Generation of Question Paper Using Blooms

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Abstract:
In any educational course curriculum, the courses are defined with learning objectives. Teachers conduct assessments to know if students have achieved certain learning objectives or not. Teachers generate variety of question papers as per the universities' assessment requirements. It is very challenging for the teachers to make question papers with varied questions and which meet learning objectives of the course. There are no standardized methods to ensure quality of question paper. Hence there arises a need to have a system which will automatically generate the question paper from teacher entered specification within few seconds. Researchers recommend different sets of tags such as cognitive level, difficulty level, type of question, content /topic for defining a question etc. In this system, we proposed an autonomous question paper-generation system. In our system we allow users to input a set of questions. We also allow the user to provide complexity for each of these questions. After this, the system will assign marks to each question based on Bloom's taxonomy using machine learning and then the questions are stored in the database along with their marks.

Keywords: Question paper generation, Machine learning,Bloom's taxonomy, Natural Language Processing (NLP)

INTRODUCTION

Making question papers that include a variety of topics and adhere to the course's learning objectives is extremely difficult for the professors. No established procedures exist to guarantee the calibre of the test questions. Therefore, it becomes necessary to have a system that would quickly and automatically produce the test questions from the teacher-entered specifications. Researchers advise using various sets of tags to define questions, such as cognitive level, difficulty level, question type, substance or topic, etc. In this system, we suggested a system for automatically generating test questions. Users are able to enter a list of questions into our system. In today's age, education is the most important way of achieving success. When we discuss education, it is imperative to mention tests and examination. Examinations prepare students in their quest for knowledge. So, having a proper examination paper and format is quite necessary. Now the traditional method of generating question paper has been manual. In this method certain officials chalk out the question paper. But this method can be ineffective at times owing to bias, repetition and security concerns.

We have proposed an Automated process of Question Paper Generation which is fast, streamlined, randomized and secure. Every task performed by this system is automated so that storage space, bias and security is not a concern anymore. Furthermore, we have proposed a new algorithm which ensures total randomization of questions and avoids repetitions. The proposed system can be helpful to many educational institutes.

LITERATURE SURVEY

Sr no	Title of paper	Author name	IEEE journals/conference
1	Exam Question Classification Based On Bloom's Taxonomy	Lobna Amouri , Nada Chaabane and Nahla EL-Haggar	2020 IEEE Eighth International Conference.[1]
2	Automatic Generation of Question Paper from User Entered Specifications Using a Semantically Tagged Question Repository	G. Nalawade and R. Ramesh	2016 IEEE Eighth International Conference on Technology for Education (T4E), 2016, pp.148-151[2]
3	An algorithm for question paper template generation in question paper generation system	V. M. Kale and A. W. Kiwelekar	2013 The International Conference on Technological Advances in Electrical,Electronics and Computer Engineering (TAEECE), 2013, pp. 256-261 [3]
4	Neural Question Generation Using Question Type Guidance	(R. Sun, X. Zhou and F. Fang	2021 17th International Conference on Computational Intelligence and Security (CIS), 2021, pp. 328-332, [4]

FUTURE SCOPE

1. Advanced Natural Language Processing (NLP) Integration
2. Real-time Feedback Mechanism
3. Support for More Question Types
4. Adaptive Question Paper Generation
5. Integration with Virtual Classrooms
6. Cross-Subject Question Paper Generation
7. Gamification of Assessments:
8. AI-Powered Question Suggestions
9. Cloud-Based Platform
10. Collaborative Question Paper Creation
11. Multilingual Support
12. Detailed Analytics and Insights
13. Integration with AI Proctoring Tools

OBJECTIVE

1. **Reduce the time:** To reduce the time required for manual question paper generation. Make traditional methods seamless.
2. **Automation:** To automate the existing manual system with the help of computerized equipment, fulfilling their requirements, so that their valuable data/information can be stored for a longer period with easy access.
3. **Reduce Errors:** To reduce the error in the question paper.

PROBLEM DEFINATIONS

As an education is a key to success, assessment process is an essential activity in educational institutions to test performance of the learners. Teacher has to spend more time and effort before examinations. The question papers are framed by the teacher according to the syllabus.In traditional system, paper Setters/Examiners used to make/set question paper manually. This is very time consuming process. While making the question paper, sometimes incorrect marks could be assigned by the examiner.To overcome this problem, we are proposing our system. One of the most popular guidelines used to write and evaluate the exam questions is Bloom's Taxonomy (BT). This rule-based approach applied Natural Language Processing (NLP) techniques to identify important keywords and verbs. To classify, the questions Na¨ıve Bayes algorithm is used.This system can assigne marks to the questions and generate question paper qas per format.

