different navigational cues. The participants were to recognize the directional cue (left or right) by responding as fast as possible using a tablet. Reaction times and errors were measured. The participants were also interviewed about the different cues and filled up the NASA-TLX questionnaire. The results showed that in comparison to visual cues all the other cues were reacted to significantly faster. Haptic only cueing resulted in the most errors, but it was evaluated as the most pleasant and the least physically demanding. The results suggest that non-visual cueing could improve safety. Copyright is held by the owner/author(s).

#### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Augmented Human Activities (AHA), School of Management (JKK)

Contributors: Nukarinen, T., Raisamo, R., Farooq, A., Evreinov, G., Surakka, V.

Number of pages: 4

Pages: 61-64

Publication date: 26 Oct 2014

#### Host publication information

Title of host publication: Proceedings of the NordiCHI 2014: The 8th Nordic Conference on Human-Computer Interaction: Fun, Fast, Foundational

Publisher: Association for Computing Machinery, Inc

ISBN (Electronic): 1595930361, 9781450325424

ASJC Scopus subject areas: Human-Computer Interaction, Software

Keywords: Car navigation, Directional cues, Haptic stimuli, Tactile displays

DOIs:

10.1145/2639189.2639231

URLs:

<http://www.scopus.com/inward/record.url?scp=84911368322&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84911368322

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

#### Tut MUVIS image retrieval system proposal for MSR-Bing challenge 2014

This paper presents our system designed for MSR-Bing Image Retrieval Challenge @ ICME 2014. The core of our system is formed by a text processing module combined with a module performing PCA-assisted perceptron regression with random sub-space selection ( $P^2R^2S^2$ ).  $P^2R^2S^2$  uses Over-Feat features as a starting point and transforms them into more descriptive features via unsupervised training. The relevance score for each query-image pair is obtained by comparing the transformed features of the query image and the relevant training images. We also use a face bank, duplicate image detection, and optical character recognition to boost our evaluation accuracy. Our system achieves 0.5099 in terms of  $DCG_{25}$  on the development set and 0.5116 on the test set.

### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Department of Signal Processing, Research group: Video, Tampere University of Technology, Research Community on Data-to-Decision (D2D)

Contributors: Raitoharju, J., Zhang, H., Ozan, E. C., Waris, M. A., Faisal, M., Cao, G., Roininen, M., Ahmad, I., Shetty, R., Uhlmann, S., Samiee, K., Kiranyaz, S., Gabbouj, M.

Number of pages: 6

Pages: 1-6

Publication date: 3 Sep 2014

### Host publication information

Title of host publication: IEEE International Conference on Multimedia and Expo, ICME 2014, Chengdu, China, July 14-18, 2014

Place of publication: Piscataway

Publisher: Institute of Electrical and Electronics Engineers IEEE

ISBN (Print): 9781479947171

ASJC Scopus subject areas: Computer Graphics and Computer-Aided Design, Computer Vision and Pattern Recognition, Human-Computer Interaction

Keywords: Data Partitioning, Face Bank, Image Retrieval, Relevance Evaluation

DOIs:

10.1109/ICMEW.2014.6890600

URLs:

<http://www.scopus.com/inward/record.url?scp=84937152405&partnerID=8YFLogxK> (Link to publication in Scopus)

### Bibliographical note

Contribution: organisation=sgn,FACT1=1<br/>Portfolio EDEND: 2014-09-25

Source: researchoutputwizard

Source ID: 1331

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

### Two patterns for minimizing human resources in a startup

In this paper, we describe two patterns that are part of a larger pattern language for software startup companies. These two particular patterns help startup companies to focus on the essential; the product itself and keeping their team intact and productive. In this way, the startup may operate with a sustainable team size.

### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Department of Pervasive Computing, Research area: Software engineering

Contributors: Leppänen, M.

Publication date: 10 Apr 2014

### Host publication information

Title of host publication: VikingPLoP 2014 Proceedings of the 8th Nordic Conference on Pattern Languages of Programs (VikingPLoP)

Publisher: ACM

Article number: 4

ISBN (Print): 9781450326605

ASJC Scopus subject areas: Human-Computer Interaction, Computer Networks and Communications, Computer Vision and Pattern Recognition, Software

Keywords: Lean startup, Organization, Organizational patterns, Patterns, Software engineering, Software product, Team

DOIs:

10.1145/2676680.2676686

Source: Scopus

Source ID: 84940021370

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

### Patterns for controlling chaos in a startup

A growing trend in industrial software engineering is that new software products and information services are developed under conditions of notable uncertainty. This is especially visible in startup enterprises which aim at new kinds of products and services in rapidly changing social web, where potential customers can quickly adopt new behavior. Special characteristics of the startups are lack of resources and funds, and startups may need to change direction fast. All these affect the software engineering practices used in the startups. Unfortunately almost 90 percent of all startups fail and goes bankrupt. There are probably indefinite numbers of reasons why startups fail. Failure might be caused by wrongly chosen

software engineering practices or inconsiderate decision making. While there is no recipe for success, we argue that good practices that can help on the way to success can be identified from successful startups. In this paper, we present two patterns that startups can consider when entering the growth phase of the lifecycle.

#### General information

Publication status: Published  
MoE publication type: A4 Article in a conference publication  
Organisations: Department of Pervasive Computing  
Contributors: Eloranta, V.  
Number of pages: 8  
Pages: 1-8  
Publication date: 10 Apr 2014

#### Host publication information

Title of host publication: VikingPLoP 2014 Proceedings of the 8th Nordic Conference on Pattern Languages of Programs  
Volume: 2014-April  
Publisher: Association for Computing Machinery  
ISBN (Print): 9781450326605

#### Publication series

Name: ACM International Conference Proceeding Series  
ASJC Scopus subject areas: Human-Computer Interaction, Computer Networks and Communications, Computer Vision and Pattern Recognition, Software  
Keywords: Lean start-up, Organizational patterns, Patterns, Software engineering, Start-up  
DOIs:  
10.1145/2676680.2676682  
Source: Scopus  
Source ID: 84940028558  
Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

#### Opportunities and Challenges of Mobile Applications as "Tickets-to-Talk": A Scenario-Based User Study

This paper presents a scenario-based user study of mobile application concepts that would encourage interaction between people within close proximity. The scenarios demonstrate three themes of digital tickets-to-talk: informing who and what are around, augmenting self-expression, and online interaction encouraging physical interaction. Our interview study explored the opportunities and challenges of such applications in developing into further face-to-face interactions between strangers. Tickets that are related to activities that convey a solid intention that would lead to practical collaboration, such as playing sports or studying together, have the best potential to advance to meaningful face-to-face interaction. Augmenting self-expression and online interaction encouraging physical interaction were found to have potential to create curiosity but seen less credible by our 42 interview participants to motivate face-to-face interaction between strangers. We conclude by discussing the potential of each theme of ticket-to-talk based on our findings as well as related literature.

#### General information

Publication status: Published  
MoE publication type: A4 Article in a conference publication  
Organisations: Department of Pervasive Computing, Augmented Human Activities (AHA)  
Contributors: Jarusriboonchai, P., Olsson, T., Ojala, J., Väänänen-Vainio-Mattila, K.  
Number of pages: 9  
Pages: 89-97  
Publication date: 2014

#### Host publication information

Title of host publication: Proceedings of the 13th International Conference on Mobile and Ubiquitous Multimedia, MUM2014, November 25-28, 2014, Melbourne, Australia  
Place of publication: New York, NY  
Publisher: ACM  
ISBN (Print): 978-1-4503-3304-7

#### Publication series

Name: International conference on mobile and ubiquitous multimedia  
ASJC Scopus subject areas: Human-Computer Interaction, Computer Networks and Communications, Computer Vision and Pattern Recognition, Software  
Keywords: Awareness system, Co-located interaction, Face-to-face interaction, Mobile technology, Scenarios, Storyboards, User experience, User study  
DOIs:  
10.1145/2677972.2677993

URLs:

<http://www.scopus.com/inward/record.url?scp=84943175665&partnerID=8YFLogxK> (Link to publication in Scopus)

### **Bibliographical note**

Contribution: organisation=tie,FACT1=1<br/>Portfolio EDEND: 2014-12-31<br/>Publisher name: ACM

Source: researchoutputwizard

Source ID: 575

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

### **Browsing patterns in retrieved documents**

The paper reports a test exploring how retrieved documents are browsed. The access point to the documents was varied - starting either from the beginning of the document or from the point where relevant information is located - to find out how much browsing and context the users need to judge relevance. Test results reveal different within-document browsing patterns.

### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Library

Contributors: Kekäläinen, J., Arvola, P., Kumpulainen, S.

Number of pages: 4

Pages: 299-302

Publication date: 2014

### **Host publication information**

Title of host publication: Proceedings of the 5th Information Interaction in Context Symposium, IliX 2014

Publisher: Association for Computing Machinery

ISBN (Print): 9781450329767

ASJC Scopus subject areas: Human-Computer Interaction, Information Systems

Keywords: best entry point, document browsing patterns

DOIs:

10.1145/2637002.2637047

Source: Scopus

Source ID: 84907010890

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

### **Real-time hidden gaze point correction**

The accuracy of gaze point estimation is one of the main limiting factors in developing applications that utilize gaze input. The existing gaze point correction methods either do not support real-time interaction or imply restrictions on gazecontrolled tasks and object screen locations. We hypothesize that when gaze points can be reliably correlated with object screen locations, it is possible to gather and leverage this information for improving the accuracy of gaze pointing. We propose an algorithm that uses a growing pool of such collected correlations between gaze points and objects for real-time hidden gaze point correction. We tested this algorithm assuming that any point inside of a rectangular object has equal probability to be hit by gaze. We collected real data in a user study to simulate pointing at targets of small (80px) size. The results showed that our algorithm can significantly improve the hit rate especially in pointing at middle-sized targets. The proposed method is real-time, person- and taskindependent and is applicable for arbitrary located objects.

### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Augmented Human Activities (AHA)

Contributors: Špakov, O., Gizatdinova, Y.

Number of pages: 4

Pages: 291-294

Publication date: 2014

### **Host publication information**

Title of host publication: Proceedings of the Symposium on Eye Tracking Research and Applications, ETRA 2014

Publisher: Association for Computing Machinery

ISBN (Print): 9781450327510

ASJC Scopus subject areas: Computer Vision and Pattern Recognition, Human-Computer Interaction, Ophthalmology, Sensory Systems

Keywords: Accuracy correction, Algorithms, Cumulative distribution function, Eye tracking, Gaze point, Pointing

DOIs:

10.1145/2578153.2578200

URLs:

<http://www.scopus.com/inward/record.url?scp=84899672400&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84899672400

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

### **Gaze gestures and haptic feedback in mobile devices**

Anticipating the emergence of gaze tracking capable mobile devices, we are investigating the use of gaze as an input modality in handheld mobile devices. We conducted a study of combining gaze gestures with vibrotactile feedback. Gaze gestures were used as an input method in a mobile device and vibrotactile feedback as a new alternative way to give confirmation of interaction events. Our results show that vibrotactile feedback significantly improved the use of gaze gestures. The tasks were completed faster and rated easier and more comfortable when vibrotactile feedback was provided.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Augmented Human Activities (AHA), School of Management (JKK)

Contributors: Kangas, J., Akkil, D., Rantala, J., Isokoski, P., Majaranta, P., Raisamo, R.

Number of pages: 4

Pages: 435-438

Publication date: 2014

#### **Host publication information**

Title of host publication: CHI 2014: One of a CHIInd - Conference Proceedings, 32nd Annual ACM Conference on Human Factors in Computing Systems

Publisher: Association for Computing Machinery

ISBN (Print): 9781450324731

ASJC Scopus subject areas: Software, Human-Computer Interaction, Computer Graphics and Computer-Aided Design

Keywords: Gaze interaction, Gaze tracking, Haptic feedback

DOIs:

10.1145/2556288.2557040

URLs:

<http://www.scopus.com/inward/record.url?scp=84900413921&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84900413921

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

### **Glasses with haptic feedback of gaze gestures**

We introduce eyeglasses that present haptic feedback when using gaze gestures for input. The glasses utilize vibrotactile actuators to provide gentle stimulation to three locations on the user's head. We describe two initial user studies that were conducted to evaluate the easiness of recognizing feedback locations and participants' preferences for combining the feedback with gaze gestures. The results showed that feedback from a single actuator was the easiest to recognize and also preferred when used with gaze gestures. We conclude by presenting future use scenarios that could benefit from gaze gestures and haptic feedback.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Augmented Human Activities (AHA), School of Management (JKK)

Contributors: Rantala, J., Isokoski, P., Kangas, J., Raisamo, R., Akkil, D.

Number of pages: 6

Pages: 1597-1602

Publication date: 2014

#### **Host publication information**

Title of host publication: CHI EA 2014: One of a ChiNd - Extended Abstracts, 32nd Annual ACM Conference on Human Factors in Computing Systems

Publisher: Association for Computing Machinery

ISBN (Print): 9781450324748

ASJC Scopus subject areas: Human-Computer Interaction, Computer Graphics and Computer-Aided Design, Software

Keywords: Gaze gestures, Gaze input, Haptics, Vibrotactile feedback, Wearable computing

DOIs:

10.1145/2559206.2581163

URLs:

<http://www.scopus.com/inward/record.url?scp=84900557759&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84900557759

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

### **Layers of user expectations of future technologies: An early framework**

User's expectations are identified as a factor affecting the actual user experience in human-computer interaction. Considering the context of emerging and future technologies, users' expectations can become increasingly diverse, especially in terms of where they stem from. This paper presents an early framework for understanding different layers of expectations that people might have of technologies in the near future: for example, 'desires' and 'social and societal norms'. The framework provides understanding of the spectrum of user expectations and what different aspects of them could be identified in user inquiries and evaluations. For concretization and credibility of this work-in-progress framework, examples from recent research on user expectations of mobile augmented reality are provided.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Pervasive Computing, Augmented Human Activities (AHA)

Contributors: Olsson, T.

Number of pages: 6

Pages: 1957-1962

Publication date: 2014

#### **Host publication information**

Title of host publication: CHI EA 2014: One of a ChiNd - Extended Abstracts, 32nd Annual ACM Conference on Human Factors in Computing Systems

Publisher: Association for Computing Machinery

ISBN (Print): 9781450324748

ASJC Scopus subject areas: Human-Computer Interaction, Computer Graphics and Computer-Aided Design, Software

Keywords: Anticipation, Emerging technologies, Expectation, Framework, Quality, User experience, User studies

DOIs:

10.1145/2559206.2581225

URLs:

<http://www.scopus.com/inward/record.url?scp=84900561033&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84900561033

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

### **The usability of text entry systems now and in the future**

Text entry is an active and growing research domain. Our SIG serves three purposes. First, to strengthen the text entry community by bringing text entry researchers working in the human-computer interaction, natural language processing and augmentative and alternative communication communities together in one room. Second, to promote CHI as a natural and compelling focal point for all kinds of text entry research. Third, to follow-up on and broaden the discussions that emerged from two previous text entry workshops held at CHI [3, 4] by engaging in dialog to identify obstacles for success and formalizing procedures for measuring progress in the field of text entry.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Augmented Human Activities (AHA), Georgia Institute of Technology, University of Glasgow, Max Planck Institute for Informatics, University of Strathclyde, Montana Tech., University of St Andrews, University of Dundee

Contributors: Clawson, J., Isokoski, P., Brewster, S., Oulasvirta, A., Dunlop, M., Vertanen, K., Kristensson, P. O., Waller, A.

