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NEURAL NETWORK BASED PERFORMANCE MONITORING SYSTEM FOR AN E-LEARNING PORTAL

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ABSTRACT

Monitoring and evaluating academic performance of students is a challenging task in on-line learning environment. This paper proposes an online intelligent performance monitoring system to validate knowledge gained by learners based on neural networks when accessing e-learning contents. E-learning environments have potential to enhance teaching, learning and assessment practices. The performance monitoring system takes as input a set of parameters of the learner and based on the outcome from a learning session it recommends suggestions to the learners. Proposed performance monitoring system would be flexible for teachers and this paper demonstrates usefulness of a suggestive system for interactive learning through analysis of learner's learning styles and their learning efficiency can be shown to improve their overall performance further.

Key words: E-portfolio, E-learning, adaptive learning, Neural Networks, learning styles, Web based learning.

MOTIVATION AND RELATED WORK

Learners of the modern days are more and more dependent on technology as part of their day-today work lives. Media-based teaching tools are commonly used in education to convey great deal of valuable information of engineering subjects quickly and efficiently in which complex components and assemblies are often difficult to visualize through words and pictures alone. An E-learning system using internet bear potential to facilitate improvement of virtual courses by providing cost-effective means for training learners quickly and easily regardless of their requirements and geographic location and provides ability to conduct training anywhere. It provides basic knowledge and also ensures that all attendees have cursory knowledge on the same level when the classroom training begins. A system adopted to get better performance of developed courses through adaptation E-learning. Course log-files can be mined by teachers using evolutionary algorithms to discover patterns, relationships between students' knowledge levels, e-learning system usage times and students' scores. E-portfolios are a new concept in e-learning which exchange ideas and feed back to encourage education and training. Naps et al. delivered remote accessibility to interactive material for Web based learning through hypermedia that supports distance learning and system independent applications. E-portfolio empowers students by maintaining an ongoing record of their learning and provides critical thinking skills and learning strategies.

Artificial neural networks (ANN) is an attempt in modeling information processing capabilities of nervous system that are designed to reduce the need for human intervention in application process to simulate human reasoning and learning. Neural networks are used in the design of Intelligent Tutoring System (ITS), simulation of student's cognitive process, and adaptive external control of student pacing. Zhang Linfeng et.al proposed and implemented one-class-in-one network for emotion recognition system in E-learning based on neural networks. The module is trained using a large database of phoneme-balanced chinese words read by speakers consciously trying to portray an emotion. David Wen Shung Tai et.al proposed a hybrid system to combine self-organizing map (SOM) of a neural network with data-mining (DM) method for course recommendation of e-learning system. It provides useful information for educators to classify e-learners or students more accurately, and to adapt their teaching strategies accordingly to retain valuable e-learners subject to limited resources. Mahapatra and Khan implemented neural network models based on back-propagation algorithm to predict quality in education for different stakeholders. Behara et al. also used back-propagation algorithm in neural networks for modeling and evaluating qualitative and intangible aspects of service. Hoefer and Gould used neural approach to predict students' academic performance in business programmes. However, Kohonen artificial neural networks have the ability to cluster performances accurately without the need for a priori knowledge of data.

Intelligent adaptive e-learning combines the characteristics of e-learning such as adaptivity and computational intelligenc, educational systems are traditionally either intelligent or adaptive, listing prominent systems like AHA1 as adaptive but non-intelligent, and other ones as intelligent but limited regarding adaptivity. This paper proposes an intelligent evaluation system to predict the student's knowledge level in accessing e-learning content. The system uses information from a learner's database in order to determine pedagogical decisions for each learner especially to control learner's progress and to adapt t presentation of contents to individual learner. The rest of this paper is structured as follows. Section 2 describes how the proposed intelligent evaluation system uses neural networks for classification. Section 3 is conclusion.

INTELLIGENT EVALUATION SYSTEM

Neural network self-organization is a fascinating topic that can learn to detect regularities, correlate input to adapt future responses accordingly and respond to group of similar input vectors in neuron layer. Competitive

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learning is a simple unsupervised learning technique that uses competitive transfer function to partition input data vectors based on distance. The competitive transfer function accepts input vector for a layer and returns 0 outputs for all neurons except for winner.

The learning styles are different for different learners. Adaptive e-learning content delivery system contains information about all type of learners stored as log file in data base and have been formed based on the learning styles of the learners. The adaptive e-learning content delivery system provides resources such as text, multimedia simulations and animated discussions based on the learning style of learners.