FLOW CHART

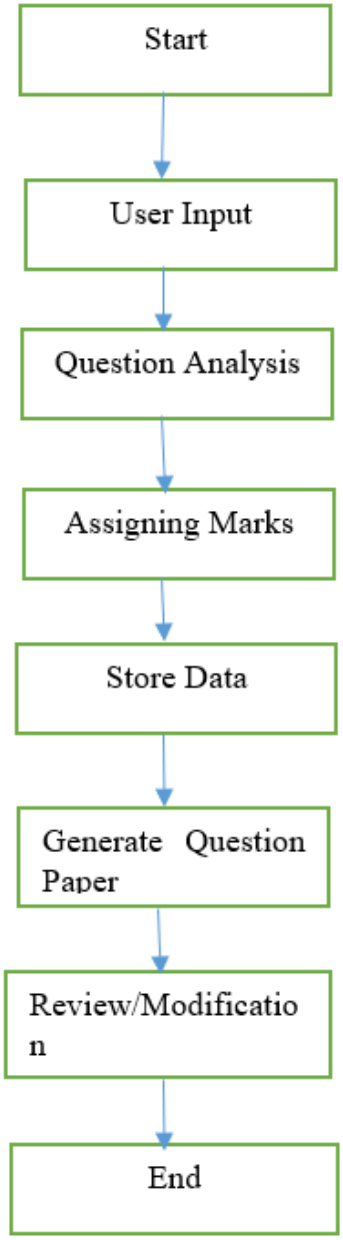

Fig: Flowchart

SYSTEM ARCHITECTUIRE

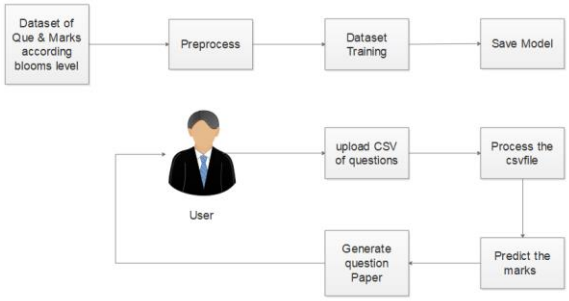

Fig: System Architecture Diagram

FUNCTIONAL REQUIREMENTS

Question Input: The system allows teachers to input questions and specify their complexity level.
Tagging Mechanism: Supports tagging questions with metadata like cognitive level, difficulty, question type, and content/topic.
Machine Learning Model for Mark Assignment: Uses machine learning to assign marks to questions based on complexity and Bloom's taxonomy.
Database Storage: Stores questions, metadata, and marks in a database for efficient retrieval.
Question Paper Generation: Automatically generates question papers based on user specifications like marks, difficulty, and topics.
Customization of Question Paper: Allows teachers to customize generated question papers by adding, removing, or editing questions.
Reporting and Analysis: Provides reports on question paper distribution and alignment with Bloom's taxonomy.
User Authentication and Authorization: Implements authentication and role-based access for teachers and administrators.
Integration with Existing Educational Systems: Integrates with Learning Management Systems (LMS) for distribution and tracking of question papers.

NON-FUNCTIONAL REQUIREMENTS

Performance: The system generates question papers within seconds after receiving specifications.
Usability: Provides an intuitive and easy-to-navigate interface for teachers to input questions and customize papers.
Reliability: Ensures the system is stable, error-free, and question papers are generated as per specifications.
Security: Secures user data and ensures encrypted storage and secure authentication.
Scalability: Handles an increasing number of users and growing datasets efficiently.
Maintainability: Supports easy updates and bug fixes, with proper logging and monitoring mechanisms.
Interoperability: Works seamlessly with other educational tools and supports multiple question formats.
Compliance: Adheres to relevant educational standards and data privacy laws (e.g., GDPR, FERPA).
Availability: Ensures high availability, with minimal downtime and disaster recovery mechanisms.

APPLICATIONS

1. Educational Institutions
2. Online Learning Platforms

3. Test Preparation Companies
4. Certification and Licensing Exams
5. Corporate Training Programs
6. Government Examinations
7. Research Institutions
8. Distance Learning and Open Universities
9. Tutoring Services
10. Learning Management Systems (LMS)

CONCLUSION

Using Bloom's Taxonomy for creating valuable and reliable assessment question papers, we have proposed a system in this work that generates question papers and assigns marks to each question. According to Bloom's Taxonomy, our system can read and categorize those questions, then place them in different levels of class. It is expected that our proposed system should be able to correctly assign the marks to the question and also able to generate multiple question papers using Bloom's Taxonomy concept and machine learning.

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