Chapter IV

Intelligent Agents Supporting the Social Construction of Knowledge in a Learning Environment

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INTRODUCTION

For a virtual community, learning is a distributed and collaborative process based on the active interaction among its members, sharing and constructing knowledge. In a collaborative learning environment learning advances through collaborative social interaction and the social construction of knowledge (Brown, 1989). In the area of artificial intelligence applied to education (Ayala, 1998b), research has been focused on the modeling of intelligent agents for CSCL (Computer-Supported Collaborative Learning) environments (Ayala, 1998a) and internet-based learning communities (Lin, 1995), (Wolf, 1996), (Bos, 1996). Currently, there is an increasing interest in applying these methodologies from the perspective of lifelong learning (Dunlap, 1999), (Fischer, 2000), (Ayala, 2000).

The chapter focuses on the modeling of software agents that present the performance and functionality needed for supporting collaborative learning, where collaboration is based on the social construction of knowledge, implementing the theory of knowledge creation by Nonaka and Takeuchi (1995). The chapter includes a discussion on the requirements for modeling software agents for learning environments, as well as the use of AI techniques for their implementation. The HCI issues of group configuration and awareness based on learner modeling in web-based environments are also discussed.

The chapter is organized as follows. The next section introduces the area of collaborative learning environments, as the context of this work, discussing the problem of effective collaboration in CSCL environments and the field of lifelong learning. The fundamentals of the theory of social construction of knowledge, background of our research, are presented. Following this, the chapter includes the discussion of intelligent agents for learning environments, presenting the basic aspects of learner-agent interaction and the characteristics of software agents in collaborative learning environments. The project CASSIEL (Computer Assisted Intelligent Environment for Learning) is introduced. This chapter appears in the book, Human Computer Interaction: Issues and Challenges edited by Qiyang Chen. Copyright 2001, Idea Group Inc.
project includes the development of three intelligent agents modeled in order to support collaboration from the perspective of social construction of knowledge in a web-based community: a *user agent*, a *facilitator agent* and an *information agent*. The user agent and its functionality in learner modeling and group configuration are topics discussed. A facilitator agent, that assists the learner in her/his participation in the social construction of knowledge in the community, is presented. Assistance in locating resources in the community’s web is done by an information agent is discussed a general view of the role of the CASSIEL agents in the social construction of knowledge is provided. Finally some implementation issues are presented.

**COLLABORATIVE LEARNING ENVIRONMENTS**

Learning is not only a way to know about our society, after all it is a way of becoming a productive member in it. We should not consider learning only as the acquisition of knowledge structures, but also as an attitude of active participation of the learner in a community of practice (Lave, 1991). Learning means social participation in a particular environment, not only in the mind of an individual.

From the perspective of situated learning (Brown, 1989), learning is considered a process of becoming a member of a community of practice. Situated cognition proposes the shift from Intelligent Tutoring Systems, where the system communicates the represented domain knowledge to the students, to environments where the computer is a tool that facilitates collaborative work (Clancey, 1991). For a collaborative learning environment learning is not just a condition for membership, but an *evolving* form of membership. It is a process of *enculturation*, where the learner participates in order to enter a community of practice and its corresponding culture, using the community knowledge in real situations as the practitioners do.

Collaborative learning, sometimes also called cooperative learning, has been defined as the instructional strategies which depend on the interaction of persons that help each other and which have some reciprocal influence. In a collaborative learning environment the learners become able to participate in a community of practice, working with the other members as they create their own models of the domain. Collaborative learning allows the progress of the knowledge of the group members and the solution of problems that would not be possible without a group effort. Through collaboration learners reflect, present and discuss their ideas and misconceptions.

The application of techniques from computer-supported cooperative work (CSCW) to collaborative learning gave birth to networked collaborative learning environments (Collis, 1994; O’Malley, 1994). A computer supported collaborative learning environment must provide a virtual space where learners, based on the experience of old-timers, propose the situations and knowledge to be practiced in a distributed community. There is not a generally accepted definition of the term computer-supported collaborative learning or CSCL. I would like to define it as:

the use of the computer as a mediational device that helps the learners to communicate, cooperate and collaborate through a network, providing assistance in their coordination and the construction and application of knowledge, becoming active members in a virtual community.

A CSCL environment implies the support needed in the development of the following basic skills by the participants:

a) Communication and cooperation skills.

b) Creation of new knowledge and its application.
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