Chapter III

Assisting Learners to Dynamically Adjust Learning Processes by Software Agents

Weidong Pan, University of Technology, Sydney, Australia

Igor Hawryszkiewycz, University of Technology, Sydney, Australia

Abstract

In order to make online learning more productive, software agent technology has been applied to provide services for learners to assist them to construct knowledge in constructivist ways. This chapter is focused on the application of software agents in assisting learners to dynamically adjust learning processes. Unlike pedagogical agents, the agents in this application do not hold domain knowledge but simply assist learners to get through the learning process by a variety of supportive services. They assist learners to develop personalized preferred learning plans and guide them to dynamically align learning towards their goals. In this chapter, the online learning process is first investigated and an approach to assisting learners to dynamically adjust learning processes is outlined. Then the structure of the UOL (unit of learning) database that provides links between a practical learning scenario...
and the required services is explored. A multi-agent architecture for realizing the services is configured and the roles of the involved agents are described. After that, the related agent algorithms for guiding learners to dynamically adjust learning processes are described.

Introduction

Constructivist learning is being recognized by more and more people as a productive learning method. Although there are diverse constructivist paradigms, they share commonly epistemological assumptions for learning (Fosnot, 1996). The fundamental epistemological assumption is that knowledge cannot be transmitted to learners but must be individually constructed and socially co-constructed by learners (Jonassen, 1999). Because constructivist learning focuses on actively constructing meaningful understandings of the study theme, it can generate more significant learning outcomes than other methods such as the objectivist ones (Wilson et al., 1995).

According to constructivist theories for learning, learners are active knowledge-constructors, whereas teachers are cognitive guides who provide guidance and scaffolds to support the construction (Mayer, 1999). Unfortunately, most current online instructional systems have not really taken such roles. Mostly they just simply deliver online course materials over the Internet without providing effective guidance on how to use these materials to build knowledge. As a result, learners only passively receive information from the presented materials. They have not been engaged in actively constructing meaningful understandings of the study theme. This research is aimed, by incorporating software agents into online learning, to actively assist learners to build knowledge by using constructivist methods.

The research into software agents has been a rapidly developing area of research. Already a lot of agent-based systems have been proposed ranging from comparatively small systems such as e-mail filters to large, complex, mission critical systems such as air-traffic control (Jennings et al., 1998). In particular, pedagogical agents have been developed to take the role as a virtual tutor or a virtual learning partner, and so forth. The agents we are developing facilitate online learning through comprehensive applications of the properties agents exhibit, for example, autonomy, learning, cooperation, reactivity, and goal-driven. They work together cooperatively to facilitate effective construction of knowledge by individual learners. They assist learners to build knowledge not through understanding the academic content of subjects, but rather through providing a wide range of services. These services include: (1) providing access to appropriate learning resources and learning strategies; (2) fostering meaningful interactions with content, teachers, and fellow learners; (3) supporting personalized learning for individual learners; (4) promoting collaborative learning.
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