CHIRA 2023

7th International Conference on Computer-Human Interaction Research and Applications

Final Program and Book of Abstracts

16 - 17 November, 2023

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Final Program and Book of Abstracts

7th International Conference on Computer-Human Interaction Research and Applications

Rome - Italy
November 16 - 17, 2023

Sponsored by
INSTICC - Institute for Systems and Technologies of Information, Control and Communication

In Cooperation with
EUSSET - European Society for Socially Embedded Technologies

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Foreword

This book contains the final program and paper abstracts of the 7th International Conference on Computer-Human Interaction Research and Applications (CHIRA 2023), which was held in Rome, Italy as a hybrid event, from 16 to 17 November.

CHIRA is sponsored by the Institute for Systems and Technologies of Information, Control and Communication (INSTICC), and is held in cooperation with the European Society for Socially Embedded Technologies (EUSSET).

The purpose of CHIRA is to bring together professionals, academics and students who are interested in the advancement of research and practical applications of human-technology & human-computer interaction. Different aspects of Computer-Human Interaction were covered in four parallel tracks: 1) Human Factors for Interactive Systems, Research, and Applications; 2) Interactive Devices; 3) Interaction Design; and 4) Adaptive and Intelligent Systems. Human-Computer Interaction is getting renewed interest as human-AI interaction, due to the increasing success of artificial intelligence and its applications.

In addition to paper presentations, CHIRA's program included three invited talks delivered by internationally distinguished speakers: Antonio Camurri (Università degli Studi di Genova, Italy), "Aesthetically Resonant Multimodal Interactive Systems", Andrea Gaggioli (Università Cattolica del Sacro Cuore, Italy), "Designing Transformative Experiences: Exploring the Potential of Virtual Technologies for Personal Change", and Wendy E. Mackay (Inria, Paris-Saclay, and the Université Paris-Saclay, France), "Creating Human-Computer Partnerships".

CHIRA received 69 paper submissions from 30 countries, of which 20% were accepted as full papers. The high quality of the papers received imposed difficult choices during the review process. To evaluate each submission, a double-blind paper review was performed by the Program Committee, whose members are highly qualified independent researchers in the CHIRA topic areas.

In addition, the Special Session on "Enhancing the Esports Experience (E3)", chaired by Sven Charleer and Laura Herrewijn was held together with CHIRA 2023.

All accepted complete papers will be published by Springer in the conference proceedings, under an ISBN reference.

The proceedings will be abstracted/indexed in DBLP, Google Scholar, EI-Compendex, INSPEC, Japanese Science and Technology Agency (JST), Norwegian Register for Scientific Journals and Series, Mathematical Reviews, SCImago, Scopus and zbMATH. CCIS volumes are also submitted for the inclusion in ISI Proceedings.

We express our thanks to all participants. First to all the authors, whose quality work is the essence of this conference; secondly to all members of the Program Committee and auxiliary reviewers, who helped us with their expertise and valuable time. We also deeply thank the invited speakers for excellent contributions in sharing their knowledge and vision.

Finally, we acknowledge the professional support of the CHIRA 2023 team for all organizational processes, especially given the needs of a hybrid event, in order to make it possible for CHIRA 2023 authors to present their work and share ideas with colleagues in spite of the logistic difficulties.

We wish you all an inspiring conference. We hope to meet you again next year for the 8th edition of CHIRA, details of which will soon be available at http://www.chira.scitevents.org/.

Hugo Plácido da Silva, IT- Instituto de Telecomunicações, Portugal
Pietro Cipresso, University of Turin, Italy

Social Event and Banquet

Unforgettable Evening at Castello di Decima
Thursday 16, 19:00 – 23:30
Castello di Decima is located at the tenth mile of the ancient Roman consular road leading to Naples.
The lava stone slabs of the consular road are still hidden under the tarmac road of the old Via Pontina, now via Clarice Tartufari.
Important archaeological findings of the Latin people were discovered near the junction for Pratica di Mare: a "grave with chariot" dating 750-725 B.C., a "female tomb" from mid seventh century B.C. and other findings are now preserved at the High Middle Age Museum in Rome.

In Roman times, there was a place for changing horses at the tenth mile. The tower of the fortress and the church rest on tufa rocks and have Roman underground walls as their foundations – these were the remains of a Roman pool. On an adjacent tufa plateau, there are Latin walls, maybe remnants of ancient Politorium, destroyed by Anco Marzio.

Although the minor consular roads fell into disuse during the lower Empire, the village was still always inhabited. Many famous people owned the Castle over several centuries. In 1768 Cardinal Luigi Torrigiani, Secretary of State of Pope Clement XIII, built the Palace in Decima on previous constructions, and restructured the parish church dedicated to St. Antonio Abate, with various houses and warehouses in Decima Bassa.

In 1938 the estate was bought by Count Romolo Vaselli, one of the most important and modern Roman entrepreneurs of the early twentieth century, and he immediately committed to developing the land. Important canals and a network of internal roads were constructed and many houses with water and electric light were built.

At the same time, he set up an innovative tobacco growing activity and planted a modern peach orchard. Many trees and a pine forest were planted. Great improvement was initiated, granting privilege to the agricultural character of the place. His heirs continued the work with important restoration works and on-going improvements in the park.

The church, headed to St. Andrew the Apostle, and part of the parish of Tor de 'Cenci, contains an interesting coffered ceiling with the coat of arms of the Torrigiani family.

The eighteenth-century Castello di Decima still maintains all the charm of its ancient past. The Castle is located within the nature reserve of Decima Malafede. With its 6,145 hectares, the estate is the largest among

the parks protected by Roma Natura. Nestled in the green hills and in a beautiful pine forest, the castle is an island away from the world, a serene and exclusive venue for our evening.

Today the ancient castle of Decima represents a perfect combination of history, beauty and nature.
The wonderful halls of the castle, with ancient painted ceilings and antique furnishings are the perfect location for our dinner. The music combined with fantastic food will provide our guests a memorable and unforgettable evening.

Important Information

Internet Access
Please check at the welcome desk the information to connect to the wireless network.

Event App
Download the Event App from the Play Store and App Store now, to have mobile access to the technical program and also to get notifications and reminders concerning your favorite sessions.

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The option “My Program” gives you the possibility of creating a selection of the sessions that you plan to attend. This service also allows you to print-to-pdf all papers featured in your selection thus creating a pdf file per conference day.

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In the option “Proceedings and Final Program“ you cannot only download the proceedings but also access the digital version of the book of abstracts with the final program.

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Keynotes Videos
The keynote lectures will also be available on video on the website after the event, as long as the appropriate authorization from the keynote is received, so you will be able to see them again or watch them should you have missed one.

Survey
Every year we conduct a survey to access the participants’ satisfaction with the conference and gather the suggestions. You will receive an e-mail after the event with the detailed information. Your contribution will be carefully analysed and a serious effort to react appropriately will be made.

* Please login to PRIMORIS (www.insticc.org/Primoris), select the role “Delegate” and the correct event.

If you have any doubt, we will be happy to help you at the Welcome Desk.

General Information

Welcome Desk/On-site Registration
Wednesday, November 15 – Open from 16:00 to 18:00
Thursday, November 16 – Open from 08:30 to 18:15
Friday, November 17 – Open from 08:30 to 17:15

Opening Session
Thursday, November 16, at 09:15 in the Romolo room.

Closing Session & Awards Ceremony
Friday, November 17, at 17:00 in the Romolo room.

Farewell Drink
Friday, November 17, at 17:15.

Meals
Coffee-breaks will be served in the Foyer to all registered participants.
Lunches will be served in the Restaurant to all registered participants. Please check the hours in the Program Layout.

Communications
Wireless access will be provided free of charge to all registered participants.

