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Employing genetic algorithms in electronic tests (intelligence subject) in distinguished schools

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Abstract. Conducting tests by extracting questions manually and using random methods of generating tests from question banks consumes a great deal of time and effort, The quality of the resulting tests is often inaccurate and the tests created may not exactly match the requirements that were previously formulated, This study focused on innovative ways to enhance the process of researching questions in ways that meet the extraction requirements and conditions that have been identified, This study proposes a genetic algorithm (GA) to generate multiple choice tests based on the difficulty levels of the questions and the extracted ratings, Experiments and analyzes with the proposed mutation operator demonstrated the success of the (GA) method with a very high percentage, An electronic system was designed to select and evaluate questions and their level of difficulty based on a genetic algorithm.

Keywords. Genetic algorithm, Question Bank, MYSQL, Python, Web Application

1. Introduction

Education is an essential element for the country's improvement and progress. Technology is used to create flexible learning environments, The challenges facing education have reached stages that enable universities and schools to provide efficient, effective and accurate operations, One of the important aspects of education is how to select and evaluate the questions set for applicants to distinguished schools in terms of quality, goal, level, Many researchers have made great efforts to automate the process of creating multiple-choice tests from available question banks, and they have demonstrated outstanding results, Since the use of computers has made multiple-choice tests more useful than other tests, Here we seek the need for a genetic algorithm to determine the most appropriate questions to complete the questions in a particular test in order to provide teachers and academics with effective means of conducting tests from multiple choice questions from the question bank, Therefore, the use of genetic algorithm speeds up the selection of the optimal solution through several stages that pass through the questions according to criteria and requirements set by academics and teachers.

Research Problem

The research problem lies in investing information technology in all its aspects in some schools for the Ministry of Education, Including distinguished schools that are in dire need of this type of technology, To transform it from the traditional manual system into an automated system for testing and evaluation.

Research Objective

The study aims to employ smart methods to select questions for distinguished school students from the question bank database, This is done by building a genetic algorithm, Thus, an automated and intelligent electronic question bank system is designed.

2. Genetic Algorithm (GA)

Genetic algorithms (GA), the genetic algorithm is one of the important methods of artificial intelligence, It is a search technique that mimics natural genetic factors. The genetic algorithm (GA) applies factors inspired by the mechanisms of natural selection from binary strings, Genetic algorithm is usually used as an optimization technique to search for the global optimum of the function, The work of the genetic algorithm begins with an initial set of sequences, which are generally called chromosomes, represented by four stages:- [5] [1] [7]

2.1 (Initialization)

A primary population is randomly selected. The chromosome is a representative solution to the problem and represents a set of genes. The size of the chromosome varies from one problem to another, The probability of each chromosome remaining in the population is then determined, in other words, fitness, according to which the chromosome is evaluated, [5] [4]

2.2 (Selection)

Where (Selection) the candidate individuals are selected from the candidate chromosomes in the next generation based on the fitness values, This means selecting only genetically new individuals (chromosomes) to be (parents) [4],[2].

