



A implementation of an automatic examination paper generation system

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ABSTRACT

This article uses lightweight J2EE tools based on B/S architecture to design an auto-generated paper management system. This system includes several modules, namely: user management, subject management, classification management, question entry, question management, paper generation, and paper management. The design process performs the analysis and composes the examination paper using an efficient algorithm with a high possibility of success. With this algorithm, the user needs to identify the subject, the question type and the difficulty level. From this input, the examination paper will be generated automatically. On the basis of a study of the JSP and Microsoft Word interface, we find that the system combines with Word very well. Therefore the editing of questions and answers is performed using Word and the final paper may be stored as “.doc” files.

The system has characteristics such as easy operation, a good interface, good usability, high security, high stability, and reliability.

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0. Introduction

Traditionally, composing examination papers is done manually by using the writers' knowledge, experience and style. Despite the high credit of the questions, there are still some shortcomings. The main problem is a low quality of papers caused by some human factors such as instability and relatively narrow range of topics. Teachers need to spend a lot of time and energy in composing examination papers. This does nothing for the separation of teaching and testing. Therefore, with the use of computers, automatic generation of test papers is an important measure for achieving the separation of teaching [1].

Automatic generation of a test system based on B/S architecture uses a browser as an interface, a test server and a WWW server as the middle layer, to complete editing questions and connection to the database. This is an important part of how the Internet's information system works; it gives a trend of developing examination systems based on networks for the future [2].

1. Solutions

1.1. System architecture

The flow chart of the system is shown in Fig. 1.

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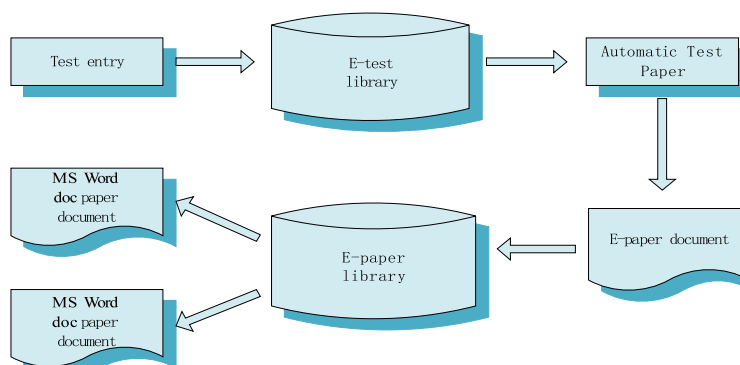


Fig. 1. Flow chart of the automatic paper generation method.

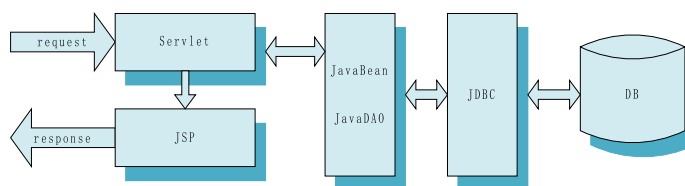


Fig. 2. Technology road-map of the system.

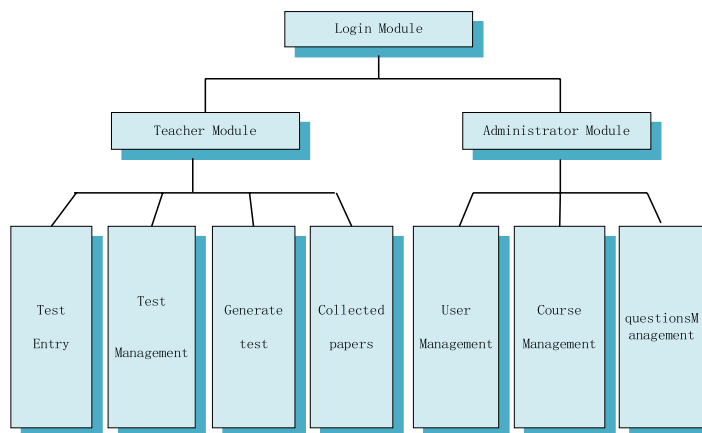


Fig. 3. Schematic diagram of the system function module.

The first step is to input the test to the temporary library. After approval, the paper is stored in the test database for future viewing and analysis. The final paper depends on an automatic generation algorithm [3]. The user can output the test paper and answers in .doc files, as shown in Fig. 2.

The system uses B/S, the MVC pattern in JSP view, JavaBean models, the Servlet Controller, and MySQL as the database [4]. The system page uses the scheme of DIV + CSS for designing the page layout. In addition, JavaScript is used to support the page details [5].

1.2. Function

The core purpose of automatic generation systems is composing examination papers. Therefore, system functions are given as shown in Fig. 3: query, update and maintenance. According to the general characteristics of the information management system, the system works in the user mode and the administrator mode.