Secretariat Contacts
CHIRA Secretariat
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2900-616 Setúbal, Portugal
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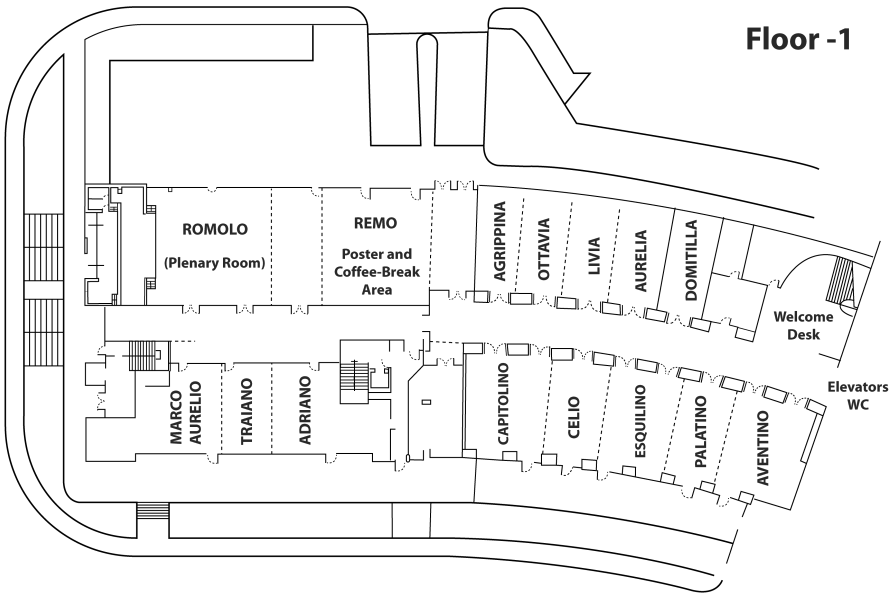
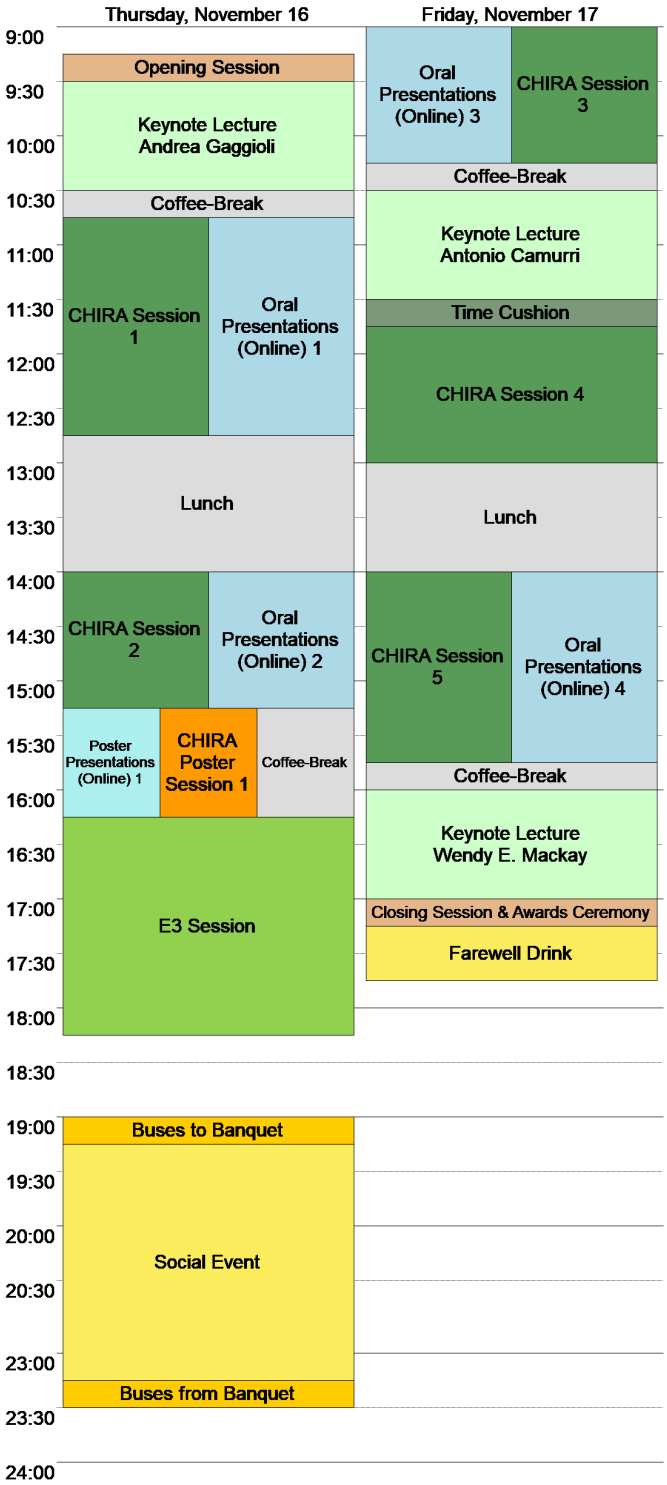
Rooms Layout



Program Layout



Final Program and Book of Abstracts

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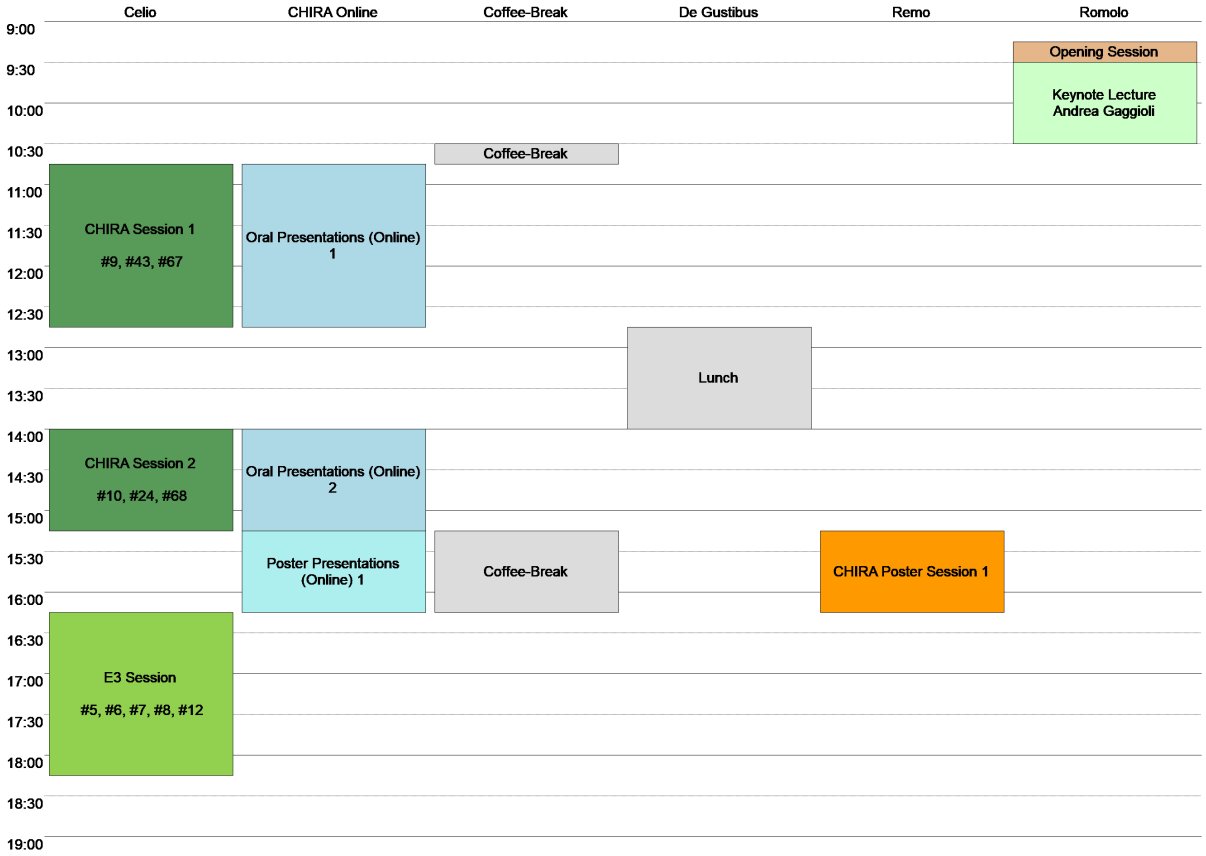

Opening Session	CHIRA
09:15 - 09:30	Room Romolo

Keynote Lecture	CHIRA
09:30 - 10:30	Room Romolo

Designing Transformative Experiences: Exploring the Potential of Virtual Technologies for Personal Change

Andrea Gaggioli
Università Cattolica del Sacro Cuore, Italy

Abstract: As the digital landscape rapidly evolves, virtual reality (VR) and augmented reality (AR) are poised to reshape the way we engage with experiences, particularly those aimed at personal growth and self-discovery. By enabling individuals to step into alternate realities and navigate simulated scenarios, these technologies have the potential to facilitate transformative experiences that lead to personal change, growth, and development. In this keynote, I will delve into the psychological mechanisms underpinning the efficacy of virtual transformative experiences, highlighting how these technologies can evoke emotional responses, challenge perspectives, and prompt introspection. Additionally, ethical considerations surrounding the design and implementation of such experiences will be addressed, ensuring that the potential of these technologies is harnessed responsibly and thoughtfully.

Session 1A	CHIRA
10:45 - 12:45	Room Celio
Human Factors for Interactive Systems, Research, and Applications	

Complete Paper #43

Gesture Me: A Machine Learning Tool for Designers to Train Gesture Classifiers

Marcus Winter, Phil Jackson and Sanaz Fallahkhair
School of Architecture, Technology and Engineering, University of Brighton, U.K.

Keywords: UX design · Machine learning · Gesture recognition

Abstract: This paper contributes to the body of work examining how designers can be sup-ported in integrating machine learning (ML) capabilities into their designs for novel applications and services. It presents an online tool enabling designers and other non-specialist audiences to define body gestures, interactively and iterative-ly train and test a classifier to recognise these gestures, and integrate the trained classifier into a template web application. An empirical evaluation with MSc User Experience Design students and practitioners, all of whom had previous experi-ence in web development but not in ML, found that the tool enables them to de-fine, train and test a gesture recognition classifier with little or no help, and that engagement with the tool advances their understanding of the capabilities, limita-tions and operational aspects of ML. The evaluation confirmed the value of visu-alising the ML perspective and encouraging designers to experiment with ML to support their experiential learning. The study led to design recommendations that can inform the development of tools supporting designers to ideate and prototype ML-enhanced applications.

Abstract #9

CPR Assistance in Mixed-Reality

Krzysztof Pietroszek
U.S.A.

Keywords: Mixed Reality, Intelligent Tutoring, Telehealth.

Abstract: We design and evaluate a mixed reality real-time communication system for remote assistance during CPR emergencies. Our system allows an expert to guide a first responder, remotely, on how to give first aid. RGBD cameras capture a volumetric view of the local scene including the patient, the first responder, and the environment. The volumetric capture is augmented onto the remote expert's view to spatially guide the first responder using visual and verbal instructions.
We evaluate the mixed reality communication system in a research study in which participants face a simulated emergency. The first responder moves the patient to the recovery position and performs chest compressions as well as mouth-to-mask ventilation.
Our RGBD cameras allow for three-dimensional visual information that helps the user through the steps. Within this project, we conducted an evaluation with 30 participants separated into two groups. Both groups were given the same tasks. They had to give first aid to a lifeless person, bring the person into the recovery position and start with CPR after the person stopped breathing. We compared instruction via the mixed reality (MR) approach (group A) with video-based communication (group B). We analyzed objective metrics of CPR quality recorded by the CPR mannequin and data from users including workload surveys and interviews.
Our main contributions as follows:
1. We introduce an MR communication system designed for remote first aid assistance.
2. We conducted a comparison between MR communication technology and video-based communication.

