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Method of rapidly generating test papers and quickly reducing papers based on random code and random numbers

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Currently, most on-line examination systems adopt random selection algorithms. The exam papers are made by using random functions on a test bank of questions. Because the exam paper content needs to be extracted by examination questions one by one, the speed of the test paper is slower. Random selection algorithms to select the number of questions on exam papers generate many questions, and the amount of clutter is not suitable for preservation. This causes the paper to be restored poorly. Thus, it is neither conducive to the comprehensive analysis of the test papers of teachers, nor useful for the teachers to estimate to what degree students grasp the knowledge points. Based on the above reasons, this paper proposes a method that can not only randomly generates tast papers, but also can quickly restore them. This method firstly increases random code to the traditional online exam, and then uses the random function to generate multiple random numbers, After that, it sorts at random according to the specific location of the test characters, and it reads the exam questions and generates papers at one time. In addition, it can fast reduce papers by using the same numbers, and is convenient for the school to analyze the papers comprehensively. Experiments show that this method can generate and restore the test paper quickly. Comparison with the existing random test paper generation method, efficiency and test paper recovery have been improved greatly over time.

1. INTRODUCTION

Exams are an important means to test students' mastery of knowledge, and are an indispensable part of teaching activity in colleges and universities[1]. It is also a test method of teaching quality at schools. With the rapid development of computer network technology, the use of computer network for the online examination form has been favored by all walks of life [2]. The use of online computer test systems is being gradually accepted by everyone. The exams include the national computer grade examination, title exam, foreign language exam and accounting title exams. These use the computer to replace the traditional paper test, achieving the paperless examination. Online examination systems not only provide a fair, impartial and efficient examination service for the majority of candidates, but also they reduce the organization links of the process. Besides, such exams can save manpower and material resources, [3] and greatly reduce paper waste, for online examination no longer prints papers [4].

At present, most online examination systems adopt a way to select randomly in the question bank, thus generating the test paper. This method only focuses on the process of examination and the collection of students' scores after the exam, but seldom considers the need for the analysis and reduction of

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the test paper after the examination. In addition, in the online examination, the examination paper is to be taken in a random way, and all questions on the paper need extracting one by one from the exam question bank. The extraction is completely dependent on the number of questions. The number of the questions on one test paper is in quantity and in disorder. Therefore, generating test papers can be slow. Teachers can not know each student's mastery of knowledge points very well. In view of this, the method based on random codes and random numbers to generate and reduce papers can quickly generate random test papers by randomly generating several numbers in the exam. After the students complete their exam papers and submit the answers, their exam can be read using the answers from the database. In this way, the exam results for the student can be found.

After the examination, the error distribution of examination questions can be analysed, identifying the examinee's mastery of knowledge [5]. At the end of the examination, the test center can restore all the test papers. According to the error rate of the test papers, the teachers can directly analyze whether they have missed or not fully explained the knowledge points in the teaching process. The application of this method can provide effective data support for further teaching reform, so that teachers will understand what they should focus on in the future teaching process. What's more, students can better understand their shortcomings and spend more time in further studying their wrong questions in the exam, which can help make up their own knowledge gaps, so as to achieve the benign cycle in the way that tests promote both teaching and learning.

2. RESEARCH STATUS AT HOME AND ABROAD

Online examination abroad is earlier and more popular. Some international giants' professional certification tests began to use it more than 10 years ago, such as Microsoft Certification Test, CISCO Certification Test, Red Hat Certification Test and so on. However, the online generating test paper algorithm is relatively simple, and the widely used random test paper generation algorithms consist of a random selection method and backtracking heuristic algorithm, or using the combination of both[6]. Based on the control index of the state space, the method of random selection works in the way that a computer calls the random function RAND (N) and generates a random number from 1 to N, then extracts the corresponding exam questions numbered N in the database according to the random number. Finally the extracted questions will be placed in the papers. By repeating this process, a set of test questions can be formed. The random selection algorithm is very simple, and it is also very easy to be realized, but the efficiency is very low. Creating a set of papers often needs to read the database many times. When a great muber of papers are needed, the test system server and database server will be under great pressure. Besides it is inclined to make the candidates wait for a long time in the large-scale test, and impact examinee' mood, which may lead to poor performance. In addition, the random number generated may occur repeatedly, if not controlled, the composition of the test paper is prone to repeat examination questions [7]. When generating a test paper, frequently querying whether the test paper is extracted will not only affect the speed of the test paper generation, but also cause great pressure on the examination system, which will cause the server crash and lead to an exam failure. The backtracking heuristic algorithm is to record the state generated by random selection, and then to release the state type of the previous record after search failure, and then generate a new state according to a certain change rule [8]. The program of realization of this algorithm is much more complex and the questions are lack randomness. The efficiency of the algorithm is related to the database size. When the database is small, rate of succeeding in generating papers by backtracking algorithm is high. However, the repetition rate of exam papers will naturally be high. The greater the database is ,the longer the exam paper generation time. So it is not suitable for large-scale exams [9].

