IJCSE International Journal of Computer Sciences and Engineering Open Access
Research Paper Volume-4, Issue-2 E-ISSN: 2347-2693

Enhancing Web Learning System Using Multimedia and Regression Algorithm

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www.ijcseonline.org

Received: Jan /24/2016 Revised: Feb/07/2016 Accepted: Feb/19/2016 Accepted: Feb/29/2016

***Abstract*— –** This paper discusses the application of multimedia technologies in web learning environment. It presents the suitable classification algorithm based on regression analysis to predict the learners' needs and performance. Predicting educational outcome and monitoring the progress of students in a web-based learning setting is a difficult task. But, there are possibilities to improve the system based on individual learning pattern in the web learning environment. In this paper, regression algorithm is implemented to predict student performance at the end of the semester. The results can be used to improve the educators' perception to reform the syllabus, thereby escalating the probability of a higher score by covering students. Higher learning institutes contribution reserve learning courses during the web can use this replica to identify which area of their itinerary can be improved by data mining technology to accomplish and enhance the performance of the student. By attempting to study the new algorithm this, research paper is a need of the hour. The main aim of this research paper is to study about the newly proposed regression algorithm and its' efficiency. It discusses the multimedia elements and their effects in the web learning system.

Keywords*—Multimedia technologies, Classification, Regression algorithms, Data Mining, Performance, Web Learning system*

I. INTRODUCTION

Web learning has become common in classroom teaching with most of the higher education institutions engaging in web learning or some form of online teaching [1]. Most of the higher education institutions are engaged in web learning. The popularity of web learning is mainly due to the concept of "anywhere" and "anytime". Universities are becoming more involved in e-learning activities as lecturers are uploading teaching materials onto e- learning systems [2]. When multimedia is introduced, it becomes an attractive feature for such e-learning initiatives. Mayer (2003) strongly posits the use of multimedia as an effective teaching and learning tool, as he stated that, "the promise of multimedia learning is that teachers can tap the power of visual and verbal forms of expression in the service of promoting the student understanding." Thus many web learning applications are now designed such that information is presented online in the websites and enhanced with multimedia features and interactivity, and follow certain design concepts [3]. Such a learning environment is deemed to be student-centered as students are empowered with the control and activity of these online modules. In such a learning environment, students are active in their learning process and are involved in acquiring and navigating through the content in the learning modules at their own pace [4]. In the institutions of higher learning to integrate ICT into their classrooms, to develop students with skills that would allow them to be effective IT workers in industry. As such, institutions of higher learning in Malaysian are beginning to incorporate ICT materials in developing e-learning methods and in web-based courses [2]. However, not all educational applications are designed based on proper guidelines and there are still very little definite classrooms on the impact of multimedia and design factors in web-learning applications on the student learning process.

Multimedia is the use of text, graphics, animation, pictures, video, and sound to present information [5]. Since these media can now be included using a computer, there has been a practical explosion of computer-based multimedia instructional applications. These applications run the gamut from serious computer-based tutorials for adults to the new category of "education" products for children. These very miscellaneous applications seem to share a common assumption-multimedia information helps people learn. Today computers, graphics, and other visual elements are an integral part of most teaching strategies (Rieber, 2000) [6].

II. RESEARCH PROBLEM

During the last ten years, multimedia has been recognized as a key design consideration for web-based learning systems. As a result, a number of the web learning system have been developed with different multimedia elements and interactivity. There are always possibilities to develop the teaching and learning process by means of web learning system and teaching methodologies. Like that, there are always need to develop the new algorithms to enhance the classification accuracy. Even though developing the web learning system and multimedia technologies need huge

technical expertise and cost it is worthwhile to enhancing the current system of learning. Web learning execution in teaching and knowledge activity needs sophisticated new technology. Above all the factors are responsible for the low web-based learning environment in educational institutions.

