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Design thinking for developing a case-based reasoning emotional robot

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Research has shown that if affective computing technology and machine learning mechanisms can be introduced to enhance interaction and feedback between interactive service robots (ISRs) and users. This study integrates the concept and method of design thinking, emotion-detection technology, and case-based reasoning (CBR) to simulate the service situation of an interview, and thus to develop a prototype emotion-sensing robot (ESR) system. The results of the experiment were then used to analyze the effectiveness of integrating corresponding technologies as well as the value, utility, and affordance of the developed system. The empirical verification of this study begins with a pilot test to create a basic database based on a simulated case, and initial weights were assigned to each attributing factor. Then, the prototype system was tested using participants from various fields of expertise and backgrounds, and differences in interaction and feedback between participants and the system were analyzed. These differences were then introduced into the system as references to modify the weights of each attributing factor when testing with participants from different professional areas. Empirical results showed that the emotional responses of participants during the simulated interview were consistent with those hypothesized in the user journey map. The results also revealed that blink rate was a significant determinant of the perception of tension. The predictive power in detecting facial expressions, analysis of semantic emotions, and accuracy of keyword matching related to perception of tension appeared to differ significantly between participants from different fields of expertise and backgrounds. Therefore, assigning more weight to detection factors that correlate specifically with participant emotions helps to reveal the utility of the prototype of the ESR system. Despite meeting both user requirements and user-oriented design requirements, as well as demonstrating the affordance of the system in this study, further improvements can be made. Future studies are necessary to enrich the cases in the database of CBR system and establish a foundation of machine learning principles for ESRs.

Biography

Sheng Ming Wang is an Associate Professor in Human-Computer Interaction Technology and Service Design, Department of Interaction Design at National Taipei University of Technology. He received his MS degree in Building and Planning, PhD degree in School of Computer Science, University of Leeds, UK, in 1998. He worked professionally with number of interdisciplinary integration projects for smart interaction technology development and serious game development. He is known for natural user interface technology development projects for future classroom, which were funded by the Ministry of Science and Technology, Taiwan.

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