Expert System Applications in E-learning Environment: Analysis on Current Trends and Future Prospects

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Abstract -- Although there are various applications of Expert system in various fields, right from agriculture to the diagnosis of diseases of patients, it has potential for extensive contribution in digital learning. This paper discusses and analyses the present applications of Expert System in e-learning and to see the usefulness and effectiveness of it. The main objective is to focus and highlight the new trends of e-learning system and by integrating Expert System tools with it, how the system will be more effective and beneficial in nature and how the system will work as an Expert E-learning interface.

This paper starts with a brief introduction of popular AI technique, the Expert System. This is followed by reviews on some of the recent applications of Expert System in the area of electronic learning. Specific focus has been given to analyse effective integration of Expert tools towards the personalised learning environment. This paper also discusses the application of Expert System for the purpose of learner centric E-learning platform.

Keywords: Expert system, digital learning, e-learning, Expert E-learnin.

1. INTRODUCTION

E-learning is purely technology-enhanced learning via internet and customised intranets. Because of the technological revolution, the education system has got tremendous changes in the later part of 90s. E-learning, by virtue of its unique, distributed and asynchronous nature, significantly improves the entire educational system. It creates a new dimension of learning that eliminates barrier of time, distance and socioeconomic status. Though e-learning have different prospect in different point of view like from learner side, content repository and management, metadata management and indexing, there is a potential benefits in Adaptive Learning Environments (ALEs). The awareness of ALEs is going high in recent years. To manage all these there is a need of standardising the whole system, by coordinating emerging technologies and capabilities. Many E-learning standards like SCORM, LOM are available now in market and they are accepted by many academias, institutions, and various Govt. and Non-Govt. organisations. Researchers are also introducing various types of implementable architectures in this field in different periods of time. Most of such standard gives more emphasis on content management of learning procedure by integrating different attractive tools like graphics, animation, videos etc. to make the system more impressive and interactive.

The whole learning system will be more interactive and promising if we integrate Expert system (ES) tools to E-learning procedures. One promising application is web security and database security of education system. The ES tools can be used to understand a learner better from their learning history. ES can make the learning system as a decision-maker for E-learners. With ES, the system can act as an expert learning system with more potentiality. Although there are many standards of E-learning in the market, proposals are for standardisation of learner profile and content packaging. There is still lack of learner centric E-learning system.

The main objective of this paper is to introduce the recent applications of ES in E-learning emphasising on learner's learning style, learning pattern etc. It also discusses the scope for potential applications and integration of Expert System Technologies to the E Learning scenario in a more effective way. The idea is now to build a "*common reference model*" for a good web-based learning with the capability of commercial or public implementation.

2. EXPERT SYSTEM TOOL

An expert system is a computer program that works in accordance with human expertise and based on knowledge and reasoning techniques. It can solve problems and can give advice in a specialized domain area. It operates as an interactive system to respond questions, asks for clarification, makes recommendations, and generally aids the decision-making process. So, we can say an ES is a decision maker, problem solver, analyser, and can use as a guide for them who does not have access to expertise. ES provides expert advice and guidance in a wide variety of activities, from computer diagnosis to delicate medical surgery. Instead of simply manipulating data sets, an ES can draw a conclusion which is the main advantage and difference from

traditional database programs. It contains both declarative and procedural knowledge. An ES has reasoning capability to arrive at conclusions from stored and supplied facts.

A very important kind of ES called Fuzzy ES is used to collect fuzzy membership functions and rules which allow more than one conclusions per rule. Here user has to give his/her confidence also with their inputs. Like the system also give conclusions with confidence level.

The basic advantage of using such Expert Systems is that there is no restriction on input data on their limits and the data not necessarily defined clearly in advance. It can give several alternative solutions, either ranked or unranked.

3. CURRENT E-LEARNING STANDARDS

There are several promising areas of E-learning. Among them content management and web security are main for which several companies have introduced several standards. According to Guild Research report 2006, the e-learning activity "Designing and developing e-learning content" is getting more focus and attention than "Addressing learner requirements and preferences" and for an organisation "Improve the quality of e-learning content" got the highest priority than the other objectives. "Extend the global reach of the e-learning content" is the second priority to get the content out beyond the geographical limit [8].

