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Editorial: Immersive reality and personalized user experiences

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Editorial on the Research Topic
Immersive Reality and Personalized User Experiences

The underlined "Human-Technology Symbiosis" has transformed the Immersive Reality (IR) technologies and computational systems to a new multidimensional communication medium providing new opportunities, activities, methodologies, processes, and services. Most researchers, designers and practitioners follow the "one-size-fits-all" paradigm, focusing on the technology used to create high-fidelity IR simulations; however, the human factors involved in achieving a state of presence must be taken into account as well. The big challenge is to build immersive spaces that consider also intangible aspects influenced by the individual differences rather than only technology-related concepts; generating personalized experiences and ensuring the expected engagement and satisfaction.

Immersive Reality (IR) technologies as a collective term representing Virtual Reality (VR), Augmented Reality (AR) or Mixed Reality (MxR) provide an unprecedented potential of integrating the users' physical reality with virtuality, when they execute tasks and actions towards accomplishing specific goals. This reality-virtuality continuum aims at enriching the user experience, view and understanding by offering the opportunity to (a) visualize different concepts in real time and interact intuitively with them in a simulation or "hybrid" world, and (b) make information and knowledge more accessible through experiential learning methods and techniques. However, embracing a standard viewpoint on given users' activities in immersive spaces may not ultimately facilitate the successful attainment of presence and engagement. Even worse, there is a high risk of overwhelming the users, creating confusion and frustration during interaction. For example, standard solutions may use designs, interaction practices and interfaces, questionable usability, functionality, efficiency, reliability and maintainability that may be ineffective for a single user or group of users.

On the other hand, the added value of human-centred adaptation and personalization empowered by artificial intelligence techniques (e.g., machine learning, natural language processing, recommender engines), and game-based mechanics and methods is highly recognized with respect to more traditional environments of interaction, as is the Web. Related applications and systems use human individual differences (e.g., cognitive and emotional traits and capabilities in information processing, intelligence, personality, motivation, perceptual characteristics, behavior and attitude, metacognition, social differences) in their core models, track and analyze user behavior, preferences, feedback, and characteristics to make predictions or adjustments. Accordingly, they offer dynamic one-to-one touchpoints with ease, delivering unique, personalized experiences regarding the content presentation and navigation increasing the users' engagement, effectiveness and efficiency during the execution of tasks.

The main focus of this Research Topic lies in the cross-borders of the aforementioned disciplines, by designing and developing solutions that adhere to:

a. Human-centred models and personalization mechanisms that will be able to regulate information processing factors, perception and engagement of users when interacting with substantial amount of information as well as to create best-fit immersive experiences to the benefit of the unique user;
b. Persuasive strategies and technologies for behavior change that can automatically adapt the content and interaction process on the users' goals and tasks;
c. Game-based or gamified elements, such as scoring, badges, timed activities and rewards, helping improve motivation, concentration, learning and positive attitude of users while accomplishing their goals; and
d. Artificial intelligence algorithms and interaction principles through the IR technologies that can handle the increasing complexity of data structures by facilitating access to the right data at the right time, intelligent support during exploration and analytics for predictive and proactive actions; while at the same time reducing cognitive-load errors or runtime experience problems.

The need for providing personalized user experiences based on human individual differences in IR technologies and simulations is even more recognizable today where there is a direct influence on the learning process, problem solving and decision making. This Research Topic showcases empirical, basic and applied research on human behavior and IR dynamics of the intuitive interaction between humans and technology, covering a broad spectrum of domains. Accordingly, it contains six contributions discussing interesting ideas in the areas of consumer immersive virtual reality devices, hand texture, medicine, personalization in VR for fear-related disorders, data visualizations in VR training tasks, and personality traits in VR interaction.

More specifically, Itaguchi sheds more light on conflicting literature outcomes of perception and actions, by (a) assessing biases in size perception of a virtual hand using a strict psychophysical method and 2) providing firm and conclusive evidence of the kinematic characteristics of reach-to-grasp movements with various virtual effectors. Pohl and Mottelson created a hand texture resource (with different skin tone versions as well as non-human hands) for facilitating lab and remote virtual reality studies, whereby the hand representation is matched to the participants' own skin tone. Rother and Spiliopoulou present a systematic review, exploring the potential of VR for medical tasks with a focus on annotation. Following a rigorous methodological approach, they offer insights around two overarching research questions in regards to (a) which healthcare-associated tasks do we find VR-associated investigations and which involve crowd worker-based annotation? (b) What extent are there gender-specific differences in the usage of VR? Along the same lines, Bergsnev and Sánchez Laws detail a mini review on the current state of the art on the personalization of virtual reality for basic research and treatment of fear-related disorders, with emphasis on the choice of self-report measures and manipulations of contextual factors that researchers are using in their virtual reality procedures. The main benefit is the great precision *via* VR modeling and control of the experimental context facilitating more effective therapy. Bueckle et al. discuss two studies (with 84 and 68 subjects, respectively), where participants were divided into experiment and control cohorts performing typical tasks in VR training scenarios (like 3D objects manipulation or navigation) and receiving support from data visualizations in VR for performance monitoring. Their findings reveal some interesting insights with respect to differences in task completion time and accuracy in such tasks. Lastly, Katifori et al. present the result of a study with 39 users exploring the effect of personality traits on user interaction in virtual reality (VR). They use the less widely studied aspect of task performance during object manipulation using the virtual hand metaphor to execute a simple selection and positioning task, with or without virtual obstacles. Their findings suggest concrete correlations between user personality traits and behavior data.

The accepted manuscripts build upon the latest advancements, theories, technologies, best practices, and lessons learned, communicating original unpublished work in the areas of human-centered immersive spaces, IR technologies, and interaction simulation with a focus on human behavior at the individual and group levels. The outcomes of these works underline the importance of human-centered IR technologies and simulations that will offer memorable personalized user experiences.

Author contributions

All authors listed have made a substantial, direct, and intellectual contribution to the work and approved it for publication.

Conflict of interest

PG was employed by SAP SE.

The remaining authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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