Interactive E-Learning and Exam System

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ABSTRACT
E-Learning platforms are increasingly used in universities, colleges and companies seeking effective and continuous training of their employees without constraint of time and space. The effectiveness of such a learning system depends mainly on the degree of information assimilated by the learner at the end of training. In this project, the focus is on the implementation of a system for measuring competence for computer sciences. This system uses the model of item response theory. The results provided by this system are presented to the student, as a dashboard. They will allow the teacher or tutor to have the necessary elements to monitor their learning by identifying the causes blocking and checking its achievements. The emphasis of this project is to en-able the learner to understand and simultaneously implement the concepts that have been designed by the content author or teacher. It is primarily geared towards enabling students to use an interactive E-Learning system that uses an algorithm based approach to assess skill levels. This system can also help to improve the recruitment process of companies using it in the selection process of candidates for jobs.

Keywords
Adaptive Assessment Approach ,E-Learning, skill level, item response theory, learner model, measuring skills, unit

1. INTRODUCTION
E-Learning systems are nowadays very frequently used by educational institutes as well as various organizations involved in the education sector. E-Learning systems were designed to help improve the learning imparted to students. However, the existing systems fail to take into consideration the fact that each student may possess different skill levels and tend to be less interactive.

Evaluation refers to a method based on questions, tests and examinations to obtain information on the learner progress in a learning process. It is important to clarify the context of evaluations in the learning process; the development and adaption of the latter directly affect the method of evaluation. The impact of choice of the evaluation type is very important and can vary the structure of the course and individual learning. The aim is to translate Classical educational materials into distant learning by applying appropriate. The result is going to inform the learner about his capacity of assimilation and to guide him through his training path.

2. APPROACHES USED IN ASSESSMENT SYSTEM
There are two measuring skills approaches that are used in the assessment system for E-Learning which are mainly based on traditional assessment and adaptive assessment.

2.1 Approaches based on traditional assessments
This approach is mostly used in E-Learning assessment due to its easy implementation. Traditional assessment such as formative and summative evaluation provides quantitative score that shows the degree of knowledge and skill of a learner [1-4].

3.2 Approaches based on adaptive assessments
Adaptive assessment used in E-Learning can be studied using adaptive evaluation based on model of Item Response Theory (IRT). Adaptive approach here is based on the results of the IRT to calculate the prior estimated skill level of a learner [5-7]. The usage of IRT derived algorithms ensures improved accuracy in calculation of test scores and ability level of any candidate appearing for the respective examination.

3. LEARNER MODEL
The learner model is defined by two representations.

- A knowledge representation of the learner in the evaluated field. This information may be represented via graphs and charts for better understanding
- A representation of the general information on the learner as the exercises he has done, how he has made (reasoning, solving process), the performance of these exercises, sections of the system selected, the time spent in each section [8].

Our adaptive assessment system models the knowledge representation of the learner using the hierarchy of concepts; each associated with a part of the learners' knowledge in the subject.

The concepts are interconnected with two relationships fixed by the tutor of the subject:

- Relationship of pre-requisites that defines the knowledge that is required to switch from one concept to another.
- Relationship of order that defines the selected hierarchical order of all concepts of the subject.

Each concept consists of several items that will be used in the adaptive assessment. This can be easily explained by using hierarchy of any concept of the adaptive assessment system which shows the actual division of concepts as we move from root to the edge.Figure 1 illustrates the hierarchy of concepts of our adaptive assessment system.

The following paragraph elucidates the core concepts with regards to the item response theory (IRT) that is used to design intelligent learning systems.

4. ITEM RESPONSE THEORY (IRT)

Item Response Theory is a set of mathematical models for the probabilistic representation of the characteristics of assessment items. These characteristics determine the skill level of a learner in a test [9].

There are many different models in the Item Response Theory. In this system, the model chosen consists of two parameters (b, c) where "b" refers to the difficulty level of the item and "c" is the pseudo-guessing parameter of the item under consideration. From the above conclusion it is derived that "c" corresponds to a new parameter giving us the probability for a learner to answer the question correctly.

