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Aptitude Question Paper Generator and Answer Verification System

Meghna Saikia, Saini Chakraborty, Suranjan Barman and Sarat Kr. Chettri

Abstract Aptitude test plays a vital role in assessing the ability of a person to perform various tasks and inculcates the ability of numerical reasoning, logical thinking, speed, accuracy and other such skills. Generating an effective aptitude question paper for aptitude test is a non-trivial task and manual generation of aptitude question paper is a conventional method. In this paper, a novel method is proposed, which automatically generates aptitude-based questions with certain keywords using randomization technique. The proposed system has the feature of generating multiple-related answers including the correct option for every generated question, and at the same time, it verifies the user's response in real time and generates score. It overcomes the major limitations of the existing automated system where question papers are generated by random selection of questions from question banks prepared by the examiner. The implementation of the proposed system has been shown along with the performance evaluation on the basis of repetitiveness of same questions.

Keywords Aptitude question paper generator · Randomization technique
Answer verifier · Android application

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1 Introduction

Aptitude test assesses one's logical reasoning and thinking ability where one needs to answer multiple-choice questions. The importance of such test can be widely understood by the fact that they are used for various purposes from choosing career to placement purpose and so on. Traditionally, composing such question papers and verifying the answers are done manually using the writers' knowledge, experience and style, which is tedious and dependency on the intelligence of question paper setters and evaluators might raise the probability of error. With the advent of latest technologies in information technology, the automation of aptitude question paper generation and verifying the responses provided by the user is the need of the hour. In this context, the proposed Aptitude Question Paper Generator and Answer Verification System (AQPG and AVS) is conceived with the idea of an automated generation of aptitude-based questions and answers in a randomized manner. The main objective is to automatically generate a wide variety of multiple-choice-based aptitude questions with certain minimal inputs. In the proposed system, randomization technique is used to achieve the goal. Compilation of the questions and probable answers results in generating the aptitude question paper. Moreover, the system would verify the correct answer and generate score of the student in real time. An Android application is developed to facilitate the entire process of question paper generation and answer verification.

2 Background and Related Work

There are few related works existing in the literature, the proposed systems [1, 2] makes use of the Fuzzy Logic algorithm and aims at an unbiased selection of questions in a question paper reducing the manpower and time required for the same. In the model proposed by Gadge et al. [3], there is flexibility for the users to choose the subjects. They can also add, delete or update the questions and the admin has rights to provide complexity level and marks for each question.

In the work titled 'Automated Question Paper Generator System using Apriori Algorithm' [4], the main focus is to efficiently generate question paper using Apriori algorithm. But while encountering dense data due to a large number of long patterns, the Apriori algorithm's performance degrades. An improved algorithm of association rules along with the classical Apriori algorithm was also proposed to tackle the issue. Some more related works [5–7] exists in the literature where soft computing techniques [8] are used. Other systems [9–11] use shuffling algorithms as randomization technique [12] where the question paper is generated from a database of questions. These systems generally make use of a large set of questions, so that the questions are less repetitive, and where the performance evaluation based on repetition of the same question is done using various data mining techniques [13–15]. This results in

the system requiring higher storage capacity, but with an increase in the size of the database of questions, the variation of questions in the final question paper increases.

All these existing systems require human staff to chalk out questions that may appear in a question paper. In some cases, algorithms have been developed for automated question paper generation, and evaluations of the performance of existing system are also done in terms of accuracy and speed. But to the best of our knowledge, automated generation of questions using a set of keywords and verification of correct answer given by the user does not exist in the literature. The common point of the existing systems is that they require a large database of questions along with their answers where a set of questions that are given as an output, are in a randomized or shuffled manner, taken from the database itself. Thus, there is a fixed amount of questions that can be taken from the database maintained by the examiner and as such it does not overcome the problem of biasness by the examiner, and literally cannot be termed as fully automated system.

3 Proposed System

In the proposed Aptitude Question Paper Generator and Answer Verification System (AQPG and AVS), there is a set of questions in each category. The basic structure of the question remains the same, but the key values/words, in specific locations of the questions changes. This, in turn, changes the answer to the question, although the way to solve the question remains unchanged. The system then calculates the answer according to the changed question and verifies it to the user's response. The advantage of such a system is that there is a wide variety of questions that can be generated using the given set of keywords.

