Chapter 18
Intelligent Agents in Education

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ABSTRACT

Distance learning through information and communication technologies has consistently had a notable impact and influence on the academic and professional world. This is greatly due to the fact that distance learning allows users, especially professionals, to learn at their own pace, according to their availability, in addition to having limited costs. These features are consistent with and support the concept of life long learning. Traditional courses delivered in an E-learning modality can sometimes, however, result in being unstimulating and leaving the student with the impression of being isolated during their learning process. Pedagogical intelligent agents, however, are able to be constantly present in the learner's training environment, interacting verbally and non verbally (gestures and expressions) with users, thus making E-learning much more interactive, interesting and fun. This ongoing interaction and support of the agent, therefore, notably helps reduce the possibility of users feeling excluded during their E-learning course, thus better enhancing their overall learning experience and reinforcing their motivation. This chapter will introduce features and potential of pedagogical agents and will illustrate, with examples, the most common techniques used to design an agent or a "society" of intelligent agents and how to integrate them into a learning environment.

INTRODUCTION

Intelligent agent technology can be considered an interesting approach to meet the challenge of modern educational systems that are greatly influenced by ICT and especially by the development of the Internet. The rapid growth of these technologies allows, on the one hand, the complexity of educational infrastructures to be managed in a more efficient way and on the other, to develop and provide innovative typologies of learning services. More specifically, it is important that these services

offer a range of features such as personalization, mobility, efficiency and information circulation that helps enhance the approach to working with new technologies. Intelligent agents seem to better provide these kinds of features compared to other existing technologies.

Improvements in user interfaces and intelligent agent technologies have enabled the development of new virtual tutors e.g. pedagogical agents that are able to converse with students in a natural language. Several interesting features characterize this kind of intelligent agent who dynamically responds and adapts to environment variations and facilitates a learning by doing approach. Agents have animated personas that permit them to show how to perform a task while communicating both verbally and non verbally, with facial expressions, gazes and gestures. They are able to interact with a community of students and other agents in order to facilitate team work and group learning. They are capable of learning from human instructors and then consequently teach students what they have learnt.

This chapter will demonstrate how pedagogical intelligent agents can effectively support a user's learning and training process. It will explore the definition of artificial intelligence (AI), its fields of application and provide a summary of the main methods currently used for the knowledge representation in AI.

The following paragraphs will provide a general description of intelligent agents that use one of the specific methods of artificial intelligence and feature a list of the most significant definitions of intelligent agents in order of complexity and properties. These definitions, according to major experts in the field, will classify the different types of agents, but will also demonstrate how all agents share at least one property in common or some similar forms of "intelligence".

The next section will discuss how intelligent agents can interact with the Learning Management System and highlight how intelligent agents or rather virtual tutors assist and support students throughout their learning path.

In conclusion, four examples of pedagogical intelligent agents will be described that clearly demonstrate and represent an effective approach for E-learning. The primary objective of this chapter, therefore, is to invite readers, especially those involved in the E-learning field, to consider the benefits and possibility of incorporating pedagogical intelligent agents into their distance learning courses.

BACKGROUND

A special type of intelligent agent is the "pedagogical agent", an actual virtual tutor who supports the students throughout their learning process within the learning management system. The virtual tutor is a unique intelligent agent due to the following specific features:

- Always visible to the user within the educational milieu.
- Takes on human (or humanoid) forms, usually having a face, hands and arms in order to point out objects to the user or to perform actions.
- Interacts with the user both verbally (by means of language) and non verbally (through gestures and/or facial expressions).
- Moves and interacts directly with the learning milieu and within the milieu itself.

Based on these general definitions, Johnson, Rickel and Lester (2000), pioneers in pedagogical intelligent agent research, describe intelligent agents as, "They increase the bandwidth of communication between students and computers, and they increase the computer's ability to engage and motivate students."

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