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Studying Data Mining and Data Warehousing with Different E-Learning System

KEYWORDS: Data Mining; Data Warehousing; e-Learning; Moodle; LMS; LCMS.

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ABSTRACT *Data Mining and Data Warehousing are two most significant techniques for pattern detection and concentrated data management in present technology. ELearning is one of the most important applications of data mining. The foremost idea is to provide a proposal for a practical model and architecture. The standards and system structural design are analyzed here. This paper provides importance to the combination of Web Services on the e-Learning application domain, because Web Service is the most complex choice for distance education during these days. The process of e-Learning can be promising more efficiently by utilizing of Web usage mining. Mor07/e sophisticated tools are developed for internet customer's behaviour to boost sales and profit, but no such tools are developed to recognize learner's performance in e-Learning. In this paper, some data mining techniques are examined that could be used to improve web-based learning environments.*

INTRODUCTION

Usually the decision-making data are stored in files and databases. The results getting by huge amount of data are not easy, for which the data mining techniques are very constructive. Data mining is the process of taking out information in terms of patterns or set of laws (e.g. association rules, sequential patterns, classification trees) from huge databases. So, it is also known as data or knowledge discovery.

For example, by pulling out demographic data of students' enrolments, the university, college or any institute could get better the qualitative explanation (e.g. information for past's students) of database. Any association does not deal with a single database, but deals with various kind of database means multiple databases but there is the need for fast processing, and integrating of these databases which can be possible by data warehouse. Centralizing data management and revival is often distinct as data warehousing. This centralizing helps the user to maximize access to the data and analyzing it.

The data warehouse supports different types of analyses, including elaborate queries on large amounts of data that may require extensive searching. When databases are set up for queries on daily transactions, they are called "operational data stores" rather than data warehouse. So, a data warehouse is a

storehouse of an organization's electronically stored data [3]. The mechanisms of data warehouse are: retrieval, extract, analysis, transform, load data and managing data dictionary. Data mining, data warehousing, and Online Analytical Processing (OLAP) together form the functionality of decision making or Decision Support System (DSS). The various areas Eof application of data mining and data warehousing are e-commerce, e governance, online shopping, digital library, online reading, e-learning or e-education, etc. Among these, these days e learning is an important application of data mining.

E-Learning is sometimes known as electronic learning or e-learning in which there is no face-to-face interaction between the teacher and the students. Rather than it is web-based learning. It uses Web or Internet technology and delivers digital contents, provides learner oriented environment for teachers and students [4]. So, the environment is not teacher-centric. It may include all types of Technology Enhanced Learning (TEL), where technology is used to support the learning process [5].

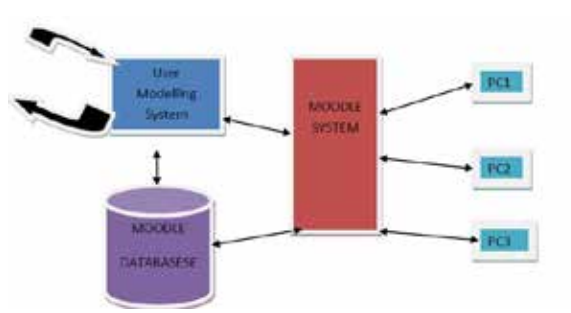
For example, in companies, e-Learning is used to deliver training courses to employees and in universities, e- Learning is used for enrolment of students in different courses, provides teaching without any face-to-face interaction, or on-campus facilities, but through internet that is online. As a whole, e- Learning includes Distance Learning (DL), Computer Based Teaching (CBT), Computer Aided Instruction (CAI), and Life Long Learning (LLL) principle. So, we see that, e-Learning consists of various types of databases, storing information for user access. To implement e-Learning, data mining can help to construct e-textbook, e-reading, digital libraries, etc.

Further scope of e-Learning is blended e- Learning which is a combination of face-to-face interaction and online learning. It incorporates online lectures, tutorials, performance and decision support systems, simulations and games, and more [5].

E-LEARNING ARCHITECTURE OR DESIGN

A. Functional Model

The practical model of an e-Learning structure creates an interface between the mechanisms and the objects of the e- Learning system. It is shown in "Fig. 1".



The structural design of e-Learning till now does not provide any apparent picture of the e-Learning components.

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The e-Learning structural design contains two models: the information model and the component model. These two replicas are to be joined and an interface must be defined to attain interoperability. This structural design of e-Learning gives a practical model of the components of e-Learning for the consistency of e-Learning development. The Advanced Distributed Learning (ADL)'s Sharable Content Object Reference Model (SCORM) practical model explains the swap of data within a Learning Content Management System (LCMS) or a Learning Management System (LMS) to track user's progress. But the functionality is not explained by SCORM.