In the proposed system, the use of a bulky database of questions is eliminated. Moreover, with the increase in the amount of keywords, the variation in the questions in turn increases. Thus, there is a least chance of repetition of same questions. In this manner, the system proves to be lightweight, easy to use, generate more variations of the non-repetitive questions and verifies user's response with the correct answer in real time.

In the proposed system (Fig. 1), two types of questions are taken into consideration; (a) Multiple choice and (b) Non-multiple choice. The question belongs to various categories like Blood Relations, Profit and Loss, Time and Work, etc. A template is designed for each type of question under every category. In each question, there are indexes, to be replaced by the set of keywords. With the random selection and insertion of different keywords both the question and answer changes.

For each type of question, keywords are used for generation of correct answer along with further related options in case of multiple-choice questions. For multiple choice type of question, the user (examinee) then selects the appropriate answer, which is then verified with the correct option. In non-multiple-choice questions, the user provides a single answer generally a numerical value, whose correctness is

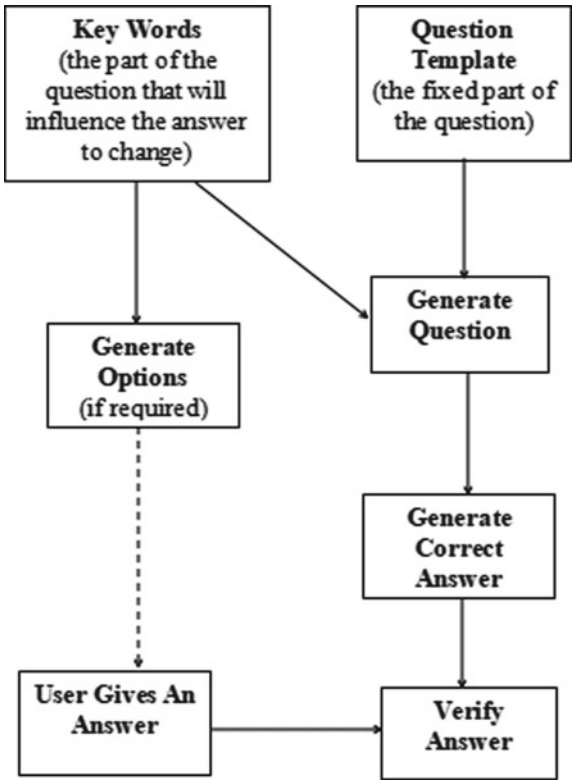

Fig. 1 Block diagram of the proposed system (AQPG and AVS)

verified by the system. For every correct answer, the marks of the user add up and at the end of the test, the user's score is displayed.

4 Implementation and Performance Evaluation

Here, is a sample example of the existing type of question (blood relations) that has been deployed in the existing Android application.

Here (Fig. 2), the terms '*female*', '*nephew*' and '*mother*' are the keywords. With simultaneous generation of questions, these keywords will change with the selection of keywords from the data set using randomization technique. As such, the answer also changes, but, it can be generated from the question itself, i.e. with each question, the correct answer is regenerated, and hence this makes our system unique. In this example, there are multiple choices that get generated in accordance to the randomly chosen keywords. Finally, the answer verification is made and the user's score gets updated automatically.