At present, computer technology online examinations will be promoted as a new application in China, such as the National Computer Rank Examination, Professional Title Computer Test, Professional Title Foreign Language Test and Accounting Title Examination. In colleges and universities, computer online examination is gradually being used instead of traditional paper tests, especially in adult education. which can solve the inconvenience of the examinees in different areas. Most of the online examination system used in domestic universities is the integrated test module in educational administration system. Algorithm generating paper mostly adopt the random selection algorithm. After the examination, the paper analysis function only has statistics on the score distribution. The analysis of test papers is single, and lack of a comprehensive analysis on the test papers. The main reason is that there is no method which can not only generate test papers at random but also quickly restore them. It is because of this root that led to the lacking of paper restoring function in the online examination system. Theses and research on papers restoration are scarce. Exams are just a tmeans of testing learning effect, and cannot be used to reflect the knowledge omission of the day-to-day teaching activities. Thus, this paper proposes a method to quickly generate and restore test papers based on a random code and random number.

3. ALGORITHM

3.1 principles of this method

The method is to be realized by optimizing the principle of a random selection method. This work uses a small number of random numbers and sorting function of the database query to realize a random sequence. Random ordering is instead of random selection in the random selection method. Both have strong randomness from the selection results, but in system optimization, this method is better than the random selection method. This method usually seperates the application server from the database server in the examination system to deploy. The application server and database server are in need of a large consumption of system resources in the method of random selection. The two servers' task allocation is not balanced, and they can not effectively play their respective advantages. The application server is responsible for selecting

the examination questions randomly, checking the selected questions and controlling the process of the examination and so on. The application rate of the server CPU resources is high. The database server is only responsible for extraction of test questions one by one according to numbers. The rate of the use of CPU server resources is low. There are higher requirements on disk I/O. When a large number of papers are generated, application server CPU and memory often become the bottleneck of the system. The database server does not need too strong operation ability but frequent read operation, easily lead to I/O disk bottleneck. Through the experiment, the application server CPU utilization rate is more than 3 times higher than the database server CPU if the random selection algorithm online examination system in adopted. In the disk I/O database server is 4∼5 times higher than the application server. The two servers' hardware resource usage is very uneven, and it's extremely easy to cause the application server crashes in high concurrent environment. The big problem of the database server reads the data delay.

This method increases a random code field in each question, by producing a random ranking position, then using the position character in random code to sort the question bank, thus realizing the exam. In Table 1 examples (only part of random codes displayed, using a sort of characters), the examination questions in the question bank are arranged by the order of entry (the number of examination questions from small to large). The sorting of the examination questions changes with the first character sort. The order of examination questions is changed to: 9, 2, 7, 5, 10, 3, 4, 6, 1, 8; after sorting with the second characters, the order of the exam is changed to: 3, 1, 7. 6, 10, 9, 4, 2, 8, 5; after sorting with the third characters, the order of the exam is changed to: 6, 8, 10, 5, 9, 4, 7, 3, 2, 1. By observing the results of the three sorts, the use of this method can be randomly confused from the question bank, since the order of the three questions are not the same. When the first character is sorted, the first characters of question 3 and 10 are the same. At this point, you can use the other two characters to sort them. By using the characters of 3 different positions in the experiment, the sorting result is more random and the question bank has a better result.

In addition, in the use of this method, the utilization ratio of the application server and the database server system is significantly lower than the use of random selection method, and the two server resource utilization is more balanced. This method reassigns server tasks. The application server is only responsible for generating a few fixed range of random numbers and test control, and does not need to check the question repeat. The database server takes advantage of its quick sort, and is responsible for the process leading to confusion. When the test paper is generated, the test question is turned into a one-time read, and the database server disk I/O operation will be greatly reduced. The utilization rate of CPU resources will be reduced by more than 50% through the experiment. The utilization rate of the database server CPU will increase slightly, and the disk I/O operation will be reduced by about 80%.

