Chapter 11

Adaptivity in ProPer: An Adaptive SCORM Compliant LMS

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ABSTRACT

Adaptive Educational Hypermedia Systems provide personalized educational content to learners. However, most of them do not support the functionality of Learning Management Systems (LMS) and the reusability of their courses is hard work. On the other hand, some LMS support SCORM specifications but do not provide adaptive features. This article presents ProPer, a LMS that conforms to SCORM specifications and provides adaptive hypermedia courses. ProPer manages and delivers SCORM compliant courses and personalizes them according to learner’s knowledge, goals, and personal characteristics. In addition, learner’s progress and behavior is monitored, and useful feedback is returned to tutors. ProPer will be used for an adaptive Java Programming course distribution to CS1 students. Statistical feedback will be gathered by tutors in order to improve course effectiveness. The technology background is briefly given, and the system’s architecture and functionality are analyzed.

INTRODUCTION

The nature of the Internet is an ideal platform for beliefs and data sharing all over the world. As a consequence, the Internet is used for knowledge distribution. Over the last years, connection speeds have become faster and the coverage of the Internet’s global population has grown impressively. Thus, more quantitative and qualitative data can be delivered to a larger number of people. Nowadays, knowledge from almost all domains and sciences is distributed via the Internet. The main advantage of web-based learning is the ability to deliver educational content to a wide number of learners regardless of their place of lodging, age, or traditional constraints such as study time. Further-
Adaptivity in ProPer

more, web-based courses support asynchronous learning processes and require less development and maintenance efforts than traditional ways of knowledge distribution. They can be used either as supplementary to directly-communicated education, complementing the conventional educational process or as an independent integrated solution for distance learning.

Learners with different personal characteristics, culture, needs, and previous knowledge can study a proposed learning content. Moreover, learners can navigate freely inside a course or visit a variety of pages, even when not related to the course, in various ways according to their goals and personal characteristics. This, however, can simultaneously be a weakness of web-based courses since they cannot satisfy the wide range of learners’ needs. A course or a system that is designed with a particular class of learners in mind may not suit learners of another class (Weber, 1999). A learner may be confused or overwhelmed by the variety of options and functions a system provides. Moreover, a learner can feel that a course is either too easy or too difficult for their knowledge level. Furthermore, it is possible for a learner to become “lost in hyperspace” (Conklin, 1987) not knowing where they are nor how to get to where they want to (Murray et al., 2000). Research has documented major problems of web-based courses related to the above situations. These problems summarized in (Murray et al., 2000) are Disorientation, Cognitive Overload, Narrative and conceptual flow, and Content readiness. Consequently, a possible solution to these problems could be the development of web-based applications that offer interactivity and adaptability (Weber, 1999).

Adaptive Educational Hypermedia Systems (AEHS) were introduced as a promising solution. These systems integrate several technologies from both hypermedia systems and Intelligent Tutoring Systems (ITS), by combining both the tutor-driven learning process of ITS and the flexibility of a student centered Hypermedia System (Eklund & Zeilenger, 1996). With AEHS the navigation process, the educational content and its presentation can be dynamically personalized to a particular learner, according to their individual needs, characteristics, goals and current progress. Therefore, with these systems each learner can have both an individual view and navigation through the educational content that hypermedia systems deliver.

The evolution of the Internet and e-learning led to the appearance of Learning Management Systems (LMS). Nowadays the use of an LMS is a very popular way to distribute learning content to the end-user. However, the use of LMS raises some issues. A course distributed by a LMS most times cannot be used by another system due to incompatibility. In addition, sometimes after an update of the LMS, hosted courses must also be updated in order to be distributed properly. Constituting specifications for all the learning units of educational content is required in order for the above problems to be avoided. Some of the most common e-learning and metadata specifications and standards that were applied are SCORM, LOM, IMS, AICC etc. SCORM, is at present the most popular specification. SCORM (ADL, 2004) known as Shareable Content Object Reference Model was proposed by the Advanced Distributed Learning (ADL) initiative and it counts on previous standards from other organizations (AICC, ARIADNE, IMS, IEEE LTSC). Its goal is to provide courses that can be interoperable (operate with a variety of operating systems, hardware etc.) and durable (no modifications required after system software updates). Respectively, SCORM provides reusable educational content by different courses and supports its indexing so as to achieve better accessibility. Consequently, a SCORM compliant course can be distributed by any SCORM compliant LMS. Thus, better quality courses can be delivered by more LMS to the end-user.

This article presents a system called ProPer, whose name comes from the initial characters of the Greek words “PROsarmostiko PERivallon” that mean Adaptive Environment. ProPer is an in-