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USAGE OF CONCEPT MAPS IN DYNAMIC CONTENT PRESENTATION FOR ONLINE LEARNING SYSTEM

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Abstract. Online learning is becoming more popular because of its advantages such as location independent and time independent learning. Hence it is very much essential to design online learning contents to suit the needs of the user and type of user. This paper presents a dynamic concept map based content presentation for online asynchronous learning systems. Dynamic concept map facilitates: understanding the type of user, tracking the user, providing appropriate content to the user based on his grasping power, ability to understand (based on intermediate tests), and gets feedback from user. We consider three types of users: student, researcher and professional.

1 Introduction

Online learning educational environments address the educational objectives by putting the learner at the centre of the educational experience (Cicognani, 2000) Internet and Web-based education offers remote access from everywhere and at any time. Internet-based distance learning has many advantages for students in the university or for trainees in industry (Anido et al., 2001). As online courses are become more prevalent in higher education programs, instructors begin to explore which teaching strategies are more effective to facilitate student learning based on different learning styles. Teaching strategy that is commonly employed in online courses are asynchronous and synchronous delivery (Conceição, 2004). On-line asynchronous students work in cyber-space, looking at content, surfing for information, dealing with web pages, computer conferencing in chat rooms and receiving/sending content on list-serves. However, in the synchronous environment, learners see, hear, speak, move curriculum and raise hands for acknowledgment (Ellis, 2006). The concern of users with the learning process is drastically reduced when the level of interactivity is low. Hence the content should be clearly explained with the help of examples, diagrams, video clips, animation, etc.

The concept map is a tool designed to identify and represent relationships between different concepts in a domain. They can be static and/or dynamic. Static relationships reduce the uncertainty in the labels by connecting the concepts in a proposition, whereas dynamic relationships are concerned with covariation among the concepts. A dynamic relationship between two concepts reflects and emphasizes the propagation of change in these concepts. The dynamic relationship shows how change in *quantity*, *quality*, or *state* of one concept causes change in *quantity*, *quality*, or *state* of the other concept in a proposition. In other words, a dynamic relationship reflects the functional interdependency of the two or more concepts involved (Derbentseva et al., 2004; Weyde, 2005; Ortegano-Layne & Gunawardena, 2004). A work on concept tagging and dynamic HTML generation for adaptive teachware using java applets was presented in (Fuhrmann, 2006). Rest of the paper is organized as follows. The proposed work is discussed in detail in section 2. Section 3 provides the experimented results and finally we conclude in section 4.

2 Proposed work

The proposed work requires a system model which comprises of following major components. The major components of online learning system model are data, server, Internet and the users. To access the data at Remote site, Internet is used but data can also be accessed locally with the help of Local Area Network (LAN). Server provides the connectivity between Internet/LAN and data.

2.1 *Concept Map based online learning*

Figure 1 depicts the concept map of proposed work (cornerstone software is used to create the concept map). Continuous line represents the static links and dotted represents dynamic ones. It presents the relationships of concepts to be presented for different types of users such as student, researcher and professionals. In general, every user is given contents according to his/her user category and switched over to different types of modules based on

understanding ability, time to grasp, feedback and the test scores. For example, student reading chapter 2 high file will be tracked for his time to read and will be given a test after completion of reading. Also, a feedback will be taken to see why he has taken more time to read, this is to ensure that time to read may be sometimes based on the interest in the chapter. Finally a score will based on these factors, if score is more than 70%, chapter 3 will be provided for reading, if score is between 55 to 70%, student will be given chapter 2 mid file (contains more details than chapter 2 high). If a student scores less than 55%, chapter 2 low file will be given for reading which consists of more detailed information in the form of video clips, animation, etc.