Complete Paper #67

Continuous Time Elicitation Through Virtual Reality to Model Affect Dynamics

Francesca Borghesi[1], Vittorio Murtas[2], Valentina Mancuso[3] and Alice Chirico[4]
[1] *Department of Psychology, University of Turin, Via Verdi 10, 10124 Turin, Italy*
[2] *Department of Computer Science, University of Turin, Italy*
[3] *Faculty of Psychology, eCampus University, Novedrate, Italy*
[4] *Department of Psychology, Research Center in Communication Psychology, Catholic University of Sacred Hearth, Milan, Italy*

Keywords: Affect dynamics · Virtual reality · Psychometrics · Mental flexibility · Markov chain · Markov models

Abstract: Affective states are constantly evolving, ranging from serenity to excitement. Understanding the dynamic transitions between emotional states, known as *affect dynamics*, is crucial for understanding intraindividual emotional hetero-geneity. Various statistical methods have been used to capture and quantify these dynamics, based on longitudinal time series models. However, both the statistical models and experimental design, e.g. Experience Sampling Method, lack a controlled manipulation of the transitions between affective states over time. This study aims to fill this knowledge gap using a meticulous experimen-tal scenario design incorporating controlled affective transitions. For this reas-on, the study employs Virtual Reality technology to effectively elicit and regu-late affective transitions, mimicking real-life situations while offering experi-mental control. Finally, we

proposed an application of the Markovian chain model to analyze affective transition. The study aims to establish a connection between theoretical insights and empirical investigation, providing new avenues for understanding emotional fluctuations within a controlled experi-mental framework.

Oral Presentations (Online) 1 **CHIRA**
10:45 - 12:45 **Room CHIRA Online**
Computer-Human Interaction Research and Applications

Complete Paper #16

Towards a Methodology for Developing Human-AI Collaborative Decision Support Systems

Alexander Smirnov, Andrew Ponomarev and Tatiana Levashova

St. Petersburg Federal Research Center of the Russian Academy of Sciences, St. Petersburg, 14th line, 39, 199178, Russia

Keywords: Decision support · Collaborative systems · Human-AI collaboration · Ontology-based systems

Abstract: Decision-making is a complex activity, often demanding collaboration, sometimes even in the form of dynamic (ad hoc) teams of loosely coupled participants col-lected to deal with a particular problem. At the same time, recent developments in the AI have shown that AI plays an important role in decision-making, and AI-agents may become full-fledged participants of collaborative decision support systems. However, integration of AI-agents into collaborative processes requires solving a number of tasks concerning human-AI interaction, interpretability, mutual learning, etc. This paper is a step towards a methodology to create decision support systems based on human-AI collaboration. An analysis of typical requirements to the collaborative decision support systems and typical scenarios that such systems have to implement sustains the introduced methodology. Based on this analysis, foundational problems needed settlements to develop human-AI collaborative decision support systems have been identified, and their possible solutions are offered. In the proposed methodology, ontologies play an important role, providing interoperability among heterogeneous participants. The methodology implies a technological backing in the form of a collaborative computational environment, helping to develop decision support systems for particular domains.

Complete Paper #29

3D Reconstruction Using a Mirror-Mounted Drone: Development and Evaluation of Actual Equipment

Ayumi Noda, Kimi Ueda, Hitorake Ishii and Hiroshi Shimoda

Kyoto University, Yoshida-honmachi, Sakyo-ku, Kyoto-shi, Kyoto, Japan

Keywords: 3D reconstruction · Drone · Nuclear Power Plant (NPP) · RGB-D camera

Abstract: A possible method to support work inside a nuclear power plant (NPP) would be to take images of the environment with an RGB-D camera and conduct 3D reconstruction. The reconstructed model is useful for confirming the site in advance. However, in imaging inside an NPP, a lot of areas are occluded by pipes or machinery, resulting in omissions in the reconstructed model. We have proposed a method to fly a small mirror-mounted drone instead of a large drone equipped with an RGB-D camera and to capture the occluded area using mirror reflection. In this paper, we examined the feasibility of mirror-mounted drone by fabricating the actual equipment. With the flight test, the proposed drone was shown to fly stably even with the mirror. In addition, we developed a method for 3D reconstruction using images obtained in the imaging with the mirror-mounted drone. The proposed method estimates the mirror pose, reduce the noise of depth images and generate the reconstructed model. The evaluation showed that although noise remained in the reconstructed model, the imaging with fewer omissions was achieved with the mirror-mounted drone.

Complete Paper #36

A Bi-National Investigation of the Needs of Visually Disabled People from Mexico and Japan

Alexandro del Valle, Zilu Liang and Ian Piumarta

Kyoto University of Advanced Science, Ukyo Ward Kyoto 615-8577, Japan

Keywords: Visual disabilities · User centered design · Assistive technology

Abstract: Around 2,200 million (2.2 billion) people have some level of visual disabilities, of which 2 million are in Mexico and 13 million in Japan. These significant communities face challenges in several aspects of their lives including risks when travelling, lack of alternative means of communication, and discrimination in their schools or workspaces. We conducted interviews and focus groups to investigate the needs and frustrations of people with visual disabilities in Mexico (State of Mexico and Mexico City) and Japan (Kyoto city) members of foundations, organizations, schools or acquaintances in the areas of mobility, safety, and everyday interactions within public spaces. According to their responses through thematic analysis we identify several opportunities for technical developments to support their needs, including for the digital devices through which they interface with the real world, and propose several technological solutions to address the problems they confront.

Complete Paper #42

Augmenting the Human in Industry 4.0 to Add Value: A Taxonomy of Human Augmentation Approach

Jacqueline Humphries[1,2,3], Pepijn Van de Ven[2,3] and Alan Ryan[2]

[1] *Technological University of the Shannon, Limerick, Ireland*

[2] *University of Limerick, Ireland*

[3] *Confirm Manufacturing Research Centre, Limerick, Ireland*

Keywords: Augmentation · Automation · Industry 4.0

Abstract: There is a lack of clarity about how to augment the human in manufacturing. For practitioners, this creates challenges in understanding which technologies to in-vest in for specific automation goals, and where the value-add exists.
A narrative review of the literature is conducted through which the relationship between augmentation and automation is clarified. Definitions for Augmentation, and the Augmented Human, and a new Taxonomy of Human Augmentation are proposed.
Five classes of augmentation are identified: Physical, Collaborative Physical, Sensory, Embedded Intelligence, and Collaborative Social Intelligence. How the Taxonomy is applied to each goal of automation is illustrated. Finally the value-add of the classes is explored through industrial use cases, and the potential im-pact

on manufacturing key performance indicators is summarised. This novel Taxonomy of Human Augmentation unifies the existing research, and provides a common description of each class of augmentation, which can assist practitioners in seeking and exploring augmentation solutions.

Complete Paper #54

Human-Centered AI Goals for Speech Therapy Tools

Chinmoy Deka, Abhishek Shrivastava, Saurabh Nautiyal and Praveen Chauhan
Indian Institute of Technology Guwahati, Guwahati, Assam, India

Keywords: Human-centerered AI · AI-based speech therapy tool · HCAI-based speech therapy

Abstract: With the advent of improved Artificial Intelligence (AI) algorithms and the availability of large datasets, researchers worldwide are developing numerous AI-based applications to replicate human capabilities. One such application is automating the task of Speech Language Pathologists (SLPs) and building automated speech therapy tools for children with Speech Sound Disorder (SSD). However, this development of AI focused on imitating human capabilities brings concerns such as algorithmic discrimination or biased algorithms, job displacements, and privacy issues. To address these challenges, researchers advocate for Human-Centered AI (HCAI) and have proposed various frameworks for AI-based systems. Although the proposed frameworks were developed for generalized AI application, it is not clear about its relevance in specialized AI application such as speech therapy. This study aims to establish HCAI goals and a goal hierarchy specific to an HCAI-based Speech Therapy Tool (HCAI-STT) designed for children with SSD. Through an Affinity Mapping exercise, we identify seven top-level goals and sub-goals, which include fairness, responsibility and accountability, human-centered empowerment, trustworthiness, privacy, unbiased funding, and security. Our findings highlight the importance of considering not only the technical capabilities of AI systems, but also their ethical and social implications. By prioritizing these goals, we can help ensure that AI-based speech therapy tools are developed and deployed in a responsible and ethical manner that aligns with the needs and values of their users. Our findings have broader implications for the development and deployment of AI systems across domains, and future research can build on our findings by exploring how the goal hierarchy we developed can be operationalized in practice.

Complete Paper #59

Easy Induction: A Serious Game Using Participatory Design

Yuwen Li, Yue Li, Jiachen Liang and Hai-Ning Liang
School of Advanced Technology, Xi'an Jiaotong-Liverpool University, 111 Ren'ai Road, Suzhou, China

Keywords: Serious games · Participatory design · Interaction design

Abstract: College freshmen often face difficulties adjusting to the new academic and social environment of university life. It is critical to help them adapt to academic and personal life, while also improving their sense of belonging and engagement with the university. In this paper, we focus on the context of a local university (abbreviated as UniversityX in the following text, anonymized for the review purpose), and present a participatory design approach to identify potential solutions collaboratively. We conducted three participatory design workshops with freshmen in undergraduate and postgraduate studies, where we discovered specific challenges, developed serious game content and design alternatives, and delivered a board game that supports academic and social integration at UniversityX. To evaluate the effectiveness of the board game, we collected both quantitative and qualitative data. The quantitative analysis revealed that the board game is effective in improving freshmen's knowledge acquisition of academic affairs, increasing their familiarity with the environment and resources, and enhancing their ability to access information and resources. The board game also received high scores in system usability and user experience. The qualitative analysis indicated that the board game was engaging, interesting, and well-received by students. They found the board game helpful in their academic and social integration and expressed a desire to play it again in the future. Our participatory design approach and the resulting board game provide a promising avenue for universities to support freshmen's transition to university life.

Oral Presentations (Online) 2 **CHIRA**
14:00 - 15:15 **Room CHIRA Online**
Computer-Human Interaction Research and Applications

Complete Paper #39

Why Are You Blinking at Me? Exploring Users' Understanding of Robotic Status Indicators

E. Liberman Pincu, S. Honig and T. Oron-Gilad
Ben-Gurion University of the Negev, Beer-Sheva 84105, Israel

Keywords: Light signals · Understandability · Human-robot interaction

Abstract: User Confusion leads to misunderstandings about the robot or the situation, and influences customer satisfaction. This study evaluates users' understanding of commercially available robot statuses presented by LED indicators. Images and videos of indicators of nine robots were taken from manufacturers' websites and were manipulated to assess how specific visual qualities of indicators, color, and animation, affect users. One hundred and forty-seven respondents participated in an online study. They were asked to: 1) select the animation that best fits a given status description, 2) rank the compatibility between an indicator and a written status description, and 3) select the status description that best fits a given animation. Results indicated that, in most cases, the manufacturers' intention was not well understood by respondents. Understandability was affected by the indicator's visual qualities and status prevalence. Recommendations and gaps are detailed.

