Research in the HCI group at the University of St. Gallen in 2021

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Summary of the key research papers published by the Human-Computer Interaction group within the School of Computer Science at the University of St. Gallen in 2021.

1 INTRODUCTION

The HCI research group in St. Gallen has conducted several research studies in different areas of human-computer interaction. These studies have led to insights that can be useful in enhancing user experience and usability and improving the accessibility and safety of technology in different contexts. The HCI group was newly established in 2021 as part of the School of Computer Science at the University of St. Gallen.

2 TECHNOLOGY AND ITS IMPACT ON USERS' EXPERIENCES

2.1 VeloCity: Using Voice Assistants for Cyclists to Provide Traffic Reports

In this article, we address the challenges cyclists face when using mobile applications while riding and present VeloCity, an application designed to report traffic incidents and structures relevant to cyclists. We conducted a case study to compare three input methods (touch, in-app speech recognition, and voice assistant) to identify the safest and most preferred method for cyclists. Our results show that participants preferred using the voice assistant as it was the least distracting, with short commands being preferred over conversational phrases. We provide five guidelines for designing voice user interfaces for cyclists and recommend moving away from touch-based interfaces, which are currently prevalent [6].

2.2 Understanding Users' Knowledge about Privacy and Security of Browser Extensions

In this study, we investigated users' awareness and attitude towards the permissions requested by browser extensions. To achieve this, we conducted an online survey with 353 participants to explore their knowledge, preferences, and concerns about extension permissions. Results indicate that users are interested in obtaining more information about the permissions requested and trust the developers but do not actively take steps to protect their data. Moreover, users have limited knowledge of the technical capabilities of browser extensions and prefer permission statements that evoke a clear mental model. Based on these findings, we propose recommendations to improve browser extension permission dialogues through precise language, technical advancements, and distinct responsibilities [4].

2.3 Multisensory Proximity and Transition Cues for Improving Target Awareness in Narrow Field of View Augmented Reality Displays

In this article, we explore the potential of multisensory cue combinations to improve awareness of out-of-view objects in narrow field-of-view augmented reality displays. Specifically, we investigate the use of proximity and transition cues in the visual, auditory, or tactile form to enhance spatial awareness of approaching objects and inform users when an object has entered their field of view. We conducted two studies to evaluate user preferences and performance measures under varying noise levels. Our findings suggest that tactile transition cues are the most effective, resulting in significantly faster reactions to incoming augmentations. We also found that visual and audio noise can have a

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detrimental effect on performance when feedback includes visual proximity cues. Our study provides recommendations for determining which cue combination is appropriate for specific applications [7].

2.4 The Role of Mobile and Virtual Reality Applications to Support Well-Being: An Expert View and Systematic App Review

The paper discusses the rise of interactive technologies for autonomous mental health management due to limited therapy access and stigma. However, most commercial mental health apps are not theory-based or clinically tested, and psychological theories are not easily accessible to app designers, making it unclear whether current mobile and VR mental health apps meet therapists' expectations. To address this gap, we conducted interviews with therapists to understand current therapeutic practices with a focus on emotion regulation and their applicability to mobile apps. We then conducted a systematic review of 60 mental health-related mobile and VR apps using the themes identified in their interviews as an understanding lens. We identify discrepancies and provide design implications for better embedding lived therapeutic practice into mental health apps. We provide a common grounding between therapists and developers on the features and properties of well-being mobile and VR apps [8].

3 HCI DURING THE PANDEMIC

3.1 Addressing the Challenges of COVID-19 Social Distancing Through Passive Wi-Fi and Ubiquitous Analytics: A Real-World Deployment

In response to the COVID-19 pandemic, social distancing measures were implemented to curb the spread of the virus. This paper presents a passive Wi-Fi scanning system that was deployed and tested to help individuals keep track of crowded spaces to comply with social distancing guidelines. The system uses passive Wi-Fi sensing to detect human presence in 93 locations around a medium-sized European touristic island. The data is made available to citizens and tourists through website plugins and a mobile application. The paper also reports on user insights collected through online questionnaires to understand the usefulness, safety, and privacy concerns of the system. Results indicate that users found the occupancy data provided by the system useful and that the public display of this information made them feel safer while travelling and planning their commute [5].

3.2 Sharing Heartbeats: Motivations of Citizen Scientists in Times of Crises

This paper investigates the socio-psychological processes and motivations for individuals to share personal data during a pandemic using the case of the Corona-Data-Donation-App launched by the Robert Koch Institute in Germany. The study aims to explore whether egoistic or collective motives prevail in virtual citizen science projects during crisis situations. By examining app reviews (n=464) and conducting in-depth interviews (n=10), the study finds that collective motives dominated among participants. The authors provide implications for future virtual citizen science tools in times of crisis, emphasizing the importance of communication, transparency, and responsibility.

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4 HCI IN SPACE

4.1 Disability in Space: Aim High

We discuss the European Space Agency's (ESA) Parastronaut Feasibility Project, which aims to send astronauts with lower-limb deficiencies to space. While a step in the right direction, the ESA's decision to limit the acceptable disabilities

discounts the potential of people with disabilities and misses an opportunity to prepare all astronauts better to adapt to in-flight trauma. We propose that the ESA broaden its criteria for eligible disabilities and develop space programs with people with disabilities, rather than just for them, to ensure that future spacecraft are accessible to all. We suggest considering a range of disabilities, including blindness, deafness, upper limb and leg deficiencies, paraplegia, multimorbidity, and cognitive or neurological deficiencies, to prepare for health issues previously observed in astronauts and improve mission safety while inspiring the next generation, including the 15% of people who have a disability [3].

4.2 Conversational User Interfaces to support Astronauts in Extraterrestrial Habitats

In this paper, we address the psychological challenges that astronauts face during long-term space missions, particularly in confined spaces with long-duration sensory deprivation. We propose the use of conversational user interfaces (CUIs) in extraterrestrial habitats as a means of augmenting astronaut well-being. We describe the design, implementation, and evaluation of two CUIs, CASSIOPEIA and PEGASUS, to support astronauts in their daily and scientific routines, as well as provide emotional support. We derived design guidelines for CUIs during a week-long analog mission with four scientists using a Wizard of Oz prototype. Our findings suggest that CUIs can effectively support astronauts in extraterrestrial habitats, and the derived guidelines can inform the development of future CUIs [2].

4.3 Crew time and workload in the EDEN ISS greenhouse in Antarctica

In the EDEN ISS project, we aim to develop technologies for greenhouses that could be used in planetary surface habitats. In this study, we investigate the crew time and workload required to operate the EDEN ISS greenhouse on-site in Antarctica and remotely from the Mission Control Center. The study revealed that crew time for on-site operators was four times higher than for remote support teams, and the remote support team perceived the highest workload. These findings indicate the need to minimize crew time and workload demands for operators of future planetary surface greenhouses. The study provides a methodology for crew time categorization for remote support activities and presents the weekly and monthly crew time demand over the experiment phase [9].

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