

A System to Generate Randomly Relocated Questions Using Ready-Made Arrays Instead of Random Functions

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Abstract. In this paper, we proposed a system to generate randomly relocated questions using ready-made arrays instead of random functions in order to reduce the time to make tests. Before making the test set, such as, short-answer questions consisting of terminologies and their meanings, at first some terminology-meaning sets are chosen from database and then either terminologies or meanings are randomly relocated using ready-made instead of random functions. As a result, the relocation using the arrays is faster than one using random functions.

Keywords: distance education, system to generate dynamic tests, automatic selection of question tests

1 Introduction

As spreading computers, Internet, and smart phones, educational application programs using them have been developed for learners and applicants. There are several researches at distance education area. As more computers have been supplied and Internet has propagated rapidly, utilization of computer and internet are positively evaluated[1], and among them the distance education site based on web has been focused in the fields of education[2].

Distance learning education is going to be an alternative education to complement many problems that occur in a traditional education, but the important thing in this education is fair evaluation of the learners' abilities anytime and anywhere. To do fair evaluation, the automatic selection of questions randomly chooses some questions from database with sets of questions in complete form[3,4] but it has the drawback that the positions of choices are fixed for the each question. On the other hand, a dynamic system to generate questions randomly relocate questions and choices for their questions obtained from database[5,6]. The system has an advantage that the positions of questions and choices may be different because of relocation using random functions whenever each applicant takes a test, but it has a drawback that it need lots of relocation time because of random function.

In this paper, we proposed a system to generate randomly relocated questions using ready-made arrays instead of random functions in order to reduce the relocation time.

2 A system to make randomly relocated questions

In a system making randomly relocated question, the system consists of client, server, and database. In the type of test to write down the terminology corresponding with its meaning, the system accepts some terminology-meaning sets from the examiner and then saves them in the database. The process at the server chooses some question-answer sets, relocates either questions or answers, makes question tests and sends them to client. The client enables the applicant to solve the question test. Such a clients and server system including database is shown in Fig. 1.

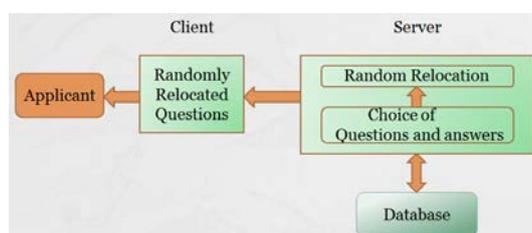


Fig. 1. A system for making randomly relocated questions

3 Algorithm to relocate questions randomly using ready-made arrays

In client-server system making randomly relocated questions, server to test lots of applicants should make lots of question tests with high speed. To reduce the time of making tests, relocation time need to be reduced since the time mainly affects the system. The system had better use the array with random numbers instead of random function to reduce relocation time.

Fig. 2 shows a ready-made array with 10x10 in which the random number is determined arbitrarily. The numbers to generate using the array randomizes less than ones using random function but the former is suitable for relocation of questions because applicants must solve these questions within limited time.

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 2 | 3 | 1 | 4 | 9 | 6 | 8 | 7 | 5 |
| 2 | 0 | 1 | 4 | 3 | 8 | 9 | 6 | 5 | 7 |
| 4 | 3 | 0 | 2 | 1 | 6 | 7 | 5 | 8 | 9 |
| 3 | 1 | 4 | 0 | 2 | 7 | 5 | 9 | 6 | 8 |
| 1 | 4 | 2 | 3 | 0 | 5 | 8 | 7 | 9 | 6 |
| 9 | 6 | 8 | 0 | 2 | 3 | 7 | 5 | 1 | 4 |
| 8 | 9 | 6 | 2 | 0 | 1 | 5 | 7 | 4 | 3 |
| 6 | 7 | 5 | 4 | 3 | 0 | 8 | 9 | 2 | 1 |
| 7 | 5 | 9 | 3 | 1 | 4 | 6 | 8 | 0 | 2 |
| 5 | 8 | 7 | 1 | 4 | 2 | 9 | 6 | 3 | 0 |

Fig. 2. A ready-made array with the size of 10x10

In the phase to make tests in the client-server system, server extracts question-answer set in suitable size, for example, 10 questions, from database randomly and save the questions and answers into question array and answer array, respectively. To relocate the 10 selected questions, the server should first choose one row, for example, the fourth row, as shown in Fig. 3.

