Automatic Question Paper Generation Using Bloom's Taxonomy

Ms. Pavithira V[1], Ms. Preethi B[2], Ms. Sangeetha V[3], Ms. Vikashni S V[4], Mr Kandasamy[5]

Abstract:

The project automatic question paper generation was proposed to generate question papers automatically in the educational institutions. Normally in all institutions, the question papers are created manually by the staffs based on bloom's taxonomy. But in this system, we have the capability to process unique sets of question papers automatically. It makes the tedious task more efficient. This software is used for all type of educational institutions either small or large scale. This software produces different question set which does not repeat in the same paper. This may make colleges to produce question papers within short span of time.

Keywords: *automatic, paper, question, generation, Microsoft SQL, AQPG, examination.*

I.INTRODUCTION

The generation of question paper manually is a tedious process in all educational institutions either in schools or in colleges. One of the basic works of the teachers would be preparing a question paper for every exam. This might waste their precious time. But these examinations play a vital role in assessing student's performance. And this is the reason to have a smart development question paper model for the growth of students. It is called to be an automatic question paper generation system. The question paper is prepared based on bloom's taxonomy. Bloom's taxonomy is generally a hierarchy that defines the classification of learning methods in schools and colleges. The goal of a professor is to encourage their students by building up by their levels of understanding their hard and soft skills. Generally, Bloom's taxonomy has six levels of classification. It includes create, evaluate, analyze, apply, understand and remember. Hence the system uses the SQL database for generating questions. The questions are stored in the database and retrieved whenever needed. New questions can also be added to the database. This project consists of several modules like authentication, staff creation, subject creation, add questions, and generation of the question paper. The administrator has the authorization to add staff and provides separate login details to the individual staff who is using the system. While generating the question paper, the staff has to select several parameters like a subject, unit, total marks, questions, and marks for each question. The randomly selected questions from that particular unit will be generated as a question paper. The questions selected will be present in the database. The staff has the option to store questions for each unit in every subject they teach for.

Software requirements:
- SQL Server 2012 Express + Management Studio
- Microsoft Visual Studio IDE

SQL Server 2012 Express + Management Studio

Microsoft SQL Server 2012 Management Studio Express is an integrated data management environment for accessing, configuring, managing, administering and developing all components of SQL server. SSMSE contains a varied group of script editors and helps the developers with an easy access to the database for their work. It enables industries to steadily manage information and confidently run today's increasingly business applications. In order to use the C# and ASP .Net code, it needs a suitable environment to develop. A version known as *SQL Server Management Studio Express* (SSMSE) is used for the purpose of databases.

Automatic Question Paper Generator system is required for the following purposes:-
- Generate unique Question Papers.
- Allows administrators to add and remove the staff in the system.
- Allows staff to add and remove subjects, questions from the database.
- Modify questions in the database.
- Select marks for individual questions.
- Print the generated question paper.

Microsoft Visual Studio

Microsoft Visual Studio is an integrated development environment which is used for easy deployment and connection with database of desired choice. It also has remote debugging facility to connect with any environment. The front end is ASP.NET and the code behind is C#.NET. The backend used in the project is SQL server.

II.PROPOSED MODEL

The existing system is manually preparing the question papers, cross check the questions and frame them based on bloom's taxonomy. It is a difficult task. The work becomes more complicated by doing these checks. So the proposed system overcomes the disadvantages of existing system. The proposed system is special software which can be used in schools, colleges, etc. This system uses large database of questions and generate questions in easy manner. It introduces a shuffling algorithm to overcome the existing problem. The randomization technique is one of the shuffling algorithms in which different sets of questions could be generated without repetition and duplication. The figure 2.1 shows the proposed model of Automatic question paper generation system.
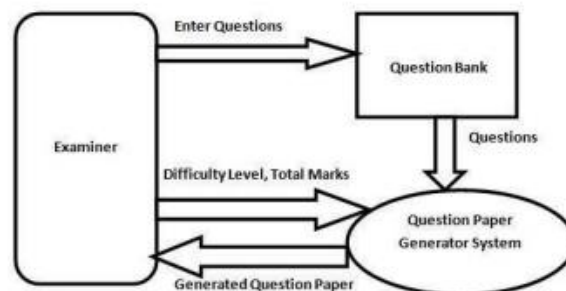

Fig 2.1: Architecture of Automatic Question Paper   Generation System.