Number of pages: 4

Pages: 1139-1142

Publication date: 2014

#### **Host publication information**

Title of host publication: CHI EA 2014: One of a ChiNd - Extended Abstracts, 32nd Annual ACM Conference on Human Factors in Computing Systems

Publisher: Association for Computing Machinery

ISBN (Print): 9781450324748

ASJC Scopus subject areas: Human-Computer Interaction, Computer Graphics and Computer-Aided Design, Software  
Keywords: Accessibility, Augmentative and alternative communication, Internationalization, Text entry  
DOIs:  
10.1145/2559206.2559217  
Source: Scopus  
Source ID: 84900546037  
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

### **TraQuMe: A tool for measuring the gaze tracking quality**

Consistent measuring and reporting of gaze data quality is important in research that involves eye trackers. We have developed TraQuMe: a generic system to evaluate the gaze data quality. The quality measurement is fast and the interpretation of the results is aided by graphical output. Numeric data is saved for reporting of aggregate metrics for the whole experiment. We tested TraQuMe in the context of a novel hidden calibration procedure that we developed to aid in experiments where participants should not know that their gaze is being tracked. The quality of tracking data after the hidden calibration procedure was very close to that obtained with the Tobii's T60 trackers built-in 2 point, 5 point and 9 point calibrations.

#### **General information**

Publication status: Published  
MoE publication type: A4 Article in a conference publication  
Organisations: Augmented Human Activities (AHA), School of Management (JKK)  
Contributors: Akkil, D., Isokoski, P., Kangas, J., Rantala, J., Raisamo, R.  
Number of pages: 4  
Pages: 327-330  
Publication date: 2014

#### **Host publication information**

Title of host publication: Proceedings of the Symposium on Eye Tracking Research and Applications, ETRA 2014  
Publisher: Association for Computing Machinery  
ISBN (Print): 9781450327510  
ASJC Scopus subject areas: Computer Vision and Pattern Recognition, Human-Computer Interaction, Ophthalmology, Sensory Systems  
Keywords: Gaze interaction, Gaze tracking  
DOIs:  
10.1145/2578153.2578192  
URLs:  
<http://www.scopus.com/inward/record.url?scp=84899688722&partnerID=8YFLogxK> (Link to publication in Scopus)  
Source: Scopus  
Source ID: 84899688722  
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

### **Look and lean: Accurate head-assisted eye pointing**

Compared to the mouse, eye pointing is inaccurate. As a consequence, small objects are difficult to point by gaze alone. We suggest using a combination of eye pointing and subtle head movements to achieve accurate hands-free pointing in a conventional desktop computing environment. For tracking the head movements, we exploited information of the eye position in the eye tracker's camera view. We conducted a series of three experiments to study the potential caveats and benefits of using head movements to adjust gaze cursor position. Results showed that head-assisted eye pointing significantly improves the pointing accuracy without a negative impact on the pointing time. In some cases participants were able to point almost 3 times closer to the target's center, compared to the eye pointing alone (7 vs. 19 pixels). We conclude that head assisted eye pointing is a comfortable and potentially very efficient alternative for other assisting methods in the eye pointing, such as zooming.

#### **General information**

Publication status: Published  
MoE publication type: A4 Article in a conference publication  
Organisations: Augmented Human Activities (AHA)  
Contributors: Špakov, O., Isokoski, P., Majaranta, P.  
Number of pages: 8  
Pages: 35-42  
Publication date: 2014

#### **Host publication information**

Title of host publication: Proceedings of the Symposium on Eye Tracking Research and Applications, ETRA 2014  
Publisher: Association for Computing Machinery



ISBN (Print): 9781450327510

ASJC Scopus subject areas: Computer Vision and Pattern Recognition, Human-Computer Interaction, Ophthalmology, Sensory Systems

Keywords: Eye tracking, Gaze input, Head movements, Pointing

DOIs:

10.1145/2578153.2578157

URLs:

<http://www.scopus.com/inward/record.url?scp=84899691537&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84899691537

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

### **Preferences for touch gestures in audio-tactile communication**

People use different touch gestures in everyday life to interact with each other. However, remote communication typically supports only auditory and visual modalities. Gestures such as squeezing, stroking and patting could be used for supporting emotional communication between remote users. In this paper we study how different touch gestures are used as a part of audio communication. A user study was conducted where participant pairs were provided with hand-held devices that converted squeeze and finger touch gestures to vibrotactile stimulation. When one participant touched the device, another participant felt the touch simultaneously on a second device. The participants' task was to use the devices during conversations that varied in their emotional topics. The results of touch use analysis showed that the participants spent more time interacting via squeeze. Also, male participants rated squeeze as more suitable than finger touch. The emotional conversation topic did not have an effect on the use of touch gestures. In discussion the current findings are compared to prior research where only the tactile modality was used.

### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Augmented Human Activities (AHA), School of Management (JKK)

Contributors: Rantala, J., Raisamo, R.

Number of pages: 4

Pages: 247-250

Publication date: 2014

### **Host publication information**

Title of host publication: IEEE Haptics Symposium 2014, HAPTICS 2014 - Proceedings

Publisher: IEEE COMPUTER SOCIETY PRESS

Article number: 6775462

ISBN (Print): 9781479931316

ASJC Scopus subject areas: Artificial Intelligence, Human-Computer Interaction

Keywords: audio communication, emotions, Haptics, tactile stimulation, touch communication, touch gestures

DOIs:

10.1109/HAPTICS.2014.6775462

URLs:

<http://www.scopus.com/inward/record.url?scp=84899576423&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84899576423

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

### **Haptic feedback to gaze events**

Eye tracking input often relies on visual and auditory feedback. Haptic feedback offers a previously unused alternative to these established methods. We describe a study to determine the natural time limits for haptic feedback to gazing events. The target is to determine how much time we can use to evaluate the user gazed object and decide if we are going to give the user a haptic notification on that object or not. The results indicate that it is best to get feedback faster than in 250 milliseconds from the start of fixation of an object. Longer delay leads to increase in incorrect associations between objects and the feedback. Delays longer than 500 milliseconds were confusing for the user.

### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Augmented Human Activities (AHA), School of Management (JKK)

Contributors: Kangas, J., Rantala, J., Majoranta, P., Isokoski, P., Raisamo, R.

Number of pages: 8

Pages: 11-18

Publication date: 2014

### Host publication information

Title of host publication: Proceedings of the Symposium on Eye Tracking Research and Applications, ETRA 2014

Publisher: Association for Computing Machinery

ISBN (Print): 9781450327510

ASJC Scopus subject areas: Computer Vision and Pattern Recognition, Human-Computer Interaction, Ophthalmology, Sensory Systems

Keywords: Gaze interaction, Gaze tracking, Haptic feedback

DOIs:

10.1145/2578153.2578154

URLs:

<http://www.scopus.com/inward/record.url?scp=84899691269&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84899691269

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

### Bars, pies, doughnuts & tables - Visualization of proportions

Visualization of proportions is one of the most common visualization types encountered in the media. Stacked bar charts, doughnut and pie charts - the most common visualizations of proportions - have all keen advocates and critics, and there are conflicting results about their performance. This study presents an experiment with a basic but ecologically valid task to evaluate the performance of these techniques. The result shows that the stacked bar chart is superior to doughnut and pie charts in task performance. However, 75% of the participants regarded pie charts as the most pleasing or second-pleasing to use, and almost half of the participants (44%) perceived the pie or doughnut chart to be the fastest visualization to understand. Only six participants recognized the bar chart as the fastest technique, and half of them still preferred the pie chart over them. This subjective preference at the expense of performance may explain why pie charts are so widely used in spite of being criticized.

### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Augmented Human Activities (AHA)

Contributors: Siirtola, H.

Number of pages: 5

Pages: 241-245

Publication date: 2014

### Host publication information

Title of host publication: Proceedings of the 28th International BCS Human Computer Interaction Conference: Sand, Sea and Sky - Holiday HCI, HCI 2014

Publisher: BCS Learning and Development Ltd.

ASJC Scopus subject areas: Human-Computer Interaction, Artificial Intelligence, Computer Networks and Communications

Keywords: Information visualization, Proportions, User studies

DOIs:

10.14236/ewic/hci2014.30

URLs:

<http://www.scopus.com/inward/record.url?scp=84961371134&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84961371134

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

### IntentRadar: Search user interface that anticipates user's search intents

We introduce IntentRadar, an interactive search user interface that anticipates user's search intents by estimating them from user interaction. The estimated intents are represented as keywords and visualized on a radial layout that organizes the keywords as directions in the information space. IntentRadar assists users to direct their search by allowing to target relevance feedback on keywords by manipulating the position of the keywords on the radar. The system then learns and visualizes improved estimates of intents and retrieves documents corresponding to the present search intent estimate. IntentRadar has been shown to significantly improve users' task performance and the quality of retrieved information without compromising task execution time.

### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Research Community on Data-to-Decision (D2D), Aalto University, University of Helsinki

Contributors: Ruotsalo, T., Peltonen, J., Eugster, M. J. A., Glowacka, D., Reijonen, A., Jacucci, G., Myllymäki, P., Kaski, S.

Number of pages: 4  
Pages: 455-458  
Publication date: 2014

#### Host publication information

Title of host publication: CHI EA 2014: One of a ChiNd - Extended Abstracts, 32nd Annual ACM Conference on Human Factors in Computing Systems

Publisher: Association for Computing Machinery

ISBN (Print): 9781450324748

ASJC Scopus subject areas: Human-Computer Interaction, Computer Graphics and Computer-Aided Design, Software

Keywords: Intent modeling, Interactive information retrieval, Search user interfaces, Visualization

DOIs:

10.1145/2559206.2574807

URLs:

<http://www.scopus.com/inward/record.url?scp=84900560093&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84900560093

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

#### Controlled experiments comparing fault-tree-based safety analysis techniques

The capability to model dynamic aspects of safety-critical systems, such as sequence or stochastic dependence of events, is one important requirement for safety analysis techniques. State Event Fault Tree Analysis, Dynamic Fault Tree Analysis, and Fault Tree Analysis combined with Markov Chains Analysis have been developed to fulfill these requirements, but they are still not widely accepted and used in practice. In order to investigate the reasons behind this low usage, we conducted two controlled experiments. The goal of the experiments was to analyze and compare applicability and efficiency in State Event Fault Tree analysis versus Dynamic Fault Tree Analysis and Fault Tree Analysis combined with Markov Chains Analysis. The results of both experiments show that, notwithstanding the power of State Event Fault Tree Analysis, Dynamic Fault Tree Analysis is rated by participants as more applicable and is more efficient compared to State Event Fault Tree Analysis, which, in turn, is rated as more applicable but is less efficient than Fault Tree Analysis combined with Markov Chains Analysis. Two of the reasons investigated are the complexity of the notations used and the lack of tool support. Based on these results, we suggest strategies for enhancing State Event Fault Tree Analysis to overcome its weaknesses and increase its applicability and efficiency in modeling dynamic aspects of safety-critical systems.

#### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: University of Kaiserslautern, Former organisation of the author

Contributors: Mouaffo, A., Taibi, D., Jamboti, K.

Publication date: 2014

#### Host publication information

Title of host publication: 18th International Conference on Evaluation and Assessment in Software Engineering, EASE 2014

Publisher: Association for Computing Machinery (ACM)

Article number: a46

ISBN (Print): 9781450324762

ASJC Scopus subject areas: Human-Computer Interaction, Computer Networks and Communications, Computer Vision and Pattern Recognition, Software

Keywords: Controlled experiment, Dynamic fault tree, Fault tree analysis, Markov chain, Safety-analysis, Safety-critical systems, State event fault tree

DOIs:

10.1145/2601248.2601255

URLs:

<http://www.scopus.com/inward/record.url?scp=84905483353&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84905483353

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

#### Integration of BIM and automation in high-rise building construction

In this paper the utilisation of building information models (BIM) and construction automation on building sites is discussed. A lot of research has been carried out to develop new applications for using BIM to assist construction site planning, different operations and logistics. The methods of production control and management on site utilize BIM together with machine control and navigation systems. In Finland machine control systems and the automation of construction equipment is widely used in infrastructure construction. Recently similar methods have been introduced also

in building construction. This paper describes some latest Finnish examples where BIM-software is used for the planning, execution and control of building construction operations. University of Oulu has studied methods and technologies to capitalize BIM-models. The research has been mainly in infrastructure construction but the activities have recently been extended to building construction. In this paper a BIM-based tower crane operation and control system is discussed as a case study. The aim of this study was to highlight the potential areas where automation can increase the crane productivity and improve site operations and logistics. The construction site managers and tower crane operators interviewed in this study were experienced in using BIM-models on site.

#### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Life Cycle Effectiveness of the Built Environment (LCE@BE), University of Oulu, Conxtech

Contributors: Heikkilä, R., Malaska, M., Törmänen, P., Keyack, C.

Number of pages: 6

Pages: 1171-1176

Publication date: 2013

#### Host publication information

Title of host publication: ISARC 2013 - 30th International Symposium on Automation and Robotics in Construction and Mining, Held in Conjunction with the 23rd World Mining Congress

ASJC Scopus subject areas: Artificial Intelligence, Human-Computer Interaction, Geotechnical Engineering and Engineering Geology, Civil and Structural Engineering

Keywords: BIM, Construction automation, Crane control, Robotics, Tower crane

URLs:

<http://www.scopus.com/inward/record.url?scp=84893521889&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84893521889

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

#### Virtual stick in caret positioning on touch screens

We present our design exploration in the area of virtual stick controllers and a preliminary evaluation in an editing task. Virtual stick controllers are one solution to the problem of precise pointing on touch screens. They operate by using an area of the touch screen as a rate control device that moves a pointer. We implemented and evaluated this technique in a text editing context where unaided precise placement of the caret is difficult. The results showed that with large fonts and long pointing distance positioning the caret with the virtual stick is significantly slower than with conventional finger touching. On the contrary, with small fonts and short pointing distance, we noted no difference.

#### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Augmented Human Activities (AHA), Université de Lorraine, Università di Salerno

Contributors: Scheibel, J. B., Pierson, C., Martin, B., Godard, N., Fuccella, V., Isokoski, P.

Number of pages: 8

Pages: 107-114

Publication date: 2013

#### Host publication information

Title of host publication: IHM 2013 - Actes de la 25ieme Conference Francophone sur l'Interaction Homme-Machine

ISBN (Print): 9781450324076

ASJC Scopus subject areas: Human-Computer Interaction

Keywords: Android, Caret movement, Gestures, Text editing

DOIs:

10.1145/2534903.2534918

URLs:

<http://www.scopus.com/inward/record.url?scp=84889583091&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84889583091

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

#### Mobile dictation for healthcare professionals

We demonstrate a mobile dictation application utilizing automatic speech recognition for healthcare professionals. Development was done in close collaboration between human-technology interaction and nursing science researchers and professionals working in the area. Our work was motivated by the need for improvements in getting spoken patient information to the next treatment steps without additional steps. In addition, we wanted to enable truly mobile spoken information entry, i.e., dictation can take place on the spot. In order to study the applicability we conducted a small-scale

Wizard-of-Oz evaluation in a real hospital environment with real nurses. Our main focus was to gather subjective expectations and experiences from the actual nurses themselves. The results show true potential for our mobile dictation application and its further development.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Augmented Human Activities (AHA), Turun Yliopisto/Turun Biomateriaalikeskus

Contributors: Keskinen, T., Melto, A., Hakulinen, J., Turunen, M., Saarinen, S., Pallos, T., Kallioniemi, P., Danielsson-Ojala, R., Salanterä, S.