Complete Paper #45

I Am in Love with the Shape of You: The Effect of Mass Customization on the Human-Robot Relationship

E. Liberman-Pincu, A. Bulgaro and T. Oron-Gilad
Ben-Gurion University of the Negev, Beer-Sheva 84105, Israel

Keywords: Personal assistance robot · Mass customization · Product design · Human-robot interaction · Technology acceptance · User enjoyment · Human-robot relationship · Older adults

Abstract: This study examined the effect of mass customization of a socially assistive robot (SAR) on older-adult users' attitudes and behaviors toward the robot. Mass customization, actively modifying aspects of a product by users before use, was proven

to increase positive reactions towards products. Thirty-one older-adult participants were invited one at a time to explore new applications of personal robots for domestic use utilizing the Temi robot. We divided them into two groups that differed in their ability to manipulate the robot's visual design using various add-ons before starting the one-on-one interaction with the robot. Results of the thematic analysis and questionnaires suggest that allowing mass customization can increase users' enjoyment, help in forming human-robot relationships, and lead to proactive Interaction.

Complete Paper #60

Creating StoryLines: Participatory Design with Power Grid Operators

Wissal Sahel[1,2], Wendy Mackay[1] and Antoine Marot[3]

[1] *Université Paris-Saclay, CNRS, Inria Saclay, France*

[2] *IRT SystemX, France*

[3] *RTE, France*

Keywords: Collaborative work · Generative theories of interaction · Participatory design · Power grid operation · Safety critical systems

Abstract: Designing interactive technology to support safety-critical systems poses multiple challenges with respect to security, access to operators and the proprietary nature of the data. We conducted a two-year participatory design project with French power grid operators to both understand their specific needs and to collaborate on the design of a novel collaborative tool called *StoryLines*. Our primary objective was to capture detailed, in-context data about operators' work practices as part of a larger project designed to provide bi-directional assistance between an intelligent agent and human operator. We targeted handovers between shifts to take advantage of the operators' existing practice of articulating the current status of the grid and expected future events. We use information that would otherwise be lost to gather valuable information about the operator's decision rationale and decision-making patterns.This paper describes how we combined a bottom-up participatory design approach with a top-down generative theory approach to design *StoryLines*, an interactive timeline that helps operators collect information from diverse tools, record reminders and share relevant information with the next shift's operator.We conclude with a discussion of the challenges of working with users in safety-critical environments and directions for future research.

Session 2A **CHIRA**
14:00 - 15:15 **Room Celio**
User Experience Evaluation

Complete Paper #10

Empowering ProductionWorkers to Program Robots: A No-Code, Skill-Based Approach

Charly Blanc[1,2], Lionel Boudry[3], Andreas Sonderegger[3], Julien Nembrini[2] and Sarah Degallier Rochat[1]

[1] *HuCE Institute, Bern University of Applied Sciences, Quellgasse 21, Bienne 2502, Switzerland*

[2] *Human-IST Institute, University of Fribourg, Boulevard de Pérolles 90, Fribourg 1700, Switzerland*

[3] *Business, Bern University of Applied Sciences, Brueckenstrasse 73, Bern 3005, Switzerland*

Keywords: Robotics · Human computer interaction · Programming learning · Upskilling · Empowerment

Abstract: The current market requires automated production systems to be reprogrammed by the shop floor workers to meet dynamic production needs. This requires new interfaces allowing the workers to acquire the needed skills for efficient and safe programming. In this article, an intuitive interface is introduced to foster both upskilling and empowerment through guided tutorials. A no-code approach to programming based on the notion of robotic skills enables interactions that are based on the worker's competencies. A preliminary study with students (N = 58) using between-group testing was performed to evaluate the usability of the interface and skill acquisition through the tutorials. The effect of a basic understanding of robots' behavior on users' performance was evaluated: a demonstration with a real robot was presented to half of the participants before the study. Our results indicate that the proposed approach enabled most novice users to achieve simple programming tasks. The demonstration with the robot had a positive impact on performance suggesting the need for real robot interaction to improve learning. In summary, the combination of a no-code, skill-based approach with problem-based tutorials and demonstrations with real robots can help non-expert users develop the competencies and confidence to autonomously program a robot. Further tests with intended target users are planned in the future.

Complete Paper #24

Trust, Perspicuity, Efficiency: Important UX Aspects to Consider for the Successful Adoption of Collaboration Tools in Organisations

Anna-Lena Meiners[1], Andreas Hinderks[2] and Jörg Thomaschewski[2]

[1] *Karlsruhe Institute of Technology, Karlsruhe, Germany*

[2] *University of Applied Sciences Emden/Leer, Emden, Germany*

Keywords: UX aspects · Collaboration tools · UX evaluation

Abstract: Collaboration tools are heavily used in work, education, and leisure. Yet, what makes a good collaboration tool is not well researched. This study focuses on what users expect of collaboration tools by investigating how they are used and which UX aspects are important to users when using them. In a survey, 184 participants described their use of collaboration tools and then rated the importance of 19 given UX aspects in their specific scenario. Results show that seven UX aspects are almost universally seen as most important. Additionally, five aspects seem to be especially relevant in specific usage domains. It is indicated that the context of use, especially the usage domain, influences which UX aspects are important to users. These results can be used by organisations as a guideline when selecting a collaboration tool suitable for their members in order to successfully adopt a tool.

Complete Paper #68

Who Pays Attention to the User Experience Content Embedded in Mobile APP Reviews

Silas Formunyuy Verkijika

Centre for Applied Data Science (CADS), Sol Plaatje University, Kimberley, 8300, South Africa

Keywords: Review helpfulness · Review response · UX richness · Review length · Review rating

Abstract: In recent years, there has been growing interest in understanding what makes a review valuable, as such reviews are vital in guiding consumer and business de-cision-making. The purpose of this study was to determine the role that the user expe-

rience of mobile applications plays in fostering review helpfulness as well as stimulating managerial responses to reviews of these applications. This study proposes a measure of UX richness for online reviews and finds that both posi-tive and negative UX-rich reviews contribute to enhancing the helpfulness of re-views as well as the likelihood that they will receive a response from the applica-tion provider. The study further demonstrates the moderating role of UX richness in the prominent effects of review length and review rating on both the helpful-ness and managerial response to mobile app reviews. The study culminates with a discussion of the implications of these findings.

Poster Presentations (Online) 1	**CHIRA**
15:15 - 16:15	**Room CHIRA Online**

Complete Paper #14

Mobile Gaming EMG-Based Brain Computer Interface

Abdulaziz Althekair, Mohanned Odeh, Mohammad AlBayaa, Marwa Sharawi and Iyad Abu Doush

College of Engineering and Applied Sciences, American University of Kuwait, Salmiyah, Kuwait

Keywords: Brain Computer Interface (BCI) · User interface · Electromyography (EMG) · Mobile gaming

Abstract: Brain Computer Interface (BCI) has demonstrated significant effectiveness in optimizing the usability of mobile applications, particularly in the realm of mobile gaming. With the increasing popularity of video games, they offer an opportune platform for exploring novel control interfaces for mobile devices. This paper introduces the Mobile Gaming Electromyography (EMG)-Based Brain Computer Interface (MGaming EMG-BCI), which aims to enhance the user experience and address challenges related to input methods, gestures, accessibility, and inclusivity associated with conventional mobile device usage in mobile gaming. The system improves device usability by offering a new input method and gestures that players can utilize to interact with the game without the requirement of maintaining a fixed posture alleviating neck stiffness commonly associated with GUI-based mobile gaming. This expands the accessibility of games for different groups of players. Furthermore, it opens up opportunities for game developers to innovate and explore new possibilities in game design.The proposed interface integrates a BCI system with a game using EMG signaling, enabling real-time communication between the BCI and the game through a database. This integration allows users to interact with the game in a hands-free manner, alleviating the need for physical touch input. The results of this study indicate that the proposed BCI Mobile Gaming Interface has the potential to serve as a universal control scheme that can be seamlessly applied to a diverse range of games.

Complete Paper #53

MAS4Games: A Reinforced Learning-Based Multi-Agent System to Improve Player Retention in Virtual Reality Video Games

Natalia Maury-Castañeda, Sergio Villarruel-Vasquez and Willy Ugarte

Universidad Peruana de Ciencias Aplicadas, Lima, Peru

Keywords: Dynamic difficulty adjustment · Q-learning · Multi-agent systems · Unity 3D · Virtual reality · Gaming experience · Game development · ML-agents framework · Video games · Artificial intelligence · Player performance · Difficulty level adaptation · Intelligent agent Training

Abstract: This paper presents a research study focused on implementing a Q-learning-based multi-agent system for Dynamic Difficulty Adjustment (DDA) in a Unity 3D fighting game. The objective of this study is to enhance the player's gaming experience by dynamically adjusting the game's difficulty in response to their performance. The research utilizes the Unity game development platform, along with the ML-Agents framework, to implement the Q-learning algorithm and train intelligent agents capable of adapting the game's difficulty level. Our findings highlight the potential of Q-learning and multi-agent systems in improving DDA in video games. Based on our experiences, we envision future works that involve testing and comparing alternative methods and approaches to further enhance DDA techniques, highlighting its potential for future investigations.

Poster Session 1	**CHIRA**
15:15 - 16:15	**Room Remo**

Complete Paper #17

Simplifying the Development of Conversational Speech Interfaces by Non-Expert End-Users Through Dialogue Templates

Maia Aguirre[1,2], Ariane Méndez[1], Manuel Torralbo[1] and Arantza del Pozo[1]

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[2] *UPV/EHU, Department of Electrical and Electronics, Faculty of Science and Technology, Campus de Leioa, 48940 Leioa, Bizkaia, Spain*

Keywords: Conversational speech interfaces · Task-oriented dialogue systems · Dialogue templates

Abstract: Conversational speech interface development, maintenance and evolution is challenging for non-experts as it requires linguistic knowledge and proficiency in chatbot design and implementation. To address this issue, this work proposes the use of Dialogue Templates, compact conversational interfaces intended to cater specific interaction capabilities which can be easily adapted to a particular use case by non-expert end-users, just with knowledge of the application domain. Our implementation of Dialogue Templates is presented and detailed for three relevant conversational spoken interaction use cases in the industrial environment: navigating maintenance management systems, recording manufacturing plant activity data and registering warehouse inventory. In addition, a comparative analysis is also conducted to assess the effort required to develop sample conversational assistants in such scenarios using our conventional development platform versus Dialogue Templates. Results show that Dialogue Templates significantly simplify the development of

conversational speech interfaces, without demanding linguistic expertise.