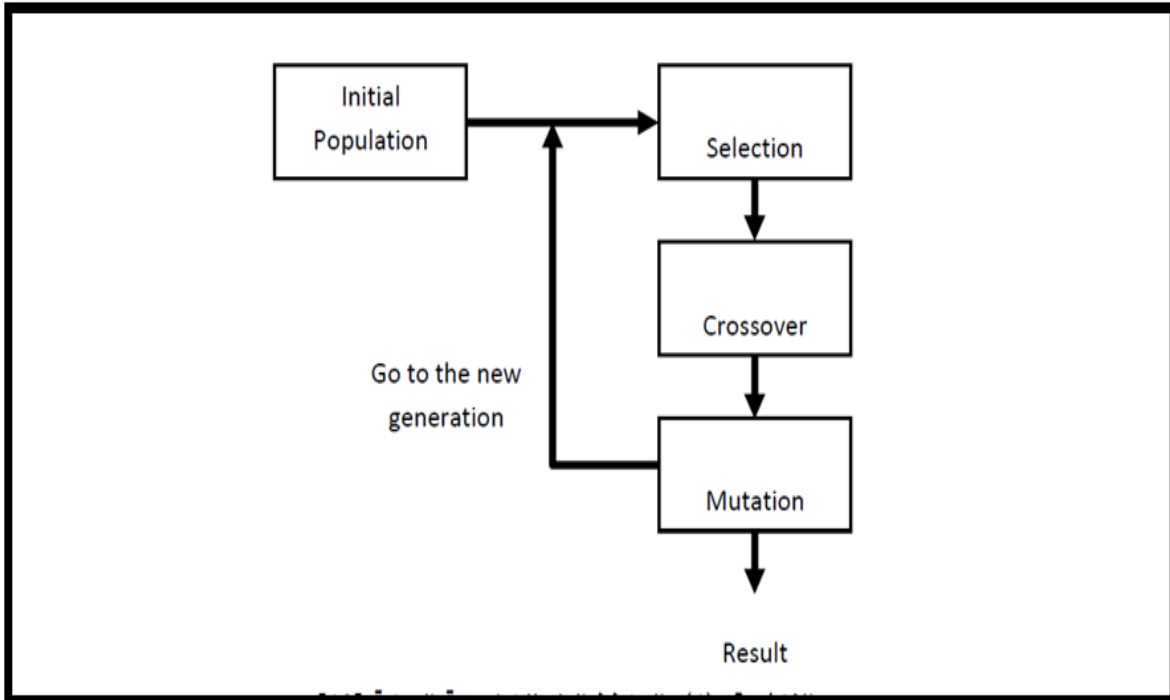
2.3 (Crossover)

After selection, the crossover process takes place and a random point is chosen for the intersection. Pairs of parents are randomly selected from the crossover population, In general, the crossover combines the features of two original chromosomes to form two new offspring from Questions, With the possibility that new chromosomes may generate better chromosomes.[7][5],[4]

2.4 (Mutation)

Here the candidate chromosomes undergo the process of mutation, The update is done on bits or Gene makes the chromosome unique. The mutation process expands the search space to areas that may not be close to the current chromosome population, thus ensuring a comprehensive search, This development cycle is repeated until the required standard is reached. This standard can be set by the number of development cycles (arithmetic operations), Or a predefined value of the objective function.[4],[3]

Figure (1) is a general diagram showing the work of the genetic algorithm [5]



3. Question selection model using the genetic algorithm (GA).

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|--|
| Genetic algorithm to choose questions |
| Input: Database |
| Output: Best questions |
| beginning first step: Determine the number of questions to be chosen. Step Two: Download the questions from the database. Third step: Fitness account. Step Four: Call the GA algorithm. Step five: The number of questions you want. end |

Group No =--GA (NO eq , DB , ID , Fitness)

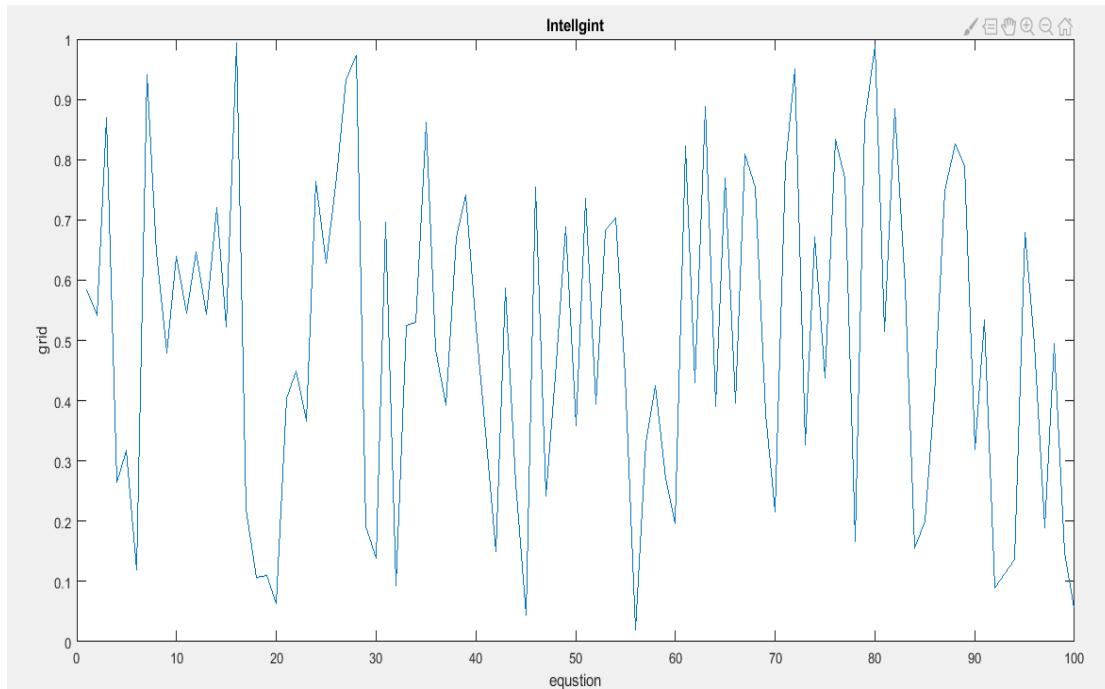
NO eq: The number of questions to be selected.