3.2 Generation of random codes

Random code is the core of this method to generate test papers randomly. When the test paper is generated, the scrambled process is based on random code character arrangement, which is no longer related to the test number. The random code of all questions need fixed length and different character arrangement. If there is the same test question with random code, the test paper may cause the exam questions to be disturbed, and the questions of the same random code will be adjacent. The characters of the random code are commonly used characters, which consist of lowercase letters, uppercase letters and numbers from 0 to 9. The total length of the random code is 62 fixed characters, and the random code is composed of 62 different characters in order to increase the question bank space. Random code generation method ([10] based on LAMP technology architecture) uses the range function to generate lowercase alphabet array L, uppercase alphabet array U, number 0 to 9 array N. Then the array_merge function is used to merge three arrays of L, U, and N to create a new array, And the array is randomly scrambled with the shuffle function, and then the implode function is used to merge the array into a string [11] At last a random code can be generated. The generation process of random code is shown in Figure 1.

$L=range ('a','z'); / / array generated lowercase letters

$U=range ('A','Z'); / / array generated uppercase letters

$N=range (0, 9); / / generate 0 to 9 digital array

$NEWARRAY=array_merge ($L, $U, $N); / / with combined array of three arrays

Can also be used to produce / / - combination, $NEWARRAY=array_merge (range ('a','z'), range ('A','Z'), range (0, 9));

Shuffle ($NEWARRAY); / / array element order disrupted combination

$randStr=implode ($NEWARRAY); / / will be merged into a string array combination

You can also use more concise random code generation methods,such as using the str_shuffle function to directly shuffle strings that contain uppercase and lowercase letters and numbers. For example:

$str='ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefgh ijklmnopqrstuvwxyz0123456789';

$NEWARRAY =str_shuffle($str);

By repeated execution of the process, 10 random codes are obtained ten times, as shown in Table 2.

Through the observation of the 10 performance results, we find that the random codes generated each time are different. The randomness of the characters composed of random codes is larger. Three base arrays and of combinatorial array will not change when generating random codes, which can be defined as a global variable. A new random code can be generated each time a shuffle function is executed. The space of generating random codes when using this method determines a single question bank space. The random code space generated by this method is huge, and the probability of repeated random

Table 1 Random sort table.

Examination number	Random code	Sort by first characters		Sort by second characters		Sort by third characters	
		Sort character	Examination order	Sort character	Examination order	Sort character	Examination order
1	sGqedv8fHEWbk7J0XVCzDKZO……	8	9	A	3	C	6
2	OigdP0349C1pLInHESu6koV5……	O	2	G	1	D	8
3	gAaBLJ8qSP6f4KpbMdtI9NyR……	e	7	J	7	J	10
4	ifYOodgS6m2UHJZLV8Rh5FrC……	f	5	O	6	O	5
5	fyOLn4YVmh8ApM3wlZv9s6zB……	g	10	R	10	Q	9
6	rOCMIDk2HZFdeQcxsLlBjbiU……	g	3	V	9	Y	4
7	eJZjFnICxDyfGrs9Y185zkTa……	i	4	f	4	Z	7
8	vlDJtp54HGhWFwYO6ZQmBXLz……	r	6	i	2	a	3
9	8VQ6v0XoBRlmghxPnUsDK2ET……	s	1	l	8	g	2
10	gRJ4QoWUtL0qXerdc1pE7P5Z……	v	8	y	5	q	1

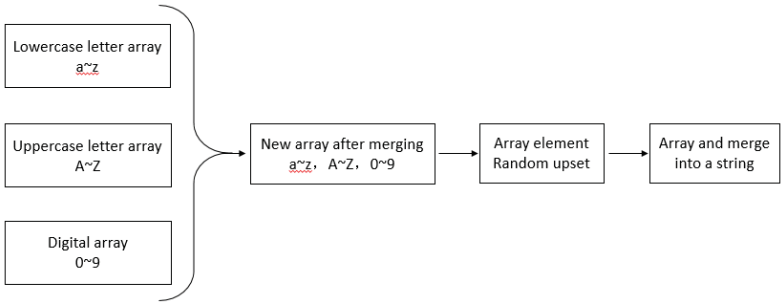

Figure 1 Random code generation processImplementation code.