It has been seen in Guild research that e-learner providers are still concentrating to improve the quality of content and few standards are already introduced and accepted by people. One such conceptual model architecture of IEEE is LTSC (Learning Technology Standardisation Committee). We can divide the learning standards into five sub standards: metadata, content packaging, learner profile, learner registration and security. For each section already some standards are there and works are still going on to improve it. To support metadata objects like indexing, storage, search, and retrieval of learning, LOM standards of IEEE and Dublin Core Metadata are commonly used standards. For content packaging and communication, the functional model SCORM of ADL is more popular than other standards like IMS Content Packaging Application and IMS Simple Sequencing specification. The most important effort to standardise the learner profile information is the IMS Learner Information package (LIP) specification. There is an initiative for learner registration is the IMS Enterprise Specification [www.imsproject.org]. Sun Microsystems also present a functional model for e-learning. Liu, Siddik and Georgans also proposed one functional model for e-learning to divide the whole learning system into two components: content management system and learning management system [4]. This works advanced than SCORM that defines an interface between each components and subsystem to achieve interoperability.

4. EXPERT SYSTEM IN E-LEARNING

The application of ES is rapidly increasing in learning environment to make the system more interactive. One such popular application is the information filtering agent to analyze the learner's web surfing habits and preferences. It filters exactly the information wanted by the learner from unwanted data which saves time and effort of searching from huge amount of data. ES determines what contents to present to the learner. ES can understand learner better and can think better way to make decision. Because of its performance, many decision support systems named as Expert System [3]. AXSYS is an intelligent system for e-learning having visual interface with graphical representations of knowledge [9]. This helps the teaching staff even if they do not have any technical background and arrange the system without any additional technical support. LCDS, The Microsoft Learning Content Development System is an expert system that creates high quality, interactive, online courses. It is a free tool that allows anyone in the Microsoft Learning community to publish e-learning courses. Its recent rank is 7 on the list of best free applications from Microsoft and is available now in seven languages. AAA is an ES of America Accounting Association provides information on Rutgers Accounting web as well as Newsletter, Teaching material and more. EZ-Xpert 3.0 is an end-user development environment with speed and accuracy. It offers a menu-driven, fill-in-the-blank interface with extensive Wizard support and presents an ordered list of tasks that need attention, leading the user through the building of the system. EXSYS Corvid is a decision-making expert system allows non-programmers to easily build interactive Web applications that capture the logic and processes used to solve problems and deliver it online, in stand-alone applications and embedded in other technologies [info@exsys.com]. Marginean and Racovitan, in their research paper, proposed one intelligent E-learning model for the students from the discipline of "Computer Science in economy" to adjust the students with theoretical and practical knowledge and practices. Vostrovsky explained in his paper the utilization of ES in knowledge management and how important ES is to solve problem with consultation of expert [11]. According to Fadzil and Munira ES rules are used in E-learning system in various applications [2]. It can use as a program advising, automated scheduling of classes, making of

assignments, plagiarism detection, retaining learners and adapting to their diverse needs and backgrounds, maintenance of property and ensuring security.

5. PROSPECTS OF E-LEARNING USING ES

From the previous sections it is seen that, most of the ES for E-learning are used to manage the contents of SLM. Most of the works are still going on to make the system more attractive and interactive for user. According to Teo and Gay, most E-learning systems are still limited to just being online repositories and lack of personalisation learning system [10]. So, one adaptive and assistive learning system for digital learner is very much important in this field. Based on the information about user-access pattern and use behaviour, a designer can improve the site organisation and presentation. Adaptive sites can monitor visitor's activity and browsing patterns and learn from them some relevant information. In e-learning environment also an ES can work as a kernel for learner and the learning system. ES can be the expert control system for both learner and the environment that can form an Expert Learning System (ELS).

Fig 1: Block diagram of ELS

Though lots of works going on and already done in content management system, Chen and Chiu argue that yet the E-learning system is lack of appropriate learning content, interaction and sense of participation and the learning problems are often difficult to be detected and solved [1]. They say that an E-learning environment is required to compose learning tools, learning management system, digital content and learning activities. So, this can be the future work to improve the system.

Not much work has been done in self evaluation procedure for learner which can improve by using ES. Evaluation procedure within a time bound is one of the prospective studies. According to Murtaza *et. el*. there are several areas in business decision making and problem solving where ES excels [7].

6. CONCLUSION

An ES tools can be used to understand a customer better, either as a group or as an individual. ES is such a tool that it enables a computer to give advice concerning an unstructured or semi structured decision that is normally made by a human expert. ES or knowledge based system usually act as a consulting experts in a specific domain areas based on its collection of knowledge. Since e-learning is a promising area of research, and ES is a technology by which one can solve and think a problem better that a human expert, integrating ES with E-learning system is the good suggestion to improve the existing system and make the system more useful and more interactive. A decision support e-learning environment for learners is also possible to work as an Expert E-learner.

In future, the learning solutions and services can be integrated into a new trend which is called mobile learning technology that can help the people who are lack of infrastructure and for the people whose job require to move.

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