

# Chapter 10

## Computers Can Feel Too: Intelligent Emotional Agents in E-Learning Systems

**K. Chatzara**

*Alexander TEI of Thessaloniki, Greece & University of Thessaly, Greece*

**C. Karagiannidis**

*University of Thessaly, Greece*

**D. Stamatis**

*Alexander TEI of Thessaloniki, Greece*

### ABSTRACT

*The introduction of emotional reactions to e-Learning environments might offer a more efficient and effective communication between the user and the machine; a more natural and realistic computer interface. Embodied Intelligent Emotional Agents (IEAs) which are highly expressive and show empathy for the users may help learners overcome academic difficulties and may contribute positively to the pedagogical procedure by making it more efficient and enjoyable. IEAs can be programmed to “show” the correct social behaviour and through them a channel of communication might open to serve for better interaction among learners. This could contribute to increase student’s self esteem, help them recover from negative emotions as well as encourage learners to overcome academic problems. In this chapter the authors review existing systems that use emotional agents and analyze their specific characteristics, their advantages and disadvantages. Finally, based on this analysis they enumerate specific requirements for efficient communication between agents and users and we use them to propose a general architecture model upon which the development of future IEAs could be based.*

### INTRODUCTION

The title of this chapter could be misleading; obviously computers can not feel as we, humans,

do. Actually computers can not feel at all. But when we are interacting with them we experience emotions and very often we express them, even knowing that nobody is there to see or feel our reactions. Some people talk to their computer systems, some even actually punch them or kiss

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them or embrace them in ways that suggest a social relationship between users and machines (Reeves & Nass, 1996; Turk, 2004).

Users have emotions when they interact with computers but computer systems do not correspond accordingly to user's emotions since those applications are rarely designed with such capabilities. To resolve this issue and add the emotional element of communication between users and systems, researchers (Bates et al, 1992a; Howe, 2009) from 1992 onwards thought of incorporating a human like character, in computer applications, that portrays emotional behaviour and acts as a medium between the user and the machine. Since then emotional human computer interaction agents have been widely used in different applications and for different scopes (Shneiderman & Plaisant, 2004). Sometimes they take the form of single agent systems, some others that of Multiple Agents Systems (MAS), acting as interface agents and playing the role of personal assistants to users. They may have anthropomorphic characteristics; they may talk, move, make gestures and occasionally, they not only portray emotions but they are equipped with some sort of emotional intelligence that makes them able to understand user's behaviour. Such agents are considered as Intelligent Emotional Agents (IEAs). The effect that these IEAs have on e-learning applications is a matter of examination. We claim that an IEA may detect the emotional state of a user or it may understand a possible problem a user faces in a learning procedure and act accordingly by adopting suitable emotional behaviour (i.e. by generating appropriate facial, vocal expressions and body gestures).

In the following we describe emotional theories that could be used in the development of a model that imitates emotional behaviour and then focus on emotions relevant to learning. We then review existing systems that use emotional agents, both in a chronological order and by classifying them based on their specific characteristics, such as types of emotions supported, their correlation

with the application domain applied to, agent's multimedia components and system's evaluation regarding agent's affect on user performance. Finally, based on the above analysis/review we enumerate specific requirements for efficient communication between agents and users in the context of e-learning environments and we propose a general architecture model upon which the development of future Intelligent Emotional Agents could be based.

## **COMPUTER MEDIATED COMMUNICATION AND EMOTIONS**

We know, computers can not feel, nevertheless we have to communicate (in a way) with them in order to accomplish certain tasks in different domains. Communication is a dynamic process, based on a set of components that depend on the environment within which they exist. The communication process starts with the communicators who must share common symbols (ontologies) for effective communication to take place. The physical setting, the relationship details, the culture within which an exchange takes place, along with the particular situation, all influence the way messages are interpreted. Communicators both send and receive messages which must be transmitted through a channel. Many factors such as tone of voice, vocabulary, body movement dynamics, all do contribute to the effectiveness of the message. This effectiveness is radically supported by the emotions evolved (Cogan, 1994). We experience an emotion and we communicate it to another person. The other person receives it, this adds to his/her current emotional state, produces another emotional state and communicates the latest to the other person. This is the basis of most communication models, described in 1954 by mathematician Schramm.

Emotions are complex in that they are diverse and are formed by multiple interconnected elements. They are also adaptive in that they have the

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