Editorial Preface

Special Theme Issue

Web-Based Learning Systems

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The rapidly growing demand for e-learning is forcing educational institutions to expand in remote learning through the Web in terms of technological and pedagogical development. It is recognized that traditional classroom-based learning cannot cope with the needs of the individual students and the increasing demand for life-long learning. The successful application of e-learning provides enhancements in workforce performance, helps to lower cost, and encourages innovation. The popularity of the World Wide Web and its development has enabled the creation and implementation of Web-based learning. This is of particular importance to shift from a teacher-centered to student-centered learning environment. The evolving new generation of education environment leads to a revolution in traditional teaching. With the rapid development of Web-based learning and new concepts like virtual classroom, virtual laboratory, and virtual university, there are various issues that need to be addressed, ranging from the technical side, the learning side, and the management side. The International Conference on Web-based Learning (ICWL) series (see http://www.hkws.org) has emerged since 2002 as an excellent forum for researchers, educators, and professionals to share their rapidly developing knowledge and report on new advances in Web-based learning systems.

This special issue presents recent technology advances on the development and application of distance learning systems in general, and the Web-based environment in particular. The six papers represent the selected papers from the 1st International Conference on Web-based Learning (ICWL'2002) held in Hong Kong, China—August 17-19, 2002, which attracted over 100 participants from throughout the world. In the first paper entitled “Mathematics Education over the Internet Based on Vega Grid Technology” by Zhiwei Xu, Wei Li, H. Fu and Z. Zeng, the authors present their research work conducted at the Chinese Academy of Sciences, on the Vega Grid technology and dynamic geometry technology. They show how the two technologies can integrate to provide a dynamic geometry education system based on grid technology. Such an approach could help to solve the interconnect problem, the performance problem, and the intellectual property problem for Internet-based education systems.

The inability of current Internet-based learning systems to deal with different kinds of learners and the high cost of developing a new learning system are well-known problems in e-learning. The second paper by Yuguang Lee, M. Junginger and J. Geller concerns these problems. In their paper entitled “High Performance Publisher/Subscriber Communication for Adaptive, Collaborative Web-Based Learning,” the authors have presented a learning middleware suite called the Collaborative and Sharable Learning (CoSL) system. CoSL is a tool set for building e-learning systems and for developing course materials for an e-learning environment. It allows users to
build and manage global real-time learning systems in a distributed and heterogeneous environment. Given the geographic distribution of the components of a Web-based e-learning system, it is crucial to support fast communication between providers and consumers of e-learning course materials. In this paper, a high performance Publisher/Subscriber communication system has been designed for real-time communication between participants.

The third paper, authored by Yuanchun Shi, Weikai Xie, and Guangyou Xu, is entitled “Project Smart Remote Classroom Providing Novel Real-Time Interactive Distance Learning Technologies.” It describes the Smart Remote Classroom project which provides several novel technologies for Interactive Distance Education. These include: 1) a hybrid transport layer multicast protocol called TORM and an adaptive content delivery scheme called AMTM, which work together to enable large-scale users to access a virtual classroom with different devices and networks synchronously; 2) a dedicated software called SameView, which takes use of the proposed TORM and AMTM technology and provides a rich set of functions for teachers and students to efficiently carry out the real-time interactive tele-education. Moreover, SameView can record the whole process of a class into a compound multimedia document for later retrieval and review of the class; 3) the classroom augmented by Smart Space technology called Smart Classroom where the user interfaces of the SameView are incorporated in the classroom space. Thus the teacher can instruct the remote students just like teaching face to face in a conventional classroom.

Web-based learning can enable students to learn from remote sites, but it could suffer from too little information for the teachers and too much information for the students. The fourth paper entitled “Data Mining and Case-Based Reasoning for Distance Learning” is authored by Ruimin Shen, Peng Han, Fan Yang, Qiang Yang, and Joshua Huang. This paper presents an open framework which makes use of data mining and case-based reasoning technologies. It allows students to interact with an automated question-answering system and to enable the teachers to analyze students' learning patterns based on students' traversal patterns. These patterns make it possible to organize the Web-based contents efficiently.

In addition to the above four regular papers, this special issue also include two concise papers. The one entitled “Towards Open Standards: The Evolution of a Collaborative Courseware Generating System” is by Changtao Qu and Wolfgang Nejdl. The paper presents the evolution of a collaborative courseware generating system that is featured by XML-based course structure representation, JSP-based dynamic courseware presentation, and WebDAV-based collaborative courseware authoring. Three versions of system implementations are respectively based on the proprietary design, SCORM 1.1, and SCORM 1.2 specification. The evolution of the system is motivated by their efforts to improve the reusability and interoperability of learning resources. The next one by Li Yang and Mustafa Sanver is entitled “Web-Based Interactive 3D Visualization for Computer Graphics Education.” It is believed that the best way to show principles and techniques in computer science is to have the related algorithms running live in the back end and to allow students to interact with them within a Web browser. This paper presents a set of Web-based live tutorials designed to demonstrate computer graphics concepts and OpenGL functions. These tutorials demonstrate subject principles and techniques through rich interactive visualization driven by underlying algorithms. The presented methodology represents a generic approach and can be applied to various other courses.

We would like to take this opportunity to thank the reviewers for their great efforts, and all the authors who submitted their papers to our special issue. We particularly thank the authors of accepted papers for their high-quality work and for having worked on a tight schedule to come up with their revised versions in a timely manner. Last but not the least, we thank the editors-in-chief, Prof. S.K. Chang and Prof. Timothy Shih, for their comments, encouragement, and support which made this special issue possible.