Chapter VI

Intelligent Tutoring Systems for Distributed Learning

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Abstract

This chapter provides information on how to design intelligent tutoring systems for distributed learning to cater to individual learner needs and styles. It argues that intelligent tutoring systems must use the expertise that tutors use in a one-to-one teaching situation to build intelligent tutoring systems for distributed learning. Also, the appropriate psychological and educational theories must be used to build the domain module, student model, and pedagogical module. The components of intelligent tutoring systems are described, and the author makes the case that to build effective intelligent tutoring systems, a multidisciplinary team should be involved. Finally, the author identifies trends that are influencing the development of intelligent tutoring systems and suggests areas for future research and development.
Introduction

According to a recent panel (Corbett, Anderson, Graesser, Koedinger, & VanLehn, 1999), the current generation of intelligent tutoring systems is only half as effective as human tutors, and we need to develop tutoring systems that are as effective as human tutors. We need to study human tutors when they provide one-to-one instruction in distributed-learning systems and use the expertise to build intelligent tutoring systems. Existing distributed-learning systems are designed to instruct students based on information already stored in memory. The systems do not adapt to the needs of the learner by diagnosing, in minute detail, the sources of errors and by providing specific instruction to overcome the errors. Distributed-learning systems need to form a model of the learner and provide instruction similar to a tutor in a one-to-one interaction mode. Bloom (1984) described the two-sigma problem, which suggests that learners who are given one-to-one instruction performed two standard deviations higher when compared to learners who received face-to-face group instruction; however, providing one-to-one attention using a human tutor could be expensive and time consuming in distributed-learning systems. As a result, distributed-learning systems need to develop and use intelligent tutoring systems so that the human tutor expertise is built into the computer system to provide the one-to-one tutoring to students. This is critical, because in distributed-learning systems, students could be in any location and may not have access to human tutors for one-to-one instruction.

The intelligent tutoring systems can conduct learner analysis based on initial interaction with the learner; adapt the instruction to meet the student learning style; monitor the learner’s progress, providing declarative knowledge when required; decide on the best way to present the next problem or instructional sequence (Heffernan, 1998); diagnose problems and provide corrective feedback; and oversee the successful completion of the learning process.

This chapter provides information on the design of an intelligent tutoring system for distributed learning to meet an individual learner’s needs and style. It describes the details of the components of an intelligent tutoring system and suggests trends and future research required in the area of intelligent tutoring systems for distributed learning.
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