Publication date: 2013

#### **Host publication information**

Title of host publication: Proceedings of the 12th International Conference on Mobile and Ubiquitous Multimedia, MUM 2013

Article number: a41

ISBN (Print): 9781450326483

ASJC Scopus subject areas: Computer Graphics and Computer-Aided Design, Human-Computer Interaction

Keywords: Evaluation, Healthcare dictation, Mobile interaction, Speech recognition, User expectations, User experience

DOIs:

10.1145/2541831.2541880

URLs:

<http://www.scopus.com/inward/record.url?scp=84893418988&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84893418988

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

#### **Seek'N'Share: A platform for location-based collaborative mobile learning**

We present a location-based collaborative mobile learning platform called Seek'N'Share. It is comprised of a Web-based learning assignment editor and a mobile application for exploring and capturing multimedia content in the field. The editor enables drag-and-drop creation of learning tasks, areas and points of interest using an intuitive Web interface.

Assignments are accessed with an Android application that uses location information to provide content and tasks to learners as they explore the environment. The mobile application enables the learners to record audio, video and take pictures of their environments. This supports the overall goal of putting together a presentation as the outcome of the learning activity by combining predefined, contextual information with user-generated content. The platform is currently piloted with local schools. Its novelty lies in its flexible support for creating location-based learning activities for unconstrained environments, and the possibility for the learners to collaboratively document their learning outcomes in situ.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Augmented Human Activities (AHA)

Contributors: Heimonen, T., Turunen, M., Kangas, S., Pallos, T., Pekkala, P., Saarinen, S., Tiitinen, K., Keskinen, T., Luhtala, M., Koskinen, O., Okkonen, J., Raisamo, R.

Publication date: 2013

#### **Host publication information**

Title of host publication: Proceedings of the 12th International Conference on Mobile and Ubiquitous Multimedia, MUM 2013

Article number: a38

ISBN (Print): 9781450326483

ASJC Scopus subject areas: Computer Graphics and Computer-Aided Design, Human-Computer Interaction

Keywords: Learning content authoring, Location-based mobile learning, Pervasive interaction

DOIs:

10.1145/2541831.2541872

URLs:

<http://www.scopus.com/inward/record.url?scp=84893425984&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84893425984

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

#### **Evaluating the experiential user experience of public display applications in the wild**

Studying pervasive systems in the wild has recently gained significant interest. However, few methods exist that focus on the subjective of user experience of such systems rather than objective metrics, like performance and task success.

Especially multimodal interaction in this context poses challenges to understanding how different input and output methods affect the users' experience. We present a new method for evaluating the experiential user experience of interactive systems. It combines two existing approaches from different fields: a questionnaire-based evaluation method called SUXES, intended for evaluating user expectations and experiences, and a theoretical experience framework, Experience Pyramid, originally developed for analyzing and improving experiential tourism products. The new method was used in two field studies of multimodal public display applications. Our findings show that the method is a practical approach for user experience evaluation in the wild, especially in the case of pervasive applications that aim to provide novel experiences rather than facilitate task-oriented information access.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Augmented Human Activities (AHA)

Contributors: Keskinen, T., Hakulinen, J., Heimonen, T., Turunen, M., Sharma, S., Miettinen, T., Luhtala, M.

Publication date: 2013

#### **Host publication information**

Title of host publication: Proceedings of the 12th International Conference on Mobile and Ubiquitous Multimedia, MUM 2013

Article number: a7

ISBN (Print): 9781450326483

ASJC Scopus subject areas: Computer Graphics and Computer-Aided Design, Human-Computer Interaction

Keywords: In situ evaluation, Measurement, Public displays, User experience

DOIs:

10.1145/2541831.2541840

URLs:

<http://www.scopus.com/inward/record.url?scp=84893393536&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84893393536

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

#### **Evaluating landmark attraction model in collaborative wayfinding in virtual learning environments**

In Virtual Learning Environments efficient navigation is a major issue, especially when it is used as a component in the learning process. This paper addresses the challenges in creating meaningful navigation routes from language learning perspective. The work is grounded on findings from a specific case on German language learning, wherein two remotely located users communicated in a wayfinding guidance scenario. The users navigated through 360-degree virtual panoramic images using body gestures and could receive communication help via spoken hints by pointing at objects in the scenery. An important design consideration is how to choose these objects, as they have both navigational importance and pedagogical significance in terms of learning the desired language. Wayfinding interactions from 21 participants were compared to the values provided by a landmark attraction model applied on the landmarks along the routes. The results show that there was a clear connection between prominence of landmarks and time spent on each panorama. This indicates that together with pedagogical planning, the model can aid in selecting the interactive content for language learning applications in virtual environments.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Augmented Human Activities (AHA), School of Management (JKK), University of Tampere

Contributors: Kallioniemi, P., Hakulinen, J., Keskinen, T., Turunen, M., Heimonen, T., Pihkala-Posti, L., Uusi-Mäkelä, M., Hietala, P., Okkonen, J., Raisamo, R.

Publication date: 2013

#### **Host publication information**

Title of host publication: Proceedings of the 12th International Conference on Mobile and Ubiquitous Multimedia, MUM 2013

Article number: a33

ISBN (Print): 9781450326483

ASJC Scopus subject areas: Computer Graphics and Computer-Aided Design, Human-Computer Interaction

Keywords: Embodied interaction, Gesture-based interfaces, Second language learning, Virtual environments, Wayfinding

DOIs:

10.1145/2541831.2541849

URLs:

<http://www.scopus.com/inward/record.url?scp=84893344351&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84893344351

### Reading on-screen text with gaze-based auto-scrolling

Visual information on eye movements can be used to facilitate scrolling while one is reading on-screen text. We carried out an experiment to find preferred reading regions on the screen and implemented an automatic scrolling technique based on the preferred regions of each individual reader. We then examined whether manual and automatic scrolling have an effect on reading behaviour on the basis of eye movement metrics, such as fixation duration and fixation count. We also studied how different font sizes affect the eye movement metrics. Results of analysis of data collected from 24 participants indicated no significant difference between manual and automatic scrolling in reading behaviour. Preferred reading regions on the screen varied among the participants. Most of them preferred relatively short regions. A significant effect of font size on fixation count was found. Subjective opinions indicated that participants found automatic scrolling convenient to use.

#### General information

Publication status: Published  
MoE publication type: A4 Article in a conference publication  
Organisations: Augmented Human Activities (AHA)  
Contributors: Sharmin, S., Špakov, O., Rähkä, K. J.  
Number of pages: 8  
Pages: 24-31  
Publication date: 2013

#### Host publication information

Title of host publication: Proceedings of the 2013 Conference on Eye Tracking South Africa, ETSA 2013  
ISBN (Print): 9781450321105  
ASJC Scopus subject areas: Human-Computer Interaction, Computer Networks and Communications, Computer Vision and Pattern Recognition, Software  
Keywords: automatic scrolling, eye movements, fixation count, fixation duration, manual scrolling, reading, reading region  
DOIs:  
10.1145/2509315.2509319  
URLs:  
<http://www.scopus.com/inward/record.url?scp=84883884057&partnerID=8YFLogxK> (Link to publication in Scopus)  
Source: Scopus  
Source ID: 84883884057  
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

### SiMPE: 8th workshop on speech and sound in mobile and pervasive environments

The SiMPE workshop series started in 2006 with the goal of enabling speech processing on mobile and embedded devices. The SiMPE 2012 workshop extended the notion of audio to non-speech "Sounds" and thus the expansion became "Speech and Sound". SiMPE 2010 and 2011 brought together researchers from the speech and the HCI communities. Speech User interaction in cars was a focus area in 2009. Multimodality got more attention in SiMPE 2008. In SiMPE 2007, the focus was on developing regions. With SiMPE 2013, the 8th in the series, we continue to explore the area of speech along with sound. Akin to language processing and text-to-speech synthesis in the voice-driven interaction loop, sensors can track continuous human activities such as singing, walking, or shaking the mobile phone, and non-speech audio can facilitate continuous interaction. The technologies underlying speech processing and sound processing are quite different and these communities have been working mostly independent of each other. And yet, for multimodal interactions on the mobile, it is perhaps natural to ask whether and how speech and sound can be mixed and used more effectively and naturally.

#### General information

Publication status: Published  
MoE publication type: A4 Article in a conference publication  
Organisations: Augmented Human Activities (AHA), IBM Research, Ita-Suomen yliopisto, University of Helsinki, Carnegie Mellon University, Aalborg University  
Contributors: Nanavati, A. A., Rajput, N., Srivastava, S., Erkut, C., Jylhä, A., Rudnicky, A. I., Serafin, S., Turunen, M.  
Number of pages: 4  
Pages: 626-629  
Publication date: 2013

#### Host publication information

Title of host publication: MobileHCI 2013 - Proceedings of the 15th International Conference on Human-Computer Interaction with Mobile Devices and Services  
ISBN (Print): 9781450322737  
ASJC Scopus subject areas: Human-Computer Interaction, Software

Keywords: mobile computing, sonic interaction, sound, sound and music computing, speech processing

DOIs:

10.1145/2493190.2499471

URLs:

<http://www.scopus.com/inward/record.url?scp=84883727754&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84883727754

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

### **Mixed reality with multimodal head-mounted pico projector**

Many kinds of displays can be used for augmented reality (AR). Multimodal head-mounted pico projector is a concept, which is little explored for AR. It opens new possibilities for wearable displays. In this paper we present our proof-of-concept prototype of a multimodal head-mounted pico projector. Our main contributions are the display concept and some usage examples for it.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Augmented Human Activities (AHA), University of Tampere

Contributors: Sand, A., Rakkolainen, I.

Publication date: 2013

#### **Host publication information**

Title of host publication: Proceedings of the Virtual Reality International Conference on Laval Virtual, VRIC 2013

Article number: 14

ISBN (Print): 9781450318754

ASJC Scopus subject areas: Human-Computer Interaction, Computer Networks and Communications, Computer Vision and Pattern Recognition, Software

Keywords: Augmented reality, Mixed reality, Multimodality, Pico projector, Wearable displays

DOIs:

10.1145/2466816.2466831

URLs:

<http://www.scopus.com/inward/record.url?scp=84882277921&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84882277921

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

### **WeSlide: Gestural text entry for elderly users of interactive television**

Interactive television provides useful services for older people. These include social networking tools, video on demand, and broadcast TV. Many of the Internet-mediated services require text entry. The usual multi-tap text entry supplied with TV remote control is not suitable to many older people. In this paper, we evaluate WeSlide, a gestural text entry technique that uses the Wiimote as the input device. We conducted a study to compare WeSlide with the multi-tap technique. WeSlide was faster and less error prone and users strongly preferred it over multi-tap.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Augmented Human Activities (AHA), Université de Lorraine

Contributors: Godard, N., Pecci, I., Isokoski, P.

Number of pages: 4

Pages: 55-58

Publication date: 2013

#### **Host publication information**

Title of host publication: Proceedings of the 11th European Conference on Interactive TV and Video, EuroITV 2013

ISBN (Print): 9781450319515

ASJC Scopus subject areas: Human-Computer Interaction, Information Systems

Keywords: Elderly users, Gestural interaction, Interactive television, Text entry, Wiimote

DOIs:

10.1145/2465958.2465963

URLs:

<http://www.scopus.com/inward/record.url?scp=84880556496&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus



Source ID: 84880556496

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

### **Gestures and widgets: Performance in text editing on multi-touch capable mobile devices**

We describe the design and evaluation of a gestural text editing technique for touchscreen devices. The gestures are drawn on top of the soft keyboard and interpreted as commands for moving the caret, performing selections, and controlling the clipboard. Our implementation is an Android service that can be used in any text editing task on Android-based devices. We conducted an experiment to compare the gestural editing technique against the widget-based technique available on a smartphone (Samsung Galaxy II with Android 2.3.5). The results show a performance benefit of 13-24% for the gestural technique depending on the font size. Subjective feedback from the participants was also positive. Because the two editing techniques use different input areas, they can coexist on a device. This means that the gestural editing can be added on any soft keyboard without interfering with user experience for those users that choose not to use it.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Augmented Human Activities (AHA), Università di Salerno, Université de Lorraine

Contributors: Fuccella, V., Isokoski, P., Martin, B.

Number of pages: 10

Pages: 2785-2794

Publication date: 2013

#### **Host publication information**

Title of host publication: CHI 2013: Changing Perspectives, Conference Proceedings - The 31st Annual CHI Conference on Human Factors in Computing Systems

ISBN (Print): 9781450318990

ASJC Scopus subject areas: Human-Computer Interaction, Computer Graphics and Computer-Aided Design, Software

Keywords: Android, Caret movement, Clipboard, Gestures, Text editing

DOIs:

10.1145/2470654.2481385

URLs:

<http://www.scopus.com/inward/record.url?scp=84877966468&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84877966468

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

### **Front-camera video recordings as emotion responses to mobile photos shared within close-knit groups**

People use social-photography services to tell stories about themselves and to solicit responses from viewers. State-of-the-art services concentrate on textual comments, "Like" buttons, or similar means for viewers to give explicit feedback, but they overlook other, non-textual means. This paper investigates how emotion responses-as video clips captured by the front camera of a cell phone and used as tags for the individual photo viewed-can enhance photo-sharing experiences for close-knit groups. Our exploration was carried out with a mobile social-photography service called Social Camera. Four user groups (N=19) used the application for two to four weeks. The study's results support the value of using front-camera video recordings to glean emotion response. It supports lightweight phatic social interactions not possible with comments and "Like" buttons. Most users kept sharing emotion responses throughout the study. They typically shared the responses right after they saw a just-taken photo received from a remote partner. They used the responses to share their current contexts with others just as much as to convey nuanced feelings about a photo. We discuss the implications for future design and research.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Augmented Human Activities (AHA), Nokia

Contributors: Cui, Y., Kangas, J., Holm, J., Grassel, G.

Number of pages: 10

Pages: 981-990

Publication date: 2013

#### **Host publication information**

Title of host publication: CHI 2013: Changing Perspectives, Conference Proceedings - The 31st Annual CHI Conference on Human Factors in Computing Systems

ISBN (Print): 9781450318990

ASJC Scopus subject areas: Software, Human-Computer Interaction, Computer Graphics and Computer-Aided Design

Keywords: Close-knit group, Co-presence, Emotion response, Feedback, Mobile, Social camera, Social photography  
DOIs:  
10.1145/2470654.2466125  
URLs:  
<http://www.scopus.com/inward/record.url?scp=84877935649&partnerID=8YFLogxK> (Link to publication in Scopus)  
Source: Scopus  
Source ID: 84877935649  
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

### **'Aie-studio' - A pragmatist aesthetic approach for procedural sound design**

This paper introduces the AIE-Studio (Audio Interfaces for Exploration), a modular dataflow patching library implemented with Pure Data. The AIE-Studio introduces new tools for procedural sound design through generative sonic and musical structures. Particular focus is on aesthetic experience. The designed modules allow versatile dataflow mapping through matrix routing system while also enabling the sound designer to influence generative processes of music creation. In particular, The AIE-Studio was used to create generative sonic and musical material in an embodied game-like application. In this paper we present key questions driving the research, theoretical background, research approach and the main development activities .

#### **General information**

Publication status: Published  
MoE publication type: A4 Article in a conference publication  
Organisations: Augmented Human Activities (AHA)  
Contributors: Luhtala, M., Turunen, M., Hakulinen, J., Keskinen, T.  
Publication date: 2013

#### **Host publication information**

Title of host publication: Proceedings of the 8th Audio Mostly: A Conference on Interaction with Sound, AM 2013 - In Cooperation with ACM SIGCHI  
Publisher: Association for Computing Machinery  
Article number: 7  
ISBN (Print): 9781450326599  
ASJC Scopus subject areas: Human-Computer Interaction, Computer Networks and Communications, Computer Vision and Pattern Recognition, Software  
Keywords: Aesthetic experience, Artistic interfaces, Generative strategies, Procedural audio, Procedural sound design, Pure data, Sonic interaction design  
DOIs:  
10.1145/2544114.2544124  
URLs:  
<http://www.scopus.com/inward/record.url?scp=84898834763&partnerID=8YFLogxK> (Link to publication in Scopus)  
Source: Scopus  
Source ID: 84898834763  
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

### **Multiplicative update for fast optimization of information retrieval based neighbor embedding**

Dimensionality reduction of high-dimensional data for visualization has recently been formalized as an information retrieval task where original neighbors of data points are retrieved from the low-dimensional display, and the visualization is optimized to maximize flexible tradeoffs between precision and recall of the retrieval, avoiding misses and false neighbors. The approach has yielded well-performing visualization methods as well as information retrieval interpretations of earlier neighbor embedding methods. However, most of the methods are based on slow gradient search approaches, whereas fast methods are crucial for example in interactive applications. In this paper we propose a fast multiplicative update rule for visualization optimized for information retrieval, and show in experiments it yields equally good results as the previous state of the art gradient based approach but much faster.

