An Instructional and Collaborative Learning System with Content Recommendation

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ABSTRACT

With the rapid development of Internet, e-learning has become a new teaching and learning mode. However, lots of e-learning systems deployed on Internet are just electronic learning materials with very limited interactivity and diagnostic capability. This paper presents an integrated e-learning environment named iCLSR. Firstly, iCLSR provides an online environment for instruction and collaborative learning, which gets rid of the constraints of time and space. Second, online teaching and learning evaluation data from instructors and learners can be collected by iCLSR and can be analyzed with an improved PSK-means clustering algorithm. Third, the learning object lists can be recommended for learners based on online evaluation results and their learning history. The application of iCLSR demonstrates that it can recommend appropriate learning materials for learners, inspire communication between learners and instructors, save time for users and therefore improve the instructional effects and learning performance.

Keywords: E-Learning, Internet Based Instruction, Learning Object, Online Evaluation, PSK-Means Clustering

INTRODUCTION

With the rapid development of Internet in various application domains, Internet has changed people’s life-style like shopping, reading, learning, entertainment and etc. Among the above, e-learning has also become more and more realistic and popular (Jin, 2009). E-learning provides facilities to people in different times and geographical locations to collaborate, learn and work together by using various educational services and saves time for instructors and students (Dillenbourg, Jarvela, & Fischer, 2009).

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Although e-learning has numerous advantages, instructors and educational researchers are experiencing both unprecedented opportunities and challenges to adapt information age. By now, lots of e-learning applications that have been deployed are just electronic learning materials with very limited interactivity and diagnostic capability (Romoero & Ventura, 2007; Romoero & Ventura, 2010; Shishehchi, Banihashem, & Zin, 2010). Few of them were employed in daily instruction and learning processes among learners and instructors (Kumar & Chadha, 2011). Therefore, integrated environments for online instruction, collaborative learning, evaluation and analysis, and content recommendation are solicited and will be very beneficial to learners and instructors. Our study was motivated by the above facts and we developed an instructional and Collaborative Learning System with content Recommendation named iCLSR to promote e-learning.

This paper details iCLSR as follows. Firstly, the teaching and learning environment is presented for instruction and collaborative learning provided by iCLSR, where instructors can give online speech and upload some video clips of some courses and then students can download them at anytime and anywhere. Furthermore, students can join or create interest groups after classes where group members can freely discuss questions and exchange ideas with or without instructors online. Secondly, online evaluation on instructors and learners can be conducted by iCLSR. Instructors and learners can give their marks based on many evaluation indices. The collected data will be clustered based on an improved PSK-means clustering algorithm so as to analyze the teaching and learning results. Lastly, content recommendation lists will be generated based on evaluation results and their learning history for learners so as to improve their learning processes and styles.

The remainder of this paper is organized as follows. The second section reviews the related work on recent research on instructional, collaborative learning and recommendation systems. The third section details an Internet-based instruction and collaborative system and the fourth section presents the online evaluation and analysis based on PSK-means clustering. The fifth section describes learning content recommendation based on evaluation data and student model. The sixth section introduces system development of iCLSR and the seventh section concludes the paper and points out the future work.

RELATED WORK

During recent years, numerous studies have been conducted in instructional and learning systems by many instructors and educational researchers. Lee and Terashima (2012) introduced a Moodle-based educational system. The browsing time of each web page for students can be recorded and then by analyzing the information, teachers can find out factors which will affect students’ learning performance, so as to apply the proposed learning performance evaluation mechanism to evaluate students’ learning performance for providing adequate auxiliary learning materials to individual students. The research reported in Alinaghi and Bahreininejad (2011) describes a multi-agent system for building a question-answering system in learning management systems and collaborative learning environments. A recommender system is constructed based on all available resources including course materials, frequently asked questions and responses from other learners, which could recommend the most appropriate answers with respect to several criteria such as learner’s knowledge, research background, history of previous questions, and the candidate answers relevant to the question. Wang and Liao (2011) proposed an adaptive learning system in teaching English. Their study explored the learning performance of various students using an artificial neural network as data mining technique of the learning system. Three different levels of teaching content for vocabulary, grammar, and reading were set for adaptive learning in their system. Yaghmaie and Bahreininejad (2011) studied a framework for building an adaptive learning management system. The proposed structure is based upon multi-agent systems and uses both SCORM...
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