Complete Paper #18

Multiparty Dialogic Processes of Goal and Strategy Formation in Hybrid Teams

Andreas Wendemuth[1] and Stefan Kopp[2]

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[2] *Social Cognitive Systems, Bielefeld University, 33501 Bielefeld, Germany*

Keywords: Spoken dialog systems and conversational analysis · Multiparty human-machine interaction · Information retrieval

Abstract: A current trend which is already prevalent in highly structured (e.g. industrial) working environments is the coopera-tion of people, intelligent physical agents (robots) and, in parts, intelligent information agents (AIs, chatbots) in hybrid teams, mostly in paired settings. This position article discusses a major generalization and extension of this concept: (a) the goals, strategies, and actions are not fully prespecified, but develop in the course of a dialogic process; (b) the agents are not merely tools or assistants, but proactively intervene as peers; (c) the hybrid teams are multiparties with several humans and (situated or remote) intelligent agents, exhibiting and modelling pronounced group behavior. Cognitive, dialogic systems are the technical backbone of such team settings, bringing together techniques of multimodal processing, information retrieval, situated action planning and autonomous action generation, recognizing and anticipating task-related states of the actors.

Complete Paper #23

Adaptive Network Modelling of Informal Learning Within an Organization by Asking for Help and Getting Help

Debby Bouma and Jan Treur

Social AI Group, Department of Computer Science, Vrije Universiteit Amsterdam, The Netherlands

Keywords: Adaptive network model · Communication · Learning within an organization · Asking for help · Mental models · Organizational learning

Abstract: This paper contributes a computational analysis of how informal learning within organizations often takes place. The approach covers asking questions, the influence of approachability and presence, and direct and indirect answering of questions asked. This is done by modeling different people with their mental states, internal mental models, and communication. The results show that both direct and indirect answering of questions to a help-seeker can improve or complete their mental model. However, when questions need to be passed to other people, this slows down the mental model learning process. These results laid the foundation for further research and confirms intuitive results.

Complete Paper #32

Do Users Tolerate Errors? Effects of Observed Failures on the Subjective Evaluation of a Gesture-Based Virtual Reality Application

Lisa Graichen[1] and Matthias Graichen[2]

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[2] *Independent Researcher, Germany*

Keywords: User experience · Virtual reality · Gestures · Malfunction

Abstract: Recently, virtual reality (VR) has received increasing attention in science, re-search, and industry, as well as in consumer electronics. Together with this hardware, innovative interaction modes such as mid-air gestures are being devel-oped and employed. Because these setups are complex and less established than traditional buttons and touch-based interfaces, there is a higher risk that users will perceive errors, failures, and technical malfunctions. This raises the question of how popular, accepted, and trusted such systems are among users and whether observed errors influence this subjective assessment. Previous studies have shown that trust typically increases with usage duration and may decay after sys-tem failures. We conducted a study using an HTC Vive headset on which we mounted a Leap Motion device for gesture detection. Participants performed basic tasks with a "blocks" application using a set of gestures. Afterwards, they were asked to rate their levels of trust in and acceptance of the system. We investigated the correlation between the number of observed errors and reported levels of trust and acceptance to determine whether malfunctions directly influence subjective assessment. We found no effect of errors on acceptance but a significant correla-tion between number of errors and overall trust score.

Complete Paper #40

Immediate-after Effect of Enhancement Push-off at a Terminal Stance Phase of Gait Using Heating of Insole Tip for the Development of Smart Insole

Kazushige Oshita

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Keywords: Stride · Step length · Walking · Hip joint · Ankle plantar-flexion

Abstract: This study investigated the changes in lower limb joint angles and the step length during and immediately-after enhancement of push-off in the gait using heating of insole tip. Twelve healthy males walked on a treadmill under three different con-ditions; Participants were instructed to 1) walk as usual (CONTROL), 2) widen strides with an enhancement of push-off with normal insole (NORMAL), and 3) widen strides while attempting to enhancement of push-off with the warm area in insole (heated on the insole tip) (HEAT). In the NORMAL- and HEAT-conditions, the hip and ankle range of motions (ROMs) and step length during gait increased during push-off attention. However, ankle ROM and step length in the HEAT-condition increased significantly even immediately-after the use of heated insoles compared to before use. This increase in ROM may have been caused by increased plantar flexion during the terminal stance phase. These re-sults suggest that if the tip of the insole is temporarily heated to enhance push-off when the step length becomes shorter, the step length widen and the effect is maintained even after heating has been removed. Therefore, existing smart insole technology can be used to detect shortened strides, and future insoles may be in-creased push-off and widened strides by temporarily heating

the insole tip.

Complete Paper #41

An Intuitive Interface for Technical Documentation Based on Semantic Knowledge Graphs

Frieder Loch and Markus Stolze

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Keywords: Human computer interaction · Semantic knowledge graph · Technical documentation · User-centered design

Abstract: Maintaining technical documentation is a challenge. Products are becoming more complex, product lifecycles are getting shorter, and the number of product vari-ants is increasing. Manuals that guide personnel in the use and maintenance of products are critical to their efficient and safe operation. Authoring system for technical documentation therefore increasingly apply semantic models to control the cost of maintaining technical documentation. Working with formal semantic structures is challenging for technical writers who usually work with plain, writ-ten text. This paper presents an intuitive interface for a semantic knowledge graph to facilitate the adoption and use of semantic models in technical documentation. The interface allows working with unstructured text and to postpone its semanti-fication. Users can add semantic annotations in an iterative and incremental way. The interface was developed using a user-centered design process and subjected to an evaluation with technical writers. The results indicate that technical writers could use the prototype successfully and enjoyed the underlying concepts. Fur-ther iterations will extend the system and, for example, use artificial intelligence to suggest semantic links to improve the quality of the knowledge graph.

Complete Paper #64

Visual Representations for Data Analytics: User Study

Ladislav Peska, Ivana Sixtova, David Hoksza, David Bernhauer and Tomas Skopal

Faculty of Mathematics and Physics, Charles University, Prague, Czechia

Keywords: Visual representations · Data analytics · User studies · Human-in-the-loop

Abstract: One of the characteristics of big data is its internal complexity and also variety manifested in many types of datasets that are to be managed, searched, or analyzed. In their natural forms, some of the data entities are unstructured, such as texts or multimedia objects, while some are structured but too complex. In this paper, we have investigated how visualizations of various complex datasets perform in the role of universal data representations for both human users and deep learning models. In a user study, we have evaluated several visualizations of complex relational data, where some proved their superior performance with respect to the precision and speed of classification by human users. Moreover, the same visualizations also led to effective classification performance when used with deep learning models.

Special Session - Session **E3**
16:15 - 18:15 **Room Celio**
Enhancing the Esports Experience

Complete Paper #8

Initial Developments of Teamwork and Mental Health Focused Minigames for the Purpose of Esports Training

Danielle Langlois[1] and Simone Kriglstein[1,2]

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[2] *AIT Austrian Institute of Technology GmbH, Giefinggasse 4, 1210 Vienna, Austria*

Keywords: Esports · Esports training · Game design · Human computer interaction

Abstract: Esports professionals have to cope with a lot of stress and really need to be in sync with their teammates in order to perform at their highest capability. As part of an ongoing project, we are working toward a battery of minigames aimed at helping esports professionals train their teamwork skills and improve their mental health. Proposed ideas include modules focused on meditation, teaching coping mechanisms for difficult social scenarios via visual novel, and synchronized breathing exercises. Each of these has positive points and negative points. With these ideas, we hope to further develop several engaging minigames which can later be user tested.

Complete Paper #12

Power to the Spectator: Towards an Enhanced Video Game Stream Discovery Experience

Laura Herrewijn and Sven Charleer

AP University of Applied Sciences and Arts, Ellermanstraat 33, 2060 Antwerp, Belgium

Keywords: Esports · Spectator experience · Video games · Twitch

Abstract: Game streaming platforms like Twitch could benefit from more user control and transparency in recommendations. In this paper, we highlight the importance of allowing users to customise their streaming experience through three design goals: Social Interaction, Captivation, and Knowledge Acquisition, the latter addressing both skill improvement and serendipity. We discuss the preliminary results of our on-going iterative and user-centred design process aimed at improving the exploration experience for game spectators. More specifically we report on the results of co-design research to explore the parameters necessary for game spectators' enhanced control over their game stream discovery experience.

Complete Paper #5

Gamers' Eden: The Functioning and Role of Gaming Houses Inside the Esports Ecosystem

alessandro franzó[1] and Attila Bruni[2]

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[2] *University of Trento, Trento TN 38122, Italy*

Keywords: Esports · Gaming houses · Platforms · Ecosystems · Socio-materiality

Abstract: The current paper aims to analyse the complex array of practices entailed by teams and esports professionals by looking at one of the most peculiar phenome-na of the esports field: gaming houses, i.e., “co-operative living arrangement[s] where several players of video games, usually professional esports players, live in the same residence” [1]. Representing one of the first attempts to assess the role of gaming houses as emerging esports spaces based on new forms of play-bour and production of and by users, the paper comprises an innovative adapta-tion of PRISMA protocol for literature and scoping reviews to shed light on how the technological, material, and social elements are enacted through gaming hous-es’ activities, which mirror the ones entailed by digital platforms. In fact, through the three moves of encoding, aggregating and computing users’ interactions [2], gaming houses (re)produce virtual and analogical goods, translating consumer practices and profoundly influencing the broader esports ecosystem. Finally, by framing themselves as ideal hives for pro players, i.e., a prototypical breeding ground for esports professionals, these structures push for new paradigms of work-life balance and users’ production, thus leading to a further reflection on the nature of play and working practices in our contemporary network society [3].