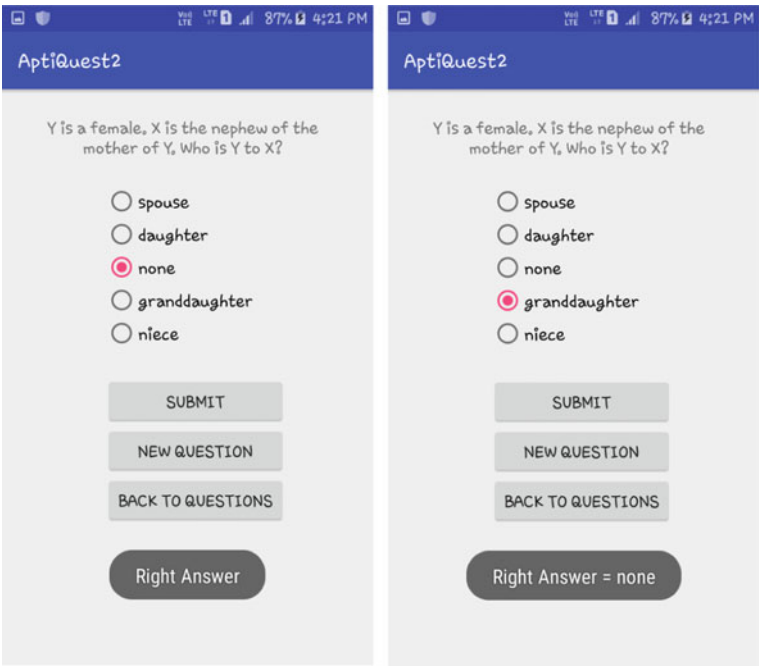

Fig. 2 Blood relationship question

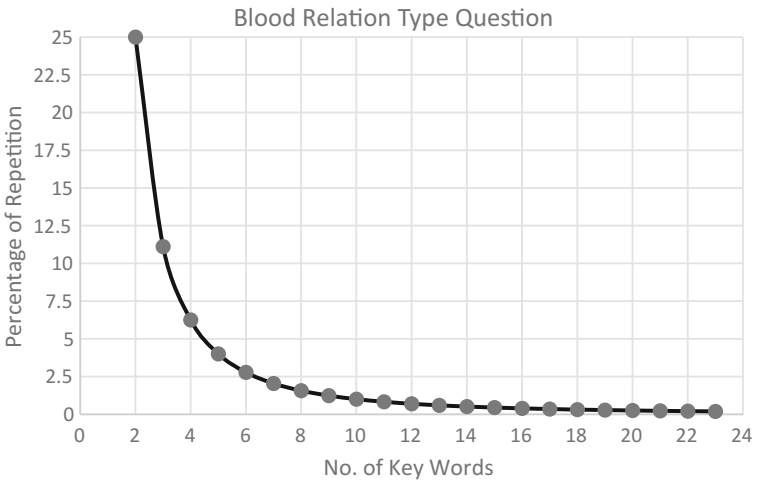

Fig. 3 Percentage of repetition of blood relationship type question

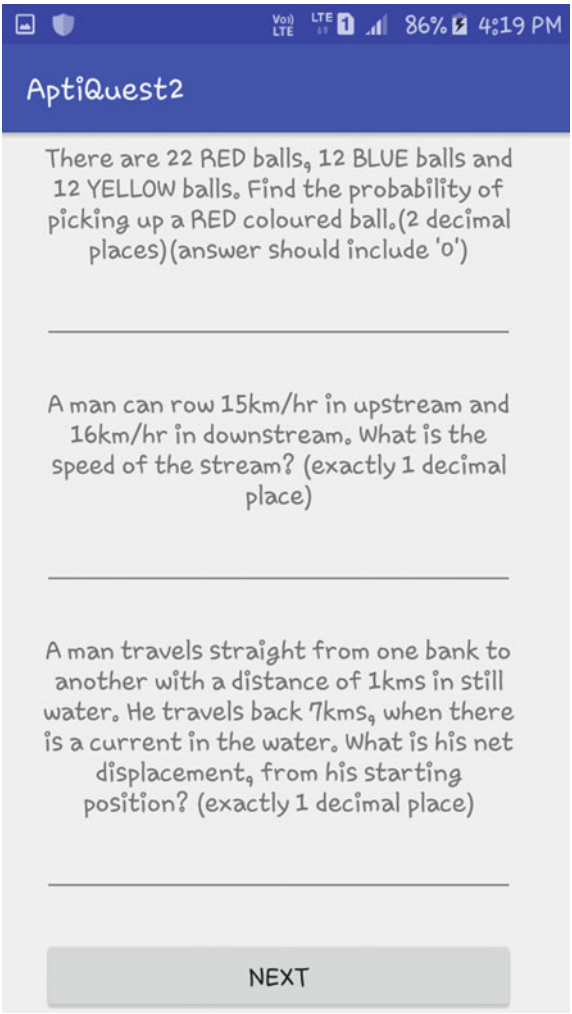

Fig. 4 Non-MCQ type questions

In AQPG and AVS, each category has their individual performance criteria. The performance criteria depend on the total amount of questions that is generated per category. In the above blood relation problem, there are a total of three indexes where keywords can be inserted. In the first index, two keywords (male or female) can be inserted. In the second and third indexes, the keywords (relationships like brother, father, sister, etc.) are inserted and may repeat. With the total of (say) 11 keywords, the total probable questions are 121 and as the first index offers 2 probabilities, the numbers of probable questions are 242. The probability of repeated questions will be approximately 0.82%.

Moreover, to decrease the probability of occurrence of repetitive questions and increase the performance, one has to just increase the number of keywords, and the

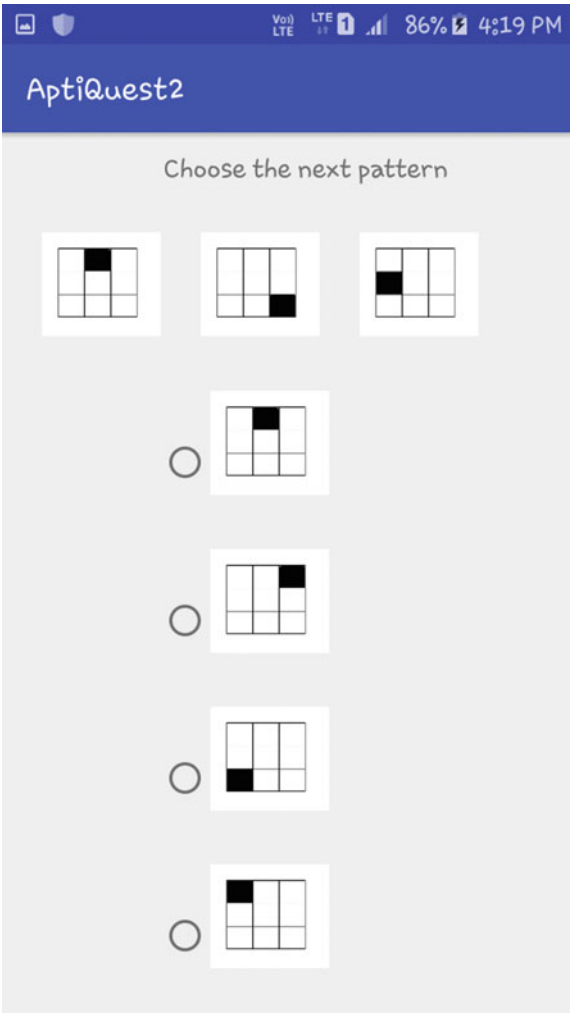

Fig. 5 Pattern type question

probability decreases. For example, if in the above case, the keywords would have been 12, the probability would drop to 0.69%. Likewise, if it were 10 keywords, the probability would have been 1%. Hence, we can say that according to each category of question, the performance is different. What is common is that with the increase of keywords, the number of questions that are able to be generated is higher. Hence, the probability of occurrence of repeated questions decreases and ultimately the performance and efficiency increases. The following graph shows the above performance criteria (Fig. 3).

Other question types include patterns, probability, stream speed, stream distance, sequence, etc. A few of which have already been incorporated in our existing app (tentative name AptiQuest2, which is the second prototype) (Figs. 4 and 5).

5 Conclusion

The proposed system (AQPG and AVS) has a unique feature; it requires less storage space as it does not have to maintain a huge collection of question banks like in the existing systems. This system is reliable, easy to use and eliminates the possibility of biasness by the examiner as questions are generated in real time with the random selection of keywords from the data set. The questions are created dynamically and the answers are derived from the generated questions. Moreover, the user's/examinee's answer is evaluated/verified with the correct answer. Thus, the proposed system aims to create a new dynamic question paper generator with the provision of automated verification of correct answer. Last, as there is no such existing system in the literature as the proposed one, hence there is a lot of potential and scope for development of such kind of automated system.

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