

Chapter 2.43

Knowledge Management for Agent-Based Tutoring Systems

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ABSTRACT

As the education field is becoming increasingly technology heavy, more educational systems involve line or interactive training and tutoring techniques, and lots of educational information becomes available via the intranet and World Wide Web. Managing large volumes of learning information and knowledge is one of the crucial issues for these educational systems, as appropriate knowledge management is the key to more effective and efficient learning. The chapter first discusses that an intelligent agent system could be successfully applied to the education field and then focuses on how knowledge management techniques play an important role in agent-based tutoring systems.

INTRODUCTION

Computer technologies are making progress rapidly and are becoming more specialized. Many different fields have benefited from newly invented and powerful computer technologies. Therefore, it is not a surprise that education adopts more computer technologies, and students and learners use computers in a lot of courses and labs. New technology integrated into the education or tutoring system can enhance the access to knowledge and improve the efficiency of knowledge transferring to learners. But such integration often requires additional training in order for its users to become familiar with a new learning environment before they can actually benefit from these technology advances; otherwise, new technology will confuse and distract, instead of helping, its users, and slow the learning

process. Agent-based tutoring systems can overcome such technical obstacles between knowledge and common users. Then, users are able to focus on information and knowledge that they are interested in and try to learn. Unlike traditional tutoring systems characterized by a stand-alone approach, i.e., autonomous and complete in itself, an agent as a software entity can work continuously and autonomously in a particular environment usually occupied by other agents. And, an agent as a software entity is able to interact with its environment in a flexible and intelligent way without demanding constant human interference or orientation. An agent working continuously for long periods of time should be able to learn from experience. In sharing its environment with other agents, it should be able to communicate and cooperate with them. Therefore, an agent can have the following attributes: reactivity, autonomy, cooperative behavior, communication ability at knowledge level, interference competence, temporal continuity, personality, adaptability, and mobility. All of these properties will make an agent-based tutoring system more effective and efficient (Silveira, 1998).

Agent-based human-machine interaction was first commonly used in the 1930s, in such applications as autopilot systems, etc. Such agents aided or performed some automatic and simple tasks that human beings would otherwise perform. A human operator will perform supervisory tasks (involving cognitive processing and situation awareness skills) instead of old manipulation tasks (usually involving sensory-motor skills) (Sheridan, 1992).

The use of software agents as intelligent assistant systems was proposed (Alchourron, 1985) to facilitate human-computer interaction to transfer information, as well as human-human interaction for better understanding through new software technology. The adoption of agents in an educational and tutoring system is natural, because information and knowledge transfer is the most important part of learning. Agents can enable the

understanding and learning of various kinds of concepts, because they involve active behaviors of the users. They enable users to focus on the content and index content in accordance with specific situations that they will better understand. To be specific, the advantages of using software agents in education may include the following:

- Customized learning environment for individuals
- Unified learning environment
- Integration of local and remote resources
- Transparent process to make users focus on knowledge to be conveyed, not how to use the tutoring tools

In this chapter, we will talk about an agent-based tutoring system architecture design and how to manage knowledge and “knowledge about knowledge” (metaknowledge) in an agent-based educational environment.

BACKGROUND

Learning is an active, interactive, and constructive social process. Technology, especially computer technology, can help learning greatly. Initially, the learning technology focused on individualized instruction, i.e., stand-alone tutoring, a universal environment for all students. The current view of training and education environments must support customized inquiry-based learning and collaboration, and such an environment has the following advantages over the old learning technologies:

- Intelligent tutoring systems have explicit tutoring models and domain knowledge that can serve each individual in a more customized and efficient way.
- Interactive learning systems enable the student to manipulate cognitive artifacts from several perspectives or viewpoints (Norman, 1992).

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