#### **General information**

Publication status: Published  
MoE publication type: A4 Article in a conference publication  
Organisations: Research Community on Data-to-Decision (D2D), Aalto University  
Contributors: Peltonen, J., Lin, Z.  
Publication date: 2013

#### **Host publication information**

Title of host publication: 2013 IEEE International Workshop on Machine Learning for Signal Processing - Proceedings of MLSP 2013  
Article number: 6661899

ISBN (Print): 9781479911806

ASJC Scopus subject areas: Human-Computer Interaction, Signal Processing

Keywords: dimensionality reduction, information retrieval, multiplicative update, visualization

DOIs:

10.1109/MLSP.2013.6661899

URLs:

<http://www.scopus.com/inward/record.url?scp=84893243408&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84893243408

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

### Scalable optimization of neighbor embedding for visualization

Neighbor embedding (NE) methods have found their use in data visualization but are limited in big data analysis tasks due to their  $O(n^2)$  complexity for  $n$  data samples. We demonstrate that the obvious approach of subsampling produces inferior results and propose a generic approximated optimization technique that reduces the NE optimization cost to  $O(n \log n)$ . The technique is based on realizing that in visualization the embedding space is necessarily very low-dimensional (2D or 3D), and hence efficient approximations developed for  $n$ -body force calculations can be applied. In gradient-based NE algorithms the gradient for an individual point decomposes into "forces" exerted by the other points. The contributions of close-by points need to be computed individually but far-away points can be approximated by their "center of mass", rapidly computable by applying a recursive decomposition of the visualization space into quadrants. The new algorithm brings a significant speed-up for medium-size data, and brings "big data" within reach of visualization.

### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Research Community on Data-to-Decision (D2D), Aalto University, University of Helsinki

Contributors: Yang, Z., Peltonen, J., Kaski, S.

Number of pages: 9

Pages: 786-794

Publication date: 2013

### Host publication information

Title of host publication: 30th International Conference on Machine Learning, ICML 2013

Publisher: International Machine Learning Society (IMLS)

Edition: PART 1

ASJC Scopus subject areas: Human-Computer Interaction, Sociology and Political Science

URLs:

<http://www.scopus.com/inward/record.url?scp=84897521276&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84897521276

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

### Recording and analyzing in-browser programming sessions

In this paper, we report on the analysis of a novel type of automatically recorded detailed programming session data collected on a university-level web programming course. We present a method and an implementation of collecting rich data on how students learning to program edit and execute code and explore its use in examining learners' behavior. The data collection instrument is an in-browser Python programming environment that integrates an editor, an execution environment, and an interactive Python console and is used to deliver programming assignments with automatic feedback. Most importantly, the environment records learners' interaction within it. We have implemented tools for viewing these traces and demonstrate their potential in learning about the programming processes of learners and of benefiting computing education research and the teaching of programming.

### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Regulation of learning and active learning methods (REALMEE), Aalto University, Department of Computer Science and Eng.

Contributors: Helminen, J., Ihantola, P., Karavirta, V.

Number of pages: 10

Pages: 13-22

Publication date: 2013

### Host publication information

Title of host publication: Proceedings - 13th Koli Calling International Conference on Computing Education Research, Koli Calling 2013

ISBN (Print): 9781450324823

ASJC Scopus subject areas: Human-Computer Interaction, Computer Networks and Communications, Computer Vision and Pattern Recognition, Software

Keywords: computer science education, computing education research, programming assignment, programming session, Python, web based programming environment

DOIs:

10.1145/2526968.2526970

URLs:

<http://www.scopus.com/inward/record.url?scp=84889581968&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84889581968

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

### **How to study programming on mobile touch devices - Interactive Python code exercises**

Scaffolded learning tasks where programs are constructed from predefined code fragments by dragging and dropping them (i.e. Parsons problems) are well suited to mobile touch devices, but quite limited in their applicability. They do not adequately cater for different approaches to constructing a program. After studying solutions to automatically assessed programming exercises, we found out that many different solutions are composed of a relatively small set of mutually similar code lines. Thus, they can be constructed by using the drag-and-drop approach if only it was possible to edit some small parts of the predefined fragments. Based on this, we have designed and implemented a new exercise type for mobile devices that builds on Parsons problems and falls somewhere between their strict scaffolding and full-blown coding exercises. In these exercises, we can gradually fade the scaffolding and allow programs to be constructed more freely so as not to restrict thinking and limit creativity too much while still making sure we are able to deploy them to small-screen mobile devices. In addition to the new concept and the related implementation, we discuss other possibilities of how programming could be practiced on mobile devices.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Regulation of learning and active learning methods (REALMEE), Department of Computer Science and Eng., Aalto University

Contributors: Ihantola, P., Helminen, J., Karavirta, V.

Number of pages: 8

Pages: 51-58

Publication date: 2013

#### **Host publication information**

Title of host publication: Proceedings - 13th Koli Calling International Conference on Computing Education Research, Koli Calling 2013

ISBN (Print): 9781450324823

ASJC Scopus subject areas: Human-Computer Interaction, Computer Networks and Communications, Computer Vision and Pattern Recognition, Software

Keywords: learning, mLearning, mobile learning, mobile touch devices, parsons problem, parsons puzzle, programming, Python, teaching

DOIs:

10.1145/2526968.2526974

URLs:

<http://www.scopus.com/inward/record.url?scp=84889570829&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84889570829

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

### **The innovations in learning and education SAVI**

This poster highlights a "Science Across Virtual Institutes" SAVI, involving sixteen research teams in Finland and the USA. The groups have formed a collaboration of eight teams (one research group from each country per team) devoted to research and development in learning sciences and technologies. The core unifying theme of the SAVI is a mission to find conditions under which immersive learner engagement can be routinely elicited.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Regulation of learning and active learning methods (REALMEE), Pepperdine University, University of Helsinki

Contributors: Hamilton, E., Multisilta, J.

Number of pages: 2  
Pages: 511-512  
Publication date: 2013

#### Host publication information

Title of host publication: Computer-Supported Collaborative Learning Conference, CSCCL

Volume: 2

ASJC Scopus subject areas: Human-Computer Interaction, Education

URLs:

<http://www.scopus.com/inward/record.url?scp=84886533677&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84886533677

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

#### Briefing news reporting with mobile assignments - Perceptions, needs and challenges

Mobile handheld devices are an increasing part of everyday fieldwork of news professionals. Mobile assignments delivered to mobile journalists' smartphones are one potential future development step. We present findings on using mobile assignments from two exploratory user studies in which smartphones were used as news reporting tools. Mobile assignments were perceived as handy for fast reporting situations and simple stories but challenging in case of more complex tasks. Structured information content of assignments, process phase based information and supporting situation and activity awareness would support the work of both editorial staff and mobile journalists. The locationing of reporters for sending location-based assignments was found acceptable for coordinating the work although some privacy concerns were expressed. The findings provide new information on using mobile assignments in work where carrying out tasks involves creativity and the tasks may be complex, not strictly limited or they may not have clear completion criteria. © 2012 ACM.

#### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Research area: User experience, Department of Software Systems, Augmented Human Activities (AHA), University of Central Lancashire

Contributors: Väättäjä, H., Egglestone, P.

Number of pages: 10

Pages: 485-494

Publication date: 2012

#### Host publication information

Title of host publication: Proceedings of the ACM 2012 conference on Computer Supported Cooperative Work CSCW'12 Seattle, WA, USA, February 11-15, 2012

Place of publication: New York, NY

Publisher: ACM

ISBN (Print): 9781450310864

#### Publication series

Name: ACM Conference on Computer Supported Cooperative Work

ASJC Scopus subject areas: Human-Computer Interaction, Software, Computer Networks and Communications

Keywords: assignment, crowdsourcing, journalist, location, mobile, news, privacy., professional, smartphone, task, work  
DOIs:

10.1145/2145204.2145280

URLs:

<http://www.scopus.com/inward/record.url?scp=84858260813&partnerID=8YFLogxK> (Link to publication in Scopus)

#### Bibliographical note

ei ut-numeroa 21.9.2013<br/>Contribution: organisation=ohj,FACT1=1<br/>Publisher name: ACM

Source: researchoutputwizard

Source ID: 5484

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

#### Location-based crowdsourcing of hyperlocal news - Dimensions of participation preferences

We studied the mobile users' preferences and concerns of using location-based assignments (LBA) and geotagging in crowdsourced news making. First, nine readers who had submitted reader's photos were interviewed about their perceptions of LBA and geotagging scenarios. Second, a quasi-experiment in field conditions was carried out with nineteen participants. After completing four LBA tasks with a mobile phone, participants were interviewed on their perceptions and asked to complete a questionnaire on their preferences for receiving LBA and usage of geotags. Findings indicate that the perceived benefits of LBA and geotagging are greater than the perceived risks. The task type, temporal

context, preciseness of location query, proximity to the reporting location, parallel tasks, social context and incentives affected the participation preferences. We propose a framework for participation preferences to support further studies in location-based crowdsourcing and in the development of crowdsourcing processes and systems. Copyright © 2012 by the Association for Computing Machinery, Inc. (ACM).

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Research area: User experience, Department of Software Systems, Augmented Human Activities (AHA), University of Tampere

Contributors: Väättäjä, H., Vainio, T., Sirkkunen, E.

Number of pages: 10

Pages: 85-94

Publication date: 2012

#### **Host publication information**

Title of host publication: Proceedings of the 17th ACM international conference on Supporting group work, GROUP '12, October 28-31, 2012, Sanibel Island, FL, USA

Place of publication: New York, NY

Publisher: ACM

ISBN (Print): 9781450314862

#### **Publication series**

Name: ACM International Conference on Supporting Group Work

ISSN (Print): 2154-9680

ASJC Scopus subject areas: Human-Computer Interaction, Computer Networks and Communications

Keywords: Assignment, Crowdsourcing, Location, News, Privacy, Reader, UGC, User-generated content

DOIs:

10.1145/2389176.2389189

URLs:

<http://www.acm.org/conferences/group/conferences/group12/>

#### **Bibliographical note**

Contribution: organisation=ohj,FACT1=1<br/>Publisher name: ACM

Source: researchoutputwizard

Source ID: 5488

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

#### **Towards usability heuristics for games utilizing speech recognition**

Speech recognition technology has reached the maturity required by serious business applications, and the game industry is increasingly adopting the technology. Since usability is one of the key elements of enjoyability and, thus, the successfulness of games, a thorough analysis of the elements, properties and effects of this new user interface is needed. However, there seems to be no existing speech interface usability analysis methods for computer games. A pragmatic and rigorous framework, which the game industry could easily adopt, could help the utilization of speech recognition technology. In this paper, we discuss the usefulness of voice recognition in games and propose usability heuristics for games utilizing speech recognition.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Managing digital industrial transformation (mDIT), University of Turku, Turku Centre for Computer Science, Business and Innovation Development (BID), Free Lancer

Contributors: Halonen, A., Hyrynsalmi, S., Kimppa, K. K., Knuutila, T., Smed, J., Hakonen, H.

Number of pages: 5

Pages: 51-55

Publication date: 2012

#### **Host publication information**

Title of host publication: 4th Asian Conference on Intelligent Games and Simulation, GAME-ON ASIA 2012 - 4th Asian Simulation Technology Conference, ASTEC 2012

Publisher: EUROSIS

ISBN (Electronic): 9789077381687

ASJC Scopus subject areas: Artificial Intelligence, Human-Computer Interaction, Modelling and Simulation

Keywords: Games, Speech interface, Speech recognition, Usability heuristics, Voice interaction

URLs:

<http://www.scopus.com/inward/record.url?scp=84922463768&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84922463768

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

### **Model for landmark highlighting in mobile web services**

We introduce a model for landmark highlighting for pedestrian route guidance services for mobile devices. The model determines which landmarks are the most attractive based on their properties in the current context of user's orientation and the location on the route and highlights these landmarks on the mobile map. The attractiveness of a landmark is based on its visual, structural and semantic properties which are used for calculating the total attractiveness of a single landmark. This model was evaluated with voluntary users conducted in laboratory environment. Test subjects were shown images of street intersections from where they selected the most attractive and prominent landmarks in the route's context. We then compared these results with the landmarks selected by the model. The results show that landmarks highlighted by the model were the same ones that were selected by the participants as most salient landmarks.

### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Augmented Human Activities (AHA)

Contributors: Kallioniemi, P., Turunen, M.

Publication date: 2012

### **Host publication information**

Title of host publication: Proceedings of the 11th International Conference on Mobile and Ubiquitous Multimedia, MUM 2012

Article number: 25

ISBN (Print): 9781450318150

ASJC Scopus subject areas: Computer Graphics and Computer-Aided Design, Computer Vision and Pattern Recognition, Human-Computer Interaction

Keywords: Landmarks, Mobile web services, Pedestrian route guidance

DOIs:

10.1145/2406367.2406398

URLs:

<http://www.scopus.com/inward/record.url?scp=84871605492&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84871605492

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

### **SiMPE: 7th Workshop on speech and sound in mobile and pervasive environments**

The SiMPE workshop series started in 2006 [2] with the goal of enabling speech processing on mobile and embedded devices to meet the challenges of pervasive environments (such as noise) and leveraging the context they offer (such as location). SiMPE 2010 and 2011 brought together researchers from the speech and the HCI communities. Multimodality got more attention in SiMPE 2008 than it had received in the previous years. In SiMPE 2007, the focus was on developing regions. Speech User interaction in cars was a focus area in 2009. With SiMPE 2012, the 7th in the series, we hope to explore the area of speech along with sound. When using the mobile in an eyes-free manner, it is natural and convenient to hear about notifications and events. The arrival of an SMS has used a very simple sound based notification for a long time now. The technologies underlying speech processing and sound processing are quite different and these communities have been working mostly independent of each other. And yet, for multimodal interactions on the mobile, it is perhaps natural to ask whether and how speech and sound can be mixed and used more effectively and naturally.

### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Augmented Human Activities (AHA), IBM Research, Carnegie Mellon University, HP Laboratories, National Research Council, University of Toronto, Canada

Contributors: Nanavati, A. A., Rajput, N., Rudnicky, A. I., Turunen, M., Sandholm, T., Munteanu, C., Penn, G.

Number of pages: 3

Pages: 251-253

Publication date: 2012

### **Host publication information**

Title of host publication: MobileHCI'12 - Companion Proceedings of the 14th International Conference on Human Computer Interaction with Mobile Devices and Services

ISBN (Print): 9781450311052

ASJC Scopus subject areas: Computer Networks and Communications, Human-Computer Interaction, Information Systems, Software

Keywords: Audio interaction, Mobile computing, Pervasive computing, Sound, Speech processing

DOIs:

10.1145/2371664.2371727

URLs:

<http://www.scopus.com/inward/record.url?scp=84867703942&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84867703942

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

### **Continuous Edgewise: Dictionary-based disambiguation instead of explicit segmentation by the user**

Edgewise is a text entry method where the user follows the edges of a physical guiding rectangle to enter corner sequences that are interpreted as characters. The original Edgewise character set resembles the Latin alphabet and includes explicit character segmentation by lifting the stylus (or centering the joystick, etc). We present a variant of Edgewise that we call the continuous Edgewise. It relies on a dictionary instead of user's character segmentation to disambiguate words. New users can use the continuous Edgewise with the help of an interactive visualization of possible continuations while writing. In a 6-session user study we measured initial text transcription performance (increased from 1 to 5.4 wpm) and the ratio of observed explicit segmentations to optimal continuous writing (decreased from 2.5 to 1.5). These results show that it is possible to learn to use the continuous writing mode, but also that the learning takes some time.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Augmented Human Activities (AHA), Université de Lorraine

Contributors: Martin, B., Isokoski, P., Karmann, G., Rollinger, T.

