

Monitoring Students Activities in Course Management Systems with CourseVis

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Abstract: CourseVis is a student monitoring and tracking system which extracts tracking data from an on-line course maintained with a Course Management System, transforms the data into a form convenient for the processing. The system then generates graphical representations that can be explored by course instructors to examine social, cognitive and behavioural aspects of distance students. CourseVis exploits the use of Information Visualisation techniques to render into an appropriate graphical manner the complex multidimensional student tracking data provided by the Course Management System; finally, it helps instructors to become aware of what is happening in their classes. The purpose of this Poster/Demonstration is to illustrate the visualisations produced with CourseVis and demonstrate how they may help instructors in supporting their students.

Introduction

Course Management Systems (CMS) is a class of software application that enables instructors to deliver information to students, produce content materials, prepare assignments and tests, engage discussions, and manage distance classes over the Internet. Commercial CMS, such as WebCT, BlackBoard, and Top Class have reached a great popularity in universities around the world for their benefits in providing Web-based distance education with the flexibility and the convenience of the client-server communication on the Web. However, current research reveals a number of problems with using CMS in distance learning, e.g. students may feel isolated due to lack of contact with instructors or other students, can get disorientated in the course hyperspace, may lose their motivation, and often find it difficult to manage without institutional support (including help with technical problems). The educational research shows that monitoring students' learning and providing learners with appropriate and prompt feedback is an essential component of high quality education. This applies also to distance education; since instructor and students are not in the traditional face-to-face environment, new forms of students' monitoring must be explored. The effective use of CMS in distance education requires that instructors should be provided with appropriate means to predict that a problem might arise or diagnose that has arisen, so that they can take immediate actions to prevent or overcome that problem.

CMS's administration components accumulate large log data of the students' activities in a distance course and usually have built-in student monitoring features that enable the instructor to view some statistical data, such as a student's first and last login, the history of pages visited, the number of messages the student has read and posted in discussions, marks achieved in quizzes and assignments, etc. Instructors may use this information to monitor students' progress and to identify potential problems. However, tracking data is usually provided in a tabular format, is often incomprehensible, with a poor logical organization, and is difficult to interpret. As a result, web log data is very rarely used by distance learning instructors.

In this work, we follow the novel approach of using Information Visualisation (IV) techniques to graphically represent the vast amount of multidimensional data collected by CMS. IV is a discipline that uses graphical representations of multidimensional abstract data to communicate ideas, facilitate comparisons of data, pattern recognition, change detection, and other cognitive skills by making use of the visual system. Using sophisticated IV tools, instructors can manipulate the graphical representations generated, which will help instructors gain an understanding of their learners and become aware of what is happening in distance classes.

Some forms of visualising cognitive aspects of students have been explored in Intelligent Tutoring Systems (ITS). An ITS is a computer-based instructional system that provides individualised tutoring exploiting a detailed model of the knowledge domain, as well as a student model. The purpose of the model is to describe the student and

represents the student's understanding of the material to be taught. Student models describe the student knowledge in terms of beliefs and are based on some Artificial Intelligence inference. Extracting student and group models can be fairly challenging, especially when large numbers of students are dealt with. By contrast, Information Visualisation techniques merely represent data collected by CMS in a visual format with minimum data processing. By managing students' tracking data with appropriate visualization techniques, instructors form mental models of individual students as well as mental models of groups of students. In this case models are inferred in the instructor's mind, instead of being inferred by algorithms.

CourseVis

CourseVis is a student monitoring and tracking system that uses the students' tracking data from a CMS, transforms the data into a form convenient for processing, and generates graphical representations that can be explored and manipulated by course instructors to examine social, cognitive, and behavioural aspects of distance students. In the current exemplification it is based on WebCT, one of the most popular CMS. Data from WebCT is extracted by the means of ad-hoc module, converted in a well-defined XML format, and stored in the *Raw Data Repository*. A *Domain Designer* is a module dedicated to instructors to define the domain model of the course. The *Domain Model* describes the entities of the course domain (i.e. the course concepts) and their relationships with the pages of the course and questions in quizzes. Data from Raw Data Repository and from Domain Model is then graphically rendered by the means of *OpenDX*, a powerful open source package for the visualisation of analytical and scientific data.

An empirical evaluation of CourseVis conducted with a sample of instructors revealed that graphical representations produced with CourseVis might help instructors to identify individuals that need particular attention, to discover patterns and trends in accesses and discussions, and to reflect on their teaching practice.

Poster Session/Demonstration

In the poster session, we will give a "live" demonstration of graphical representation produced with CourseVis using data from an on-line course in Java Programming currently provided with WebCT. We will show how these representations can be used by instructors of distance courses to gain useful insights from their students, to improve the quality of materials, and to reflect on their teaching activities.