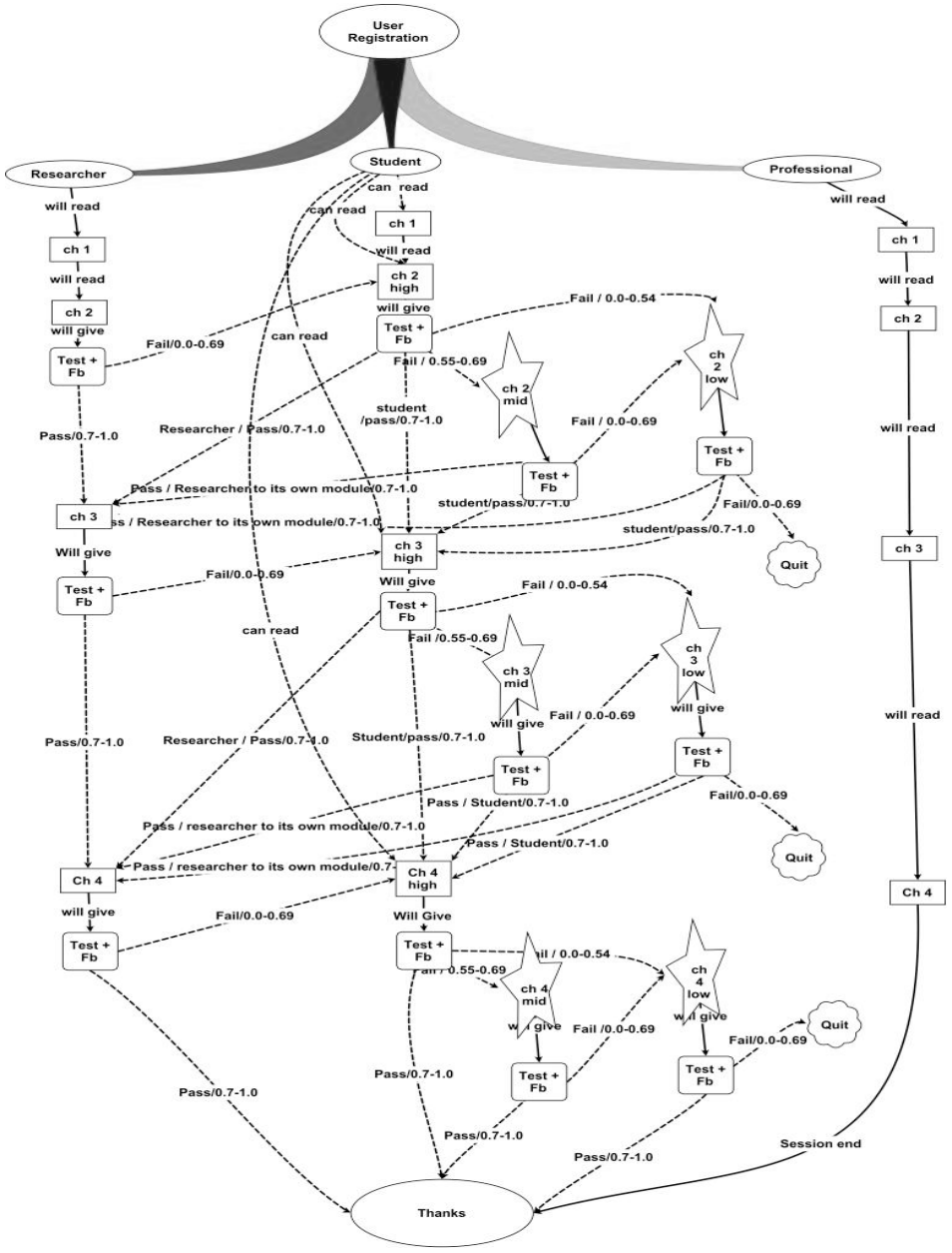

Fig 1. Concept Map of proposed Work

Any person working in the field of related research work is to consider as Researcher, Novice falls under the student category and person working in related industrial field will be considered as professional. Researchers can access information regarding research with the help of provided white papers. Student will be accessible to the

subject contents, providing basic knowledge of subject. And, professional can take notes on upcoming and profit making technologies in the market.