Complete Paper #6

The Communication Effectiveness of AI Win Prediction Applied in Esports Live Streaming

Minglei Wang

College of Media and International Culture, Zhejiang University, Hangzhou, China

Keywords: AI win prediction · Esports spectators · Esports live streaming · Viewing experience

Abstract: AI win prediction is widely used in the live streaming of Esports games, with the assumption that it is capable of significantly enhancing the viewing expe-rience and providing valuable information to spectators. However, there is very little empirical research to demonstrate the actual attitudes and feelings of spectators towards AI win prediction. This paper describes an ongoing study from the perspective of communication effectiveness that aims to bridge this gap and explore some possible influencing factors, which could provide a scientific basis for better presenting AI prediction information in future Esports live streaming, thus further improving the viewing experience and engagement of spectators. This study has not yet officially begun on a large scale, so this paper primarily reports primary results from in-depth in-terviews, as a pilot study for the formal survey experiment. The perceived usefulness, the balance between credibility, accuracy, and dramatic effects, and the anthropomorphic image are mainly discussed.

Complete Paper #7

Using Audience Avatars to Increase Sense of Presence in Live-Streams

Tomáš Pagáč[1] and Simone Kriglstein[2]

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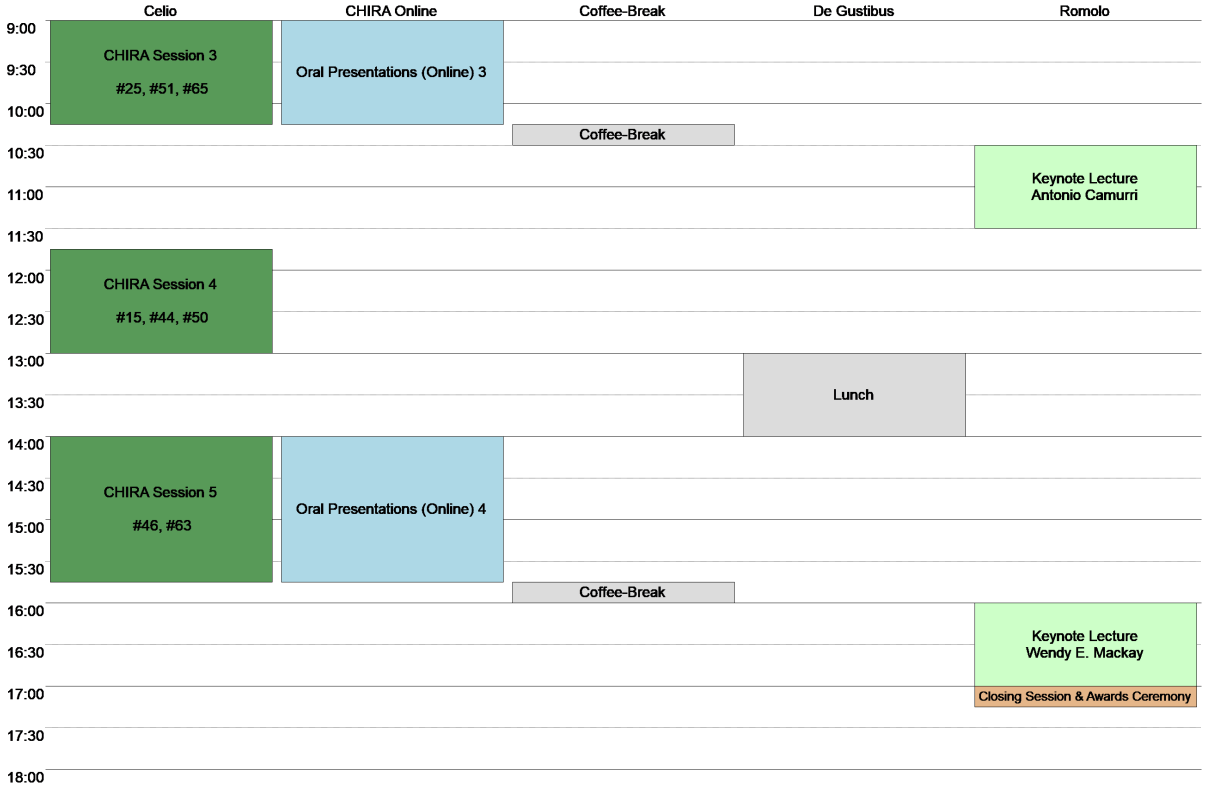
[2] *AIT Austrian Institute of Technology GmbH, Giefinggasse 4, 1210 Vienna, Austria*

Keywords: Live-streaming · Spectatorship experience · Avatar

Abstract: Social interactions and the sense of presence are important for the spectatorship experience in live-streams. In large audiences, communication gets harder and viewers participate less. This paper explores the possibility of representing an audience using animated avatars to increase the sense of presence and potentially move some traffic from the chat window to the avatars. We discuss the motivations for and the challenges in creating an audience avatar interface.

Friday Sessions: November 17

Friday Sessions: November 17 Program Layout



Session 3A **CHIRA**
09:00 - 10:15 **Room Celio**
Design and Evaluation

Complete Paper #25

Tracing Stress and Arousal in Virtual Reality Games Using Players' Motor and Vocal Behaviour

Susanna Brambilla, Giuseppe Boccignone, N. Alberto Borghese, Eleonora Chitti, Riccardo Lombardi and Laura Ripamonti

University of Milan, Milan 20133, Italy

Keywords: Virtual reality · Arousal · Stress · Video game · Prosodic features · Motion behavioral data

Abstract: In this study, we tackle the integration of stressors and voice interaction in a Virtual Reality game to assess players' arousal and stress levels. The selected game genre and its characteristic components are used as a basis to create stress-inducing elements. Additionally, a voice interaction module has been created using a voice assistant called Minerva. The module allows for real-time detection and recording of players' emotional responses based on variations in pitch and intensity of speech. The game consists of a single level divided into four areas with increasing levels of stress. The experiment involved 16 volunteer students who played the game while their prosodic and behavioral movement data were collected. Participants also completed questionnaires and produced ratings to assess their perceived stress and arousal levels. The collected data were analyzed to evaluate the effectiveness of the real-time estimation of arousal and stress.

Complete Paper #65

A Web Platform to Investigate the Relationship Between Sounds, Colors and Emotions

Silvia Dini[1], Luca Andrea Ludovico[2], Alessandro Rizzi[3], Beatrice Sarti[4] and Maria Joaquina Valero Gisbert[1]

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[2] *Università degli Studi di Milano, via G. Celoria 18, Italy*

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[4] *MIPS, University of Milan, Italy,*

Keywords: Computer-human interfaces · Chromesthesia · Music · Colors · Emotions · Art

Abstract: This paper presents a novel web platform designed to investigate the relationship between sounds, colors, and emotions, with the overarching goal of enhancing the sensory experience of impaired individuals in visual art museums. Leveraging the principles of sensory substitution, the project aims to bridge the gap between auditory and visual perception, allowing individuals with visual or cognitive impairments to engage with visual art through alternative sensory modalities. The platform's architecture is centered around the delivery of short sound stimuli to participants, who then provide feedback on the associations they perceive between these auditory cues and both colors and emotional dimensions. The collected data will be analyzed to discern patterns and correlations, shedding light on how auditory stimuli can be used to evoke visual and emotional responses. This paper outlines the technical and methodological aspects of the web platform, including its design, development, and implementation. It discusses the selection of sound stimuli and the integration of user-friendly interfaces to ensure a seamless experience for participants. Preliminary results from volunteer tests are briefly presented, highlighting intriguing findings regarding the associations between sounds, colors, and emotions.

Complete Paper #51

An Augmented Reality Environment for Testing Cockpit Display Systems

Caner Potur[1,2] and Gokhan Ince[2]

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[2] *Faculty of Computer and Informatics Engineering, Istanbul Technical University, Istanbul, Turkey*

Keywords: Augmented reality · Cockpit display systems · Test automation

Abstract: In the avionics industry, software test automation is a crucial component, as it plays a significant role in accelerating the development process. Since all automation systems are error-prone, the automation systems that affect flight safety should be supervised by humans as they must be reliable. In this study, an augmented reality based software verification system is designed to observe the visual verification of cockpit screens and detect possible automation errors. In the designed system, an observer can instantly see the test steps and automation results using an augmented reality glasses as a hologram on the cockpit screen and can report the errors they observe in test automation. The performance of the proposed system was analyzed qualitatively and quantitatively. The experimental results demonstrated that the use of augmented reality in cockpit display verification systems accelerated the testing process, reduced users' cognitive load, and improved the system's usability.

Oral Presentations (Online) 3 **CHIRA**
09:00 - 10:15 **Room CHIRA Online**
User Experience Design

Complete Paper #37

Student-Centered Development of an Online Learning Support Feedback Software Tool: A Design Study Approach

Gilbert Drzyzga and Thorleif Harder

Institute of interactive systems, Technische Hochschule Lübeck, Germany

Keywords: Design study · User-centered design · Design process · Gestalt laws · Interaction principles · Eye-tacking & thinking aloud · Self-regulated learning · Usability · User experience · Cognitive load

Abstract: Online programs risk higher student dropout rates. Supporting learning tools such as learning analytics dashboards (LADs) can promote self-regulated learn-ing and positively impact student outcomes. In this paper, a three-level design study is presented that demonstrates the reduction of cognitive load at multiple levels when students are involved in the LAD design process. Through a user-centered design process (including requirements analysis and expert interviews), a wireframe was developed using participatory methods and evaluated by 24 uni-versity students using the laws of Gestalt psychology, resulting in a clickable, low-fidelity prototype (LFD). This was then evaluated by 24 university students using the interaction principles of EN ISO 9241-110:2020. The refined LFD was further evaluated with university students in an eye-tracking study using the thinking-aloud technique (n=10). The feedback emphasized the importance of

participatory design and provided critical insights into the most effective use of the LAD and its elements, taking into account cognitive aspects. The results showed significant optimization in the small details and the big picture in the use of content elements, e.g., it is a crucial part to create a navigation structure adapted to the needs of an LAD and it is beneficial to present a reduced level of infor-mation during the initial access, with the option to add or access additional ele-ments as needed.