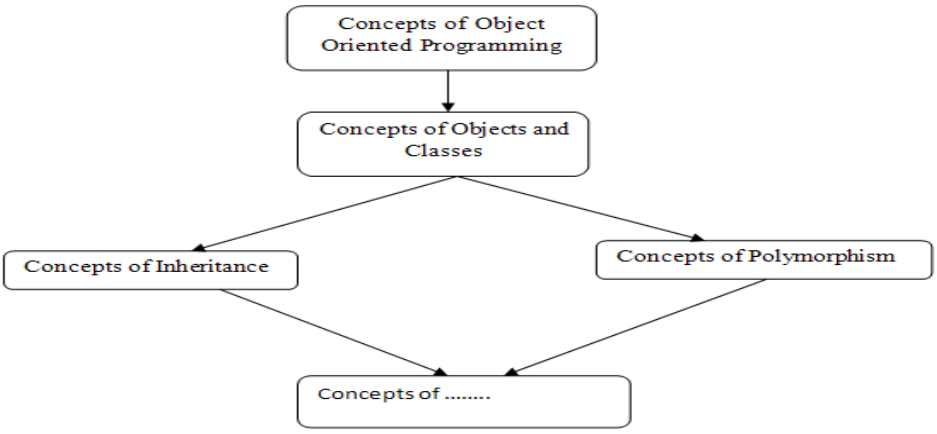

Figure 1. The Hierarchy of concepts of adaptive assessment system

5. ALGORITHM

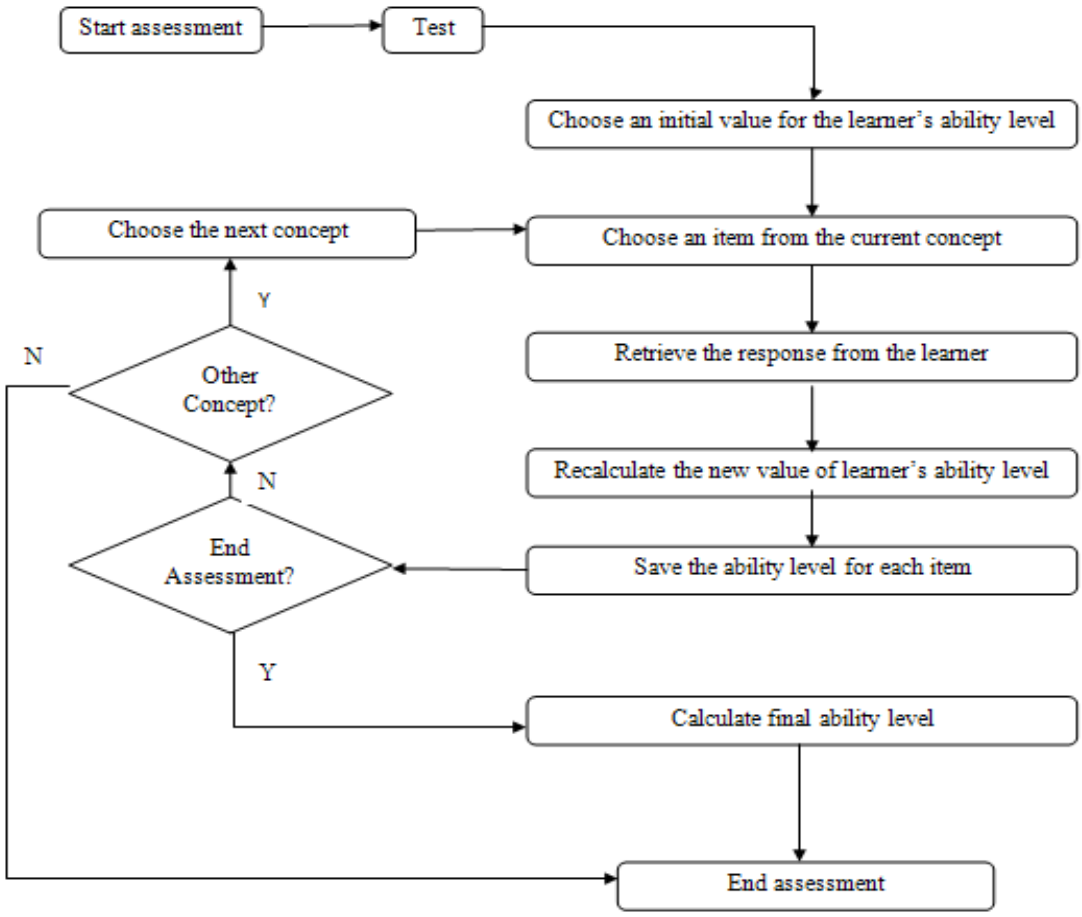

Figure 2. Algorithm Of Measuring Skill Approach

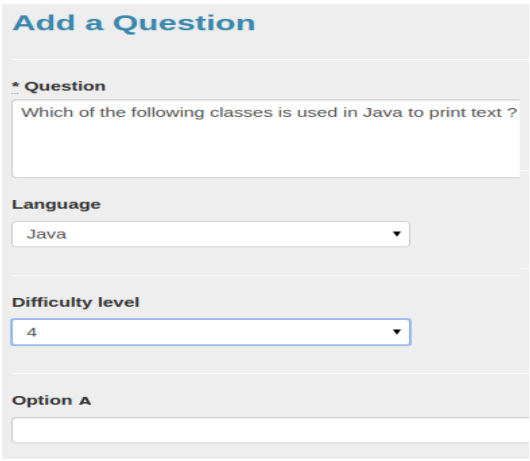

Figure 3: The author is able to add questions for a particular subject along with its difficulty level.

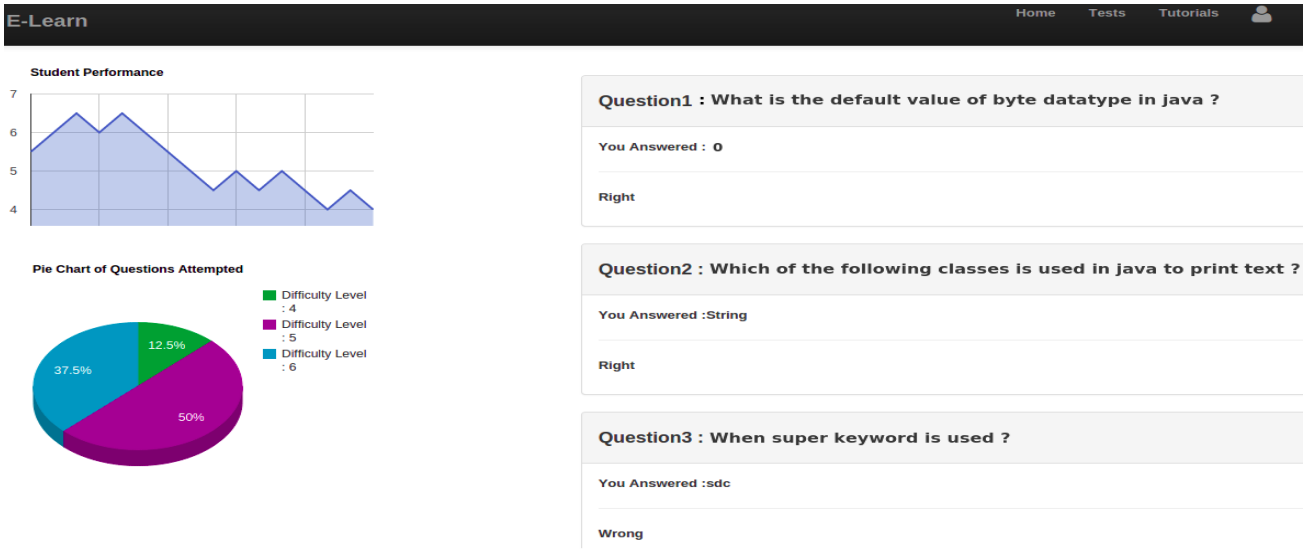

Figure 4: Test results are based on the adaptive assessment logic applied. Further, charts and graphs may be used to illustrate the performance of the algorithm

6. ONLINE SOURCES

The source code for the algorithm along with its implementation in a Ruby-On-Rails based web application at https://github.com/umangmathur92/Language-learning-kit.
The project is open-sourced by the authors of this paper and may be reused, modified and freely distributed.

7. REFERENCES

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