

Intelligent Online Examination Portal Using Bloom's Taxonomy

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Abstract- Examinations play a vital role in testing student's performance. That is why there is need to develop a smart examination system model. This model will not only help in testing student's performance but also test their learning skills. For this an effective question paper must be generated. In traditional method, teachers manually prepare question paper for every test which is very tedious job. An online question bank and examination system is a relatively new and rapidly expanding system. Questions are uploaded by teacher in question bank and new question paper is generated automatically for every new test by the system. Most of present examination systems were designed to give result based on correct answer given or not.

This method is not precise enough to represent the knowledge of individual student and to extend his current level of understanding. In current system, there is no mechanism to define the level of difficulty for each question. Hence, there is need of a system which can have difficulty level for each question as measure for assessment.

In this project, it is able to generate question paper with 4 verticals namely chapter selection, type of question, level of difficulty and bloom's taxonomy. Hence the performance of student is tested properly and also the student is able to improve the area in which he lacks.

Keywords- Database Management, Information Storage and Retrieval, Authentication, Data Mining, Statistical Databases

I. INTRODUCTION

The teachers have to face tedious jobs of generating question papers every time for every new test manually. The test is also not precise enough to represent the knowledge of individual student and to extend his current level of understanding.

Also there is no such proper system which can give feedback of teacher's teaching. The feedback will help teachers to improve in areas where students are unable to understand. Hence the system which can generate an effective

question paper automatically and give feedback of teachers is needed.

MCQ exams helps student to test his knowledge of any subject. It will improve his knowledge and help him to understand what else he needs to cover to get hold on that subject.

Bloom's Taxonomy is a classification system of educational objectives based on the six levels, with the principle that competence at higher level implies a reasonable degree of competence at lower levels.

1. Knowledge
2. Comprehension
3. Application
4. Analysis
5. Synthesis
6. Evaluation

So here the whole concept is to combine MCQ and Bloom's to create an innovative online exam platform which will help teachers to understand which part is difficult to which students. So that he can further take action accordingly.

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II. LITERATURE SURVEY

We all know examination process is an important activity for educational institutions to assess student performance.

Thus the nature of the exam questions would determine the quality of the students produced by the institutions. There have been some methodologies that have been proposed previously in this domain. G. Sai Krishna and his colleagues suggested the use of shuffling algorithm for selection of questions from the question bank **Error! Reference source not found..** They also propose the use of randomized algorithm which is used to identify the question

type (category of blooms) based on the words in a question and the keywords for each blooms level.

Similarly in another paper that is Use of an Evolutionary Approach for Question Paper Template Generation by Dimple V. Paul and her colleagues proposes a methodology to generate a template of the question paper based on the input criteria.

Wang Aimin, Wang Jipeng worked on Design And Implementation Of Web-Based Intelligent Examination System. This paper introduces the design and implementation technology of a web-based intelligent examination system. In this system the random linear algorithm for question selection and intelligent examination paper grouping algorithm based on question bank structure, examination question structure and controlling parameters have been constructed and realized.

Mukta Goyal, Divakar Yadav and Alka Choubey worked on the Fuzzy Logic Approach for Adaptive Test Sheet Generation in E-Learning. This paper suggests the use of fuzzy approach to evaluate student preferable test in e-learning environment.

III. PROPOSED METHODOLOGY

III. I System Architecture

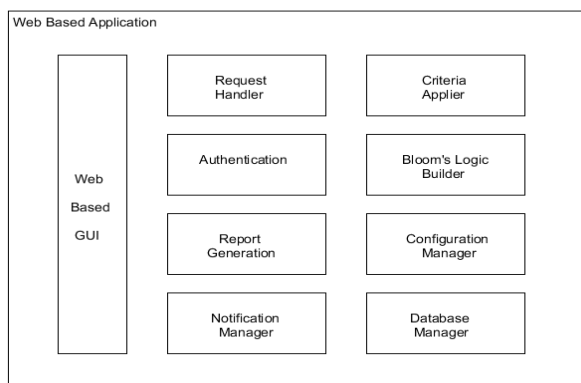


Fig I: System Architecture

In this project our proposed system is web based applications which consist of different modules such as:

1. Web Based GUI
2. Request Handler
3. Criteria Applier
4. Authentication
5. Bloom's Logic Builder
6. Report Generation
7. Configuration Manager

8. Notification Manager

9. Database Manager

III.I.I Web based GUI:

Our proposed system is web based GUI. It is graphical user interface which helps user to interact with the system.

III.I.II Request Handler:

This module is responsible for handling the requests coming from different users of the system.

III.I.III Criteria Applier:

This module is responsible for applying the criteria on question paper which is set by teachers or course coordinators. Based on these criteria, question paper generator system generates the question paper.

III.I.IV Authentication:

Security of the system is maintained by this module. The authentication module is responsible for checking the logged in user is authenticated or not.

If the user is not authenticated then this module does not allow user to log in into the system.

III.I.V Bloom's Logic Builder:

One of the most primary functionality of the system is to generate the question paper according to criteria set by the teacher. For this purpose we would be maintaining a buffer in a hierarchical form, each node of each level represents a category of question. Every node would maintain number of questions in the sub category and their question id's. This would help in checking whether the criteria can be satisfied and accordingly whether the question paper can be generate.

