•Editorial•

Human-computer interactions for virtual reality

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Human-computer interactions constitute an important subject for the development and popularization of information technologies, as they are not only an important frontier technology in computer science but also an important auxiliary technology in virtual reality (VR). In recent years, Chinese researchers have made significant advances in human-computer interactions. To systematically display China's latest advances in human-computer interactions and thus provide an impetus for the development of VR and other related fields, we have solicited articles for this special issue from experts in this area to participate in the review process. The following articles have been selected for publication in this special issue.

"Review of studies on target acquisition in virtual reality based on the crossing paradigm" provides a summary of the mainstream target selection methods in VR, a detailed overview of research on the crossing paradigm, and an analysis of the factors that may affect crossing interactions from the perspectives of input space and visual space. The findings of this study will therefore serve as a reference for future studies on VR target selection based on the crossing paradigm.

"Tactile sensitivity in ultrasonic haptics: Do different parts of hand and different rendering methods have an impact on perceptual threshold? " investigated the sensitivity of the human hand under various conditions in terms of ultrasonic haptics, in the context of amplitude-modulated ultrasonic tactile representation systems. This includes perceptual thresholds of different areas of the palm, changes in perceptual thresholds with respect to different motion trajectories and moving speeds in the ultrasonic focus point, and changes in the perception threshold due to the presence of a DC offset in the modulating wave.

"Gesture-based target acquisition in virtual and augmented reality" presents and discusses three pieces of research on the gesture-based target acquisition in VR and AR. Two key models, mental model and behavior model of user, were studied in the interaction process to better understand user's intention and improve the efficiency and accuracy of the target acquisition tasks.

"Virtual fire drill system supporting co-located collaboration" proposes a virtual fire drill system that facilitates co-located collaboration among users to complete a firefighting mission. Because of the incorporation of multiscreen stereoscopic projection displays and ultrawideband (UWB) wireless positioning technology in this system, users can roam freely within the virtual world and view an accurate rendering of their position by wearing dedicated active shutter 3D glasses. Users can thus divide work to complete the virtual task, significantly increasing the flexibility of co-located collaboration.

"The influence of multi-modality on moving target selection in virtual reality." By designing a VR scene where the user plays a game of badminton, this study investigated the effects of the shuttlecock's velocities,

serving angle, and modality clues on the performance as well as the subjective feelings of the user in relation to the moving target (shuttlecock). By summarizing and analyzing the user's performance and subjective feelings, combinations of modality clues are proposed for a variety of scenarios.

"A Swarm Robot Platform for Intelligent Interaction" introduces a swarm robotics system that acts as a universal platform capable of multiple forms of interaction. This study describes the fundamental interaction modes possible for swarm robots and the feasible application scenarios that are enabled by these interaction modes. In addition, this article provides a simplified description of the implementation of the swarm robotics system and the designs of several simple experiments for verifying the location accuracy of the swarm robots.

"Trajectory prediction model for crossing-based target selection" proposes a trajectory prediction model for crossing-based target selection based on dynamics models. A user-controlled mouse cursor was treated as the particle, and the principles of dynamic models were used to predict the trajectories of the particle. The results of the simulation indicate that the proposed model exhibited excellent fits in its predicted trajectories, end points, and hitting times.

This special issue covers the latest advances in the theories, technologies, and applications of human-computer interactions that have been achieved by researchers and engineers in this field. We would like to thank *Virtual Reality & Intelligent Hardware* for their guidance and assistance in the publication of this special issue and also thank all reviewers for their timely, patient, and detailed reviews. Finally, we extend our sincere gratitude to all authors who have contributed to this publication. We hope that the publication of this special issue will have a positive effect in promoting research on human-computer interactions.

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