Number of pages: 8

Pages: 357-364

Publication date: 2012

#### **Host publication information**

Title of host publication: Proceedings of the Working Conference on Advanced Visual Interfaces, AVI 2012

ISBN (Print): 9781450312875

ASJC Scopus subject areas: Software, Human-Computer Interaction

Keywords: continuous writing, dictionary, disambiguation, EdgeWrite, segmentation, text entry

DOIs:

10.1145/2254556.2254625

URLs:

<http://www.scopus.com/inward/record.url?scp=84863566610&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84863566610

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

### **Comparison of video-based pointing and selection techniques for hands-free text entry**

Video-based human-computer interaction has received increasing interest over the years. However, earlier research has been mainly focusing on technical characteristics of different methods rather than on user performance and experiences in using computer vision technology. This study aims to investigate performance characteristics of novice users and their subjective experiences in typing text with several video-based pointing and selection techniques. In Experiment 1, eye tracking and head tracking were applied for the task of pointing at the keys of a virtual keyboard. The results showed that gaze pointing was significantly faster but also more erroneous technique as compared with head pointing. Self-reported subjective ratings revealed that it was generally better, faster, more pleasant and efficient to type using gaze pointing than head pointing. In Experiment 2, mouth open and brows up facial gestures were utilized for confirming the selection of a given character. The results showed that text entry speed was approximately the same for both selection techniques, while mouth interaction caused significantly fewer errors than brow interaction. Subjective ratings did not reveal any significant differences between the techniques. Possibilities for design improvements are discussed.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Augmented Human Activities (AHA)

Contributors: Gizatdinova, Y., Špakov, O., Surakka, V.

Number of pages: 8

Pages: 132-139



Publication date: 2012

### Host publication information

Title of host publication: Proceedings of the Working Conference on Advanced Visual Interfaces, AVI 2012

ISBN (Print): 9781450312875

ASJC Scopus subject areas: Software, Human-Computer Interaction

Keywords: computer vision, eye tracking, face detection, text entry, video-based interaction, virtual keyboard, visual gesture

DOIs:

10.1145/2254556.2254582

URLs:

<http://www.scopus.com/inward/record.url?scp=84863593939&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84863593939

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

### Gaze gestures or dwell-based interaction?

The two cardinal problems recognized with gaze-based interaction techniques are: how to avoid unintentional commands, and how to overcome the limited accuracy of eye tracking. Gaze gestures are a relatively new technique for giving commands, which has the potential to overcome these problems. We present a study that compares gaze gestures with dwell selection as an interaction technique. The study involved 12 participants and was performed in the context of using an actual application. The participants gave commands to a 3D immersive game using gaze gestures and dwell icons. We found that gaze gestures are not only a feasible means of issuing commands in the course of game play, but they also exhibited performance that was at least as good as or better than dwell selections. The gesture condition produced less than half of the errors when compared with the dwell condition. The study shows that gestures provide a robust alternative to dwell-based interaction with the reliance on positional accuracy being substantially reduced.

### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Augmented Human Activities (AHA), De Montfort University

Contributors: Hyrskykari, A., Istance, H., Vickers, S.

Number of pages: 4

Pages: 229-232

Publication date: 2012

### Host publication information

Title of host publication: Proceedings - ETRA 2012: Eye Tracking Research and Applications Symposium

ISBN (Print): 9781450312257

ASJC Scopus subject areas: Computer Vision and Pattern Recognition, Human-Computer Interaction, Ophthalmology, Sensory Systems

Keywords: assistive input devices, eye tracking, gaze and gaming, gaze gestures, physically disabled user groups

DOIs:

10.1145/2168556.2168602

URLs:

<http://www.scopus.com/inward/record.url?scp=84862671730&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84862671730

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

### Comparison of eye movement filters used in HCI

We compared various real-time filters designed to denoise eye movements from low-sampling devices. Most of the filters found in literature were implemented and tested on data gathered in a previous study. An improvement was proposed for one of the filters. Parameters of each filter were adjusted to ensure their best performance. Four estimation parameters were proposed as criteria for comparison. The output from the filters was compared against two idealized signals (the signals denoised offline). The study revealed that FIR filters with triangular or Gaussian kernel (weighting) functions and parameters dependent on signal state show the best performance.

### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Augmented Human Activities (AHA)

Contributors: Špakov, O.

Number of pages: 4

Pages: 281-284  
Publication date: 2012

#### Host publication information

Title of host publication: Proceedings - ETRA 2012: Eye Tracking Research and Applications Symposium  
ISBN (Print): 9781450312257  
ASJC Scopus subject areas: Computer Vision and Pattern Recognition, Human-Computer Interaction, Ophthalmology, Sensory Systems  
Keywords: algorithms, eye tracking, filters, gaze, smoothing  
DOIs:  
10.1145/2168556.2168616  
URLs:  
<http://www.scopus.com/inward/record.url?scp=84862667279&partnerID=8YFLogxK> (Link to publication in Scopus)  
Source: Scopus  
Source ID: 84862667279  
Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

#### Simple gaze gestures and the closure of the eyes as an interaction technique

We created a set of gaze gestures that utilize the following three elements: simple one-segment gestures, off-screen space, and the closure of the eyes. These gestures are to be used as the moving tool in a gaze-only controlled drawing application. We tested our gaze gestures with 24 participants and analyzed the gesture durations, the accuracy of the stops, and the gesture performance. We found that the difference in gesture durations between short and long gestures was so small that there is no need to choose between them. The stops made by closing both eyes were accurate, and the input method worked well for this purpose. With some adjustments and with the possibility for personal settings, the gesture performance and the accuracy of the stops can become even better.

#### General information

Publication status: Published  
MoE publication type: A4 Article in a conference publication  
Organisations: Augmented Human Activities (AHA)  
Contributors: Heikkilä, H., Rähä, K. J.  
Number of pages: 8  
Pages: 147-154  
Publication date: 2012

#### Host publication information

Title of host publication: Proceedings - ETRA 2012: Eye Tracking Research and Applications Symposium  
ISBN (Print): 9781450312257  
ASJC Scopus subject areas: Computer Vision and Pattern Recognition, Human-Computer Interaction, Ophthalmology, Sensory Systems  
Keywords: closure of both eyes, eye tracking, gaze control, gaze gestures, gaze-based interaction, off-screen space  
DOIs:  
10.1145/2168556.2168579  
URLs:  
<http://www.scopus.com/inward/record.url?scp=84862701036&partnerID=8YFLogxK> (Link to publication in Scopus)  
Source: Scopus  
Source ID: 84862701036  
Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

#### The validity of using non-representative users in gaze communication research

Gaze-based interaction techniques have been investigated for the last two decades, and in many cases the evaluation of these has been based on trials with able-bodied users and conventional usability criteria, mainly speed and accuracy. The target user group of many of the gaze-based techniques investigated is, however, people with different types of physical disabilities. We present the outcomes of two studies that compare the performance of two groups of participants with a type of physical disability (one being cerebral palsy and the other muscular dystrophy) with that of a control group of able-bodied participants doing a task using a particular gaze interaction technique. One study used a task based on dwell-time selection, and the other used a task based on gaze gestures. In both studies, the groups of participants with physical disabilities performed significantly worse than the able-bodied control participants. We question the ecological validity of research into gaze interaction intended for people with physical disabilities that only uses able-bodied participants in evaluation studies without any testing using members of the target user population.

#### General information

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

Organisations: Augmented Human Activities (AHA), De Montfort University  
Contributors: Istance, H., Vickers, S., Hyrskykari, A.  
Number of pages: 4  
Pages: 233-236  
Publication date: 2012

#### Host publication information

Title of host publication: Proceedings - ETRA 2012: Eye Tracking Research and Applications Symposium  
ISBN (Print): 9781450312257  
ASJC Scopus subject areas: Computer Vision and Pattern Recognition, Human-Computer Interaction, Ophthalmology, Sensory Systems  
Keywords: assistive input devices, eye tracking, gaze communication, physically disabled user groups, representative users  
DOIs:  
10.1145/2168556.2168603  
URLs:  
<http://www.scopus.com/inward/record.url?scp=84862702657&partnerID=8YFLogxK> (Link to publication in Scopus)  
Source: Scopus  
Source ID: 84862702657  
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

#### Designing and evaluating text entry methods

Our workshop has three primary goals. The first goal is community building: we want to get text entry researchers that are active in different communities into one place. Our second goal is to promote CHI as a natural and compelling focal point for all kinds of text entry research. The third goal is to discuss some difficult issues that are hard or near impossible to handle within the traditional format of research papers.

#### General information

Publication status: Published  
MoE publication type: A4 Article in a conference publication  
Organisations: Augmented Human Activities (AHA), University of St Andrews, Georgia Institute of Technology, University of Strathclyde, Oregon Health and Science University, Montana Tech., University of Dundee, Visiting Graduate Student in Department of Urban Design and Planning, University of Washington, Seattle, USA 1.1.2012-15.6.2012 (12.9.2011 alkaen)  
Contributors: Kristensson, P. O., Clawson, J., Dunlop, M., Isokoski, P., Roark, B., Vertanen, K., Waller, A., Wobbrock, J.  
Number of pages: 4  
Pages: 2747-2750  
Publication date: 2012

#### Host publication information

Title of host publication: Extended Abstracts - The 30th ACM Conference on Human Factors in Computing Systems, CHI 2012  
ISBN (Print): 9781450310161  
ASJC Scopus subject areas: Human-Computer Interaction, Computer Graphics and Computer-Aided Design, Software  
Keywords: accessibility, augmentative and alternative communication, internationalization, text entry  
DOIs:  
10.1145/2212776.2212711  
URLs:  
<http://www.scopus.com/inward/record.url?scp=84862678655&partnerID=8YFLogxK> (Link to publication in Scopus)  
Source: Scopus  
Source ID: 84862678655  
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

#### An exploratory study of eye typing fundamentals: Dwell time, text entry rate, errors, and workload

Although eye typing (typing on an on-screen keyboard via one's eyes as they are tracked by an eye tracker) has been studied for more than three decades now, we still know relatively little about it from the users' point of view. Standard metrics such as words per minute and keystrokes per character yield information only about the effectiveness of the technology and the interaction techniques developed for eye typing. We conducted an extensive study with almost five hours of eye typing per participant and report on extended qualitative and quantitative analysis of the relationship of dwell time, text entry rate, errors made, and workload experienced by the participants. The analysis method is comprehensive and stresses the need to consider different metrics in unison. The results highlight the importance of catering for individual differences and lead to suggestions for improvements in the interface.

#### General information

Publication status: Published  
MoE publication type: A4 Article in a conference publication  
Organisations: Augmented Human Activities (AHA)  
Contributors: Rähkä, K. J., Ovaska, S.  
Number of pages: 10  
Pages: 3001-3010  
Publication date: 2012

#### Host publication information

Title of host publication: Conference Proceedings - The 30th ACM Conference on Human Factors in Computing Systems, CHI 2012  
ISBN (Print): 9781450310154  
ASJC Scopus subject areas: Human-Computer Interaction, Computer Graphics and Computer-Aided Design, Software  
Keywords: Adjustable dwell time, Error analysis, Extended study, Eye tracking, Eye typing, Workload  
DOIs:  
10.1145/2207676.2208711  
URLs:  
<http://www.scopus.com/inward/record.url?scp=84862102858&partnerID=8YFLogxK> (Link to publication in Scopus)  
Source: Scopus  
Source ID: 84862102858  
Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

#### Haptic visualization of bathymetric data

Visualization of water depth in geographical maps is limited by contour line density and by human ability to distinguish a subtle difference of the color gradient at a specific map scale. We were interested in whether it is possible to increase the accuracy of subjective assessment of the bathymetric information coded by color intensity when visual observation would be complemented with haptic feedback presented as a function of the water depth. This paper describes the results of an evaluation of the new interaction technique that has potential to increase the estimation accuracy of color-coded information presented in a two-dimensional space of a topographic map. In particular, it was demonstrated that untrained subjects could accurately navigate between two geographic locations on the map of the lake by providing the necessary depth when values of the color intensity were associated with haptic feedback presented as a function of the lake floor. A comparative evaluation of the accuracy of navigation was carried out visually, using a regular mouse, and instrumentally with the StickGrip haptic device. The accuracy of navigation with the StickGrip haptic device appears to be higher by 14.25% to 23.5% in a range of bathymetric data of 40-140 m. We confirmed that a kinesthetic sense of distance to the surface of interaction (tablet) and self-perception of the finger joint-angle positions enhance the accuracy in distinguishing the color intensity of the digital map. The new mobile technique can be used as an alternative to the earlier non-mobile force-feedback devices for interaction with geospatial data.

#### General information

Publication status: Published  
MoE publication type: A4 Article in a conference publication  
Organisations: Augmented Human Activities (AHA)  
Contributors: Evreinova, T. V., Evreinov, G., Raisamo, R.  
Number of pages: 6  
Pages: 359-364  
Publication date: 2012

#### Host publication information

Title of host publication: Haptics Symposium 2012, HAPTICS 2012 - Proceedings  
Article number: 6183815  
ISBN (Print): 9781467308090  
ASJC Scopus subject areas: Human-Computer Interaction  
Keywords: data exploration, geovisualization, haptic feedback, human-computer interaction, virtual environments  
DOIs:  
10.1109/HAPTIC.2012.6183815  
URLs:  
<http://www.scopus.com/inward/record.url?scp=84860816274&partnerID=8YFLogxK> (Link to publication in Scopus)  
Source: Scopus  
Source ID: 84860816274  
Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

#### Efficient optimization for data visualization as an information retrieval task

Visualization of multivariate data sets is often done by mapping data onto a low-dimensional display with nonlinear dimensionality reduction (NLDR) methods. Many NLDR methods are designed for tasks like manifold learning rather than low-dimensional visualization, and can perform poorly in visualization. We have introduced a formalism where NLDR for

visualization is treated as an information retrieval task, and a novel NLDR method called the Neighbor Retrieval Visualizer (NeRV) which outperforms previous methods. The remaining concern is that NeRV has quadratic computational complexity with respect to the number of data. We introduce an efficient learning algorithm for NeRV where relationships between data are approximated through mixture modeling, yielding efficient computation with near-linear computational complexity with respect to the number of data. The method inherits the information retrieval interpretation from the original NeRV, it is much faster to optimize as the number of data grows, and it maintains good visualization performance.

#### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Research Community on Data-to-Decision (D2D), Aalto University

Contributors: Peltonen, J., Georgatzis, K.

Publication date: 2012

#### Host publication information

Title of host publication: 2012 IEEE International Workshop on Machine Learning for Signal Processing - Proceedings of MLSP 2012

Article number: 6349797

ISBN (Print): 9781467310260

ASJC Scopus subject areas: Human-Computer Interaction, Signal Processing

Keywords: dimensionality reduction, efficient computation, mixture modeling, neighbor retrieval, Visualization

DOIs:

10.1109/MLSP.2012.6349797

URLs:

<http://www.scopus.com/inward/record.url?scp=84870701014&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84870701014

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

#### Reducing the number of unit tests with design by contract

Design by Contract (DbC) and unit testing (UT) are complementary approaches to improve the belief of correctness and the quality of the software. The interplay between the two techniques has been studied previously, e.g., in the use of test oracles and test automation. However, we propose that DbC should drive the UT to become more cost-effective. The paper demonstrates some means for this approach by showing how to test a mapping data structure entirely with just one unit test script.

#### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Managing digital industrial transformation (mDIT), Department of Information Technology, Turku Centre for Computer Science, University of Turku

Contributors: Hakonen, H., Hyrnsalmi, S., Järvi, A.

Number of pages: 6

Pages: 161-166

Publication date: 2011

#### Host publication information

Title of host publication: Computer Systems and Technologies - 12th International Conference, CompSysTech'11 - Proceedings

Volume: 578

ISBN (Print): 9781450309172

ASJC Scopus subject areas: Human-Computer Interaction, Computer Networks and Communications, Computer Vision and Pattern Recognition, Software

Keywords: contract cohesion graph, design by contract, unit testing

DOIs:

10.1145/2023607.2023635

Source: Scopus

Source ID: 80052810613

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

#### Interpretation of ambiguous images inspected by the StickGrip device

Interpretation of ambiguous images perceived visually and relying on supplementary information coordinated with pictorial cues was selected to evaluate the usefulness of the StickGrip device. The ambiguous visual models were achromatic images composed from only two overlapping ellipses with various brightness gradients and relative position of the components. Inspection of images by the tablet pen enhanced with the pencil-like visual pointer decreased discrepancy

between their actual interpretation and expected decision by only about 2.6 for concave and by about 1.3 for convex models. Interpretation of the convex images ambiguous with their inverted concave counterparts inspected by the StickGrip device achieved three times less discrepancy between decisions made and expected. Interpretation of the concave images versus inverted convex counterparts was five times more accurate with the use of the StickGrip device. We conclude that the kinesthetic and proprioceptive cues delivered by the StickGrip device had a positive influence on the decision-making under ambiguous conditions.

#### **General information**

Publication status: Published  
MoE publication type: A4 Article in a conference publication  
Organisations: Augmented Human Activities (AHA)  
Contributors: Evreinova, T. V., Evreinov, G., Raisamo, R.  
Number of pages: 8  
Pages: 209-216  
Publication date: 2011

#### **Host publication information**

Title of host publication: Proceedings of the IADIS International Conference Interfaces and Human Computer Interaction 2011, Part of the IADIS Multi Conference on Computer Science and Information Systems 2011, MCCSIS 2011  
ISBN (Print): 9789728939526  
ASJC Scopus subject areas: Human-Computer Interaction, Information Systems  
Keywords: Kinesthetic feedback, Pen-based interaction, Pictorial depth, StickGrip haptic device, Surface computing  
URLs:  
<http://www.scopus.com/inward/record.url?scp=84860816622&partnerID=8YFLogxK> (Link to publication in Scopus)  
Source: Scopus  
Source ID: 84860816622  
Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

#### **SiMPE: 6th Workshop on Speech in Mobile and Pervasive Environments**

With the proliferation of pervasive devices and the increase in their processing capabilities, client-side speech processing has been emerging as a viable alternative. The SiMPE workshop series started in 2006 [5] with the goal of enabling speech processing on mobile and embedded devices to meet the challenges of pervasive environments (such as noise) and leveraging the context they offer (such as location). SiMPE 2010, the latest in the series brought together, very successfully, researchers from the speech and the HCI communities. We believe this is the beginning. SiMPE 2011, the 6th in the series, will continue to explore issues, possibilities, and approaches for enabling speech processing as well as convenient and effective speech and multimodal user interfaces. Over the years, SiMPE has been evolving too, and since last year, one of our major goals has been to increase the participation of speech/multimodal HCI designers, and increase their interactions with speech processing experts. Multimodality got more attention in SiMPE 2008 than it has received in the previous years. In SiMPE 2007 [4], the focus was on developing regions. Given the importance of speech in developing regions, SiMPE 2008 had "SiMPE for developing regions" as a topic of interest. Speech User interaction in cars was a focus area in 2009 [2].

#### **General information**

Publication status: Published  
MoE publication type: A4 Article in a conference publication  
Organisations: Augmented Human Activities (AHA), IBM Research, Carnegie Mellon University, Univ. of New Hampshire, Microsoft Research  
Contributors: Nanavati, A. A., Rajput, N., Rudnický, A. I., Turunen, M., Kun, A. I., Paek, T., Tashev, I.  
Number of pages: 3  
Pages: 733-735  
Publication date: 2011

#### **Host publication information**

Title of host publication: Mobile HCI 2011 - 13th International Conference on Human-Computer Interaction with Mobile Devices and Services  
ISBN (Print): 9781450305419  
ASJC Scopus subject areas: Computer Networks and Communications, Human-Computer Interaction  
Keywords: mobile computing, pervasive computing, speech processing  
DOIs:  
10.1145/2037373.2037500  
URLs:  
<http://www.scopus.com/inward/record.url?scp=80054831380&partnerID=8YFLogxK> (Link to publication in Scopus)  
Source: Scopus  
Source ID: 80054831380  
Research output: Chapter in Book/Report/Conference proceeding > Conference contribution > Scientific > peer-review

### **Multimodal multi-device program guide for smart conferences**

We demonstrate a multimodal, multi-user, and multi-device conference program guide for conference participants. Its functionality includes access to the conference program with additional multimedia content, voting, feedback, and communication with the other participants. People can interact with the system in a multimodal way using spoken language, gestures and haptic feedback with mobile phones and shared public displays.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Augmented Human Activities (AHA)

Contributors: Turunen, M., Hella, J., Miettinen, T., Valkama, P., Hakulinen, J., Raisamo, R.

Number of pages: 4

Pages: 679-682

Publication date: 2011

#### **Host publication information**

Title of host publication: Mobile HCI 2011 - 13th International Conference on Human-Computer Interaction with Mobile Devices and Services

ISBN (Print): 9781450305419

ASJC Scopus subject areas: Computer Networks and Communications, Human-Computer Interaction

Keywords: conference systems, electronic program guides, gestures, multimodal interaction, speech interfaces, spoken interaction

DOIs:

10.1145/2037373.2037483

URLs:

<http://www.scopus.com/inward/record.url?scp=80054840305&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 80054840305

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

### **We need to talk: Rediscovering audio for universal access (A panel)**

"In all the wonderful worlds that writing opens, the spoken word still resides and lives. Written texts all have to be related somehow, directly or indirectly, to the world of sound, the natural habitat of language, to yield their meanings." Only 22% of the human population accesses the Internet. The larger fraction of the world cannot read or write. Worldwide, 284 million people are visually impaired. And yet, there are 5.3 billion mobile subscribers, and their numbers are increasing. Much of the mobile work by HCI researchers explores a future world populated by high-end devices and relatively affluent users. This panel turns to consider the hundreds of millions of people for whom such sophistication will not be realised for many years to come. How should we design interfaces and services that are relevant and beneficial for them?

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Augmented Human Activities (AHA), University of Glasgow, University of Swansea, IBM Research, University of Duisburg-Essen

Contributors: Brewster, S., Jones, M., Murray-Smith, R., Nanavati, A. A., Rajput, N., Schmidt, A., Turunen, M.

Number of pages: 2

Pages: 715-716

Publication date: 2011

#### **Host publication information**

Title of host publication: Mobile HCI 2011 - 13th International Conference on Human-Computer Interaction with Mobile Devices and Services

ISBN (Print): 9781450305419

ASJC Scopus subject areas: Computer Networks and Communications, Human-Computer Interaction

Keywords: mobile speech, mobile user interfaces, speech user interfaces

DOIs:

10.1145/2037373.2037494

URLs:

<http://www.scopus.com/inward/record.url?scp=80054832996&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 80054832996

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

### **Presenting spatial tactile messages with a hand-held device**

This paper introduces a multi-actuator tactile device designed for remote touch communication. While closely-spaced high-frequency vibrotactile actuators can be difficult to distinguish, our system utilized four linear DC motors for presenting spatial tactile messages through low-frequency actuation. An experiment was conducted to determine accuracy for recognizing stimuli presented on the palm of the hand. Participants were asked to identify 10 predefined stimulus patterns created from the four linear actuators positioned in either a diamond or square configuration. Results showed that positional, linear, and circular stimuli were recognized with mean response accuracies of 98.8, 96.5, and 90.2 %, respectively. No statistically significant differences were found between the actuator configurations. These findings can be utilized in developing a remote communication channel that supports the transfer of spatial aspects of touch such as mapping the location of finger touch of one user to tactile sensation on the palm of another user.

### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Augmented Human Activities (AHA), mediaX and H\*STAR Stanford University Stanford

Contributors: Rantala, J., Myllymaa, K., Raisamo, R., Lylykangas, J., Surakka, V., Shull, P., Cutkosky, M.

Number of pages: 6

Pages: 101-106

Publication date: 2011

### **Host publication information**

Title of host publication: 2011 IEEE World Haptics Conference, WHC 2011

Article number: 5945469

ISBN (Print): 9781457702976

ASJC Scopus subject areas: Human-Computer Interaction

Keywords: Haptics, spatial feedback, tactile communication, tactile stimulation

DOIs:

10.1109/WHC.2011.5945469

URLs:

<http://www.scopus.com/inward/record.url?scp=79961190512&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 79961190512

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

### **Comparison of gaze-to-objects mapping algorithms**

Gaze data processing is an important and necessary step in gaze-based applications. This study focuses on the comparison of several gaze-to-object mapping algorithms using various dwell times for selection and presenting targets of several types and sizes. Seven algorithms found in literature were compared against two newly designed algorithms. The study revealed that a fractional mapping algorithm (known) has produced the highest rate of correct selections and fastest selection times, but also the highest rate of incorrect selections. The dynamic competing algorithm (designed) has shown the next best result, but also high rate of incorrect selections. A small impact on the type of target to the calculated statistics has been observed. A strictly centered gazing has helped to increase the rate of correct selections for all algorithms and types of targets. The directions for further mapping algorithms improvement and future investigation have been explained.

### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Augmented Human Activities (AHA)

Contributors: Špakov, O.

Publication date: 2011

### **Host publication information**

Title of host publication: Proceedings of the 1st Conference on Novel Gaze-Controlled Applications, NGCA'11

Article number: 6

ISBN (Print): 9781450306805

ASJC Scopus subject areas: Human-Computer Interaction, Computer Networks and Communications, Computer Vision and Pattern Recognition, Software

Keywords: Algorithm design, Eye gaze pointing and selection, Gaze controlled applications, Gaze to object mapping

DOIs:

10.1145/1983302.1983308

URLs:

<http://www.scopus.com/inward/record.url?scp=79960161638&partnerID=8YFLogxK> (Link to publication in Scopus)



Source: Scopus

Source ID: 79960161638

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

### Designing tactile feedback for piezo buttons

The present aim was to study the preference of tactile feedback stimulations given by non-physical (i.e., solid) piezo-actuated buttons. Participants (n=16) ranked 16 different tactile feedback stimuli varied by 4 output delays and 4 vibration durations. The results showed that the mean ranks of the stimuli differed significantly from each other. The timing parameters of delay and duration interacted with each other, for example, so that preference of certain vibration duration fluctuated in response to different output delays. Using a very short time window (i.e., 10-453 ms) combining both delay and duration parameters of the feedback could result either in favorable or significantly less favorable subjective experience. The results suggest that a preferred perception of tactile feedback from non-physical buttons requires careful design and controlling of the timing parameters.

#### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Augmented Human Activities (AHA), School of Management (JKK), Aito Interactive Inc

Contributors: Lylykangas, J., Surakka, V., Salminen, K., Raisamo, J., Laitinen, P., Rönning, K., Raisamo, R.

Number of pages: 4

Pages: 3281-3284

Publication date: 2011

#### Host publication information

Title of host publication: CHI 2011 - 29th Annual CHI Conference on Human Factors in Computing Systems, Conference Proceedings and Extended Abstracts

ISBN (Print): 9781450302289

ASJC Scopus subject areas: Computer Graphics and Computer-Aided Design, Human-Computer Interaction, Software

Keywords: Delay, Haptics, Interaction design, Lag, Non-physical buttons, Piezo-electric, Tactile feedback

DOIs:

10.1145/1978942.1979428

URLs:

<http://www.scopus.com/inward/record.url?scp=79958177983&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 79958177983

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

### On the costs of multiple trajectory pointing methods

Several enhanced pointing techniques aim to reduce the Fitts' law targeting distance by providing multiple target trajectories in the hope that a shorter path is available. However, these techniques introduce a search or decision component to pointing - users must examine the alternatives available and decide upon the trajectory to use. We analyse these difficulties, present a methodology for examining them as well as other behaviour issues, and report empirical results of performance with pointer wrapping and Ninja cursors. Results show that offering multiple trajectories incurs a significant search or decision cost, and that users are therefore poor at capitalising on the theoretical benefits of reduced target distance.

#### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Augmented Human Activities (AHA), University of Canterbury, Polytech' Paris-Sud

Contributors: Quinn, P., Cockburn, A., Rähkä, K. J., Delamarche, J.

Number of pages: 4

Pages: 859-862

Publication date: 2011

#### Host publication information

Title of host publication: CHI 2011 - 29th Annual CHI Conference on Human Factors in Computing Systems, Conference Proceedings and Extended Abstracts

ISBN (Print): 9781450302289

ASJC Scopus subject areas: Human-Computer Interaction, Computer Graphics and Computer-Aided Design, Software

Keywords: Fitts' law, Multiple trajectories, Ninja cursors, Pointing, Search/decision, Wrapping cursors

DOIs:

10.1145/1978942.1979067

URLs:

<http://www.scopus.com/inward/record.url?scp=79958170256&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 79958170256

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

### **Squeeze vs. tilt: A comparative study using continuous tactile feedback**

This paper presents an investigation into the performance of squeezing as a manipulative interaction technique in comparison to tilting with an aim to answer two questions: is squeezing an effective input technique for mobile devices and can tactile feedback improve performance? The experiment results show that both input methods are viable but squeezing is significantly faster and more sustainable than tilting (with and without tactile feedback).

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Augmented Human Activities (AHA), Nokia

Contributors: Hoggan, E., Trendafilov, D., Ahmaniemi, T., Raisamo, R.

Number of pages: 6

Pages: 1309-1314

Publication date: 2011

#### **Host publication information**

Title of host publication: CHI EA 2011 - 29th Annual CHI Conference on Human Factors in Computing Systems, Conference Proceedings and Extended Abstracts

ISBN (Print): 9781450302289

ASJC Scopus subject areas: Software, Human-Computer Interaction, Computer Graphics and Computer-Aided Design

Keywords: Haptic I/O, Mobile interaction, Pressure, Squeeze

DOIs:

10.1145/1979742.1979766

URLs:

<http://www.scopus.com/inward/record.url?scp=79957943879&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 79957943879

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

### **Facial expression classification based on local spatiotemporal edge and texture descriptors**

Facial expressions are emotionally, socially and otherwise meaningful reflective signals in the face. Facial expressions play a critical role in human life, providing an important channel of nonverbal communication. Automation of the entire process of expression analysis can potentially facilitate human-computer interaction, making it to resemble mechanisms of human-human communication. In this paper, we present an ongoing research that aims at development of a novel spatiotemporal approach to expression classification in video. The novelty comes from a new facial representation that is based on local spatiotemporal feature descriptors. In particular, a combined dynamic edge and texture information is used for reliable description of both appearance and motion of the expression. Support vector machines are utilized to perform a final expression classification. The planned experiments will further systematically evaluate the performance of the developed method with several databases of complex facial expressions.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Augmented Human Activities (AHA), Univ of Oulu

Contributors: Gizatdinova, Y., Surakka, V., Zhao, G., Mäkinen, E., Raisamo, R.

