

A Dynamic Approach with Automatic Question Paper Generation Using a Randomization Shuffling Algorithm

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Abstract: In this paper, an Automatic Question Paper Generator (AQPG) that uses a Randomization Shuffling Algorithm (RSA) is implemented as a dynamic solution to the laborious task of writing question papers for competitive exams. Conventional techniques for creating question papers by hand require a lot of work, especially when it comes to tests with multiple-choice questions (MCQs), which are frequently seen in competitive examinations such as UPSC, GATE, Bank PO, UGC NET, and Railway RRB. In this system Questions are chosen at random from a central database using a randomization mechanism and it includes a system to avoid question repetition and similarity. These selected questions are then further categorized and numbered as I, II, III, and so forth. Following categorization, the questions are shuffled and arranged into various forms, such as Series A, B, and C papers, using a RSA technique and questions are sequenced in a specific form to make sure there are no similar questions on question paper series. This meticulous procedure ensures that each exam paper is distinct and equitable. The process of creating papers would be quicker, easier, more streamlined, randomized, and secure with an automated approach. Using a random technique, the proposed system commutative exam questions are automatically generated. The randomization technique allows us to choose questions at random.

Keywords: Randomization Algorithm, Shuffling, Question Paper Generation

Introduction

Exams are used to evaluate people's knowledge in particular fields; they might be subjective, objective, or a combination of the three. Multiple-choice questions (MCQs) are a common aspect of competitive exams for their objective component [1]. There are many benefits associated with automatically evaluating objective assessments, such as decreased resource consumption, increased efficiency, and time savings [2]. The traditional approach of creating competitive exam questions involves experts selecting significant topics and creating questions in a predetermined manner [3]. To ensure that the questions are clear and accurate, they are checked. They were then combined to create the exam paper. But it takes a lot of time and work to complete this process. Sometimes, the questions might not differ much from one another by making simple errors [4]. Additionally, it can be challenging to update the content to keep it updated [5]. We are introducing "A Dynamic Approach with Automatic Question Paper Generation Using a Randomization Shuffling Algorithm". This study presents an innovative

method to generate automated question papers using the Randomization Shuffling Algorithm (RSA) [6] to assure effectiveness and fairness. Through the utilization of technology and a systematic strategy, this autonomous system seeks to mitigate the drawbacks of the traditional approach and bring in a novel era of effectiveness and dependability [7]. This method is based on a central database that contains a variety and large volume of questions. Randomization shuffling algorithm (RSA) is used to select questions randomly, it avoids replication and similarity of questions, and ensure fairness [8]. Following selection, questions are divided into sections such as I, II, III etc. Questions are then shuffled, and papers are sorted into forms like Series A, B, and C. The questions in each series are sequenced in a specific form as shown in Table.1.

Question Paper Series	A	B	C	D
1	I	II	III	IV
2	II	III	IV	V

3	III	IV	V	I
4	IV	V	I	II
5	V	I	II	III

Table.1 Questions Sequencing

For an example, the RSA selects 75 questions from database and it divides the 75 question into 5 divisions with 15 questions each as shown in Table.1 each division are numbered as I, II, III, IV and V that contains 15 unique questions. Question paper series are named as A, B, C and D, each question is sequenced accordingly so that there are no similar questions that appear on question paper series. This automatic generating system is extremely useful for competitive examinations and aptitude tests, especially when it comes to the common multiple-choice question (MCQ) format. It has been suggested to use this automated method to create question papers that are quick, safe, effective, and random [9]. Because the system is entirely automated, it uses less storage capacity and has fewer security issues. As the question bank gets larger, it automatically creates a variety of sets of questions every now and then so that there's no need to worry about replication and repetition from the original exam [10] [11].

Objective:

- To ensure fairness and effectiveness while constructing automated question papers, use a dynamic approach utilizing the Randomization Shuffling Algorithm (RSA).
- Maintain an extensive collection of questions in database to facilitate the creation of unique and varied exam papers.
- By selecting questions from the database using a reliable randomization procedure, you may reduce the chance of repetition.
- To save time and effort, automate the creation of question papers.
- Provide a safe, effective system with low storage requirements and security risks.