DB: Questions in the database

ID: question number.

Fitness: Question efficiency

Through the above model, which explains how the genetic algorithm works to select questions from the question bank, where the input to this system is a database containing a large number of questions, Then, in the first step, the number of questions to be selected from the database is determined, Then in the second step, the questions are downloaded from the database, In the third step, the efficiency of the Fitness questions is calculated by storing the efficiency of each question in the question bank in the database, Then in the next stage, the genetic algorithm is applied through four stages that take place on the questions through the steps of the genetic



algorithm and in accordance with the established requirements, Thus, the number of desired questions is extracted according to the required and specific conditions and requirements.

Figure (2) shows the proficiency rates of the questions for the intelligence subject

4. The research sample

The proposed system was applied to the questions and answers of the intelligence exam from (distinguished schools), where a database was designed using the MySQL program, which includes test questions for the years from 2010 to 2022, as well as the results of students' answers to the questions.

5. Work Environment

The model was designed in the Python 3.7.4 programming environment, and the (Django Library) program was used for the purpose of building a web application to display questions and answers.

6. Conclusions

- The genetic algorithm (GA) achieved very good results in finding the optimal solution to the questions selected from the database (question bank) in terms of selection and evaluation from the database.
- The genetic algorithm GA shows, in the mutation technique stage, that questions are not repeated in the group that was chosen for the application.

7. Resources

[1] Esmin, Ahmed Ali Abdalla, Germano Lambert-Torres, and Guilherme Bastos Alvarenga. "Hybrid evolutionary algorithm based on PSO and GA mutation." 2006 Sixth International Conference on Hybrid Intelligent Systems (HIS'06). IEEE, 2006

- [2] مها عبد الاله محمد البدراني " استخدام الخوارزمية الجينية في تطابق أنماط الاحرف الإنكليزية" ، مجلة التربية والعلم ، 4.19 (2007) : 84-99 .
- [3] Huang, Mu-Jung, Hwa-Shan Huang, and Mu-Yen Chen. "Constructing a personalized e-learning system based on genetic algorithm and case-based reasoning approach." *Expert Systems with applications* 33.3 (2007): 551-564.
- [4] Yildirim, Mehmet. "A genetic algorithm for generating test from a question bank." *Computer Applications in Engineering Education* 18.2 (2010): 298-305.
- [5] يحيى قاسم إبراهيم "مهاجمة نص مشفر (معلوم نصه الصريح) باستخدام الخوارزمية الجينية، مجلة التربية والعلم ، 168 -158:(2014) 1.27
- [6] Garg, Harish. "A hybrid PSO-GA algorithm for constrained optimization problems." *Applied Mathematics and Computation* 274 (2016): 292-305
- [7] Mirjalili, S., & Mirjalili, S. (2019). Genetic algorithm. *Evolutionary Algorithms and Neural Networks: Theory and Applications*, 43-55.