Table 2 Random code.

Results of the first execution	sGqedv8fHEWbk7J0XVCzDKZO6McRrTwtipnBF2Y1lg3hSaIxPL4NouyQjAmU59
Second execution results	OigdP0349C1pLInHESu6koV5ZYBsflrzhaJtcMRm2xNwUqXGey7jvW8DAFQbTK
Results of the third execution	gAaBLJ8qSP6f4KpbMdtI9NyRT1ZrCuYDWF7swmx30ehkEQ5zVXcHiOUonj2lGv
Fourth execution results	ifYOodgS6m2UHJZLV8Rh5FrCcjNAvI97eBDyw0nGaXqlTWKszPQ1tEku4pMbx3
Results of the fifth execution	fyOLn4YVmh8ApM3wlZv9s6zBNDqKj17o0xRFEQrXIP5bugakeGt2WcHUJSidTC
Results of the sixth execution	rOCMIDk2HZFdeQcxsLlBjbiUJuNvqVn3p7KgPz019AafYwGSTWhERXmto6854y
seventh execution results	eJZjFnICxDyfGrs9Y185zkTahEAQtSlmuM72Ld30XbiHwUOBpVP6cvqNoKWR4g
eighth execution results	vlDJtp54HGhWFwYO6ZQmBXLz0kf738rAbETSaocVnj1dUIRKMNPxsiuCqy2g9e
Ninth execution results	8VQ6v0XoBRlmghxPnUsDK2ETFrfcdYAjWyZ7wL5bqup1GHkIOeJt93M4CSazNi
Tenth execution results	gRJ4QoWUtL0qXerdc1pE7P5ZNyIjFlx2KVDwz8O3kY9HsGnivmA6BTfbSMaChu

code is very low. The space calculation formula of random code is as follows:

$$A_n^m = n(n-1)(n-2)\cdots(n-m+1) \quad \text{(Formula1)}$$

Both n and m in the formula are 62, that is, the factorial of 62. By calculating, the number of random codes generated by this way is 3.146997326038794e+85, which is huge enough to meet the needs of any item bank. So when we use this method to generate random codes, we don't need to consider the problem of random code space being not enough. Although the probability of generating the same random code is very low, random codes still need to be checked whether there is duplication. If there is a need to regenerate, the random code is generated when the question bank examination is entered, although duplication will be checked, it does not affect the examination process.

3.3 2.3 test paper generation

In the process of generating test papers, it is necessary to generate at least 3 random numbers of specified ranges and unequal random numbers. They are R1, R2, R3, and the ranges of three random numbers are 1 to 62 (including 1 and 62), and the interval representation is U1, 62Y. Test assembly is done by three random numbers corresponding to the location of the random code in a test paper. The query command of SELECT and additional ORDER BY can be used to query the question library. The result of the final database query is a disorganized

examination. According to the test questions requires, a set of papers can be composed by reading the corresponding number of questions from the query results. In sorting, different database systems have different case sensitivity. In an insensitive database system, it defaults the lowercase and uppercase of the same letter is the same, for example, the alphabetical "a" and "A" are sorted by the same character. In this case you need to adjust the configuration file of the database to open the case sensitive. You can also use the ASCII function to sort specific location characters into ASCII code values to sort. The decimal value of the converted letter "a" is 97, and the decimal value of the letter "A" is 65, ranking in alphabetical sequence of ASCII code. In this example, by changing the character set of the MySQL database to utf8_general_cs, the MySQL database can distinguish the field contents from the case.

Using three random numbers in this method is for the purpose of preventing repeat of specific ranking position characters. If a repeat character appears in a sort, it can be sorted by the second characters, and so on. Theoretically, three random numbers can be used to make up 37820 different sets of test papers. It is enough for the general test. The space calculation formula of the test paper generation is as follows:

$$A_{62}^{3} = \frac{62}{(62-3)} = \frac{62 \times 61 \times 60 \times \cdots 1}{59 \times 58 \times \cdots 1} = 37820 \quad \text{(Formula2)}$$

If the test paper space is not large enough, the test space can be increased by increasing the number of random numbers. For example, 5 random numbers can be used to produce 6471002 sets of test papers, and the calculation formula is changed into the following:

$$A_{62}^{5} = \frac{62}{(62-5)} = \frac{62 \times 61 \times 60 \times \cdots 1}{57 \times 56 \times \cdots 1} = 6471002 \quad \text{(Formula3)}$$