1.3. Algorithm

The current automatic paper generation systems fall into three types, namely: (1) random-algorithm-based systems, (2) the backtracking system, and (3) artificial intelligence and information processing systems. However, the first two

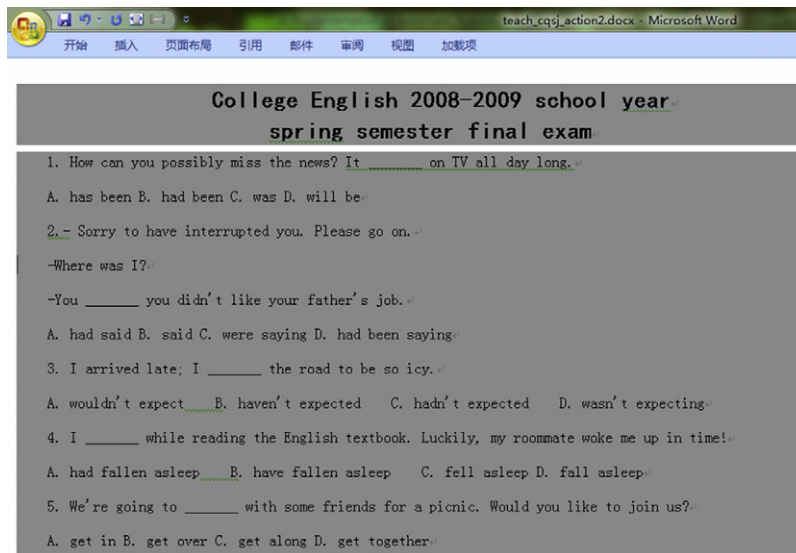


Fig. 4. Sample preview.

systems cannot satisfy the requirements and are unable to enter the practical stage [6]. The automatic paper generation system based on artificial intelligence and intelligent information processing has been improved to avoid the disadvantages of the two algorithms mentioned above. And on top of that, the system is capable of searching for questions on the basis of experience and knowledge. Such a system normally establishes a knowledge base and reasoning mechanism to guarantee a high possibility of success and quality of examination papers. However, the flexibility and maintenance of the examination papers produced need to be improved [7].

In general, users may have requirements as regards quality of examination papers, including the amount of topics, average degree of difficulty, proportion of each type of question, proportion of each section and some key sections and knowledge points.

On the basis of artificial intelligence and information processing, the algorithm avoids redundancy. In the test, the algorithm works quickly and selects non-repeated questions randomly. The questions and answers can be successfully separated.

2. Experiment results

By adopting the method described in the point mentioned above, we can simulate the system. The system can generate the required papers. For example, subjects for papers set on “English”, in a paper entitled “College English 2008–2009 school year spring semester final exam”, took five questions from the library in the multiple-choice questions. Examples of the examination file produced as a Microsoft Word .doc file for this paper are shown in Fig. 4.

3. Discussion

There are three kinds of systems for paper generation: (1) the database will be viewed as the questions set for selection by experienced teachers; (2) the test paper set will be used for random selection; and (3) automatic paper generation will be implemented using a generating strategy. The first and second systems are able to guarantee quality. But the first one works similarly to manual operation, while the second limits the number of papers. The third type uses random selection and could form thousands of papers almost without limitation.

Through the analysis of the advantages and disadvantages of the above-mentioned algorithms, we see that it is easy to generate an examination paper that is selected by teachers. However it takes a lot of time, at the expense of cost for the examination process, which does not meet requirements. Under the control of the state space, a random selection method may be proved to carry out a large number of invalid operations in the dead cycle, which eventually leads to the failure of the examination papers. The adaptive genetic algorithm has intelligent search technology with global optimization. Good convergence characteristics can work well for meeting the requirements for automatic test papers [8].

4. Conclusions

This automatic examination paper generation system uses J2EE tools, such as JSP, JavaBean, and Servlet, to develop and function call a JSP page through the Tomcat server. The system's major characteristics are openness, convenience and flexibility. The system allows the teachers to act according to their demands and extract each kind of test question quickly

from the existing trial question bank to suit an examination paper developed according to the teachers' needs. Moreover, the examination paper's difficulty level and form as well as each topic score are determined by the teachers according to their needs. The teacher logs on the system after effective identification authentication in the browser, extracts the paper, and produces the model answer. Simultaneously, the paper and the answer will be recorded in the library to supply the verification, the consultation, and the historical data for examination paper analysis [9]. This system has simplicity and convenience of operation, and supports carrying out the operation according to the jurisdiction of the system—namely the different kinds of users have differing jurisdiction—to guarantee data security and the integrity of the entire database [10].

The automatic paper generation system is a complex systematic project developed through the analysis of examinations in schools. This paper describes the features and implementation of each module. The system composing examination papers is successful. This trend shows why computer, network, multimedia and virtual reality technologies are developing at a fast pace and why IT technology has been adopted in many activities of national production [11].

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