

# Design of the Automatic Generative System of Examination Papers Based on ARM

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**Abstract**—With the development of network technology, the design for the automatic generative system of examination papers that is based on web has become a trend. In order to reduce the burden on teachers and avoid duplication of work, we design the system to automatically generate test papers. It is based on a constantly updated examination question bank system, according to the teachers' demands, which can automatically generate the test paper with a certain degree of difficulty, the number and value. The client configuration is simple and it can be free from geographic constraint. Users only need to go through their own identity authentication to enter the automatically generated system of test papers, and to manage and maintain examination questions, exam and user information and so on. The exam contents can be constantly enriched and improved and the data sharing among teachers can be easily performed. It will have important practical significance to improve work efficiency.

**Keywords**—Automatic generative system; ARM; Management model; Database; Parameters.

## I. INTRODUCTION

In the daily teaching work, especially before the midterm and final exams, first trouble and stressful issue before teachers is to design a set of scientific and reasonable examination papers. In general, a teacher wants to come up with a test paper, either to find out the questions in a huge examination question bank, and then, one by one, to put them on the paper, either to pick out a one from several books related to the subject.[1] Of course, there are some teachers now, or selecting and modifying the questions from the teaching plan of the usual lectures. Thus, it will be difficult to ensure the coverage areas and difficulty of the questions.

With the development of network technology, the traditional examination way is quickly replaced by paperless examination, which has become the mainstream now. Therefore, the development of the automatic generative system of examination papers will have a strong practical value.[2] The examination of the paper for learners is the primary method for the evaluation of teaching effectiveness. The number, difficulty and discrimination of the questions on the paper will eventually affect the reliability of teaching evaluation. [3] For a teacher, a good automatically generated system of test papers can reduce the burden on teachers, and avoid duplication of work to improve work efficiency. [4]

In this paper, the automatic generative system of examination papers is an application based on the internet network. This paper develops papers automatic generation

system is based on Internet applications, the client configuration is simple and it can be subject to geographical constraints. Users only need to their own identity authentication to enter the automatically generated system of test papers, and to manage and maintain examination questions, exam and user information and so on. In addition, all test questions are based on a set of test database, its contents can be continuously enriched and improved, and the data sharing is very convenient among teachers.

## II. ANALYSIS FOR USER'S REQUIREMENTS

For the automatic generative system of examination papers, first, it should be designed by the different kinds of type, the number of questions, the difficulty and score, in order to establish the corresponding the test database. Second, the papers is composed of random. Third, in a paper automatically generated, the knowledge keys involved can not occur. Fourth, the resulting paper should meet the requirements of the syllabus.

When the test paper is made, the questions are selected by the system in the questions database, they can meet user's requirements, and the efficiency and probability of success is high.

The user interface of this soft is friendly. The user's requirements can be set by way of human-computer interaction, such as: the scores for all kinds of questions in the test paper, the overall difficulty, the distribution of knowledge points and the proportion of various types of questions, and so on.

## III. IMPLEMENTATION OF FFT PROGRAM OF DATA PROCESSING

Spectrum analysis is required by the data signal in many cases and the theoretical basis is the discrete Fourier transform (DFT). Fast Fourier transform analysis is the tool to analyze and process digital signal. This paper mainly introduces the decimation-in-time radix-2 FFT butterfly algorithm and its implementation of S3C2410X program.

According to the definition,  $x(n)$  DFT of  $N$  point sequence is as shown in formula (1).

$$X(k) = \sum_{n=0}^{N-1} x(n)e^{-j\frac{2\pi nk}{N}} = \sum_{n=0}^{N-1} x(n)W_N^{nk}, k = 0, 1, \dots, N-1 \quad (1)$$

and

$$W_N = e^{-j\frac{2\pi}{N}} \quad (2)$$

The basic idea of butterfly algorithm is that first conduct odd-even halving for the sequence until each subsequence becomes a term, then merge odd-even sequence combined with the butterfly diagram, and finally synthesize the original sequence DFT according to the sequence of  $N/2$ . Its mathematical description is shown as below:

Set the length of  $x(n)$  as  $N = 2^L$  and merge the odd-even sequence into two sub-sequences. The computational formula is shown as follows:

Odd sequence:

$$z(r) = x(2r + 1) \quad (3)$$

Even sequence:

$$y(r) = x(2r) \quad (4)$$

In the formula (3) and (4),  $r = 0, 1, \Lambda, \frac{N}{2} - 1$ . And DFT of  $y(r)$  and  $z(r)$  is  $Y(k)$  and  $Z(k)$ , therefore the DFT of  $x(n)$  can be expressed as:

$$\begin{cases} X(k) = Y(k) + W_N^k Z(k) \\ X(\frac{N}{2} + k) = Y(k) - W_N^k Z(k) \end{cases} \quad k = 0, 1, \Lambda, \frac{N}{2} - 1 \quad (5)$$

In formula (5),  $W_N^k$  is known as the butterfly factor, that is,

$$W_N^k = e^{-j\frac{2\pi}{N}k} = \cos(\frac{2\pi}{N}k) - j\sin(\frac{2\pi}{N}k) \quad (6)$$

As the calculating diagram of formula (5) is like a butterfly as shown in Fig. 1, it is called the butterfly algorithm.

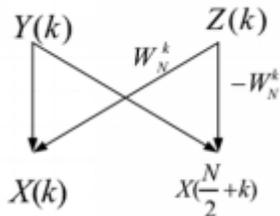


Figure 1. The butterfly diagram of the calculating relation

Based on the above analysis, the callable function of butterfly algorithm is Bit\_Reverse.Reversely rearrange the original sequence in accordance with the bit code. When  $n = n'$ , data is not exchanged; when  $n \neq n'$ , exchange  $x(n)$  and  $x(n')$ . Taking  $N = 8$  as an example, reversely rearrange  $x(n)$  in accordance with the bit code  $n = 0, 1, \Lambda, 7$  and the calculation results are as shown in Table 1 below.

TABLE I. 8-BIT CODE INVERTED SEQUENCE ADDRESSING

Source sequence bit code $n$	Storage address	Bit code inverted sequence address	Bit code of new sequence $n'$
0	000	000	0
1	001	100	4
2	010	010	2
3	011	110	6
4	100	001	1
5	101	101	5
6	110	011	3
7	111	111	7

The sequence of complex numbers which meets  $N = 2^L$  is divided into  $L$  levels in FFT algorithm and each level can be subdivided into several groups which include a number of butterfly units. The number of levels is expressed as  $stage = 1, 2, \Lambda, N/2$ , the number of groups is expressed as  $group = N/2, N/4, \Lambda, 1$ , the butterfly unit is expressed as  $s\_cnt = 0, 1, \Lambda, stage$  and the relationship between the butterfly computation data is as shown in equation (6).

$$\begin{cases} indexB = indexA + stage \\ indexA = indexB + 1 \end{cases} \quad (7)$$

For the number of levels  $stage$  and the number of units  $s\_cnt$ , the butterfly factor can be expressed as:

$$W_{stage \times 2}^{s\_cnt} = \cos(\frac{\pi}{stage} s\_cnt) - j \cdot \sin(\frac{\pi}{stage} s\_cnt) \quad (8)$$

Conduct successive iteration for the results combined with the butterfly algorithm. Reversely rearrange the original input data and conduct FFT calculation.

#### IV. THE DESIGN FOR THE AUTOMATIC GENERATIVE SYSTEM OF EXAMINATION PAPERS

The development of this system is based on Web, its design is more compact. The requirements on the server performance are not high. It provides a friendly interface and the simple operation in order to enable users to easily access. The function of the system is rich and its practicability is stronger. The interface of the management menu is shown in Fig. 2.



Figure 2. Management menu page

##### A. The Main Function of the System

The main functions of the automatic generative system of examination papers include the user management module, test subjects management module, system management module and question database management module, and so on. The system structure is shown in Fig.3.