Classification of contents: Subject content file is divided into three types: High, Mid and Low. High file has been designed for briefing the contents to the user. While, Mid file consists contents with diagrams and a more explanation, and Low file contains a good explanation at basic level supported with videos, animations, audio clips, as well.

2.2 Procedure for online learning

Procedure for online learning is divided into three phases: User Registration, Parameter Estimation, and Content Presentation.

User registration: User must execute a formal registration before getting started, which should be transmitted to the server for authentication and options selecting (i.e. novice or expert mode, etc.). The underlying mechanisms are Java interface and interactive HTML forms. Such forms are automatically transmitted to the server and will be processed. After which, another page of information is returned to the learner for review.

Parameter estimation: The parameters considered to determine the user level of understanding are as follows. READ SCORE (RS): Read time (RT) is considered as the time taken by user to read the content file. After obtaining the Read Time, it will be compared with default conditions to allot read Score as per given conditions: RS = 0.150 if RT<= Th, 0.075 if Th<RT<=1.5*Th, 0.000 Otherwise. Where, Th is the threshold time, fixed for every content file. TEST SCORE (TS): Every content file is followed by a test, wherein number of questions in every test file has been fixed to 10. For every correct answer 0.07 marks will be allotted and 0 for wrong answer. The test score has been calculated by the following formula: $TS = \sum 0.07*I_i$, Where, $I_i = 1$ if correct answer, 0 Otherwise. FEEDBACK SCORE (FS): In the feedback, if user says, the topic was interesting and he has read the contents several times even though he has understood in the first attempt of reading, RS will be set to 0.150. Every test is followed by 3 feedback questions. For every matched answer a score of 0.05 will be provided and 0 for unmatched one's . Score will be calculated as per given formula: $FS = \sum 0.05*I_i$, Where, $I_i = 1$ if correct answer, 0 Otherwise.

Contents are presented based on the scores computed as follows: **Total Score = RS + TS + FS**

This Total Score ranging between 0-1 will be matched with default conditions to decide what content should be provided.. Total score obtained after presenting high, mid and low files have different conditions and are shown in tables 1,2 and 3 , respectively.

Total Score	**Next file**
1 – 0.70	Next Chapter
0.69 – 0.55	Same chapter mid level
0.54 – 0.00	Same chapter low level

Table 1: Total Score of High file presentation.

Total Score	**Next file**
1 – 0.70	Next Chapter
0.69 – 0.00	Same chapter low level

Table 2: Total Score of Mid file presentation.

Total Score	**Next file**
1 – 0.70	Next Chapter
0.69 – 0.0	What do you want to do? Quit or will read low level file again

Table 3: Total Score of Low file presentation.

3 Experiment

Proposed work has been implemented using HTML 4.0, Java Servlet page, Java Script, Microsoft Access and Tomcat Apache Server. HTML 4.0 has been used to design the content files and login form. Java Servlet page (.jsp) is used as programming language, which is able to submit the information of the user on to the server and provides content file, it also supports the content file being next given to user based upon his performance. While, Java script is used to calculate the time taken by user to read the content file and to evaluate test & feedback form. Optical communication subject was considered for prototype implementation of the proposed system. We evaluated the performance of the system by using Mean opinion Score. Mean opinion score (MOS) is the score given by users based on Interactivity, Grasping rate, User friendly and content presentation based on score scale of 5. For example, 5 students gave 4, 4, 3, 5, and 3 score out of five, so the mean opinion score is 19/20. MOS is given as, $\mathbf{MOS = \sum S_i / 5i,}$ where S_i = score point given by i^{th} user and varies in between 0 to 5. We have considered 10 researchers, 25 students and 20 professionals to test the proposed system. It was observed that MOS of 10 researchers was 37/50, of 25 students was 118/125 and of 20 professionals was 84/100. Hence, the proposed system was better in giving good education to on-line users.

4 Conclusion

The paper proposed concept map based dynamic content presentation to different kind of users based on parameters such as user reading rate, test scores and the feedback. During prototype implementation of the proposed system it is found that user had better education in the subject.

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