

Sequencing in Web-Based Education: Approaches, Standards and Future Trends

Sergio Gutiérrez, Abelardo Pardo

Department of Telematic Engineering
University Carlos III of Madrid
Av. Universidad, 30
E-28911 Leganés, Madrid (Spain)
[sergut,abel]@it.uc3m.es

Summary. Web-based education (WBE) has seen in recent years a significant increase both in its functionality as well as possible scenarios. After a first stage in which these systems offered mainly content management and course management capabilities, systems now offer solutions that cover pedagogical aspects such as activity sequencing. This chapter presents several approaches to the problem of adaptive sequencing. They are representative of the main initiatives for defining sequences of learning units that can be adapted to different users, with different capabilities and needs. All of them have some graphical background, but they focus on different issues use of well-known tools, use of simple metaphors like graphs, etc. The main two initiatives of standardization related to the sequencing problem (IMS Simple Sequencing and IMS Learning Design) are also examined. Finally, two approaches to social sequencing, an emerging trend inspired by the behaviour of social insects, are depicted.

1 Introduction

Web-based education (WBE) has seen in recent years a significant increase both in its functionality as well as possible scenarios. e-Learning systems are now present in an ever growing number of companies as well as educational institutions of all levels. After a first stage in which these systems offered mainly content management and course management

capabilities, systems now offer solutions that cover pedagogical aspects such as activity sequencing. In this context, a learning activity may be described as an instructional event or events embedded in a content resource, or as an aggregation of activities that eventually resolve to discreet content resources with their contained instructional events [1].

When users of an e-learning platform are simply given access to a set of documents for each course, there is a high risk of being “lost in cyberspace” [2]. As important as having access to the proper documents, course activities and how they are organized within a course have a direct impact on the overall effect of the learning experience. Adaptive Hypermedia is a research area that focuses on how hypermedia can be changed according to the user needs. When applied to e-learning, these techniques are generally known as “personalized learning” or “adaptive educational hypermedia”. The idea is to customize learning material and activities and provide a personal environment for each learning [3]. This means adapting the learning content, its sequencing, and maybe more aspects of the learning experience [4].

The problem of adaptive sequencing is that of, given a set of learning activities, finding the best sequence for a particular student. There are students that prefer top-down approaches, that will learn more if general explanations are given first. Other students would rather take a bottom-up, starting with examples and abstracting general principles from them. Some learners will catch some concepts earlier, while others will take more time. The former will benefit from short sequences that do not bore them once they have learnt what they wanted to, and the latter will need a longer sequence (maybe with loops that repeat some of the activities).

This chapter presents several approaches to the problem of adaptive sequencing. They are representative of the main initiatives for defining sequences of learning units that can be adapted to different users, with different capabilities and needs. All of them have some graphical background, but they focus on different issues of the questions. Some give more importance to the use of tools that are known to the software and Web engineering community (Sect. 2). Others give preference to the use of simple graph metaphors that make it easier to define a path along the activities according to some rules (Sect. 3). Finally, in Sect. 4 an approach is presented in which the sequence of activities is not selected deterministically but stochastically. Although this leaves little space for individual adaptation at first, interesting results are obtained when swarm intelligence techniques are used, as explained in Sect. 6.1. All these approaches present some common characteristics (e.g. many use some kind of