Chapter 99
Affective Agents in E-Learning Platforms

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ABSTRACT

During recent decades there has been an extensive progress towards several Artificial Intelligence (AI) concepts, such as that of intelligent agent. Meanwhile, it has been established that emotions play a crucial role concerning human reasoning and learning. Thus, developing an intelligent agent able to recognize and express emotions has been considered an enormous challenge for AI researchers. Embedding a computational model of emotions in intelligent agents can be beneficial in a variety of domains, including e-learning applications. However, until recently emotional aspects of human learning were not taken into account when designing e-learning platforms. Various issues arise when considering the development of affective agents in e-learning environments, such as issues relating to agents' appearance, as well as ways for those agents to recognize learners' emotions and express emotional support. Embodied conversational agents (ECAs) with empathetic behaviour have been suggested to be one effective way for those agents to provide emotional feedback to learners' emotions. There has been some valuable research towards this direction, but a lot of work still needs to be done to advance scientific knowledge.

INTRODUCTION

A main subject in Artificial Intelligence (AI) is the idea of intelligent agent. We consider AI as a study of agents who engage perceptions from the environment and realise actions. Agent is each entity that acts in an environment. In the information technology, an agent of software is an abstraction, a reasonable model that describes the software that acts for a user or for another program concerning a service (Franklin & Graesser, 1996). The relative and produced significances include the intelligent agents, particularly those exposing

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some aspect of artificial intelligence, as learning and reasoning.

During the last decades, affective neuroscience and psychology have reported that human affect plays a significant and useful role in human learning and decision making, as it influences cognitive processes (Damasio, 1994). More and more evidence from research confirms that the rational ability is tightly connected to emotion. Inspired from these researches (Bechara, Damasio, Tranel, & Damasio, 1997; Damasio, 1994, 2003; Goleman, 1995), the objective of many researchers has become the creation of a computing system capable of recognizing and expressing emotions. Agents able to simulate or process emotional behaviour are the kind of agents that we would call emotional agents (Camurri & Coglio, 1998). Preliminary conclusions on emotional artificial intelligence are located in researches for physical expressions of emotions through suitable choice of embodied agents' gestures and body language, and in the region of recognition and composition of speech. These characters, in which is inherent the significance of emotion and personality are also known as embodied conversational agents (ECAs) (Cassell, Sullivan, Prevost, & Churchill, 2000).

There is a variety of human expressions in computer applications, however, these are limited in symbolic gestures, as a meaning of hand that would mean greeting and in expressions that would declare emotion, as is a grin. Thus, in the planning of emotional agents, there is an effort to develop gestures and expressive characteristics in connection to the speech, so as to give naturalness to discussions with the users. Due to the emergence of believable and social agents, a number of computational models of emotions have been proposed within the agent's community. The goal is to have emotional agents who will be able to recognize user's emotion and respond in a way that will increase positive and decrease negative emotions, according to the objectives of each application.

Concerning e-learning, researchers of AI in education considered the integration of intelligent agents capable of modelling students' affective states and providing an adequately tailored response based on a pedagogical models. A step towards this direction is to provide computer aided learning systems with an automatic affect recognizer, in order to collect data which identify a student's emotional state. With this information, the computer could respond appropriately to the student's affective state rather than simply respond to student's commands (Picard, 1997). An appropriate computer response to a student's affective state also requires evolving and integrating pedagogical models into computerized learning environments, which assess whether or not learning is proceeding at a healthy rate and intervene appropriately (Picard, Papert, Bender, Blumberg, Breazeal, Cavallo, et al., 2004).

OVERVIEW: AFFECTIVE AGENTS IN E-LEARNING

Faced with frustration, despair, worry, sadness, or shame, people lose access to their own memory, reasoning, and the capacity to make connections (Goleman, 1995). In many cases students' intellectual energies and capacities are weakened by negative emotional states. Integrating affective agents into e-learning platforms who will be able to recognize learners' emotion and provide adequate emotional support, could significantly enhance learning. In order to do so, it is fundamental to create a research basis about affective agents' emotion recognition and emotional expression, and acquire benefit from the knowledge concerning emotional agents' psychological effects.

The recognition of learners' emotional state may play a vital role to the amelioration of the effectiveness of e-learning. The lack of recognition of emotions has been considered as one of the main limits of traditional tools of e-learning. While experienced teachers can modify their teaching

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