The core code of the test paper composition (taking the PHP+MySQL environment as an example to form a set of 100 test papers):

```
/ /Three random numbers

$r1=rand (1,62);

$r2=rand (1,62);

$r3=rand (1,62);

// Through the cycle to verify whether the three random numbers are repeated, if there is duplication to regenerate two random numbers, until the three different random number are not the same.

While ($r1==$r2 $r2==$r3 $r1==$r3 ||||) {

$r2=rand (1,62);

$r3=rand (1,62);

}

// take the top 100 questions on the database query to generate papers

$query='SELECT question,questionitem,examorder,randcode FORM tb_exam ORDER BY SUBSTRING(randcode,?,1) ASC, SUBSTRING(randcode,?,1) ASC , SUBSTRING(randcode,?,1) ASC LIMIT 0,100';

// Generate preprocessed SQL commands, using preprocessing to prevent SQL injection

$stmt=$con->prepare($query);

// Bind three plastic parameters, r1, r2, r3

$stmt->bind_param('iii', $r1,$r2,$r3);

$stmt->execute();

$stmt->store_result();

$stmt->bind_result($question,$questionitem,$examorder, $randcode);

// The two dimensional array of test questions is stored, and the test questions are put into the two-dimensional array by traversing the query results to generate the test questions array

$result=array();

while ($stmt->fetch()){

$result[]=array( 'question'=>$question, 'questionitem'=>$questionitem,

'examorder'=>$examorder, 'randcode'=>$randcode );

}
```

Through practice, in the test bank with 1500 questions, this method is used to form randomly two sets of test papers with 100 questions. The random numbers are generated and the questions number of the test paper are listed as follows.

When the random number is obtained: r1=12, r2=38, and r3=22, the test paper is numbered as:

1012, 1317, 523, 614, 116, 402, 374, 1318, 367, 28, 989, 1219, 700, 1244, 854, 1017, 1072, 1328, 1048, 946, 529, 806, 1201, 773, 597, 50, 537, 1359, 899, 1308, 811, 1113, 468, 742, 1047, 715, 639, 1046, 518, 36, 981, 603, 295, 447, 288, 1390, 478, 1034, 814, 875, 1156, 94, 1475, 1336, 1407, 530, 616, 391, 677, 713, 958, 352, 1356, 752, 18, 785, 166, 676, 859, 371, 673, 500, 927, 57, 1088, 617, 824, 1256, 247, 275, 1090, 297, 1316, 1123, 152, 84, 93, 538, 829, 1223, 282, 1313, 569, 810, 513, 1466, 395, 549, 756, 784

When the random numbers are: r1=29, r2=62, r3=11, the test questions are numbered:

783, 484, 1221, 1160, 351, 1301, 1345, 1087, 447, 513, 79, 758, 1233, 1176, 1019, 269, 1314, 655, 1295, 838, 1208, 947, 282, 1403, 251, 970, 287, 972, 553, 1470, 1089, 197, 70, 1195, 108, 159, 434, 378, 793, 82, 1094, 545, 1338, 209, 1379, 1184, 147, 64, 595, 528, 1321, 132, 1269, 396, 1054, 1092, 256, 487, 568, 577, 1154, 536, 731, 456, 823, 284, 1325, 476, 113, 370, 619, 646, 1332, 542, 1369, 437, 94, 813, 1481, 678, 684, 55, 1472, 937, 629, 772, 1076, 1303, 1307, 505, 904, 590, 679, 713, 733, 143, 1001, 330, 31, 943

By comparing the numbers of two sets of test papers, the scope of the random selection of the examination questions is wide, and the examination question extraction is more dispersed [12]. Through practice, when generating a large number of test papers, statistics on the questions drawn show that the

repetition rate of test questions in any two sets of test papers is about 5%. The probability of random extraction in the question bank is more balanced, and no part of the examination questions will be frequently pumped, since the other questions are less frequently used.

3.4 test paper reduction

When the candidates hand in their papers, the three random numbers will be stored in the form of "AABBCC". When the number is a single digit, the number "0" should be added to the front. The final 6 digit string is formed. Only 6 bit numeric strings need to be decomposed when the test paper is restored. Three random numbers are used to regenerate the test paper to restore the test paper. The complete reduction of students' answer papers can be achieved by using the answers submitted by the students in the process of reduction. The rate of accuracy was 100% by repeated test papers.

