

A Study of Empirically Based Genetic Decision Making for Intelligent Examination Systems¹

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Examination systems store a question database and apply a different subset of these questions to each applicant. Forming these subsets is an important problem for the success of the evaluation of applicants. In this paper we propose a solution that learns the sequence of the questions based on the success rate of the applicants.

1. Introduction

This study is an empirical based effort to implement a genetic algorithm in an application of intelligent user interface. The interface used in an examination system is the object of interest.

Computers are used in many examination systems. Especially if the exam is performed several times on different interest groups, the main challenge is the selection of questions from overall question set. Even this procedure is performed by some random behaved algorithms, they are not sufficient to maintain a desired level of quality and success rate. The basic idea behind this study is to fill this gap of decision requirement by a self learning interface. Since the supporting assumption is that this exam is performed several times, it's totally acceptable to say that past experience and observations are the most useful and trustworthy information to develop better sequences of questions.

This paper consists of five sections. First we will discuss the problem in detail by determining some primary problems that solution should think about. In Section 3 we propose our solution system to handle these problems and explain the implementation in detail within Section 4. We conclude our research within section 5 and discuss some future works that can be done to improve our solution.

¹ This work is uncompleted because of health problems, though submitted due to time considerations. This situation will be compensated in the final paper.

2. Problem Definition

A topic may have many sub-topics that are independent from each other. Many questions for each sub-topic is prepared and stored in database of examination system. The number of questions in the database of examination system may have much many questions that cannot be answered by a single applicant.

The system should prepare a subset of questions for each applicant. Preparation of this subset is so important that the resulting set should clearly measure the knowledge level of an applicant. There are some primary problems that system should care about:

- There might be a correlation between questions of the same sub-topic. If a correlation is present and those questions are used for the same applicant, the evaluation quality of the examination decreases.
- Applicants may perform better performance on some sub-topics. System should understand this extra performance and select other questions from different sub-topics.
- Applicants may perform low performance on some sub-topics. System should be aware of this low performance and clearly affect the error level of the applicant's examination.
- Time spent on each question is an important parameter that system should be care about. Time spent on a right answer and a wrong answer has different meanings. System should measure time spent on each question and use it in its learning process.
- There are much many combinations of questions for an examination. An empirical learning process cannot have all possible combinations have learned before making a decision. System should use some heuristic methods to incrementally improve the learning.
- The knowledge and intelligence level of applicants may have a big variation. System should propose questions depending on the applicants' capacities. For this reason system may run some other process for learning the level of the applicant.

3. Proposed Solution

The problem defined in section 2 can be handled with a machine learning application. The basis of our solution is the empirically based decision making system proposed in [1]. Our problem does not support an experiment phase that can try all possibilities on

subjects, because there are much many combinations of questions to implement an examination.

3.1 Experiment Phase

An empirical decision making system depends on observations of real or experimental setups. In our system learning will be done with the real subjects that apply to the examination. There are some parameters that affect the learning phase:

3.1.1 Difference in Subjects

The experiment in [1] uses a simple question & answer interface that minimizes the effect of different subjects. But they have controlled distraction mechanism that effects users' concentration on questions which lowers the success rate. They apply planned distraction to the subjects and try to get the results similar to the real situations.

In our problem we don't have the controlled distraction parameter, but the knowledge level of each subject is different then others. This difference affects the success rate of the users but we don't have any control in the experiment.

3.1.2 Genetic Learning

4. Implementation Details

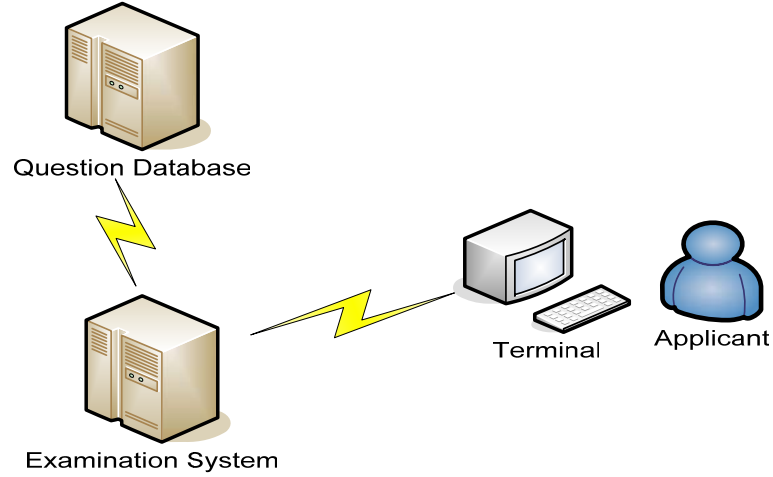


Fig. 1. Components of the system

5. Conclusion and Future Work

In this paper we proposed a solution that implements intelligent examination systems. Our system allows to clearly evaluate knowledge level of applicants.

We couldn't implement the solution we proposed due to time and technical limitations. In the future we may try to implement our system in order to understand its benefits over other solutions.

References

- [1] A. Jameson, B. Gröumann-Hutter, L. March, R. Rummer, T. Bohnenberger, F. Wittig, "When actions have consequences: empirically based decision making for intelligent user interfaces," *Knowledge-Based Systems*, vol. 14, pp. 75-92, 2001.