Publication date: 2011

#### **Host publication information**

Title of host publication: Selected Papers from the Proceedings of the 7th International Conference on Methods and Techniques in Behavioral Research - Digital Edition, MB'10

Article number: 21

ISBN (Print): 9781605589268

ASJC Scopus subject areas: Human-Computer Interaction, Computer Networks and Communications, Computer Vision and Pattern Recognition, Software

Keywords: Action unit, Emotion, Expression classification, Facial expression, Human behaviour understanding, Local binary pattern, Local oriented edge, Spatiotemporal descriptor

DOIs:

10.1145/1931344.1931365

URLs:

<http://www.scopus.com/inward/record.url?scp=79952499491&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 79952499491

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

### **Of discs, boxes and cartridges: The material life of digital games**

So far the field of game studies has mostly bypassed the everyday meanings attached to the material manifestations of digital games. Based on qualitative survey data, this article examines what kind of personal and collective values are attached to the physical copies of games, including the storage medium and packaging. The results show how materiality resonates with the reliability and unambiguity of ownership. Furthermore, games as physical objects can have a key role in the project of creating a home, receiving their meaning as part of a wider technological and popular cultural meaning structure. Finally, collecting associates games with more general issues of identity, sociability and history. Through storing and organising games and having them on display, gamers position themselves as part of game culture, gather subcultural capital and ensure the possibility for nostalgia.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Mathematical modelling with wide societal impact (MathImpact)

Contributors: Toivonen, S., Sotamaa, O.

Publication date: 2011

#### **Host publication information**

Title of host publication: Proceedings of DiGRA 2011 Conference: Think Design Play

ASJC Scopus subject areas: Computer Graphics and Computer-Aided Design, Human-Computer Interaction, Software

Keywords: Collecting, Digital distribution, Domestication, Game culture, Material culture, Nostalgia, Physical copies

URLs:

<http://www.scopus.com/inward/record.url?scp=84873337886&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84873337886

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

### **The making of Nordic larp: Documenting a tradition of ephemeral co-creative play**

Research and documentation of live action role-playing games, or larps, must tackle problems of ephemerality, subjectivity, first person audience and co-creation, as well as the underlying question of what larps are. In this paper these challenges are outlined and solutions to handling them are proposed. This is done through the prism of producing a picture-heavy art book on Nordic larp. The paper also discussed the problems of writing about game cultures as an insider and makes a case for addressing normative choices in game descriptions head on.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Mathematical modelling with wide societal impact (MathImpact)

Contributors: Stenros, J., Montola, M.

Publication date: 2011

#### **Host publication information**

Title of host publication: Proceedings of DiGRA 2011 Conference: Think Design Play

ASJC Scopus subject areas: Computer Graphics and Computer-Aided Design, Human-Computer Interaction, Software

Keywords: Documentation, Game culture, Games, Larp, Nordic, Play, Role-playing games

URLs:

<http://www.scopus.com/inward/record.url?scp=84873389573&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84873389573

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

### **Narrative friction in Alternate Reality Games: Design insights from conspiracy for good**

Alternate Reality Games (ARG) tend to have story-driven game structures. Hence, it is useful to investigate how player activities interact with the often pre-scripted storyline in this genre. In this article, we report on a study of a particular ARG production, Conspiracy For Good (CFG), which was at the same time emphasising the role of strong storytelling, and active on-site participation by players. We uncover multiple levels of friction between the story content and the mode of play of live participants, but also between live and online participation. Based on the observations from the production, we present design recommendations for future productions with similar goals.

### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Mathematical modelling with wide societal impact (MathImpact), Nokia, Stockholm University

Contributors: Stenros, J., Holopainen, J., Waern, A., Montola, M., Ollila, E.

Publication date: 2011

### Host publication information

Title of host publication: Proceedings of DiGRA 2011 Conference: Think Design Play

ASJC Scopus subject areas: Computer Graphics and Computer-Aided Design, Human-Computer Interaction, Software

Keywords: ARG, Design, Gameplay, Games, Larp, Narrative, Pervasive, Transmedia

URLs:

<http://www.scopus.com/inward/record.url?scp=84873344376&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84873344376

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

### Framework for designing and evaluating game achievements

This paper presents a framework for evaluating and designing game design patterns commonly called as "achievements".

The results are based on empirical studies of a variety of popular achievement systems. The results, along with the framework for analyzing and designing achievements, present two definitions of game achievements. From the

perspective of the achievement system, an achievement appears as a challenge consisting of a signifying element, rewards and completion logics whose fulfilment conditions are defined through events in other systems (usually games).

From the perspective of a single game, an achievement appears as an optional challenge provided by a meta-game that is independent of a single game session and yields possible reward(s).

### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Mathematical modelling with wide societal impact (MathImpact), Aalto University, University of Helsinki

Contributors: Hamari, J., Eranti, V.

Publication date: 2011

### Host publication information

Title of host publication: Proceedings of DiGRA 2011 Conference: Think Design Play

ASJC Scopus subject areas: Computer Graphics and Computer-Aided Design, Human-Computer Interaction, Software

Keywords: Game achievements, Game design, Game ontology, Game rewards, Gamification, Marketing, Motivation,

Online games

URLs:

<http://www.scopus.com/inward/record.url?scp=84873368072&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84873368072

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

### Social and privacy aspects of a system for collaborative public expression

In this paper, we are concerned with how a real-world social situation shapes the interaction with a novel technology that combines collocated mobile phone and public display use for groups of people. We present a user study of a system that allows collaborative creation and sharing of comic strips on public displays in a social setting such as a pub or café. The system utilizes mobile phones and public displays for shared collaborative expression between collocated users. A user study spanning three sessions was conducted in real-world settings: one during the social event following a seminar on games research and two in a bar on a regular weekday evening. We present and discuss our findings with respect to how the larger social situation and location influenced the interaction with the system, the collaboration between participants of a team, how people moved between different roles (i.e., actor, spectator and bystander), and the privacy issues it evoked from participants.

### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Mathematical modelling with wide societal impact (MathImpact), Nokia

Contributors: Holopainen, J., Lucero, A., Saarenpää, H., Nummenmaa, T., Ali, A. E., Jokela, T.

Publication date: 2011

### Host publication information

Title of host publication: Proceedings of the 8th International Conference on Advances in Computer Entertainment Technology, ACE 2011

Article number: 23

ISBN (Print): 9781450308274

ASJC Scopus subject areas: Human-Computer Interaction, Computer Networks and Communications, Computer Vision and Pattern Recognition, Software

Keywords: Collaborative interaction, Evaluation, Mobile phones, Public interfaces, Social context

DOIs:

10.1145/2071423.2071452

URLs:

<http://www.scopus.com/inward/record.url?scp=84855410287&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84855410287

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

### **Forward kinematic analysis of a planar cable driven redundant parallel manipulator using force sensors**

Newly developed cable driven redundant parallel manipulators (CDRPM) have numerous advantages compared to that of the conventional parallel mechanisms. However, there exist some challenging issues in over-constrained mechanisms like CDRPMs. In contrast to serial manipulators, complexity of parallel manipulator forward kinematics (FK) is one of the main issues being under study in the control of such manipulators. Moreover, using extra sensory data is a common approach in the FK solution of rigid-linked parallel manipulators, which is considered by fewer researchers for CDRPMs. In this paper, tension force sensors of the cables are used as an extra sensor to simplify analytical solution of the FK for a planar CDRPM. To find a suitable solution, geometrical and physical characteristics of the robot are analyzed. It is shown that the proposed method provides the required accuracy and significantly improves the process time compared to the conventional methods.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Advanced Robotics and Automated Systems (ARAS), K.N.Toosi University of Technology, K. N. Toosi University of Technology

Contributors: Oftadeh, R., Aref, M. M., Taghirad, H. D.

Number of pages: 6

Pages: 2295-2300

Publication date: 2010

#### **Host publication information**

Title of host publication: IEEE/RSJ 2010 International Conference on Intelligent Robots and Systems, IROS 2010 - Conference Proceedings

Article number: 5649471

ISBN (Print): 9781424466757

ASJC Scopus subject areas: Artificial Intelligence, Human-Computer Interaction, Control and Systems Engineering

DOIs:

10.1109/IROS.2010.5649471

URLs:

<http://www.scopus.com/inward/record.url?scp=78651477214&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 78651477214

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

### **Explicit dynamics formulation of Stewart-Gough platform: A Newton-Euler approach**

Dynamic analysis of parallel manipulators plays a vital role in the design and control of such manipulators. Closed-chain kinematic structure affects the dynamics formulations by several constraints. Therefore, especially for higher degrees of freedom manipulators, manipulation of implicit and bulky dynamics formulation looses the tractability of the analysis. In this paper, a methodology and some simplification tools are introduced to achieve explicit dynamics formulation for parallel manipulators. This methodology is applied for the dynamics analysis of the most celebrated parallel manipulator, namely Stewart-Gough platform. By avoiding any recursive or component-wise derivations, the resulting dynamics formulation provides more insight for designers, and can be much easier used in any model-based control of such manipulators. In order to verify the resulting dynamics equations, Lagrange method is used to derive and compare the manipulator mass matrix. This methodology can be further used to formulate the explicit dynamics of other parallel manipulators.

#### **General information**

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Advanced Robotics and Automated Systems (ARAS), K. N. Toosi University of Technology

Contributors: Oftadeh, R., Aref, M. M., Taghirad, H. D.

Number of pages: 6  
Pages: 2772-2777  
Publication date: 2010

#### Host publication information

Title of host publication: IEEE/RSJ 2010 International Conference on Intelligent Robots and Systems, IROS 2010 - Conference Proceedings

Article number: 5653157

ISBN (Print): 9781424466757

ASJC Scopus subject areas: Artificial Intelligence, Human-Computer Interaction, Control and Systems Engineering  
DOIs:

10.1109/IROS.2010.5653157

URLs:

<http://www.scopus.com/inward/record.url?scp=78651487377&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 78651487377

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

#### Information interaction in molecular medicine: Integrated use of multiple channels

Task-based information access is a significant context for studying information interaction and for developing information retrieval (IR) systems. Molecular medicine (MM) is an informationintensive and rapidly growing task domain, which aims at providing new approaches to the diagnosis, prevention and treatment of various diseases. The development of bioinformatics databases and tools has led to an extremely distributed information environment. There are numerous generic and domain-specific tools and databases available for online information access. This renders MM as a fruitful context for research in task-based IR. The present paper examines empirically task-based information access in MM and analyzes task processes as contexts of information access and interaction, integrated use of resources in information access and the limitations of (simple server-side) log analysis in understanding information access, retrieval sessions in particular. We shed light on the complexity of the between-systems interaction. The findings suggest that the system development should not be done in isolation as there is considerable interaction between them in real world use. We also classify system-level strategies of information access integration that can be used to reduce the amount of manual system integration by task performers.

#### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Department of Information Studies and Interactive Media

Contributors: Kumpulainen, S., Järvelin, K.

Number of pages: 10

Pages: 95-104

Publication date: 2010

#### Host publication information

Title of host publication: IliX 2010 - Proceedings of the 2010 Information Interaction in Context Symposium

ISBN (Print): 9781450302470

ASJC Scopus subject areas: Human-Computer Interaction, Information Systems

Keywords: Integrated information environment, Molecular medicine, Task-based information access, User studies

DOIs:

10.1145/1840784.1840800

Source: Scopus

Source ID: 77957950766

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

#### Mobile Journalist Toolkit: A field study on producing news articles with a mobile device

Today's handheld mobile devices with advanced multimedia capabilities and wireless broadband connectivity have emerged as potential new tools for journalists to produce news articles. It is envisioned that they could enable faster, more authentic, and more efficient news production, and many large news producing organizations, including Reuters and BBC, have recently been experimenting with them. In this paper, we present a field study on using mobile devices to produce news articles. During the study, a group of 19 M.A.-level journalism students used the Mobile Journalist Toolkit, a lightweight set of tools for mobile journalist work built around the Nokia N82 camera phone, to produce an online news blog. Our results indicate that while the mobile device cannot completely replace the traditional tools, for some types of journalist tasks they provide major benefits over the traditional tools, and are thus a useful addition to the journalist's toolbox.

#### General information

Publication status: Published  
MoE publication type: A4 Article in a conference publication  
Organisations: Department of Software Systems, Nokia  
Contributors: Jokela, T., Vääätäjä, H., Koponen, T.  
Number of pages: 8  
Pages: 45-52  
Publication date: 2009

#### Host publication information

Title of host publication: MindTrek 2009 - 13th International Academic MindTrek Conference: Everyday Life in the Ubiquitous Era  
ISBN (Print): 9781605586335  
ASJC Scopus subject areas: Computer Science Applications, Human-Computer Interaction, Software  
Keywords: Camera phones, Field study, Journalism, Mobile devices, Multimedia publishing  
DOIs:  
10.1145/1621841.1621851  
Source: Scopus  
Source ID: 76749139559  
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

#### The SenseCam as a tool for task observation

The SenseCam is a passive capture wearable camera, worn around the neck and developed by Microsoft Research in the UK. When worn continuously it takes an average of 2,000 images per day. It was originally envisaged for use within the domain of Human Digital Memory to create a personal lifelog or visual recording of the wearer's life, which can be helpful as an aid to human memory. However, within this paper, we explore its applicability as a tool for use within observational and ethnographic studies. We employed the SenseCam as a tool for the collection of observational data in an empirical study, which sought to determine the information access practices of molecular medicine researchers. The affordances of the SenseCam making it appropriate for use within this domain, as well as its limitations, are discussed in the context of this study. We found that while the SenseCam, in its current form, will not offer a complete replacement of traditional observational methods, it offers a complimentary and supplementary route to the collection of observational data.

#### General information

Publication status: Published  
MoE publication type: A4 Article in a conference publication  
Organisations: Dublin City University, Department of Information Studies  
Contributors: Byrne, D., Doherty, A. R., Jones, G. J. F., Smeaton, A. F., Kumpulainen, S., Järvelin, K.  
Number of pages: 4  
Pages: 19-22  
Publication date: 2008

#### Host publication information

Title of host publication: Proceedings of the 22nd British HCI Group Annual Conference on People and Computers: Culture, Creativity, Interaction, BCS HCI 2008  
Volume: 2  
Publisher: BRITISH COMPUTER SOCIETY  
ISBN (Electronic): 9781906124069  
ASJC Scopus subject areas: Computer Networks and Communications, Human-Computer Interaction  
Keywords: Microsoft SenseCam, Task observation  
URLs:  
<http://www.scopus.com/inward/record.url?scp=84923820004&partnerID=8YFLogxK> (Link to publication in Scopus)  
Source: Scopus  
Source ID: 84923820004  
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

#### HCI and homecare: Connecting families and clinicians

The proposed workshop aims to form a community of individuals interested in using computing technology to promote healthcare and support wellness in the context of homecare. We strive to connect and engage researchers from several distinct fields of scientific inquiry and practice: people with clinical experience, developers of enabling technologies and HCI researchers interested in home healthcare and issues such as aging in place. The focus of this one-day workshop is on establishing common ground in vocabulary, research methods and research framework; understanding the shared needs of people with health challenges, their families and clinicians, and developing a joint framework for future research.

#### General information

Publication status: Published

MoE publication type: A4 Article in a conference publication

Organisations: Visiting Graduate Student in Department of Urban Design and Planning, University of Washington, Seattle, USA 1.1.2012-15.6.2012 (12.9.2011 alkaen), VTT Technical Research Centre of Finland, Coherent, Inc., Aarhus Univ, Aarhus University, MINDLab, VTT Information Technology, Siemens Corporate Research, Center for Pervasive Healthcare, GUV Center, Georgia Institute of Technology, Information School and Biomedical and Health Informatics, University of Washington Seattle

Contributors: Mamykina, L., Bardram, J. E., Korhonen, I., Mynatt, E., Pratt, W.

