Adaptation in Educational Hypermedia Based on the Classification of the User Profile

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Abstract. This paper presents SEDHI - an adaptive hypermedia system for a web-based distance course. The system architecture includes three main modules: the Classification Module, the Student Module, and the Adaptation Module. SEDHI classifies the students according to profiles that were defined based on a statistical study of the course user and usage data, and adapts the navigation using the techniques of link hiding and link annotation. The results of an evaluation of the SEDHI prototype show the potential of the classification and adaptation approach.¹

1 Introduction

In the context of distance education, web-based courses are frequently offered to a large number and broad range of students. Most times, the contents and presentation of didactic materials are exactly the same to all students. The objective of this work is to consider user and usage data to provide support to navigation. Among others, the aim is to facilitate the work of the human tutors who typically give support to students in distance courses.

This paper presents SEDHI (Educational Hypermedia System, in Portuguese), a system for web-based distance education. Based on a statistical study of user and usage data [8] of a particular course, a classifier with three student profiles was defined. SEDHI classifies the students according to these profiles and adapts the navigation using the techniques of link hiding and link annotation [1][2].

The paper is structured as follows: section 2 reports on related work; section 3 provides an overview of SEDHI; section 4 describes the system evaluation; section 5 presents the conclusions and directions for further work.

2 Related Work

Adaptive Hypermedia (AH) [1][2] makes possible the organization of hypermedia environments, the conduction of the user through desirable paths, the omission of

¹ This research is partially supported by FAPESP grants 03/08279-2 and 03/08776-6. The authors thank Ilog Tecnologia, IEA, and Sebrae Nacional.

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links irrelevant to the objectives, preferences, and interests of the user, making the navigation in hyperspace more attractive and organized, according to the user profile and his or her representation in the User Model. Adaptation occurs typically in two levels: adaptive presentation, in which the contents are adapted; and adaptive navigation, in which the links are adapted.

A number of educational hypermedia systems that adapt the navigation have been developed, e.g. ISIS-TUTOR \[3\]; ELM-ART \[5\]; AHA \[6\]; INTERBOOK \[4\]; and KBS Hyperbook System \[10\], among others. Such systems support navigation using different techniques in order to improve learning outcomes.

In web-based educational systems that generate large amounts of student data, data mining algorithms \[7\] can provide input for adaptive navigation. Data mining is indicated for discovering pedagogical relevant data for providing feedback, supporting teachers and learners, and so on \[11\] \[12\]. In addition, adaptation to students based on user and usage data is relevant in collaborative learning \[8\] \[9\]. In this work, students are classified according to profiles that were defined based on a statistical analysis of a course user and usage data. While it might be argued that profiles are limited from the point of view of student modelling, some educational adaptive hypermedia systems adopt the profiling approach (see \[14\] for an example). Regarding classification algorithms, this approach allows pre-defining classes based on data attribute values and providing adaptation based on past student behaviour obtained from the web-based systems databases.

3 SEDHI: An Educational Hypermedia System

SEDHI design is based on a study of a web-based distance course on Entrepreneurship. The course objective is to teach the students how to write a Business Plan in a step-by-step fashion, train the student in organizing ideas and resources, and consider the relevant aspects for planning and starting a business. The course is offered since the year 2001 by a Brazilian national organization that provides support services to small businesses. So far, more than 250,000 students completed the course. Each edition of the course has around 70 classes of 200 students, summing 14,000 students in each course edition.

The course is designed to be completed in two months (60 days). The contents are divided into five Modules - Entrepreneur Profile, Identifying Business Opportunities, Market Analysis, Products and Services Development, and Financial Analysis - that are presented with hypermedia (text and figures). Additional resources include interactive games, activities, exercises, and hints. In each class an instructor is in charge of answering students’ questions, and monitoring both the students’ progress through the contents and participation in the learning activities. The learning environment allows the student to access to the contents, communication and collaboration tools (e.g., discussion list and chat), technical support, digital library, FAQ, and help. Also, there is an illustrative character that accompanies the student since his or her first interaction with the environment. The course learning management system handles other users: instructors, administrators, and the technical support team.