Methodology & Algorithm

This question PAPER generation system is developed in order to overcome the inconsistencies of the current method. We offer intelligent question-generating technology for competitive examinations.

It functions as follows:

- **Randomization Algorithm:** The Randomization Algorithm ensures that no question has been repeated, and similarity is achieved by selecting questions at random from the database.
- **Categorization:** The chosen questions are divided into several sections (such as Part I, Part II, etc.).
- **Randomization Shuffling Algorithm:** The questions in each section are shuffled using the shuffling algorithm. To ensure that every paper is different, the order is changed.
- **Arrangement:** Lastly, several variants of the questions (such as Series A, B, and C) are framed. This provides candidates with multiple versions to work on and helps prevent cheating.

1. Question Bank

The question bank in the Automatic Question Paper Generator System functions similarly to a database's vast collection of knowledge. Every relevant detail, including the question form, choices (in the case of multiple-choice questions), degree of difficulty, and topic matter, has been carefully organized and stored for each question.

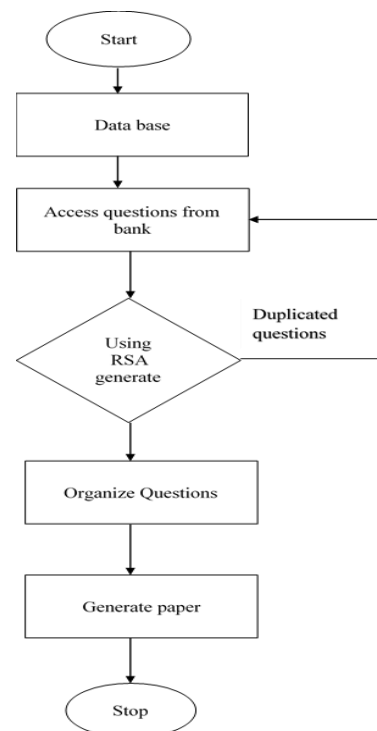


Fig: Random Algorithm

Random Algorithm

Define a function similarity(a, b):
Use SequenceMatcher to compute the similarity ratio between strings a and b
Return the similarity ratio
Define a function fetch_questions(limit=12, similarity_threshold=0.6):
Define a list hardcoded_questions containing the predefined questions
Create an empty list selected_questions to store selected questions
Shuffle the list hardcoded_questions to make the questions random
Iterate over each question in hardcoded_questions:
Check if the question is similar to any already selected question based on the similarity_threshold
If not similar, add the question to selected_questions
Break the loop if the limit of questions is reached
Return selected_questions
Call fetch_questions(limit=12) and store the result in a variable questions
Divide questions into four parts:
Define num_parts as 4
Calculate the part size by dividing the number of questions by num_parts
Iterate over the range from 0 to the number of parts - 1:
Slice the questions list into parts of equal size and store them in question_parts
Rotate question_parts to achieve different output orders
Print the output number (i+1)
Iterate over each part in rotated_parts:
Shuffle the questions within each part
Print the part number
Iterate over each question in the part:
Print the question with its index
Print an empty line to separate parts
Questions are chosen using the following procedure, which is based on the algorithm mentioned:

1.1 Initialization: To store the selected questions, the algorithm first defines an empty list called **selected_questions** and a list called **hardcoded_questions** that contains predetermined questions.

1.2 Randomization: To provide some element of chance to the selection process, the hardcoded_questions list is shuffled.

This guarantees that every time the function is run, the questions are asked in a new order.

1.3 over the iteration Questions: Every question in the hardcoded_questions list is iterated over by the algorithm.

1.4 Similarity Check: Using a similarity threshold, the algorithm evaluates each question to see if it is comparable to any previously chosen questions.

A question is deemed similar and skipped if the ratio of similarity between it and any chosen question is higher than the predetermined threshold.

1.5 Selection: The question is added to the selected_questions list if it is not identical to any previously chosen questions.

1.6 Limit Check: To make sure that the number of chosen questions remains within the given limit, the algorithm exits the loop if the limit of questions (limit) is reached.