3.5 Scalability of methods

This method has strong expansibility. If we don't change the number of random numbers, we can increase the test space and enhance the randomness of selection test questions. We can extend the method in the following two ways.

Firstly by random ordering: when the test paper is generated, the examination questions use the ascending order of 3 random code characters by default (ASC). At the time of sorting, three random code characters can be randomly ordered, that is, randomly generating a sort keyword ASC (ascending) and DESC (descending), which can be directly used in three binary expression, such as rand (0,1) ==1? 'ASC': 'DESC'.

After the use of random ordering, the original 6 bits need to be changed to 9 bits when three random numbers are saved in the form of "AAXBBXCCX". "AA", "BB", "CC" are three random numbers. X represents 0 and 1 for random ordering, 0 for ASC (ascending) and 1 for DESC (descending). For example, the save string is "160491570", representin 16th - bit ascending, 49th - bit descending, and 57th - bit ascending to order questions in the question library.

Secondly, random read position: It starts by default from the first section of the database query result when reading the exam questions. Test papers are completed by reading the the amount of papers required once. Here you can generate random read position to increase the exam extraction uncertainty. Random reading position calculation method is random number generating 0 randomly (MySQL database query result set first record numbered 0) to N Random. When reading the examination questions the starting point is the location of the random number. Test papers are completed by reading the the amount of papers required at one time. The calculating formula of N is as follows:

$$N=\left[X \times \left(1-\frac{Y}{X}\right)\right] \qquad \text{(Formula4)}$$

Among them, X is the total amount of the questions in the question library. Y is for the paper quantity, the use of it must be satisfied:$1 \leq Y < X$, otherwise there is no meaning.

Through the experiment, in a question band with 1500 exam questions, we can use this method to make up test papers for 100 thousand times, each set of paper with 100 questions. By using the random reading position method, the probability of the test in the question bank is more balanced. The equilibrium rate is 1.83 when the random read position is not used, and the equilibrium rate changes to 1.24 when it is used. In this case, the method of calculating the equilibrium rate is the number of times / the least in the number of pumping in the question bank. The closer the calculation results is towards 1, the more balanced the test question extraction is.

In the random read position, the length of the string is saved when saving three random numbers will become unfixed, because of the random reading of the location N, the range generated is directly related to the size of the question library. The character length is not fixed. In order to distinguish a string generated from a random sort, it is saved in the way of "AABBCC|N". For example, the saved string is "093759|157", which means 9th bits, 37th bits and 59th bits of random code are arranged in ascending order, and 157th questions are read from query.

4. TEST PAPER GENERATION EXPERIMENT

In order to embody the efficiency of the test paper of this method and the traditional method to generate the test paper, we conduct the simulated test paper test separately. There are 1500 questions in the the experimental question bank and the number of examination questions in each set of papers is 100. The hardware configuration of the experimental environment is: processor: Inter i7-4790 3.6GHz, memory: 16GB, hard disk: Sansung SSD 120G; experimental software environment: operation system Windows 10 Enterprise Edition, Apache 2.4.23, PHP 5.6.28, MySQL 5.5. In order to get more accurate data in the experiment, it is done by 5 times to generate 50 sets, 100 sets, 500 sets, 1000 sets, 2000 sets of test papers respectively, and the time spent in each batch test is recorded. Finally, the average time consumption of each experiment was calculated. The experimental data are shown in Table 3.

In Table 3, under the same experimental conditions, by comparing the traditional random generation of test paper and the way of batch production of test paper, we can find that this method is more efficient than the traditional random generating test paper, and the working efficiency can be increased by several times.

5. PROMOTION AND APPLICATION

From February in 2016 to the present, this method has been applied to a college to carry out a network examination on some of the courses and to record and count the specific applications. See Table 4.

In the years of 2015, 2016 and 2017, 1000 students at this college were randomly selected for a online examination service satisfaction survey, [13], the results of the survey are shown in Table 5.

The statistical data in Figure 2, Figure 3 and Table 4 show that this method has strong practicability, and can fully meet

Table 3 Test paper generating test data.