III. ADVANTAGES OF PROPOSED SYSTEM

There are several advantages of proposing this new model of generating question papers. The advantages are as follows:

- This system allows for the addition of questions by staff.
- Simple interface for the users to update data.
- Generate and prepare question set in a short span of time.
- Questions can be classified based on bloom's taxonomy easily.
- Questions can be easily edited.The proposed system increases efficiency. Hence this may be very useful for institution purposes.

IV. ALGORITHM
In this system, two approaches are used in generating question paper.

• The randomization technique is used to randomly select questions from the database to generate the question paper.

• The porter stemmer algorithm to classify the questions in accordance with hierarchies of bloom's taxonomy.

A.Randomization technique:

Randomization technique helps in generating question paper without repetition or duplication. This technique focuses on selecting the question randomly and generating the question paper in a less amount of time. This technique increases the efficiency of the system and helps the in generating the question paper in a smart way. In this case, randomization techniques are used to improve the result of the desired proposed system.

B.Porter Stemmer Algorithm:

The porter Stemmer Algorithm is a process by which we remove the common morphological phrases and endings which seem to be inflexional from words in common English. The main use of this algorithm is the process of normalization of text in any retrieval system for information.

This algorithm is used for the categorization of questions based on the hierarchy of bloom's taxonomy. By using this algorithm, the questions are deeply analyzed, pre-processed and transformed into a simpler form and acts as input to the system. There are four conditions to be taken into account before deciding the category for each question. They are as follows:

- First, considering the verb alone does not bring the exact meaning to what the question is supposed to be. There are four main areas that should be considered for questions: topic, focus, comment and perspectives. Focus and perspectives have been the concern to help decide the suitable rules for the question.

- Second, the wh-word questions are a separate feature that is considered compared to other styles of questioning. The wh-word feature that appears in the training sets are: what, why, when, which and how.

- Third, sometimes there are ambiguities when creating a pattern using part-of-speech (POS). Considering regular expression (regex) in the pattern is a good option to resolve this.

- Fourth, based on the training set, some of the question contains the verb similar to the action verb of Bloom's taxonomy. As the whole question is considered as one and assigned a suitable category.

V. SYSTEM ARCHITECTURE

The software architecture consists of the question paper generator system contains the Client Tier, Application Tier and Data Tier.
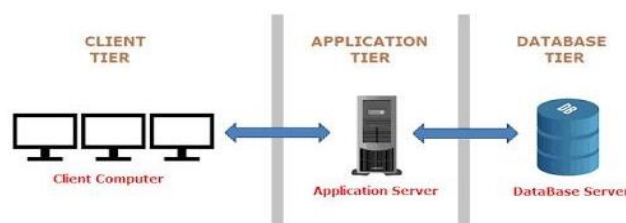

Fig 5.1 : Software Architecture

Data Flow Diagram:

On a DFD, the data items tend to flow from an external data source to an internal data source through an internal process. The DFD diagram for the question paper generator system is as follows
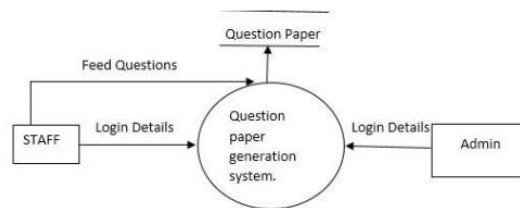

Fig 5.2 : Data Flow Diagram for Question Paper Generation

VI. SYSTEM TESTING

The whole process of a creating question paper is manually done by professors till date without any software intervention. This process of generating a question paper by a staff manually by typing the questions is a very difficult task and allocation of weightage to questions is not relatively efficient.
The Drawbacks in the existing manual Question paper generation is as follows:
• The existing manual system is difficult is a time consuming process.
• It is very difficult to allocate questions manually using the blooms taxonomy weightage
• So many questions are evaluated before finalizing the questions for the question paper.
• The fear of leakage of the prepared question papers is relatively high in the existing model.
• Paper processing takes longer because it is completed manually.
• A lot of time is consumed when a staff has to prepare question paper for multiple subjects at the same time.