1.7 Return: At last, the algorithm gives back the list of selected questions, or selected_questions. We can represent the shuffling algorithm using mathematical operation through probability distribution.

Let us consider shuffling array A with n elements and we can denote initial permutation array as A_0 (n) and results of shuffles as A_1 (n1), A_2 (n2) and so on. $P(A_i)$ represents the probability of obtaining permutation A_i after shuffling and to have series of shuffles we can iterate the following equation:

$$P(A_1) = P(A_2) = P(A_3) = \dots = P(A_k) = \frac{1}{n!}$$

Where $n!$ is the number of permutations of array A of length n.

Example

Consider one example generates questions using RSA, suppose 10000 questions are stored in a database, first we define a predetermined limit for questions chosen.

suppose we give limit 12 the RSA selects 12 questions from the database and also it checks similarity and avoid duplication and similarity of that questions. Once it selects questions, it divides them into four parts, like parts I, II, III, and IV.

After the categorized questions, each part is independently shuffled for variation. Then several variants of the questions (such as Series A, B, and

C) are framed and each questions are sequenced as described earlier.

Output:

Series A	Series B	Series C	Series D
Part I: 1. What year did World War II end? 2. What is the chemical symbol for water? 3. What is the largest ocean on Earth?	Part I: 1. Who is known as the 'Father of Computers'? 2. Who painted the Mona Lisa? 3. What is the freezing point of water in Celsius?	Part I: 1. Who wrote the novel 'To Kill a Mockingbird'? 2. Who discovered penicillin? 3. Who wrote the play 'Romeo and Juliet'?	Part I: 1. Who was the first person to step on the moon? 2. What is the powerhouse of the cell? 3. Who composed the 'Moonlight Sonata'?
Part II: 1. Who is known as the 'Father of Computers'? 2. What is the freezing point of water in Celsius? 3. Who painted the Mona Lisa?	Part II: 1. Who discovered penicillin? 2. Who wrote the novel 'To Kill a Mockingbird'? 3. Who wrote the play 'Romeo and Juliet'?	Part II: 1. Who composed the 'Moonlight Sonata'? 2. What is the powerhouse of the cell? 3. Who was the first person to step on the moon?	Part II: 1. What is the chemical symbol for water? 2. What year did World War II end? 3. What is the largest ocean on Earth?
Part III: 1. Who discovered penicillin? 2. Who wrote the play 'Romeo and Juliet'? 3. Who wrote the novel 'To Kill a Mockingbird'?	Part III: 1. Who was the first person to step on the moon? 2. What is the powerhouse of the cell? 3. Who composed the 'Moonlight Sonata'?	Part III: 1. What is the largest ocean on Earth? 2. What is the chemical symbol for water? 3. What year did World War II end?	Part III: 1. Who painted the Mona Lisa? 2. Who is known as the 'Father of Computers'? 3. What is the reezing point of water in Celsius?
Part IV: 1. Who was the first person to step on the moon? 2. Who composed the 'Moonlight Sonata'? 3. What is the powerhouse of the cell?	Part IV: 1. What is the chemical symbol for water? 2. What is the largest ocean on Earth? 3. What year did World War II end?	Part IV: 1. What is the freezing point of water in Celsius? 2. Who is known as the 'Father of Computers'? 3. Who painted the Mona Lisa?	Part IV: 1. Who discovered penicillin? 2. Who wrote the novel 'To Kill a Mockingbird'? 3. Who wrote the play 'Romeo and Juliet'?

Conclusion

In conclusion, writing exam papers the old-fashioned manual way can be difficult and time-consuming, particularly for multiple-choice questions and competitive exams. A workaround is offered by "A Dynamic Approach with Automatic Question Paper Generation Using a Randomization Shuffling Algorithm." This system quickly creates original question papers by automating the

process using a structured database and the Randomization Shuffling Algorithm (RSA). It reduces the possibility of repeating questioning, guarantees justice, and saves time. With automated procedures in place, teachers may concentrate on instructing rather than writing papers. This strategy also lowers security concerns and storage requirements. All things considered, automated question paper generation transforms

assessment procedures, improving educational efficiency.

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