III.I.VI Report Generation:

This module is responsible for generating the report of each and individual student or individual batch. The report would reflect the student's competence in a subject based on various levels of blooms. This would help the students and teachers to identify areas of improvement.

III.I.VII Configuration Manager:

The Configuration Manager handles the changes in software projects.

III.I.VIII Notification Manager:

The Notification Manager is responsible for delivering appropriate and timely notifications to the users. E.g. Notification regarding scheduled test to the students or request send by course coordinator or administrator to the teacher to schedule the test.

III.I.IX Database Manager:

The Database would be the most important part of the system which would maintain all the information related to it. Database Management system module would be responsible for managing all the database related operations.

III.II PRODUCT FUNCTIONALITY

We propose to design an intelligent online examination system based on Bloom’s Taxonomy technique which will help teachers to identify student’s performance and difficulties category wise.

Teachers would be uploading questions into system and each question will be tagged with type, subject, chapter, difficulty level and blooms. Teacher can upload a single question or an excel sheet which has multiple questions in it

When teacher design any test then system needs to consider 4 different verticals while generating question papers. Those 4 verticals are:

- 1. Type of Question:**
MCQ, Short Answer, Long Answer
- 2. Chapter Selection:**
Each subject is divided into multiple chapters and teacher is be able to select chapters from that subject
- 3. Difficulty Level:**
Easy, Medium, High
- 4. Bloom’s Taxonomy:**
Knowledge, Comprehension, Application, Analysis, Synthesis, Evaluation

So for example consider that from a question bank of 10,000 questions teacher wanted to generate a question paper of 25 questions with following constrains:

- Subject: Java
- Chapter 1: 40%, Chapter 2: 50%, Chapter 3: 10%
- MCQ: 50%, Short questions: 30%, Long questions: 20%
- Knowledge: 25%, Application: 25%, Comprehension: 25%, Evaluation: 25%
- Easy: 50%, Medium: 25%, Hard: 25%

So application generates the question paper which support all 4 types of constraints

System should generate meaning full report based on test for per student and per batch which can be visible to teacher, course coordinator and admin as applicable.

III.III QUESTION BUFFER

While generating the question paper the teacher would be given a form wherein he/she would have to give the number of question he would like to include in the paper. Then the teacher would have to give the number of question of each criterion (blooms levels, type of question, etc) in the form of percentage.

To optimize the question search based on the criteria entered by the teacher we suggest using a buffer which would be a tree like structure in which each node would represent category of question and the number of questions in subcategory of the sub-tree.

Each node in the graph would be linked to a list which would maintain the question ids of question that would help us search question form database later on. The use of this tree would help to reduce unnecessary database searches by predetermining whether the specified criteria by performing a search on the tree.

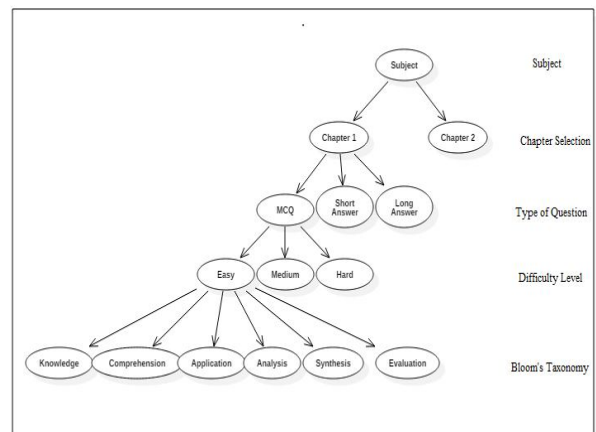


Fig II : Question buffer tree

IV. ALGORITHM

Algorithm for the question paper generation is given below:

```

for(each chapter)
{
    count=calculate number of question for this chapter
    according to its percentage contribution;
    check if count number of question available in
    database
    {
        for(each blooms level)
        {
            blooms_count=calculate number of question required
            for current blooms level out of count number of questions;
            check if blooms_count number of
            question of current_blooms and current_chapter are available
            in database
            {
                for(each difficulty level)
                {
                    level_count = calculate number of question required for
                    current difficulty level out of number of questions;
                    check if
                    level_count number of question of current_blooms,
                    current_level and current chapter are available in database
                    {
                        retrieve
                        available questions for question paper generation;
                    }
                }
            }
        }
    }
}
    
```

V. ACKNOWLEDGMENTS

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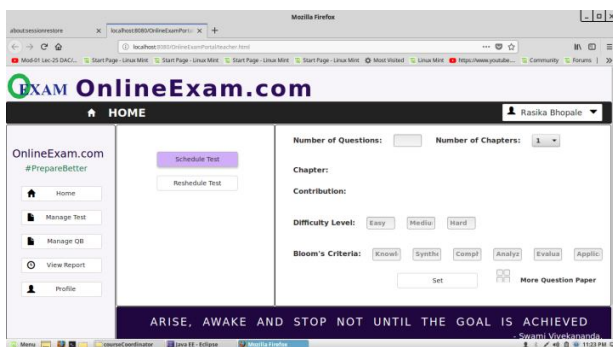


Fig III: Check Criteria