A multi-user atmosphere in which the knowledge developer can create, reuse, manage, store, and distribute digital learning content from a central storehouse is known as LCMS. Here the processes adjoining the learning are managed by LMS. LCMS permits the users to generate and to use again small units of digital instructional learning material.

The incorporated use of metadata arrangements and learning object import and export formats also allows learning objects to be created and shared by multiple tools and repositories. LCMS integrates specifications of metadata, content wrapping, and content communication. The components of LCMS are shown in "Fig 1".

LMS needs the interchange of customer profile and customer registration information with other systems. The position of the course choice and the learner action are offered by the LCMS. The mechanisms and information needed are shown in "fig 1". So, there is an incorporation of LMS and LCMS.

Secondly, the SCORM is developed by US Department of Defense's ADL. This is an "application profile" consisting of a set of terms and conditions. The three main mechanisms of SCORM are:

1) Runtime Environment: The runtime environment is an API describes the interface between learning object and LMS or LCMS to track learner's progress;
2) Meta-Data: A set of data elements to explain learning contents so that it can simply explore for identified and accessed [7];
3) Content wrapping: Content wrapping is the release and exchange of structured content i.e. learning objects and courses between different LMS and LCMSs;

As a course is separated into lessons, and sometimes the lessons are divided into topics The SCORM condition explains two hierarchical levels:

1) Content aggregation: A group of learning resources to construct complex structures, contents aggregations may be nested and may have lower-level blocks of contents which outline a content aggregation;

2) Resources: Two major types of educating resources are there: SCO and ASSET;

The stage at which student interacts with the learning content and also the LMS tracks the results is known as SCO. Basically, it is a learning object.

A part of content in form of movie, sound, graphic or other media item is referred as an ASSET. Most ASSETS are started by SCOs as part of their in-house content (e.g. graphics come into view on an HTML page).

STANDARDS IN E-LEARNING

Standards in e-Learning give standardized data structures and communication protocols for e-Learning objects and cross-system workflows [1]. The standards are of the following types:

1) Metadata: Metadata refers to the labelling of learning contents and catalogs to maintain indexing, storage, detection (searching), recovery of learning objects by several repositories of data mining and data warehousing techniques. The data utilized here is known as metadata;
2) Content Wrapping: Content Wrapping permits the transport of course content from one learning management system to another learning management system. The most significant content wrapping system these days is, ADL's SCORM [7]. The facts of the contents are stored in various databases which can be developed and received by data mining and data warehousing techniques;
3) User Profile: User Profile consist personal data, learning history, prerequisites, learning plans, degrees and certifications, evaluation of information and contribution status in existing learning;
4) Student Registration: Student Registration identifies the availability of courses for the learner, also, information about other members of the course.
5) Content Communication: It gives an interface between student data and previous activity after content is started. The message is developed by ADL's SCORM Object Reference Model.

BENEFITS OF DATA MINING IN E-LEARNING

There are several web usage tools to carry out data mining and data ware housing tasks. For, instance, Two data mining and data ware housing tools are WebSIFT and WebLogMiner for pattern detection from web logs [10] [11] but these tools are not initiated in e-Learning environment till now because if the educator does not have sufficient knowledge in data mining, can't use these tools to get better efficiency of e- Learning. Web usage mining is a new system, devoted for e-Learning is being industrialized to permit the educators for on-line assess activities [9]. It facilitates the educator to follow the activities in the course web site and take out patterns and behaviours, get better or adapt the course content. For example, one could recognize the paths regularly or frequently visited, the paths never visited, etc. By analyzing these general traversal paths of the course content web pages or recurrent changes in individual traversal paths, the design of the course can be known to be better fit the requirements of students

CONCLUSION AND FUTURE WORK

In this paper, an obvious analysis of the content state of e-Learning standard is being explained. Also, a functional model of dissimilar learning objects is presented here. The swapping of system workflows is also being explained in this paper. E-learning standard gives interoperability between learning systems and tools from several vendors. A standard means of message is set up between dissimilar software applications. This communication is likely by the Web-Services technology.

The Web usage mining technique is explained in this paper, which is a non-trivial procedure of taking out helpful and previously unknown blueprints from the use of Web. The data mining techniques to improve e-education are

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explained in this paper. Since e-Learning process is a endlessly changeable process, the safety services, the encryption of messages, and the general facts to explain services and services access points in e-Learning systems environments are in call for thought.

Though, several tools using data mining techniques to aid e-Learning system are being developed, the research is still in progress, since the data record given by the Web Servers are inadequate, so there is a call for more specialized logs from the application side to improve the already logged information.

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