

# Automated Test Paper Generation Using Utility Based Agent and Shuffling Algorithm

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## ABSTRACT

This article describes how with the advent of computer-based technology, there is movement from manual to automated systems for different aspects of the education system. Testing is an essential part of teaching process that helps academics in classifying the level of students and evaluating the outcomes of their teaching process. The testing process requires a large amount of attention and professionalism. Automated Test Paper Generation is a system applying the shuffling algorithm in designing different sets of questions without repetition and duplication. It helps the faculty in developing and designing exams with a particular level of difficulty required in evaluating the students by using the utility-based agent. The system includes a knowledge base of many questions' types that are linked to a test engine where the faculty can specify the type and the difficulty level of the exam and then the system will assemble the exam and produce the output as electronic or paper-based. Questions will be picked randomly from the knowledge database. This automated system provides cost saving and time efficient solutions.

## KEYWORDS

Automated Software, Knowledge Base, Shuffling Algorithm, Test Paper Generation, Utility-Based Agent

## 1. INTRODUCTION

Many problems facing exam designing process, the necessity to solve this is the authors' main motivation in developing this system. The most important one in that the process of designing exam papers is a redundant and very time-consuming process that will take place many times during each semester, which forms a challenge to the examiner especially with all other commitments. Also, exam design process requires experience and many examiners face problems in adjusting the difficulty level of the exam for the different sections of the same course which cause fairness problems. And for examiners with little experience formatting the question structure is very difficult. The necessity to change and update the question knowledge bases to guarantee versatilities is very important for examiners and the process of keeping old questions registered to avoid redundancy is a very important task. The storing and utilization of generating work by adding all new updated and modified questions to questions knowledge base and will help saving organization experience and knowledge. Researchers

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noticed that some of the available literature reviews and research focus on shuffle algorithm and other research focus on the utility based agent. This research contributes to the body of knowledge is combined both utility-based agent and shuffling algorithm for test paper generation.

### 1.1. Proposed Solution

To solve above problems, we need to develop a test paper generation system that is linked to questions knowledge base. The examiners will log into the system, specify the question type and the difficulty level and other required attributes, and then the system will automatically assemble the exam paper which will save the time and effort of the examiner and enhance standards and unified the level of difficulty between different sections. So, this application aims to help examiners, faculty members in particular in one of the most important tasks in education and training environment by providing them with a well-designed, secure way to create exams. The system aims to develop a test paper generation system for colleges at Princess Nourah bint Abdulrahman University (PNU), in the future; it will be for examiners in general (Universities, Schools, and examiners in Training and Educational centers). It aims to achieve the following objectives:

- Reduce the time, which allocated for testing the generation process by providing an automatic way to accomplish the task.
- Help examiners in choosing the appropriate level of difficulty and unify it through the exam.
- Help to avoid redundancies by keeping a record of recently-chosen questions.
- Provide a unified tool for all educators to achieve consistency.
- Provide a secured tool that chooses randomly from a vast question knowledge base.
- Ensure is more complying with educational standards by providing versatile types of questions that can be chosen according to the required test type.

## 2. BACKGROUND INFORMATION

The test development process is a very critical task in the educational environment that should guarantee comprehensiveness and accuracy and should cover all parts of the courses. Exams include different types of questions and mean to test knowledge and skills. In the e-learning context, one of the indispensable components is the E-test system involving test generation, delivery, evaluation, and results publishing (Hua & Hairui, 2008). Questions are useful and used to recognize any deficits in the learner's knowledge and enhance the learning process and outcomes. In Automatic Question Generation (AQG) field, most of AQG systems focus on the text-to-question task, where a set of content-related questions are generated based on a given text. Usually, the answers to the generated questions are contained in the text (Ci & O'Farrell, n.d.).

### 2.1. General Test Items Categories

- **Objective Items:** Require students to select the correct response from several alternatives or to supply a word or short phrase to answer a question or complete a statement (Liu, et al., 2010).
- **Subjective or Essay Items:** Permit the student to organize and present an original answer. Objective items include multiple-choice, true-false, matching and completion, while subjective items include a short-answer essay, extended response essay, and problem-solving and performance test items (Liu et al., 2010).

#### 2.1.1. Exams Preparation Issues

To prepare Exams, the following specific and accurate steps are needed (Center for Innovation in Teaching and Learning, n.d.):

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