The proposed automatic question paper generator with reference to blooms taxonomy has following features:
• The system will produce question paper based on the weightage of blooms taxonomy and hence can be used for all sorts of examination based on the input.
• The question paper which will be generated automatically will be efficient based on the input provided the staff.
• The proposed system is incredibly secure as no chances of leakage of question paper because it depends on the administrator only.
• The generated question paper will be edited to suit the necessities.
• The question paper generator system based on Blooms taxonomy is a software that can be easily explained to the users.

The usual test result summarizes the results for specific test cases. Some of the examples include checking the username and password details provided by administrator who plays major role in maintaining the entire system. If an invalid input is provide the system throws an error and remains in the same page without navigating to the next page. The system also checks for valid user details in case of registration. For example the phone number column must consist of numbers only and with limited count of ten digits only. If there occurs an error in case the webpage tends to throw the error and will stop in the same page. Many sets of questions can be generated from this software. It is assured that there will be no duplicates. Regarding the fact that question paper generation is a tedious and time consuming task; our system helps the instructor to generate and save the question paper automatically considering the questions are already uploaded in database. This will be a time-consuming process for professors. These customized question papers are helpful in long run. However, there are few concerns regarding the privilege provided to staffs to admin, but proper   implementation of same can fetch reliable results.

VI. WORKING OF SYSTEM

• Firstly, the Administrator has to login to the system using the credentials.

- The administrator provides access to the staffs/Other important persons for generation of Question paper
- The staff then selects the required marks or weightage depending on the examination.
- The questions have already been uploaded by the staff depending on the bloom's taxonomy hierarchical model which includes Knowledge, Comprehension, Application, Analysis, Synthesis and Evaluation.
- The weightage must be provided by the staff depending on the examination and process of the Institution.
- The system then connects with the database that contains the frequently asked questions that had been uploaded by administrator depending on the subject.
- For security the administrator only has access to the data base. Only persons who have been provided access can view the questions
- Then the system generates the question paper using the bloom's theory and perfect weightage. The admin/staff ensures there are no issues in the question paper.
- The admin has option to save it as .docx, so that admin can edit as per the requirements and print it.
- The admin can effectively use this system to generate
- multiple question papers with ease and can save much time.

VII. LITERATURE SURVEY

Automatic question paper generation has been a field of interest for many researchers and a lot of research has been done for question paper generation system with the help of Bloom's Taxonomy. Researchers are very much interested in this field. The reason behind the interest is basically the time consumed in generating the paper by the professors. And every researcher has undergone the university processes. The paper presented by Mr. MihirJoisher, Mr. SwapnilGhagare, Ms. Mittal Patel and Mr. RiteshRathi in which they provide an algorithm which helps to shuffle or randomize questions from database. Their algorithm is straight forward and easy to understand and implement in other systems too. The paper presented by SurajKamya, MadhuriSachdeva, NavdeepDhaliwa and Sonit Singh proposed a system based on Fuzzy Logic in which all parameters where categorized based upon some logic so that the system can be easily acquainted with them. The paper presented by Vijay KrishanPurohit, Abhijeet Kumar, AsmaJabeen, Saurabh Srivastava, R H Goudar ,Shivanagowda proposed a system "Design of Adaptive Question Bank Development and Management System" that was an adaptive system but the data entered is assumed to be error free which could affect the overall accuracy of the system. The paper presented by Noor Hasimah Ibrahim Teo, Nordin Abu Bakar, MohamadRezduanAbd Rashid proposed a system "Representing Examination Question Knowledge into Genetic Algorithm" in which text matching and question sorting was done by the system itself but one of the major limitations of this system was the total number of questions that could be added.

VI. REFERENCES

[1] Zalte S.V , Jadhav C.C , Mangire A.A , Hole A.D ,Tulshi A.R, "Automatic Question Paper Generator System" International Journal of Advanced Research in Computer and Communication Engineering (IJARCCE), vol. 7, March 2018.

[2] Aleena Susan Mathew, Vidya. N "Implementation of
Automatic Question Paper Generator System" International Research Journal of Engineering and Technology (IRJET),Vol 6 Feb 2019

[3] Fenil Kiran,Hital Gopal,Ashwini Dalvi "Automatic question paper generator", International Journal of Computer Applications 166(10):42-47 · May 2017

[4] Surbhi Choudhary, Abdul Rais Abdul Waheed, Shrutika Gawandi,Kavita Joshi "Question Paper Generator System", International Journal of Computer Science Trends and Technology (IJCST) – Volume 3 Issue 5, Sep-Oct 2015.