ABSTRACT

Intelligent Tutoring Systems increasingly show promise as a technology that will expand the horizons of web-based education to anyone with an Internet connection. The use of computer technologies to support education and learning has more than doubled in the last decades. ITSs may be one of the most significant contributions to the field of educational technologies. This powerful new technology has revolutionized the delivery of e-content. However, there are many considerable challenges in making such systems more effective. A major challenge of today’s learning systems is to provide the user with the right learning material at the right time and in the right form. Moreover, the ability to offer adaptation along with collaboration within the same system is still a challenging and important problem.

Before understanding the web-based ITS And its associated benefits, one must be first somewhat familiar with the enabling technologies upon which the ITS is based. This thesis investigates some of the related concepts and technologies. The investigated concepts include: related pedagogical theories, computer–based learning systems, E-Learning standards, agent-based systems, knowledge representation techniques, metadata and user modeling.

Researchers in the ITS community have always considered it important to develop a model of the learner. The adaptive and collaborative capabilities of the system are mainly based on this model. Thus, the thesis proposes a multi-layer comprehensive user model that is based on the LIP standard. On the other hand, this work has adopted the LOM standard for Knowledge modeling.

This research presents an adaptive tutoring model based on experience gained during successful course intakes. This experience-based model enables the generation of complex and realistic course plans. Compared to other adaptive models, this approach generates structured course plans that are adapted to a variety of different learning goals and to the
learners’ competencies. To make this possible, this research has developed formulas to calculate similarity measures allowing the selection of the best-fit teaching experience. Moreover, the research describes basic techniques for adaptive course delivery (e.g., introducing the learner to an appropriate example or exercise). This work is based on studying multiple dimensions of the user model (i.e. knowledge, skills, and learning styles dimensions) allowing the selection of the most appropriate learning objects in a pedagogically sensible way.

This research has contributed to the area of collaborative learning by presenting a new experience-based collaborative approach. This approach is based on enabling virtual collaborators to learn from real interactions between collaborated students.

Knowledge management solutions relying on central repositories have not met expectations. Thus, in this work a distributed E-Learning environment with multiple distributed repositories is considered. To make this possible, the learning objects in these repositories must conform to the LO standards. This allows the sharing and reusability of learning materials across E-Learning systems. Moreover, user profiles can be shared since they conform to the standards too.

More abstractly speaking, this work brings different dimensions together to form a proper foundation for E-Learning systems. It combines techniques from web-based learning, intelligent tutoring systems, course management systems, adaptive hypermedia systems, collaborative learning systems and traditional learning systems to present a better web-based intelligent tutoring system that conforms to the E-Learning standards.

Finally, based on the experience-based approach, this work has investigated the technical feasibility of applying a multi-agent technique to implement a prototype system for the proposed model. A web-based e-learning system called Intelligent Distributed Experience Based Adaptive Learning (IDEAL) has been implemented in JSP to test the functionality of the model.