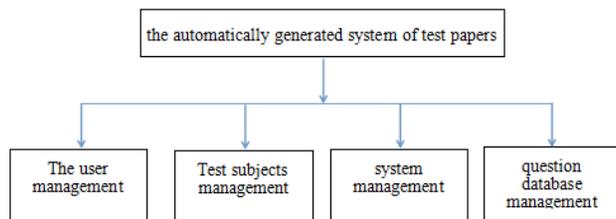


Figure 3. The structure of the automatic generative system of examination papers

The module includes the management of administrators, the teaching teachers, questions entry operators. The administrator can set teacher's teaching subjects. The administrators consider that the teachers registered in the system is the teaching teachers, who must also be registered for teaching the lesson. In order to ensure the security of the legitimate user account, the system provides a function to

modify personal information. The teachers and administrators can modify their own login password in a timely manner through this function, its purpose is to ensure that their accounts are not stolen by others. The questions entry operators can only enter the questions and the additional information can not be modified by them.

The administrators can manage the test subjects, such as: delete and add the test subjects. The teachers can add, delete and query the examination information they is teaching the courses. After the parameters related to the examination papers are specified, it can automatically generate paper. Then, after the preview and edit, finally, the papers needed are printed out. Teachers can not modify or query the examination information of other teachers teaching the lesson.

The system management model includes the managements of the test database for various subjects and the backup / restore functions of the database. Once the system is damaged, the normal state will be quickly restored.

This model includes adding and modifying the description of the questions in the test database. To reduce the burden on teachers, the questions can be completed by the questions entry operators with a lower level. Considering the boring and repetitive questions entry work, the questions entry operators and the corresponding management modules are added. For system security reasons, the entry operators are only responsible for the examination questions. If the test database needs to be changed, the authorization can be applied, but other settings will be restricted for the system. After the teacher's identity of the corresponding subjects is verified, it is formally submitted to the database. So the deleting operation can only be done by the teacher.

##### B. The Protect of the System and Database Files

In order to prevent the unauthorized access to the automatic generative system of examination papers, there are many different interfaces on the home page, which are offered to the different people to log in. The permissions of the teachers, the administrators and the questions entry operators are divided, and the function of changing the password is provided. Especially, each page has the authentication check, and the purpose of checking the user's authority is to determine whether the page can be accessed. The login page for the automatically generated system of test papers is shown in Fig. 4.

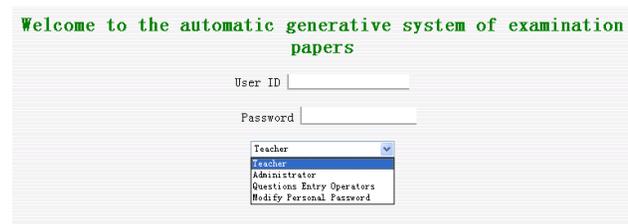


Figure 4. The login page for the automatic generative system of examination papers

The database files of the system are placed in the other directory, and use the irregular directory names and the

special file names, the purpose is to prevent the unauthorized users to download program files and database files.

In the event of an accident, in order to prevent the databases of the system from loss, the database backup and recovery features is added to the system. So the users can backup and recovery the database according to their need. In order to ensure the lawful rights of the users and the security of their accounts, the function of the personal information, which can be modified by users, has been increased. The landing system is available to all users through the function, the login password can be timely modified to prevent it from being stolen.

### C. Setting the Major Parameters of the Examination Paper

Before the papers are generated, the examination name, the subjects and the type of questions, etc., which need to be set. If the number of questions is 0, this type means no test questions. The page of the test subjects and the questions, which need to be set, is shown in Fig.5.

Figure 5. The page of the test subjects and the questions

After the test subjects and questions are set, the parameters of the papers need to be checked in order to ensure the correct parameter settings. After the confirmation, the user can click the button to generate the papers. If not satisfied, can click the Reset button and again set the parameters and confirm. The interface, which the parameters of the papers need to be confirmed, is shown in Fig. 6.

Figure 6. The parameters of the papers need to be confirmed

For the particular subject, if the papers randomly generated not be satisfied, the user can refresh the page to regenerate the new one. The display and printing button of the answer is at the bottom of the papers, the user can print directly to the answer.

## V. CONCLUSION

This system is based on the Internet and suitable for the test papers automatically generated. it has a constantly updated examination question database and can constantly enrich and improve examination contents according to the teachers' demands. At the same time, it can also automatically generate the test paper with a certain degree of difficulty, the number and value. The client configuration is simple, and it can be subject to geographical constraints. Users only need to their own identity authentication to enter the automatically generated system of test papers, and to manage and maintain examination questions, exam and user information and so on. The data sharing among teachers can be easily performed.

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