Complete Paper #56

Designing a WhatsApp Inspired Healthcare Application for Older Adults: A Focus on Ease of Use

Saurabh Nautiyal and Abhishek Shrivastava
Indian Institute of Technology Guwahati, Guwahati, Assam, India

Keywords: Ageing population · Digital healthcare · Healthcare application · User Interface (UI) design · WhatsApp · Older adults

Abstract: The increasing ageing population in any country necessitates high-quality healthcare services. Smartphone-based healthcare applications can play a pivotal role in meeting this requirement. Previous studies indicated that older adults exhibit lower acceptance of smartphone-based healthcare applications. In contrast, older adults popularly use smartphone applications for social interaction. WhatsApp is one such popular application used by older adults for social interaction. This study aims to enhance the ease of use of a dedicated healthcare application among older adults by incorporating WhatsApp's user interface design attributes. The present study comprises three phases. In the first phase, we assessed the usability of WhatsApp and observed its good usability characteristics for older adults. In the second phase, we identified the design attributes of WhatsApp's user interface by employing the affinity mapping method. In the third phase, we applied the identified design attributes to develop a prototype of a healthcare application and tested it with older adults. We found that the developed prototype of the healthcare application is easy to use among older adults. This study recommends developing a WhatsApp-inspired dedicated healthcare application for older adults. The study demonstrates how older adults perceive a new healthcare application as user-friendly, inspired by a familiar user interface. This research will aid designers and developers in creating dedicated healthcare applications tailored to the needs of older adults. Consequently, it will enhance the adoption of digital healthcare applications among the ageing population.

Complete Paper #58

Participative Development of a Learning Dashboard for Online Students Using Traditional Design Concepts

Gilbert Drzyzga, Thorleif Harder and Monique Janneck
Institute for Interactive Systems, Technische Hochschule Lübeck, Germany

Keywords: Digital degree programs · Dropout rates · Self-regulation · User-centered design · Gestalt laws · Factual and interaction problems · Learning analytics

Abstract: In order to improve online learning outcomes, a Learning Dashboard (LD) for online students is being developed as a plugin for the learning management system Moodle to support self-regulation. The project itself focuses on the factors that lead to success and failure in online learning. Using a user-centered design approach, the LD will provide students with feedback and functional elements through different cards. 24 online students completed a three-part term paper in which they examined the elements of two wireframes of the LD in relation to Wertheimer's Gestalt Laws and in terms of factual and interaction problems. We also received 11 card designs from them as a voluntary bonus assignment. Assignments 1 & 2 had to be completed successfully in order to be admitted to the exam. The study was designed to encourage student participation and improve accessibility by taking into account their expertise. The results showed that clearer overviews, clarification of how content elements fit together, more compact solutions, and intuitive controls improved clarity and usability

Keynote Lecture **CHIRA**
10:30 - 11:30 **Room Romolo**

Aesthetically Resonant Multimodal Interactive Systems

Antonio Camurri
Università degli Studi di Genova, Genova, Italy

Abstract: Art and science are often viewed as distant domains only loosely connected. In recent years we are now witnessing more interaction between the two. This has led to an increased awareness of how art and science are indeed two different but strongly coupled aspects of human creativity, both driving innovation as art influences science and technology, and as science and technology in turn inspire art. Recognizing this mutually beneficial relationship, the Casa Paganini research centre cultivates the intersection of scientific and technological research in human-centered computing where art and humanistic culture are a fundamental source of inspiration in a trans-disciplinary approach. In this seminar, I discuss concrete examples on how our collaboration with artists informed our work on the automated analysis of nonverbal expressive and social behavior and interactive sonification, including presentation of some of the scientific and technological results from the EU projects H2020 FET PROACTIVE EnTimeMent and EU Horizon Europe STARTS ICT ReSilence.

Session 4A **CHIRA**
11:45 - 13:00 **Room Celio**
Accessible and Adaptive Interaction

Complete Paper #50

Accessible Applications to Improve the Tourist Experience

Irene De Paoli[1], Alessia M. Di Campi[1] and Flamina Luccio[2]
[1] *Università Ca' Foscari Venezia, Italy*
[2] *DAIS, Università Ca' Foscari Venezia, Venezia, Italy*

Keywords: Accessibility · Applications · Tourism

Abstract: Traveling is known to improve a person's well-being and happiness, and tourism experiences should be offered to all types of tourists, including those with different disabilities. At the same time, technology is evolving and tourism applications are spreading. In this paper, we focus our attention on accessible mobile applications that can support a tourism experience. We first reviewed and classified a wide range of applications dedicated to users with visual, hearing, motor, cognitive impairments, and also others dedicated to the elderly. We have included this last category of users as they represent an interesting but at the same time specific target for the tourism industry. To understand

how these dedicated apps could be better designed to improve accessibility we have then run a study collecting empirical data through questionnaires proposed to 210 users with diverse cognitive abilities, and to 50 elderly users, respectively. We have investigated and analyzed their approach to using tourist apps, also trying to understand the challenges they most commonly encounter when using them, and discussing possible improvements.

Complete Paper #15

Towards Gesture Based Assistive Technology for Persons Experiencing Involuntary Muscle Contractions

Christine Pocock[1], Chris Porter[1] and May Agius[2]

[1] *Department of Computer Information Systems, University of Malta, Msida, Malta*

[2] *Department of Communication Therapy, University of Malta, Msida, Malta*

Keywords: Human-Computer Interaction (HCI) · Assistive Technology (AT) · Involuntary gestures

Abstract: This research investigates the viability of leveraging Machine Learning (ML) algorithms to develop gesture recognition systems that may benefit people who experience involuntary muscle contractions. This presents distinct challenges, such as the reduced ability to perform gestures accurately and repeatedly (flawed gestures) as well as the ability to provide sufficient data to pre-train models. This investigation revolves around three shortlisted gesture recognition algorithms which were evaluated in a controlled lab environment. The primary objective was to observe specific characteristics such as robustness under different simulated conditions, training requirements, as well as classification latency and accuracy. Results show distinct properties for each shortlisted algorithm. kNearest Neighbour (KNN) with Dynamic Time Warping (DTW), or KNN-DTW, is well suited where accurate gesture training is challenging due to frequent involuntary movements. Although this approach works well with one sample, the classification response time is significantly longer than KNN and Support Vector Machine (SVM). However, timing may not always be a priority, depending on the context of use. On the other hand, when real-time responses are necessary, KNN and SVM both offer a good level of performance. These, however, rely on training data to produce accurate classifications, in which case the user must be able to perform gestures in a reasonably repeatable manner. This work also presents a dataset of 1600 samples for four gesture classes, including a corresponding set of flawed gesture samples for each class.

Complete Paper #44

A Case Study on Netychords: Crafting Accessible Digital Musical Instrument Interaction for a Special Needs Scenario

Nicola Davanzo[1], Federico Avanzini[1], Luca A. Ludovico[1], Davys Moreno[2], Antonio Moreira[2], Oksana Tymoshchuk[2], Júlia Azevedo[3] and Carlos Marques[3]

[1] *Laboratory of Music Informatics (LIM), Department of Computer Science "Giovanni Degli Antoni", University of Milan, Via Celoria 18, IT-27133, Milan, Italy*

[2] *Research Centre on Didactics and Technology in the Education of Trainers, 3810-193, Aveiro, Portugal*

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Keywords: Accessibility · Digital musical instruments · Cerebral palsy · Music education · Special needs · Eye tracking

Abstract: Musical expression significantly impacts individual development, enriching cognitive, emotional, and social capacities. This influence is particularly profound in young individuals with cognitive or physical impairments. To address this, we devised an ecosystem of software tools, paired with specially designed hardware devices, such as an eye tracker. Our approach empowers even severely impaired users, with no prior music education, to achieve musical performance. In this paper, we detail a case study involving a child with cerebral palsy, providing an examination of the strengths and shortcomings of our approach. By utilizing a specialized instrument, called *Netychords*, the child achieved a significant milestone, namely the enrollment in Portugal's Arts Education Program, which fostered musical interaction with his peers and educators. This paper focuses on the technical aspects of the user's experience with the instrument, which catalyzed numerous redesign phases, adapting it to the child's unique needs and motor abilities. Our analysis of this adaptive design process strives to offer valuable insights to extend our approach to cater to various special needs scenarios.

Session 5A **CHIRA**
14:00 - 15:45 **Room Celio**
Computer-Human Interaction Research and Applications

Complete Paper #46

Eco-Design of a Smart Module to Provide Customizable and Effective Interaction for the Elderly

Simona D'Attanasio, Tanguy Dalléas, Dorian Le Boulc'h and Marie Verel

Icam School of Engineering, Toulouse Campus, 75 av. De Grande Bretagne, CS 97615, 31076 Toulouse Cedex 3, France

Keywords: Social interaction · Smart wooden furniture · Customizable module

Abstract: Social isolation and loneliness are risk factors of morbidity and mortality for the elderly, whose number will increase in the future. Smart devices can offer solu-tions to stimulate activities and social contact to fight these threats, on condition that the real needs, expectations and capacities of the target users are considered. Among smart devices, smart wooden furniture provides a sustainable way for-ward that can be easily integrated and accepted into the domestic environment. The article presents a module in a compact 3D-printed box with a smart tactile icon and visual and auditory feedback, built to be integrated in a wooden piece of furniture. A variety of simple scenarios can be programmed and the pattern of the icon can be changed according to the user's needs and preferences. Various tests to validate the design have been performed and are presented. The electronic components are accessible for repair and the aim is low consumption, according to eco-design recommendations. The module showed to be a promising simple, robust and customizable tool to promote effective interaction with the elderly.

