Book Reviews

E-learning with Intelligent Agents

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Designing Distributed Learning Environments with Intelligent Software Agents
Fuhua Oscar Lin, ed.
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Distance learning is becoming increasingly popular for two main reasons: it lets institutions overcome problems of scale (not enough students in a single location or course) and rarity (a specialized subject isn't locally available). Unfortunately, most learning environments focus primarily on the infrastructure and neglect the learning services and personalized pedagogy aspects of e-teaching.

Designing Distributed Learning Environments with Intelligent Software Agents discusses a possible solution to this problem. Using agents as an abstraction tool or a metaphor for the design and construction of distance-learning systems provides novel possibilities in delivering user-focused e-learning content. Furthermore, the book presents the agent-oriented approach as a way to address the complexity of distributed-learning environments. Each of the book’s 10 chapters covers different issues arising in agent-based approaches to developing distributed e-learning systems. The first two chapters as well as the final chapter focus on implementation-related problems, while the others cover issues such as theory, legacy, and pedagogy.

Agent-based e-learning systems: Toward implementation

In the first chapter, Hilton José Silva de Azevedo and Edson Emilio Scalabrin discuss developing and implementing a multiagent system based on a collaborative online learning environment (COLE). The authors primarily consider how the proposed system can support development of professional as well as social competences (such as the ability to work in a team). They claim that to achieve these goals, agents should support three types of services:

1. helping students perform innovative activities,
2. stimulating social behavior among students, and
3. offering educators clear, objective information about students’ performance.

The authors first give an overview of modern research on the learning process as well as ways of stimulating social activity among students. Then they present UML diagrams describing the system’s main functions and implementation details.

In chapter 2, Weiqin Chen and Barbara Wasson discuss how agents can support students and instructors in distributed collaborative-learning environments. As in chapter 1, the authors consider different social “moments” that affect collaborative competences. However, instead of focusing on tools for supporting collaborative techniques, they concentrate on the different psychological moments...
in a collaboration. For example, they discuss several problems that can occur in a collaborative learning process:

- Teams might divide up work unequally. For example, a “free driver” might leave it to the others to complete the task, whereas a “sucker”—a more active or able member of a team—might discover that the other team members are leaving all the work up to him or her.
- In a “status sensitivity” situation, more able and/or active members have a disproportionate impact on the team’s activities and products.
- When the team “gangs up on the task,” they collaborate with each other to complete the whole task as easily and quickly as possible, regardless of quality.

If these problems aren’t properly addressed, collaborative learning won’t be effective. The main implementation idea is to inject intelligent agents into the FLE (Future Learning Environment), a Web-based groupware for computer-supported collaborative learning. The authors present a diagram for integrating a facilitator agent into the FLE, discuss the structure of the knowledge database, and provide examples of learning rules. They present the rules in the RuleML language, which supports storage, interchange, and retrieval via the Web.

**Extending the vision**

In chapter 3, Larry Korba and his colleagues discuss requirements, standards, and legislation that could be useful in addressing privacy and trust issues surrounding using agents in distance learning.

The next three chapters discuss intelligence in multiagent systems-based distributed learning environments. You’ll find a discussion of the state of the art of various AI techniques as applied to e-learning as well as numerous interesting ideas about where and how distance-learning systems can efficiently use intelligence in agents.

In chapter 7, Fuhua Lin, Larbi Esmahi, and Lawrence Poon discuss the design and development of adaptive distributed systems based on agent technology and Web services. You’ll find an overview of several such systems as well as a discussion of existing problems in Web-based distributed learning. To overcome these and other problems, the authors propose an approach based on intelligent software agents. A key problem is system adaptability; the authors’ solution employs a team of agents (monitoring, notifying, personal, learning-object, and learning-object-repository agents) that deal with and service students and teachers. The authors describe some of them (such as the monitoring agent) in detail.

This theme of delivery of adaptive e-learning (that is, personalization of information provisioning) continues in chapter 8. Larbi Esmahi and Fuhua Lin discuss some existing systems for adaptive e-learning. They also propose an architecture and design for a multiagent framework for course personalization.

In chapter 9, Hong Lin covers how to model the agent-based system (presentation and description of interactions, communication, and so on). Lin describes the Gamma language and gives multiple examples of its use. Throughout the chapter, he argues that using a high-level specification language could help solve architectural-design problems in building e-learning environments.

The last chapter, by Timothy K. Shih, Ying-Hong Wang, and Yung Hui Chen, is devoted to the integration of virtual reality and communication technologies with distance-learning systems. For example, the VR-based Virtual Agent System allows online discussions via different real-time communication channels. An instructor can analyze student activities on a virtual campus and adapt course content and distance-learning tools accordingly. To achieve effective course adaptation, the authors developed a declarative specification language. This chapter provides a detailed description of this language and several examples of its use.
I recommend this book for anyone interested in knowing more about agents, agent-based systems, e-learning, and perspectives on the use of multiagent systems in e-learning. Unfortunately, most of the systems the book introduces are in the early stages of development or implementation, so the issues it discusses are serious and hard to solve. So, although interested readers will find numerous potential solutions to these problems, it remains to be seen whether the proposed approaches really work. However, if you’re looking for new ideas concerning e-learning and software agents, such as research inspiration and a long list of open research issues, this book is for you.

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