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EDITORIAL

Editorial for special issue on big HCI, better service: pervasive, collaborative and innovative interaction

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1 Introduction

There is an upward trend in integrating techniques and applications of pervasive computing, collaborative computing and human–computer interaction (HCI) to provide better cross-domain services to users. Such a "big HCI" framework would be of significance in designing and developing application systems for smart home, smart health, smart education, intelligent transportation, participatory governance, smart cities, social-cyber-physical environments, etc. On the other hand, the "big HCI" framework poses new research challenges due to the diversity of user experience, uncertainty of scenarios, privacy and security, and resource constraints. Therefore, this special issue provides an opportunity for researchers and practitioners to review and discuss state-of-the-art research results in both theoretical and practical aspects, including algorithms, user models, hardware and software systems, user interface design, measurement and evaluation.

2 In this issue

This special issue is dedicated to original results and achievements by active researchers and practitioners working on theoretical and practical challenges of big HCI research. The seven papers in this issue can be classified into three main topics. Two review papers (1st, 2nd) summarize user experience design and evaluation in virtual environments. Two papers (3rd, 4th) propose quantitative models to improve user experience and predict user preference. Three papers (5th, 6th, 7th) present detailed analysis of interaction techniques and interfaces based on biosignal sensor technologies.

The first paper, "Human Factors/Ergonomics Evaluation for Virtual Reality Headsets: a Review" by Chen et al. reviews studies related to human factors/ergonomics evaluation for virtual reality headsets. The paper discusses human factors, such as human performance, pressure, fatigue and visual induced motion sickness, in virtual reality interaction. The paper highlights the importance of human factor evaluation for virtual reality headsets, and explores methodologies of human factors/ergonomics from the perspective of both subjective and objective evaluations. The paper also discusses the future development trend of virtual reality, which would be of helpful to the promotion of virtual reality design.

The second paper, "Value-Based Model of User Interaction Design for Virtual Museum" by Zou et al. summarizes three levels of user experience (LoUX) in a museum exhibition and proposes the unique "creation level" experience of museum virtual reality exhibition (VRME), which constitutes the closed-loop of the VRME experience. The paper reviews and analyzes recent studies, and summarizes the trends of technology application and the different interaction problems arising from each LoUX. Based on the results of literature analysis, the paper proposes a "rose model" of VRME. The model summarizes the relationship between exhibition technology, sensory types, LoUX, and human-exhibition interaction factors. Finally, this paper discusses the results of the literature review and the interaction design insights brought by the model, which would benefit VRME design.

The third paper, "Dual-Label Aware Service Replacement for Interaction Quality Improvement in Heterogeneous MEC System" by Li et al. proposes a dual label aware service replacement (D-LASR) algorithm to achieve dynamic service placement to fit service load variations. Experimental results

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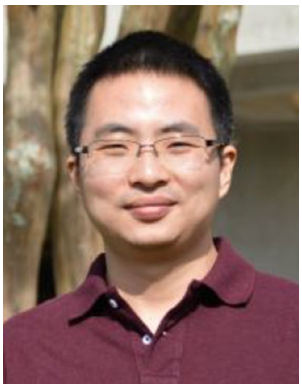
showed that the D-LASR algorithm can reduce the average service response time by 40–60%, indicating that the D-LASR algorithm has better performance in improving interaction quality for service provision in Mobile Edge Computing (MEC) system. Their study could be helpful to service provision design, which in turn could improve user experience.

The fourth paper, "Computational model for predicting user aesthetic preference for GUI using DCNNs" by Xing et al. explores a practical and objective evaluation model of GUI aesthetics based on a large aesthetic image database built by the authors. The aesthetic GUI image database was constructed with 38,423 design works collected from Huaban.com, a popular social network for art and design sharing, collection, and exhibition in China. The number of user collection and likes of each design work were used as the annotation to represent the user preference levels. Deep convolutional neural networks were used to evaluate the aesthetic preferences of GUIs based on a large dataset of user interface design images with ground-truth annotation. The study could contribute to the analysis and design of visual aesthetics for graphical user interfaces.

The fifth paper, "Research on the Physiological Load of Interactive Gesture in Elderly Based on sEMG" by Wang et al. focuses on evaluating physiological load of gesture interaction for older people. By using surface electromyography technology (sEMG), the physiological load of different gesture movements was evaluated to find out gesture characteristics which meet physiological needs. The results showed that the biceps brachii was closely related to the fatigue of the deltoid, which was significantly related to the tendency of the deltoid fatigue caused by extensive movement or arm straightening, and the subjective fatigue was related to the deltoid fatigue. The results could contribute to gesture design and interaction.

The sixth paper, "Research on Cognition and Application of Icon Complexity Based on EEG" by Yang et al. presents an investigation into the impact of icon complexity on user's cognitive load with the event-related potential (ERP) technology. Complexity is one of the important cognitive attributes of icons, which affects the semantic cognitive process of icons. The paper summarizes influence factors of icon shape complexity from several calculation models of shape complexity. It also analyzes different ways to improve icon shape complexity. It then proposes a method for icons optimization design by improving the complexity of icon shapes, and verified its effectiveness with an application example. The results could provide implications to icon design.

The seventh paper, "How does Frame-Loss Affect Users' Perception of Smoothness?An Experimental Study on User Perception Mechanism for The Smoothness of Smartphone Operations" by Tan et al. explores factors that may potentially affect user perceptual experience of smoothness in smartphone operation. The smoothness of smartphone operations is essential to user perceptual experience. However, the underlying mechanism of how smoothness can impact user experience has not been elucidated. The study conducted two experiments to probe into the question. Research results provide preliminary suggestions to guide developers to configure the performance of smart phones, so as to control the frame loss of smart phones and avoid bad user evaluation.



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