Generated quantity (set)	Traditional mode (second)	This method (seconds)	reduce hours (seconds)	Efficiency promotion
50	5.9560	0.2268	5.7292	96.2%
100	11.9211	0.5495	11.3716	95.4%
500	59.4371	3.6501	55.7870	93.9%
1000	120.1113	7.9561	112.1552	93.4%
5000	242.3253	14.5351	227.7902	94.0%

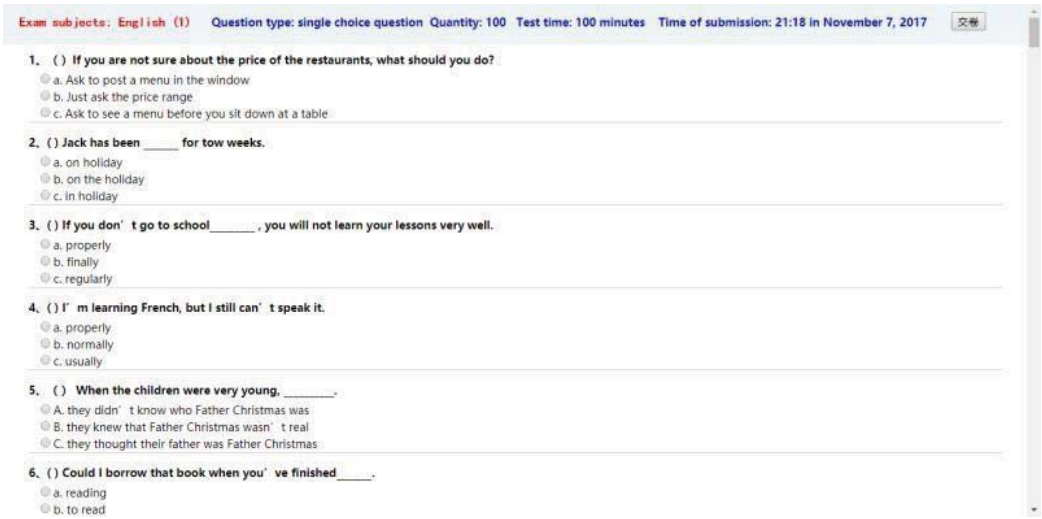

Figure 2 The examination papers of the network examination of a university.

Figure 3 Network examination papers of a college.

Table 4 Record statistics table.

time	Number of subjects	Examination students	Group volume	Average volume group time
2016-06	11	6283	69113	0.0105A秒
2016-10	16	6541	104656	0.0180A秒
2017-06	14	6541	91574	0.0140A秒
2017-10	16	5988	95808	0.0188A秒

Table 5 Survey statistics.

Questionnaire Projects	Very good proportion			Good proportion			General proportion			Poor proportion		
	2015	2016	2017	2015	2016	2017	2015	2016	2017	2015	2016	2017
System Access	9.50	27.10	36.70	18.50	42.10	46.90	24.60	26.50	14.90	47.40	4.30	1.50
Examination paper Generate	8.50	45.10	48.30	16.70	42.90	45.50	23.10	7.50	5.70	51.70	4.50	0.50
Answer questions Process	12.80	19.70	23.10	27.50	31.60	36.90	30.10	41.70	35.20	29.60	7.00	4.80
Marking Score	9.70	18.90	27.60	11.20	45.70	45.90	28.50	32.60	21.40	50.60	2.80	5.10
Wrong question Browse	2.10	35.90	51.90	5.30	41.80	30.50	4.70	15.90	17.20	87.90	6.40	0.40

the application of online examination in colleges and universities. It can keep relatively stable running state while meeting the demand of tens of thousands of test paper generation. Through the satisfaction survey table in Table 5, we can see that in 2015 without the use of the method, system access speed, paper formation rate, scoring rate, and error browsing satisfaction are very low. Nearly half of the students in the use of online examination service were not satisfied with the service effect. In 2016 and 2017, by using this approach, students' overall satisfaction with online test service has been greatly improved, especially in the wrong topic browsing. It has filled the gap that the original online test service test is unable to restore. The application of the method has been recognized by the majority of teachers and students.

6. SUMMARY

In this paper, a method of fast test paper composition based on random code and random number is studied. Compared with the traditional random selection method, this method has obvious advantages in the efficiency of the test paper generation and the reduction of the test paper, While reducing the server pressure, it increases the number of concurrency of the examination system. And it also solves the problem of inconvenience reduction after examinations. It has filled the gap that the original online test service test is unable to restore, Through the practical application, it can reduce the manpower and material input in online examination process, improve the utilization rate of online examination service, and improve the satisfaction degree of examination process. Thus, it has higher popularization and greater value in use.

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