A Study on Datamining Techniques in Personalised Learning

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Abstract—**Presently Personalised learning environment and Web-Based educational system throw open huge amount of data which are related to perform online activities by the learners. The data mining approach is one of the related one that can be used to extract knowledge from the systems through the analysis of the information. The useful information discovered can be used directly by the teacher or the author of the course to improve the instructional/learning performance. This paper aims at providing data mining techniques in Personalised learning. Data mining techniques have been applied to student's classification based on their learning performance, detection of irregular learning behaviours, clustering according to similar Personalised learning system usage and system adaptability to student's requirements and capacities.**

Keywords—Personalised learning, data mining, web usage mining, pattern mining.

INTRODUCTION

Personalised learning is a general term used to refer to a form of learning in which the instructor and learner are separated by space or time where the gap between the two is bridged between through the use of web. With web-based learning it is possible for the learners to learn from anywhere, any time.

Personalised learning content has been shown to increase learners' interest, comprehension and hence their learning success. The Personalisation of learning material in the form of a content adaptation tailored to needs of the learners is frequently proposed as one of the ways by which the acceptance and efficiency of Personalised learning can be increased.

The Personalised learning system uses Adaptive and Intelligent web-based educational systems. These systems build a model of objectives, preferences and knowledge of an individual user in order to adapt the system to his or her learning needs.

Fig 1.   Personalised Learning

Many of systems use data mining techniques in order to personalise the output data obtained avoiding information overload and recommending items required by the current user based on previous or current interaction of other users with similar profiles.

DATA MINING TECHNIQUES

Data mining is often defined as finding hidden information in a data base. It is also known as data driven discovery, and deductive learning. The application of data mining to the field of education is a teacher-centred approach aimed at improving courses. The data mining technique can be applied in the area of knowledge to which the course relates and level of education. Data Mining can be used to extract knowledge from Personalised learning systems through the analysis of the information available in the form of data generated by their users. In this case, the main objective becomes finding the patterns of system usage by teachers and students and, perhaps most importantly, discovering the students' learning behavior patterns.

A STUDY ON PERSONALISED LEARNING

During the last few years, personalised learning has become an important field of research in education. The main goal of Personalised learning is to deliver to a given user information that is tailored to his/her preferences and interests. The personalised systems are generally based on using one or more types of knowledge. We use the recommender system for personalised learning environment by applying web usage mining techniques and taking into account web access historyof learners and learning materials.

Personalized learning technological systems (Fig.2) support learners to set their own learning goals, manage their learning, managing both content and process, communicate with others in the process of learning, and thereby achieving learning goals. These systems may be composed of one or more sub-systems which may in turn build on desktop-based application orweb-based services.
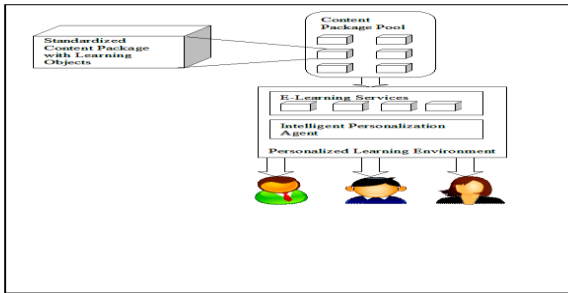
Fig 2 .   Personalised Learning Environment

PERSONALISATION USING WEB MINING

Web mining is mining of data related to the World Wide Web. The data present in web pages or data related to web activity. Web mining tasks can be divided into several classes. Fig.3 Shows one taxonomy of Web mining activities.
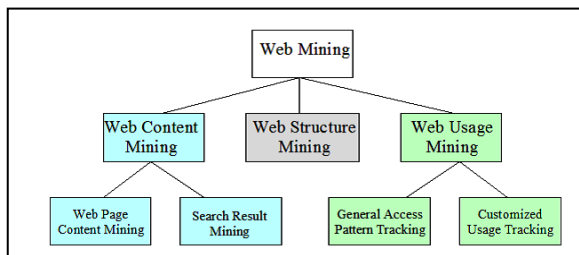

Fig 3. Taxonomy of Web Mining

More on Web Usage Mining

There are two main categories of web usage mining:

- Learning a user profile (personalized)-Web users would be interested in techniques that learn their needs and preferences automatically.

