Improvement of Individual Performance on Standardized Assessments Based on Identification of Difficult Areas

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Abstract - The different learners have different capacity when they are studying. After a learner goes through the learning materials, the learner will be given to do a question paper of the subject that he intended to learn. The questions will be categorized into five levels considering the difficulty of the question and all the questions will be stored in a question bank. Afterwards, the system identifies what areas the user is weak by using their answer sheet. Answering pattern includes identifying the correct answers out of the questions given and the area the user is needed to study further. Then, the system identifies the percentages of the questions which need to be added in the next question paper. The mechanism behind creating the next question paper can be identified as users will be given more questions related to the areas which they performed less in previous paper. By continuously evaluating each learner, the average progress percentage each student will be calculated using machine learning algorithms. Also, by finding the correct answer percentage of each learner and the knowledge level of the subject are identified. Further, the instructors or the lecturers do not need to assess learners individually since the proposed system detect the answering style and the performance of each learner automatically. This indicates that a personalized evaluation mechanism will be carried out to evaluate each learner's performance. This assists the learners to make self-study plan without giving any efforts.

Eventually, recommendations will be made to enhance learners' knowledge in identified weak areas in learning. i.e. Suggest other learning resources (web sites, videos etc.).

Keywords - computerized adaptive testing; adaptive learning system.

I. INTRODUCTION

Nowadays, the knowledge is the key to make everything success. Everyone starts their education since they are in mother's womb and it will never end. There is at least one thing to learn every day. When considering the learning process of a student, their learning styles are different. That said, the students gain their knowledge through various ways such as reading, listening and watching. But they can't get the best knowledge as much as they expected. As their individual performance directly affects the success rate of learning, they must concern about their individual performance in each subject. To evaluate their performance against the efforts they put on their learning process, first they must understand their level of knowledge in each subject. Then the progress presentation can be obtained. To get an exact idea of the progress percentage, they must follow some evaluation methods to assess which can be either self-assessments or competency-based assessments.

To increase individual performance, use Computerized Adaptive Testing (CAT) system. then, the Computerized Adaptive Testing system provide a question papers and assess the students through the system. The questions are dividing into five different levels and add a weightage to considering level of difficulty.

Level of Difficulty	Weightage
very simple	1
simple	2
medium	3
hard	4
very hard	5

Table 1: Level of Difficulty of the questions

Weight is added when a question is adding to the system by a tutor or a responsible person.

Datasets

In this model used two kinds of dataset fist one is the question dataset. It is used to generate question papers and the second one is five result answer datasets. which is used

to calculate the average progress percentage using machine learning algorithms.

II. LITERATURE REVIEW

There are many methods to support student studying. Several organizations provide systems to support their studying. but no one hasn't found learning progress percentage. In the literature review has found mostly used question bank and provide question papers. After, the system gave the correct answers count. further, the system gave correct answers to the incorrect answers. then learner can check the correct answers to the wrong answers.

III. METHODOLOGY

In general, the adaptive learning system is composed of domain model, instruction model, adaptive model, student model and the user interface. In order to more effectively evaluate the learner's individual performance and supports the personalized learning, we integrate the computerized adaptive testing (CAT) module into an adaptive learning system. The novel architecture of CAT in the adaptive learning system is illustrated in figure 3. The computerized adaptive testing (CAT) the module includes a predefined question database. The basic principles of the system are described as follows: First of all, according to the domain model, teachers set up the question bank and determine the question parameters. Secondly, a student requests a question paper selecting a specific area, the system will fetch the questions from the database and generate a question paper and provide it to the student. after finished the question paper the student will submit the paper to the system. moreover, students get the question papers again and again based on identifying his wrong answers areas. The question papers are given until the correct number of questions exceeds 75%.the tutor can decide the percentage.
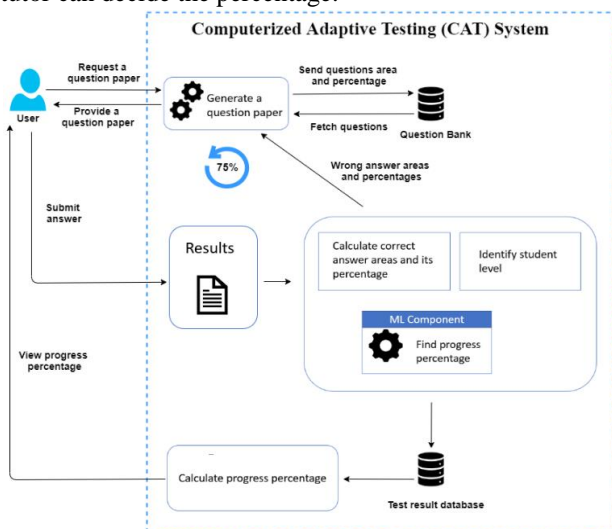