III. PROBLEMS IN WEB BASED LEARNING ENVIRONMENT

The main problems of web-based learning are

- Social Separation
- De-individualized training
- Cost
- Technical problems
- Instructional design
- Knowledge for technology's sake

This paper focused the problems of the web-based learning and rectifying with regression algorithm

Multimedia

Multimedia Computers, as we understand them today, came into subsistence about four decades ago. At first, the computers supported only the computations related to research. As time progressed and with the technological advance, the computer became reliable contrivances and today they are an integral part of our day-to-day life. Observation, reminiscence, thought, and reason, which is measured the basic character of human beings, are being today by particular systems that are built using scheming computers.

Uses of multimedia in education

In typical years, multimedia has introduced the pedagogical power in facilitating student knowledge and supplementing knowledge with liveliness as it adds richness and meaning to the information presentation with the use of more than one intermediate Multimedia involves the management of media in producing the media-rich outputs and is arranged in some splitting which are linked by the hypermedia [7]. Students can navigate to the source of information in a shorter time, build the connections between relevant topics, and bring together their knowledge by associating to the meaningful in order. Studying the understanding the human nature can help to develop the suitable human computer interface (Sorden, 2005) [8]. It is significant for students to self-adjust the time and determine the information based on human being differences, so that when individual being differences can be provided somewhere to stay by having alternatives in education, students will then be engaged at a deeper attitude and be glad about the student-centered knowledge come up to with more sense of contribution. In a multimedia-based learning environment the learners' positive mind state has significant effects on learning performance, cognitive load, motivation, satisfaction and perception of the learning (Um, E. 2008) [13]. Moreno & Mayer (2007) suggested an interactive multimodal environment based on the cognitive-affective theory of learning-CALM. It included five design principles of guided activity, reflection, feedback, pacing, and pre-training (Mayer, 2002) [12]. Moreno studied the effect of various media on learning. She differentiated the method-affects-learning hypotheses versus a media affects-learning hypothesis in 2006. She applied the concept of Multimedia Learning based on cognition.

Web-based learning

Web-based learning includes all instructive intervention that makes use of the internet. There are currently three broad classifications or configurations within web learning tutorials, online discussion groups [11]. The difference between these configurations are often indistinct, and in fact, a given web learning interfering might use a combination of two or three, but the implications for teaching demand a theoretical, albeit at times subjective, separation.

Online tutorials are similar to in-person to in person (face-to-face) lecture. They usually consist of information structured by the instructor in a way that will (hopefully) facilitate learning [9]. A Studying unit is often enhanced by features such as compact disk (sound, pictures, movies, and animations), links to online funds (full-text journal articles or related web sites) and other areas within the path, and self-assessment tools [10].

CLASSIFICATION ALGORITHM

Classification: - This can categorize data according to their classes i.e. put data in a single group that belongs to a familiar class. This is also called supervised classification

REGRESSION ANALYSIS

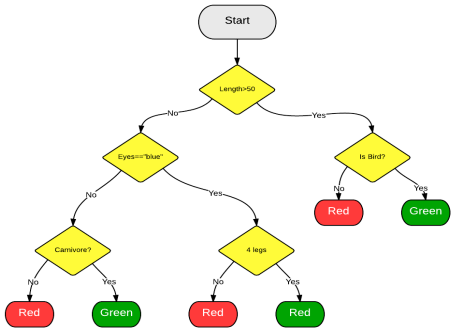

Figure 1: Regression analysis

CART algorithm was developed by Brieman, Friedman, Olshen, and Stone in 1984. CART creates trees that have binary splits on nominal or interval inputs for a nominal,

ordinal, or interval target. The CART algorithm does not require binding; data is handled in its raw state. The CART algorithm uses the GINI index to measure impurity at the node. For a binary class, the GINI measure of impurity is given by

$$GINI(t) = 1 - \sum [p(t \mid j)]^2$$

Where $p(j \mid t)$ is the relative frequency of class j at node t. When a node p is split into x partitions, the quality of split is given by

$$GINI_{split} = \sum_{i=1}^{x} \frac{n_i}{n} GINI(t)$$

Where =number of records at the child I n I n = a number of records at node p CART also supports the towing splitting criterion which can be used for multi-class problems. It uses the minimal cost complexity pruning to remove features from the classifier that are not significant. CART algorithm automatically balances the class variable, can handle missing values, and allows for cost-sensitive learning and probability tree estimation