- Learning user navigation patterns (impersonalized)-Information providers would be interested in techniques that improve the effectiveness of their Web site or biasing the users towards the goals of the site.

The usage of web mining for providing personalized learning can be approached as:

Web Content Mining techniques can be used for the retrieval of relevant content from web to formulate a Learning Object (LO) like topic or chapter, based on learner's preference.

Web Structure Mining techniques can be used to analyse and establish the linkages in the form of sequencing and navigation between different LOs in order to formulate a instructional unit like Course or Module, based on learner's preference.

Web Usage Mining techniques can be used to track, assist, and guide the learner, based on his/her cognitive patterns.

WEB RECOMMENDER SYSTEMS

Web recommender systems are used to locate relevant items in which the user is interested. This can be done, based on the user's data that is collected implicitly (Web access logs) or explicitly (ratings). Generally, it is more efficient and user-friendly to provide users with what they need *automatically* and without asking them explicitly for it. A number of knowledge discovery and statistical techniques are generally used in advanced recommendation systems. The latter can be divided, depending on the techniques used, into content based filtering, collaborative based filtering, and hybrids, which are summarized below.

Content-based filtering

Content-based filtering (or item-based filtering) systems recommend items to a given user based on the correlation between the content of these items and the preferences of the user). This means that the recommended items are considered to be similar to those seen and liked by the same user in the past. Thus, there is no notion of a *community* of users, rather only *one* user profile is considered while making recommendations.

Collaborative-based filtering

Collaborative filtering system recommends items that are liked by other users with similar interests. So, the exploration of new items, in this approach, is assured by the fact that *other similar* user profiles are also considered. Thus, the history of *community* of users is combined. This approach relies on a historic record of all user preferences and interests which can be obtained *explicitly* by asking users to give a rating on each item (product, Web page, etc) or *implicitly* by observing the user's behaviour when browsing a Website, for instance via their click streams.

Hybrids

Hybrid recommender systems combine *several* recommendation strategies to provide better performance than either strategy alone. Most hybrids work by combining several input data sources or several recommendation strategies. There are many hybridization methods reported in the state of the art. Generally, content/collaborative hybrids are the most popular hybrid strategies.

SUPPORTING TOOLS FOR PERSONALISED LEARNING

Here is a review of the possibilities of the application of web usage mining and clustering techniques to meet some of the current challenges in distance education system. The proposed approach could improve the effectiveness and efficiency of discovery of aggregate and individual path for students that could help in the personalised learning.

Personalised learning in which data mining techniques can be used is given below.

Table 1: Data mining Techniques for Personalised Learning

Project Name	Data Mining Technique	Personalised Learning Topic
Moodle	Predictive classification	Course adaptation purpose
AHA!	Prediction rules	Course adaptation to students navigation behaviour
ATutor	Statistical analysis	Assessment system and student behaviour tracking
aLFanet	Machine learning, Association rules	Course adaptation to the students navigational behaviour
WebCT	Statistical analysis	Assessment system and student behaviour Tracking
Black Board	Statistical analysis	Selecting course and tracking student behaviour
Sakai	Classification technique	Course management system

Several large research projects have dealt with the integration of Data Mining methods in e-learning (see Table 1). The aLFanet project consists of an e-learning platform that provides individuals with interactive, adaptive and personalized learning through the Internet. aLFanet includes a component to provide support to the interpretation and presentation of dynamic adaptive questionnaires and their evaluation at run-time, based on the student preferences and profile. The adaptation component applies Machine Learning (ML) techniques, Association Rules, and Multi-Agent architectures to provide online real-time recommendations and advice to learners based on previous users' interactions, the course structure, the contents characterization and the questionnaires' results.

CONCLUSION

In this paper we have outlined the general data mining techniques in personalised learning.In personalised learning web mining technology is used to take care of one of the important steps in content and behaviour personalisation . The study has given the variety and wide availability of data mining techniques and software tools for personalised learning which deals with student learning assessments, learning materials and course e valuation and adaptation techniques, based on student learning behaviour.

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