Figure 1. Architecture of CAT in adaptive learning system

A. Find Gradient of a Question Paper

After completing the question paper, take the answer sheet. then get how long did it take for each question and how much weight is taken into for a question. Then we mark on a graph the allocated weight for a question for the x axis and the time taken for each question on the y axis.

Then a straight line is drawn for the marked data using a machine learning algorithm. the two algorithms linear regression and support vector regression are used to draw the line.

In this case, to select the best line, take the R-Squared value is higher and get the best line with that value. The gradient is obtained according to the line drawn at the end.

What is required here is that the gradient should be less from a question paper to a question paper. which is that the time taken by the student to complete each question is less, which means that the student's progress on the new question paper is more than the progress of the old question paper. After the gradient, the question paper number and student information will be stored in the database

B. Calculate Average Progress Percentage

For calculate average learning progress at the beginning learning progress of each question paper should be calculated. It is calculating by looking at how much the gradient of the second question paper different from the order of the first paper. The following formula is used to get the progress percentage.

$$\text{Progress percentage} = \frac{\left[\dfrac{\text{First question paper}}{\text{Gradient}} - \dfrac{\text{Current question paper}}{\text{Gradient}} \right] * 100}{\dfrac{\text{First question paper}}{\text{Gradient}}}$$

Average progress percentage can be obtained by the following formula. after finding the progress percentage of all the question papers.

$$\text{Avarege Progress percentage} = \frac{\sum_{i=1}^{n} \left[\text{Progress percentage}_i \right]}{n}$$

n = No of question papers

Above formula, shows the addition of the progress percentage of all question papers and divide it to the number of question papers to get the average progress percentage.

IV. RESULTS

After processing the data sets the results are shown below figure. to get the result used five-question answer sheets.
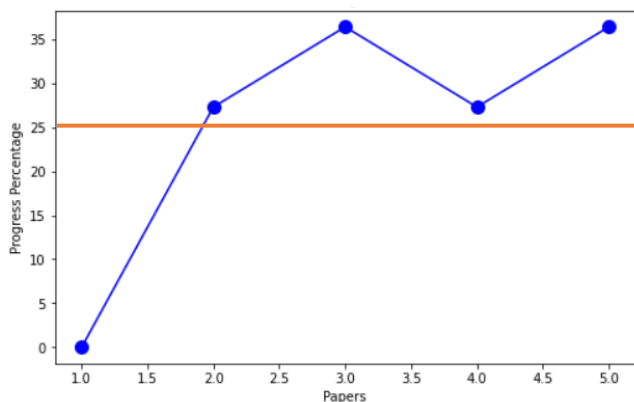

Figure 2. Average progress percentage

The above figure shows how the progress is changed by question paper to paper. the progress percentage has gone up and down. the average progress percentage shows in a red line it is 25.45% compared to the first question paper.

CONCLUSION

This research is focused on finding the progress of a student who is studying in ICT subject. but, this model can be applied to any subject to find their learning progress. using five datasets calculated the progress percentage. a student can know their percentage a particular subject which is he can know the progress of their hard work. also, this model helps to the teachers to know their student's progress.

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