C4.5 Algorithm

C4.5 is an algorithm used to generate a decision tree developed by Ross Quinlan. C4.5 is an extension of Quinlan's earlier ID3 algorithm. The decision trees generated by C4.5 can be used for classification, and for this reason, C4.5 is often referred to as a statistical classifier. C4.5 builds decision trees from a set of training data in the same way as ID3, using the concept of information entropy.

The training data is a set $S = s_1, s_2, \cdots$ of already classified samples. Each sample s_i consists of a p-dimensional vector $(x_{1,i}, x_{2,i}, \ldots, x_{p,i})$, where the x_j represent attribute values or features of the sample, as well as the class in which s_i falls.

At each node of the tree, C4.5 chooses the attribute of the data that most effectively splits its set of samples into subsets enriched in one class or the other. The splitting criterion is the normalized information gain (difference in entropy). The attribute with the highest normalized information gain is chosen to make the decision. The C4.5 algorithm then recurs on the smaller sub-lists.

This algorithm has a few base cases. All the samples in the list belong to the same class. When this happens, it simply creates a leaf node for the decision tree saying to choose that class. None of the features provide any information gain.

In this case, C4.5 creates a decision node higher up the tree using the expected value of the class. An instance of previously-unseen class encountered. Again, C4.5 creates a decision node higher up the tree using the expected value.

RESEARCH METHODOLOGY

The model of the newly proposed multimedia web learning system considers the learners' personal data such as age, education, gender, web usage, multimedia knowledge, etc. and learning the style.

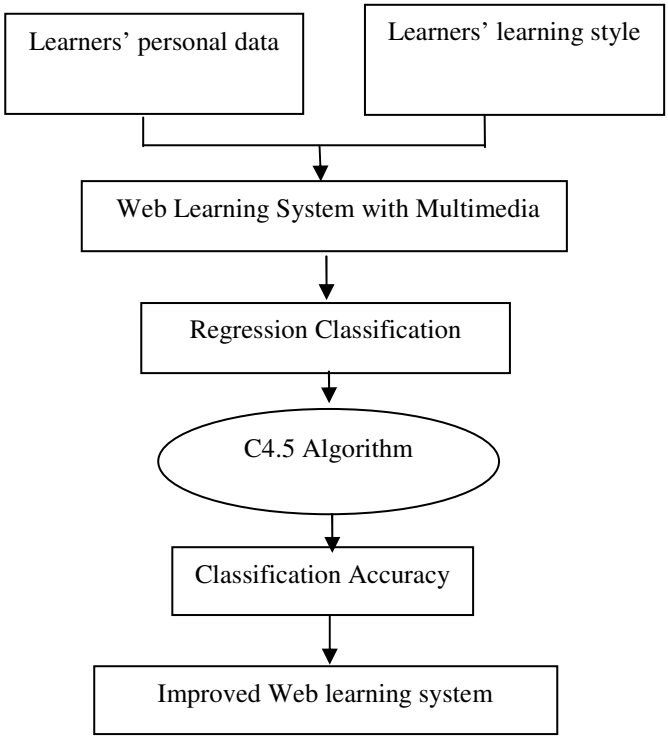

Figure 2. Research methodology

IV. CONCLUSION

A web-based learning environment with more multimedia applications attracts the students towards this new and flexible learning environment. It indicates the need to develop more web-based learning modules with proper multimedia aspects. In addition to that, the student's favorable response to the module made the learning process relevant to them and, therefore, shows the importance of incorporating authentic learning principles into the module. Hence, it is important for educational technologists who are developing web-based modules. The regression algorithm and C4.5 algorithm are useful to predict the accuracy of multimedia-based web learning technology. Further research is important to identify the visual and graphic elements' effects on attention and perception.

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