Emotional Design Tutoring System Based on Multimodal Affective Computing Techniques

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ABSTRACT
In a traditional class, the role of the teacher is to teach and that of the students is to learn. However, the constant and rapid technological advancements have transformed education in numerous ways. For instance, in addition to traditional, face to face teaching, E-learning is now possible. Nevertheless, face to face teaching is unavailable in distance education, preventing the teacher from understanding the student’s learning emotions and states; hence, a system can be adopted to collect information on students’ learning emotions, thereby compiling data to analyze their learning progresses. Hence, this study established an emotional design tutoring system (EDTS) and investigated whether this system influences user interaction satisfaction and elevates learning motivation. This study determined that the learners’ perception of affective tutoring systems fostered positive attitudes toward learning and thereby promoted learning effects. The experimental results offer teachers and learners an efficient technique for boosting students’ learning effects and learning satisfaction. In the future, affective computing is expected to be widely used in teaching. This can enable students to enjoy learning in a multilearning environment; thus, they can exhibit higher learning satisfaction and gain considerable learning effects.

KEYWORDS
Affective Computing, Affective Tutoring Systems, E-Learning, Emotional Design, Multilearning

INTRODUCTION
Computers are man-made products for solving problems and increase efficiency. To date, computers have been an integral part of human life, and the current popularity of smart devices demonstrates that daily life in modern society is heavily influenced by computers. Applied software is not only functional but also humanistic. In conducting design classes, theory-based courses are generally taught face to face. During lessons, teachers do not know students’ learning status and cannot provide immediate feedback to improve the students’ learning states. By contrast, online teaching prevents teachers from having direct contact with students. Moreover, students’ learning achievements are determined only through written tests. Therefore, to address the preceding limitations, theory-based courses should incorporate affective computing. Using feedback on emotions produced by affective tutoring systems, teachers can implement after-school tutoring programs to promote learning effects. In this study, an affective computing system was applied in an emotional design course.

The affective computing tutoring system, called the emotional design tutoring system (EDTS), can be used by both students and teachers. After the affective computing system recognizes subjects’

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learning emotions, their learning status is filed. Negative emotions may suggest that the subjects are confused or are having difficulty in the course. The emotion-recognition data is classified by the system and sent to the teacher interface. Teachers can then conduct after-school tutoring programs based on the emotion-recognition data. In this study included 136 participants with college education. The participants were divided into two groups: One of the groups underwent to online teaching, and the other was subjected to the EDTS, an affective tutoring system. The participants attended a 50-min emotional design course in a computer classroom equipped with experimental equipment. In the group using the affective tutoring system, the computers used were equipped with a webcam, network connection, and a pair of earphones. All the participants are frequent computer users with prior knowledge of computer operation as well as having experience using audio and video learning materials. Two experiments, an original evaluation and a final evaluation, were performed in this study, and the experimental results were analyzed using a questionnaire. To determine the average score for each dimension, the scores from all the questions within the dimension were summed and then divided by the number of questions in the dimension. The results were then analyzed through descriptive statistics to determine the participants’ satisfaction with the man–machine interface of the EDTS. Furthermore, an analysis of variance was conducted using a t test to examine the two groups’ interaction satisfaction. This study involved qualitative and quantitative components that entailed observing the participants and interviewing them.

LITERATURE REVIEW

Affective computing has been gradually progressing. Numerous domestic and international scholars have employed various mediums to probe human interactions in their studies on emotion recognition. Various sensors can detect facial expressions and physiological signals aroused by emotions and feelings. Subsequently, these signals are interpreted as people’s feelings, and appropriate feedback is then provided (Clavel & Callejas, 2016; Manovich, 2001; Vesterinen, 2001; Wan, 2007). Extensive research is being conducted in this field to determine how to set up emotional perception, develop proper emotion models, express emotions appropriately in different ways, and even transmit emotions on the Internet.

Affective computing is also called emotion sensing, attentive computing, and emotional calculation. Technological advancements have enabled computers to understand human emotions and even have their own, and thereby interact with human beings more naturally (Picard, 2000). Several domestic and international scholars have proposed different methods for recognizing emotions. Additionally, scholars such as Ekman (1992), Morris and Feldman (1996), Pantic and Rothkrantz (2000), and Ortigosa, Martin, and Carro (2014) have proposed methods for recognizing various sentiments, which exhibit high recognition rates. AboutFace, a facial-expression model system developed at the Massachusetts Institute of Technology Affective Computing Lab, uses voltage sensors to observe the movement of the eyebrows and examine users’ confusion and interest. Videotaping is used to detect changes in facial expressions and establish personal facial-expression data (Picard and Healey, 1997; Picard, 2003). The results of relevant studies suggest that applying various recognition modules to learning can enhance the emotion-recognition rate and degree of stability.

Affective Computing

Computers can understand subjects’ text semantics mainly through natural language processing and semantic analysis, the two most critical techniques in understanding the subjects’ Chinese text semantics. After receiving subjects’ messages correctly, computers can perform emotion recognition. Regarding text emotion recognition, the first step is to understand text semantics to receive correct messages. (Lin, Lin & Lin, 2014; Tsai, Lin, & Sun, 2010; Yan, Bracewell, Ren, & Kuroiwa, 2008). After receiving correct messages, computers can perform various processes such as emotion recognition and feedback provision. Rao, et al. (2016) collect short documents by many forum posts and have
Active Teaching Phases: Skills Based and Analysis/Synthesis Pedagogies
www.igi-global.com/chapter/active-teaching-phases/45072?camid=4v1a

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