4-th row(k=3)

| | | | | | | | | | |
|-----|---|---|---|---|---|---|---|---|---|
| i=0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 3 | 1 | 4 | 0 | 2 | 7 | 5 | 9 | 6 | 8 |

Fig. 3. A single row chosen randomly at ready-made array

In the next phase to relocate, load random number 3 of the 1-st column for i=0 and then move Question 0 at index 0 of the question array into the 4-th position of a new question array. For i=1, load 1 of the 2-nd column and then move Question 1 at index 1 into the 2-nd position of a new question array. In the case of i=2, load 4 of the 3-rd column and then move Question 3 into the 5-th position, and so on, as shown in Fig. 4.

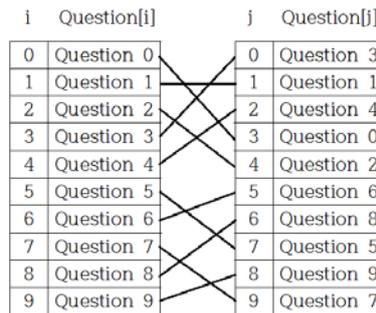


Fig. 4. Random relocation of questions using ready-made array

Algorithm for random relocation questions is the followings:

- [Step 1] Extract question-answer set in suitable size x from database randomly and save the questions and answers into a question array QA and an answer array AA in size x , respectively.
- [Step 2] Load ready-made values into array RA.
- [Step 3] The k -th row is chosen from ready-made array RA using a single random number obtained by a random function.
- [Step 4] Load random number j of the i -th column at the k -th row in RA from $i=0$ to $i= x-1$ one by one and then move the value of the i -th question QA[i] into the j -th position of a new question array QA2[j].
- [Step 5] After making a question test, server sends question test to applicant and answer table to scoring program to check applicant's answers.

4 Implementations and Discussion

The algorithm in previous section is implemented on environments of JSP, apache-tomcat server, and Mysql. Fig. 5 shows the screen to show relocated questions using ready-made array. To compare the relocation time for two cases: one using random function and the other using randomly array relocated array, we execute 4 times for 10000 times loop. The algorithm using randomly array relocated array is about 4.64 times faster than one using random function.

| No | Meaning | Terminology |
|----|---|-----------------------------|
| 1 | A transmission mode in which the communication is unidirectional, as on a one-way street. | Half-duplex mode |
| 2 | Topology in which one long cable acts as a backbone to link all the devices in a network. | Bus topology |
| 3 | The technical advisor to the ISOC. | Internet Architecture Board |
| 4 | A global internet that uses the TCP/IP protocol suit. | Internet |
| 5 | The device that receives the message. | Receiver |
| 6 | The geometric representation of the relationship of all the links and linking to on another. | Topology of a network |
| 7 | The device that sends the data message. | Sender |
| 8 | A working document (a work in progress) with no official status and a six-month lifetime. | Internet draft |
| 9 | A set of rules that govern data communications. | Protocol |
| 10 | A thoroughly tested specification that is useful to and adhered to by those who work with the internet. | Internet standard |

Fig. 5. A screen to show randomly relocated questions using ready-made array

5 Conclusions

In this paper, we have proposed the system to generate randomly relocated questions using ready-made arrays instead of random functions to reduce the relocation. To compare the relocation time, The algorithm using randomly array relocated array is about 4.64 times faster than one using random function.

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