Number of pages: 2

Pages: 1715-1716

Publication date: 2004

#### Host publication information

Title of host publication: Conference on Human Factors in Computing Systems - Proceedings

ISBN (Print): 1581137036, 9781581137033

ASJC Scopus subject areas: Human-Computer Interaction, Computer Graphics and Computer-Aided Design, Software

Keywords: Aging, Health care, Home, Medicine, Pervasive computing

DOIs:

10.1145/985921.986197

URLs:

<http://www.scopus.com/inward/record.url?scp=84876764103&partnerID=8YFLogxK> (Link to publication in Scopus)

Source: Scopus

Source ID: 84876764103

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

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

##### General information

Publication status: Published

MoE publication type: B1 Article in a scientific magazine

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

Contributors: Suzumori, K., Hyon, S. H., Semini, C., Mattila, J., Kanda, T.

Number of pages: 1

Publication date: 3 May 2018

Peer-reviewed: No

##### Publication information

Journal: Advanced Robotics

Volume: 32

Issue number: 9

ISSN (Print): 0169-1864

Ratings:

Scopus rating (2018): CiteScore 2.7 SJR 0.346 SNIP 0.886

Original language: English

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

DOIs:

10.1080/01691864.2018.1466427

Source: Scopus

Source ID: 85047515551

Research output: Contribution to journal > Editorial > Scientific

#### Designing interactive systems for work engagement

##### General information

Publication status: Published

MoE publication type: B1 Article in a scientific magazine

Organisations: Pervasive Computing, School of Arts, Aalto University, Copenhagen Business School, University of Leicester

Contributors: Roto, V., Clemmensen, T., Väättäjä, H., Law, E. L. C.

Number of pages: 5

Pages: 135-139

Publication date: 2018

Peer-reviewed: No



### Publication information

Journal: Human Technology

Volume: 14

Issue number: 2

ISSN (Print): 1795-6889

Ratings:

Scopus rating (2018): CiteScore 1.1 SJR 0.151 SNIP 1.314

Original language: English

ASJC Scopus subject areas: Social Psychology, Communication, Human-Computer Interaction

Electronic versions:

Roto\_Clemmensen\_Väätäjä\_Law\_GEIntroduction

DOIs:

10.17011/ht/urn.201808103814

URLs:

<http://urn.fi/URN:NBN:fi:ty-201901101051>

### Bibliographical note

EXT="Roto, Virpi"

Source: Scopus

Source ID: 85058931876

Research output: [Contribution to journal](#) › [Editorial](#) › [Scientific](#)

### Social human-robot interaction in the wild: A workshop proposal for academic mindtrek 2020

This workshop will collect experts and stakeholders from all fields of human-robot interaction: both social and industrial applications and uses of robotics are of interest as far as they have human in the loop. The workshop will present recent and fully new research work in social HRI, including first results of a 3.5 month field trial and mixed-method study of a social robot Pepper in a shopping mall in Finland.

### General information

Publication status: Published

MoE publication type: B3 Non-refereed article in conference proceedings

Organisations: Computing Sciences, Tampere University, VTT Technical Research Centre of Finland

Contributors: Niemelä, M., Ahtinen, A., Turunen, M.

Number of pages: 2

Pages: 168-169

Publication date: 29 Jan 2020

### Host publication information

Title of host publication: AcademicMindtrek 2020 - Proceedings of the 23rd International Academic Mindtrek Conference : January 2020, Tampere

Publisher: ACM

ISBN (Electronic): 9781450377744

ASJC Scopus subject areas: Software, Human-Computer Interaction, Computer Vision and Pattern Recognition, Computer Networks and Communications

Keywords: collaborative robots, human-robot interaction, social robots

DOIs:

10.1145/3377290.3377320

### Bibliographical note

INT=comp,"Turunen, Markku"

Source: Scopus

Source ID: 85080870105

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

### Special Issue on Designing Interactive Systems for Work Engagement

#### General information

Publication status: Published

MoE publication type: C2 Edited books

Organisations: Pervasive Computing, School of Arts, Aalto University, Copenhagen Business School, University of Leicester

Contributors: Roto, V. (ed.), Clemmensen, T. (ed.), Väätäjä, H. (ed.), Law, E. L. C. (ed.)

Number of pages: 5

Pages: 135-257

Publication date: 2018

Peer-reviewed: Yes

### Publication information

Journal: Human Technology

Volume: 14

Issue number: 2

ISSN (Print): 1795-6889

Ratings:

Scopus rating (2018): CiteScore 1.1 SJR 0.151 SNIP 1.314

Original language: English

ASJC Scopus subject areas: Social Psychology, Communication, Human-Computer Interaction

URLs:

<http://humantechnology.jyu.fi/archive/vol-14/issue-2>

### Bibliographical note

EXT="Roto, Virpi"

Research output: Contribution to journal › Special issue › Scientific › peer-review

### Increasing user and customer understanding through rapid ethnography in emerging markets

Rapid ethnography enables us to gain an in-depth understanding of customers and end-users as well as the business of the customers and the local market. A new approach was developed and trialled for company R&D purposes at Konecranes during the FIMECC UXUS programme.

### General information

Publication status: Published

MoE publication type: D2 Article in professional manuals or guides or professional information systems or text book material

Organisations: Department of Pervasive Computing, Research area: User experience, Konecranes Plc

Contributors: Väättäjä, H., Haggrén, J.

Pages: 99-101

Publication date: 2015

### Host publication information

Title of host publication: User Experience and Usability in Complex Systems - UXUS : FIMECC Publications Series No. 8, 2010-2015

ISBN (Print): 978-952-238-146-0

ISBN (Electronic): 978-952-238-147-7

### Publication series

Name: FIMECC Publication series

Publisher: FIMECC Oy

Volume: 8

ISSN (Print): 2342-2688

ISSN (Electronic): 2342-2696

ASJC Scopus subject areas: Management of Technology and Innovation, Human-Computer Interaction

Keywords: user experience, Usability, complex systems, human-computer interaction, human-centered design, rapid ethnography

URLs:

<http://hightech.fimecc.com/results/final-report-uxus-user-experience-and-usability-in-complex-systems>

Research output: Chapter in Book/Report/Conference proceeding › Chapter › Professional

### Benefits for supplier and customer with the help of logged usage data

Visual analytics of logged usage data based on end-user interactions can increase understanding of user experience and system use. This in turn can support continuous development, technology renewal and service development that enhances the end-user's experience, as well as create competitive advantage.

### General information

Publication status: Published

MoE publication type: D2 Article in professional manuals or guides or professional information systems or text book material

Organisations: Department of Pervasive Computing, Research area: User experience, University of Tampere

Contributors: Väättäjä, H., Heimonen, T., Tiitinen, K., Hakulinen, J., Turunen, M.

Pages: 110-112

Publication date: 2015

### Host publication information

Title of host publication: User Experience and Usability in Complex Systems - UXUS : FIMECC Publications Series No. 8, 2010-2015

ISBN (Print): 978-952-238-146-0

ISBN (Electronic): 978-952-238-147-7

### Publication series

Name: FIMECC Publication series

Publisher: FIMECC Oy

Volume: 8

ISSN (Print): 2342-2688

ISSN (Electronic): 2342-2696

ASJC Scopus subject areas: Management of Technology and Innovation, Human-Computer Interaction

Keywords: user experience, Usability, complex systems, human-computer interaction, human-centered design, logging

URLs:

<http://hightech.fimecc.com/results/final-report-uxus-user-experience-and-usability-in-complex-systems>

Research output: Chapter in Book/Report/Conference proceeding › Chapter › Professional

## UX sensors - Understanding the UX of complex systems through usage analysis

### General information

Publication status: Published

MoE publication type: D2 Article in professional manuals or guides or professional information systems or text book material

Organisations: Department of Pervasive Computing, Research area: User experience, University of Tampere, University of Jyväskylä, Fastems

Contributors: Heimonen, T., Tiitinen, K., Turunen, M., Keskinen, T., Väättäjä, H., Varsaluoma, J., Jokinen, J., Nieminen, H.

Pages: 113-115

Publication date: 2015

### Host publication information

Title of host publication: User Experience and Usability in Complex Systems - UXUS : FIMECC Publications Series No. 8, 2010-2015

ISBN (Print): 978-952-238-146-0

ISBN (Electronic): 978-952-238-147-7

### Publication series

Name: FIMECC Publication series

Publisher: FIMECC Oy

Volume: 8

ISSN (Print): 2342-2688

ISSN (Electronic): 2342-2696

ASJC Scopus subject areas: Human-Computer Interaction

Keywords: user experience, Usability, complex systems, human-computer interaction, human-centered design, rapid ethnography

URLs:

<http://hightech.fimecc.com/results/final-report-uxus-user-experience-and-usability-in-complex-systems>

Research output: Chapter in Book/Report/Conference proceeding › Chapter › Professional

### Getting started with the experience design process

A shared vision of the targeted user experience and further user experience goals are required when designing for experiences. To achieve this, the design process should start with an experience-goals elicitation process where all relevant stakeholders together prioritize and choose the target experience goals. In the subsequent evaluation, appropriate metrics are needed to ensure that the targeted experiences are realized.

### General information

Publication status: Published

MoE publication type: D2 Article in professional manuals or guides or professional information systems or text book material

Organisations: Department of Pervasive Computing, Research area: User experience, VTT Technical Research Centre of Finland, School of Arts, Design and Architecture, Aalto University

Contributors: Varsaluoma, J., Väättäjä, H., Kaasinen, E., Karvonen, H., Lu, Y.  
Pages: 125-127  
Publication date: 2015

#### Host publication information

Title of host publication: User Experience and Usability in Complex Systems - UXUS : FIMECC Publications Series No. 8, 2010-2015  
ISBN (Print): 978-952-238-146-0  
ISBN (Electronic): 978-952-238-147-7

#### Publication series

Name: FIMECC Publication series  
Publisher: FIMECC Oy  
Volume: 8  
ISSN (Print): 2342-2688  
ISSN (Electronic): 2342-2696  
ASJC Scopus subject areas: Human-Computer Interaction  
Keywords: user experience, Usability, complex systems, human-computer interaction, human-centered design, goals, requirements engineering, design  
URLs:  
<http://hightech.fimecc.com/results/final-report-uxus-user-experience-and-usability-in-complex-systems>  
Research output: Chapter in Book/Report/Conference proceeding › Chapter › Professional

### Characterizing Context of Use in Mobile Work

#### General information

Publication status: Published  
MoE publication type: D3 Professional conference proceedings  
Organisations: Department of Pervasive Computing, Research area: User experience  
Contributors: Väättäjä, H.  
Number of pages: 10  
Publication date: 2015

#### Host publication information

Title of host publication: Proceedings of Human Work Interaction Design HWID, IFIP TC 13.6 working group  
Publisher: University of West London  
Article number: 14  
ASJC Scopus subject areas: Human-Computer Interaction, Information Systems  
Keywords: user experience, context of use, mobile work, smartphone, framework, mobile journalism, news making  
URLs:  
<http://www.uwl.ac.uk/academic-schools/computing/hwid-conference-2015>  
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Professional

### Understanding engagement in web-based Acceptance and Commitment Therapy interventions for parental burnout: Usage, dose-response and user experiences

Web-based acceptance and commitment therapy (ACT) interventions have shown their capacity to improve mental health and well-being (Brown et al., 2016). Engagement in technology-aided interventions is considered to be linked to intervention outcomes (Mattila et al., 2016; Short et al., 2018). Engagement can be defined as a composite of various measures such as usage time, task completion, interaction activity and user experience. We investigated how engagement influences outcomes in guided web-based acceptance and commitment therapy interventions for parents whose children have chronic conditions. We present findings from two studies: the first study was conducted in Sweden in 2017 (10-week intervention; N=36; median usage time 2:37 hours), and the second in Finland in spring 2019. Results related to the dose-response relationship between usage and the changes in psychological measures will be discussed. User experience findings of the two interventions will be compared to illustrate design choices that may have an influence on the engagement.

#### General information

Publication status: Published  
MoE publication type: Not Eligible  
Organisations: Computing Sciences, Karlstad University, Department of Psychology, University of Jyväskylä  
Contributors: Kaipainen, K., Sairanen, E., Lappalainen, P.  
Publication date: 28 Jun 2019  
Peer-reviewed: Unknown  
Event: Paper presented at ACBS World Conference, Dublin, Ireland.  
ASJC Scopus subject areas: Applied Psychology, Human-Computer Interaction

URLs:

[https://contextualscience.org/wc17\\_symposium\\_detail](https://contextualscience.org/wc17_symposium_detail) (Complete list of conference symposia with abstracts)

Research output: [Other conference contribution](#) › [Paper, poster or abstract](#) › [Scientific](#)

### **Digital services and youth participation in processes of social change: World Café workshops in Finland**

This paper focuses on the role of digital services in empowering youths to participate in social change. The aim is to discover what kind of potential digital services have in creating opportunities for youths of various backgrounds to be active in various processes of change at both the grassroots and policy levels. We also address questions concerning differences between distinct groups in the relationship between ICT proficiency and social participation. The key results of this paper suggest that youths can be engaged to participate by using digital services and becoming active possessors of their human rights. Nevertheless, the role played by power relations and differences in youths' ICT skills must be acknowledged, as they affect opportunities to participate in processes of social change.

#### **General information**

Publication status: Published

MoE publication type: Not Eligible

Organisations: Pervasive Computing, Tampere University, Tampere University

Contributors: Meriläinen, N., Pietilä, I., Varsaluoma, J.

Number of pages: 30

Pages: 1-30

Publication date: 22 Aug 2018

Peer-reviewed: Unknown

Event: Paper presented at European Consortium for Political Research General Conference, Hamburg, Germany.

ASJC Scopus subject areas: Human-Computer Interaction, Sociology and Political Science

Keywords: youth participation, processes of social change, digital services, human rights, obligations, legislative processes, user experiences, digital accessibility

URLs:

<https://ecpr.eu/Filestore/PaperProposal/b1e33045-418a-4e54-97fd-1689fb07816e.pdf>

Research output: [Other conference contribution](#) › [Paper, poster or abstract](#) › [Scientific](#)

### **The nexus between social media behaviour, negative consumer emotions and brand disloyalty**

#### **General information**

Publication status: Published

Organisations: Department of Information Management and Logistics, Research group: Novi, Managing digital industrial transformation (mDIT), Turku University of Applied Science

Contributors: Jalonen, H., Jussila, J.

Publication date: 11 Nov 2016

Peer-reviewed: Unknown

Event: Paper presented at 12th European Conference on Management Leadership and Governance, Bucharest, Romania.

ASJC Scopus subject areas: Human-Computer Interaction

Keywords: social media, Electronic word of mouth, negative emotions, brand disloyalty

URLs:

<http://www.academic-conferences.org/conferences/ecmlg/ecmlg-future-and-past/>

Research output: [Other conference contribution](#) › [Paper, poster or abstract](#) › [Scientific](#)

### **Neural networks, cell cultures and some older work on data analysis.**

#### **General information**

Publication status: Published

Organisations: Faculty of Biomedical Sciences and Engineering

Contributors: Acimovic, J.

Publication date: 15 Jun 2009

Peer-reviewed: Unknown

Event: Paper presented at Okinawa Computational Neuroscience Course 2009, Japan.

ASJC Scopus subject areas: Cellular and Molecular Neuroscience, Neuroscience (miscellaneous), Modelling and Simulation, Signal Processing, Human-Computer Interaction

Keywords: computational neuroscience, spiking networks, complex networks, cortical networks, brain-machine interfaces

Research output: [Other conference contribution](#) › [Paper, poster or abstract](#) › [Scientific](#)