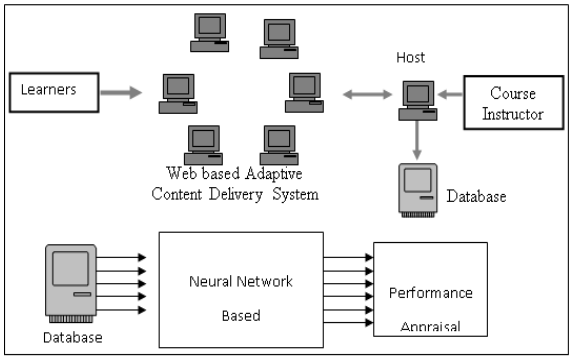

Figure.1.Neural network based performance evaluation system

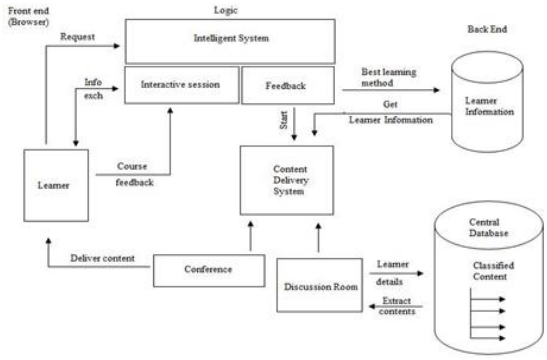

Figure.2.Architecture of the interactive E-portfolio system

The course instructor is responsible for monitoring and guiding e learners through the learning process using host system. The learners are encouraged to peruse the resources of interactive e-learning and to participate in provided online activities. The answers for the queries from learners are stored in the database by the instructor. The learner can access performance appraisal online by sending IP address of the user system and his student ID number. Based on the scale of performance, learner can improve their performance. Gender is one of the moderating factors influences relationships between personality traits and academic performance. Nguyen et al have reported that both emotional stability and openness predicted academic performance positively and significantly in male but not in female students. Harb and El-Shaarawi have concluded from their study that non-national students outperform national students and female students outperform male counterpart. Study effort, age of learners, learner's learning style and instructor's teaching style all have positive effect on student's performance. Lane and Porch found age and attitude have significant effect on student performance in undergraduate financial accounting course.

Figure.1 illustrates neural network based performance evaluation system, in which classifier classifies overall performance of the learners into various grades such as Outstanding, Excellent, Good, Satisfactory, Improvement needed and Unsatisfactory. Important parameters considered as inputs to the neural network IP address and Student ID. Performance of learner, age of learner, access time (i.e. the time taken by student to access the e-learning content**, t**ime taken to write and execute the programs and number of queries posted) are displayed using Student ID**.** The performance of the learner is also evaluated based on how they are answering the quiz questions posted by instructor.

Table.1.Learners Attributes

Input Attributes	IP address
	Student ID
	Age
	Access time
	Time taken to write and execute the programs
	number of queries posted
	No. of quiz questions answered
Output Suggestions	Session Successful
	Improvement Required
	Request Additional Content
	Fundamental Understanding Required
	Revert to Previous Session
	Provide Basic Knowledge

Age plays a major factor in the learning process. The system is logged in by learners of various age groups with 19 years as minimum entry age. This includes the learners of varied background knowledge. Research has

shown that younger learners learn faster than the older learners. Thus consideration in the evaluation system is also given accordingly. Time taken to write and execute the programs is the next major factor in evaluation system. The time taken to execute programs is directly proportional to learning efficiency. The more knowledge gained the less time the learner takes to execute the programs. Access time gives information about the duration the learner has accessed e-content. This factor is correlated directly to the learning of the learner i.e. with the assumption that the longer accession time the more learnt and the more interest shown by the learner to the system. Queries posted by the learner shows the interaction of the learner with the system. The queries also give a detail of depth of knowledge gained by the learner. Table.1 gives the learners attributes taken as inputs for the neural network and the outputs considered for analyzing the performance of learners.

Working of the System

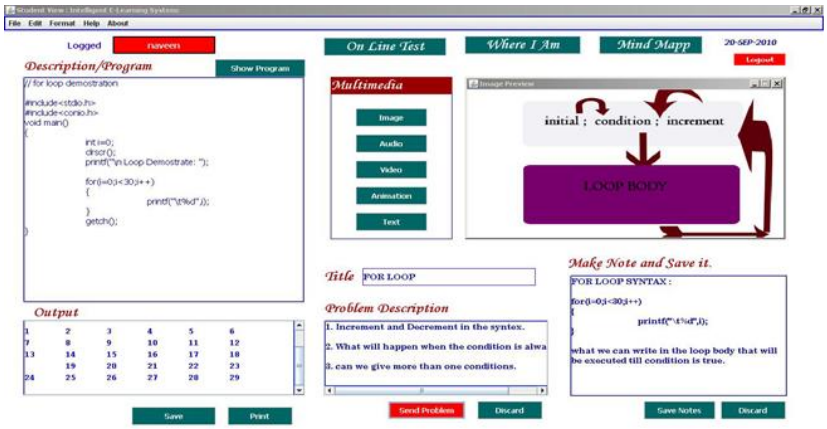

Figure.3.Content Delivery System

Figure.2 illustrates overall architecture of interactive E-portfolio system in which Intelligence system is the proposed performance evaluation system which decides learning style of the learner. Set of questions are asked to learner by intelligent system and based on the answers given by learner, the intelligence system suggests suitable content to the learner. The intelligence system gets feedback from learner after a session, and the suggestions would be considered for future modifications. Neural network provided in the intelligent system decides the performance of student. Function of the Content Delivery system is to deliver e-content to learner which is suggested and preferred by learner. Screen shot of adaptive content delivery system is provided in Figure.3. Database contains adaptive content materials, learner details and the feedback offered by learners. The contents are stored based on different learning styles. The system judges learning style and preference of learner and offers content accordingly. Initially learner interacts with system through intelligence module. To judge learning style of a learner, the intelligent module puts some questions to learner and the answers are analyzed to deliver referred contents to the learner. The content delivery system based on the instruction from the intelligence system delivers the content to the learner. After a learning session the feedback and suggestions from the learner are also recorded for future modifications.

CONCLUSION

As the learners are subjected with a lot of media entertainment these days, it is the right time the education industry takes necessary measures to bring in interest in the learners by employing suitable techniques and that could be possible by utilizing good e-learning methods. This paper has presented a framework for intelligent online evaluation system for the learners to improve their performance appraisal. The proposed system not only helps the learners in organizing their study but also motivates them to continue learning as they can check their performance. Especially when teaching programming languages in an on-line environment become a challenging task these systems can be employed. The system also proposes a model to deliver content based on the preference of the learner. This is a major step to achieve adaptive feature in the system.

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