Abstract #63

Development of Feasible GUI Input Elements for Smartphone Cross-Haptic Handling by Pilots While Steering Small Planes

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Keywords: Flight navigation assistance · Cross-haptic GUI · Ubiquitous plane cockpit tools · Smartphone apps for pilots

Abstract: Smartphone technology has evolved over the last decades various GUI input and output elements, which were rooted back into the very early developments of computing based on the concept ideas of transferring switches, push buttons, selectors, and wheels from electromechanic panels for a display on RGB screens. The standard elements known from GUI libraries like X11 or TCL/TK were also reflected into smartphone programming features. In smartphone handling, human users typically hold the devices with one hand and apply input controls on a touch screen surface with fingers of the other hand. New ideas for haptic actions came up like two-finger stretching and single-finger wiping, which even is used with acceleration and slow-down effects. Due to the physical small screen size, which is quite natural for devices that should be carried in small pockets, finger touches require certain precision on the display surface. Especially when a choice between several top-level elements is desirable, the input elements appear even smaller. When haptic precision is not possible, such concepts clearly do not work well.
In the research described here, the handling environment of smartphones as assistive tool for small and sporting plane pilots is focused. This kind of environment doesn't enable pilots to use two hands for a smartphone at all, since one hand is always occupied with holding the main control stick or yoke, often it is not even practicable to look at the smartphone screen while applying some input control. During operation and steering of planes the continuously varying and unpredictable side and shaking forces prevent reliable precision in touching input elements on any smartphone screen.
Fundamental potential analysis yields two basic input modes without visual trace: (a) either one single finger without further guidance touches the input screen anywhere, or (b) one hand embraces the smartphone housing and allows more particular touch down direction of its forefinger on the screen area. In both cases (a) and (b), the finger action can be controlled as short significant touch, clear long press, or knocking either with a certain number of counts or even by applying a certain tapping rhythm. While the finger touching position on 2D screen surface arises relatively random for (a), tapping orientation on screen is possible to a certain extent in (b) since the hand provides a feeling of the screen limits. According to practical experience it is possible to split the screen surface logically into two halves - up and down or left and right - or four quadrants through reference to the corners - while landing the input finger action with some haptic coordination. Also finger wipes and circular movements with alternative linear or rotational direction will work reliably for (b). Summing up all these modes, a high number of distinguishable single finger input events are available, when handling the device blindly.
These concepts were derived during the recent years from development and field testing of smartphone tools, which shall efficiently assist pilots of small planes in navigation and flight logging especially in phases of high workload. The supplement video shows, e.g., how zoom in/out for a moving map software can be commanded blindly by single finger input action with long press and quick tapping respectively. More cross-haptic input elements are used in these pilot apps, which are still being improved further.

Oral Presentations (Online) 4 **CHIRA**
14:00 - 15:45 **Room CHIRA Online**
Human Factors for Interactive Systems, Research, and Applications

Complete Paper #26

Electro-Oculographic Discrimination of Gazing Motion to a Smartphone Notification Tone

Masaki Omata and Shingo Ito

University of Yamanashi, Kofu, Yamanashi, Japan

Keywords: Electro-oculogram · Skin conductance response · Gazing motion · Notification tone

Abstract: This paper describes an experiment to validate whether unconscious responses or conscious gazing motions to notification tones can be discriminated from skin conductance responses or electro-oculograms. Our goal is to solve a problem that a smartphone cannot discriminate that a user has noticed a notification from the smartphone unless the user directly operates it or speaks to it when the user noticed the notification. In our experiment, participants were presented with notification tones while they were watching a video or reading orally as a main task, and their physiological signals were recorded during the task. As the results, we found that it took approximately four seconds to discriminate the response from skin conductance responses, whereas it took only one second to discriminate the response from the electro-oculogram. Furthermore, we found that the recall was 92.5% and the precision was 96.1% for discriminating the conscious gazing motions to the notification tones from the electro-oculograms between upper and lower of an eye.

Complete Paper #28

Why is Career Orientation Often Difficult and How Can Digital Platforms Support Young People in this Process?

Jessica Brandenburger and Monique Janneck

Technische Hochschule Lübeck, Institute for Interactive Systems (ISy), Lübeck, Germany

Keywords: Career orientation · Online learning platforms · Human-centered design

Abstract: Countless career options and support services make it difficult for young people to choose a career. Within a research project (JOLanDA), we are developing a digital platform that is intended to support decision-making processes in the con-text of career choice at an early stage and, thanks to a playful approach and a novel interaction concept, to be used in a self-motivated manner outside of school if possible. In a German-wide online survey (n = 1044) among school and university students (14-35 years), requirements for career orientation platforms were collected. The results show that the *decision-making* and *planning knowledge* as well as the *exploration* and the *occupational knowledge* are rather low. The young people seem to have little knowledge of application processes and the organization of a course of study or in-company training. Choosing a career seems to be difficult, as almost one in two does not know what interests him or her. One-third do not know about corresponding offers and one-fifth state that existing platforms do not contain enough offers. We have summarized implications for developers so that platforms for skills acquisition can be made more attractive and also more conducive to young people.

Complete Paper #47

Technology Enhanced Mulsemedia Learning: Insights of an Evaluation

M. Mohana[1], Aleph Campos da Silveira[2,3], P. Subashini[1], Celso Alberto Saibel Santos[2] and Gheorghita Ghinea[3]

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Keywords: Human-computer interaction · Mulsemedia · Multimedia · e-Learning · Quality of Experience (QoE) · STEM

Abstract: Human-Computer Interaction (HCI) plays an essential role in the design and development of e-learning systems due to ensure that learners' interactions with technology are effective, cost-effective, and user-friendly. In the context of e-learning, HCI is concerned with designing interfaces and experiences that optimize learners' engagement, interaction, and overall achievement in learning. Educators are actively working on a variety of initiatives intended at enhancing students' motivation, engagement, and academic achievement, with a particular emphasis on Science, Technology, Engineering, and Mathematics (STEM) disciplines. However, when it comes to adapting and interpreting learning material and information, learners are not actively engaged with e-content. This paper analyses the user's quality of experience (QoE) in STEM education content through a developed Technology Enhanced Multimedia Learning (TEML) web portal with different multisensorial effects such as olfactory, vibration, and airflow. This is ongoing research work focused to analyse learners' emotional states while learning with Mulsemedia effects. However, this paper has analysed the initial insides of the developed Mulsemedia device and Learning portal through a self-assessed QoE questionnaire. It was initially conducted with 60 participants and was divided into two subgroups namely experimental and control groups. The results showed that both groups had a positive experience in Mulsemedia-based learning environment which means Setup was designed well for STEM subjects.

Complete Paper #52

Human-Centred Digital Sovereignty: Explorative Conceptual Model & Ways Forward

Dennis Lawo[1], Thomas Neifer[1], Margarita Esau[1,2] and Gunnar Stevens[1,2]

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Keywords: Digital sovereignty · Human autonomy · Conceptual model

Abstract: In recent years, both authoritarian and democratic states have started using the term *digital sovereignty* as a basis for their digital policies. Although the interpretations and resulting policies may differ, the autonomy and sovereignty of individuals and their communities are at stake. Current political discourses mainly focus on governmental and corporate actors and their aspirations to control the digital sphere. Given the importance of this term, scholars in our community have begun to engage with the discourse. However, there is still a lack of dissemination, coming with a lack of conceptual models to explain, explore, and research human-centred digital sovereignty. Inspired by claims for human-centred digital sovereignty, this paper takes up the discourse and creates an explorative conceptual model that aims to guide early research within HCI, support an understanding of the field, and helps to identify relevant cases. Moreover, we discuss key challenges and potential ways forward.

Complete Paper #57

Understanding Adoption of Last Mile Electric Micromobility in Rural Areas: A Structural Equation Modeling Approach

Thomas Neifer[1,2,3], Ariane Stöbitsch[2,3], Kalvin Kroth[2,3], Caroline Baja[3], Dennis Lawo[2], Lukas Böhm[2,3], Paul Bossauer[2,3] and Alexander Boden[2,3]

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Keywords: Electric micromobility · Last mile problem · Public transport · Adoption

Abstract: Electric micromobility is a promising part of the transition towards more sustainable and ecologic transportation systems – especially as a complement to public transportation on the last mile. However, so far adoption of such services is still not ideal, especially in rural areas. By means of a quantitative study with 137 users, our work-in-progress paper investigates user acceptance in urban and rural areas. Based on a structural equation model, our research shows that rural municipalities and providers should especially consider aspects that address the performance expectation and the perceived collective environmental impact of potential users, as these have been found to be especially relevant for the intention to use. Our study thus contributes to the theoretical understanding of e-micromobility, which has so far been mostly investigated in urban areas.

Keynote Lecture **CHIRA**
16:00 - 17:00 **Room Romolo**

Creating Human-Computer Partnerships

Wendy E. Mackay

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Abstract: How can we can design "human-computer partnerships" that take optimal advantage of human skills and system capabilities? Artificial Intelligence research is usually measured in terms of the effectiveness of an algorithm, whereas Human-Computer Interaction research focuses on enhancing human abilities. I argue that better AI algorithms are neither necessary nor sufficient for creating more effective intelligent systems. Instead, we need to focus on the details of interaction and how to successfully balance the simplicity of the user's interaction with the expressive power of the system. After describing our approach to "generative theories of interaction", I will illustrate how to create interactive intelligent systems where users can discover relevant functionality, express individual differences and appropriate the system for their own personal use.

Closing Session & Awards Ceremony **CHIRA**
17:00 - 17:15 **Room Romolo**

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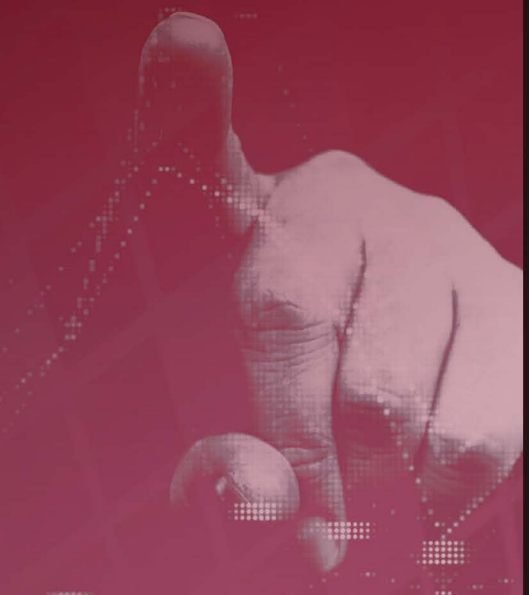

Final Program and Book of Abstracts of CHIRA 2023

7th International Conference on Computer-Human Interaction Research and Applications

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