Research Note

A Novel Algorithm for Computer Based Assessment

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Abstract

Student learning outcomes have been evaluated through graded assignments and tests by most paper-based assessment systems. But computer based assessments have the opportunity to improve the efficiency of assessments process. Recently internet is widely used in various areas from banking to trade, from education to entertainment. In this paper, ideas for efficient and fast usage of internet on education have been suggested and applied to implementation of multiple choice examination system. There are two contributions to the science in this paper. The first is the implementation of new software which uses the bandwidth efficiently. The second is to introduce new mechanism for creating question bank.

Keywords: multiple choice examination system, computer based assessments, question production mechanism, question bank, Ajax, Html DOM

1. Introduction

The extensive use of internet, which connects all computers and servers all over the world, has transformed society from "industrial" to so-called "information" society. Today, internet has become an indispensable part of life from banking to commerce and from entertainment to education on many issues. With the use of the internet, distance education that can be done remotely regardless of place is becoming widespread. In addition there is a serious need of machinery and equipment in the laboratory for experimental study at formal education. Moreover, it is impossible to establish a laboratory environment in some areas. This is because visualization of education by using the visual programming techniques has become valuable.

Unfortunately, the widespread use of the internet has brought some limitations. The bandwidth is at the beginning of these limitations. Because, the key technology in the information society is speed and accurate information exchange. Development at the modulation technology is always out-stretch the required bandwidth. This is why the efficient use of available bandwidth in recent academic and commercial applications are crucial.

Measurement and evaluation as a part of the computer-aided education, in other word examination and implementation of question bank connection with examination, and the efficient use of the question bank are issues pending solution from researchers. Questions should be up to date as well as question bank must have greater diversity.

In this contribution, novel multiple choice examination system, which uses available bandwidth efficiently by using recent programming technologies, is introduced. This system also has enhanced question creation mechanism that is developed in this paper. By using introduced question creation mechanism called "SUM" by the authors, creation of the up-to-date and comprehensive examination is made possible.

2. Technical Background

The purpose of this project is to develop multiple choice examination system, which uses internet bandwidth efficiently as well as has dynamic question producing mechanism, by using recent web based programming technologies. As a result, this project has two goals. These are;

• To use internet bandwidth efficiently

• To develop both a question bank and a novel mechanism of which the production of new questions are easy

To reach first goal mentioned above, the Ajax technique conjection with html DOM as well as XHMhtmlRequest. This section gives brief information about new web based technologies by which multiple-choice examination, that efficiently uses available bandwidth, has been developed.

2.1. Ajax

Ajax is a technology developed by. It is only a technique and consists of many technologies. Ajax as a method is an approach which gives ability to user to request from internet browser in an asynchrony manner. In addition partial updates are also possible by using ajax. In the conventional web applications, user requests from browser to bring all page content. When user selects anything from uploaded page or fills a form in that page, server sends whole page again. In ajax technique, when user acts or fills on/in the uploaded page, only selected part will be updated from the server by internet browser (Keith 2007).

2.2. Html DOM

Html DOM is used in ajax method both to dynamically update the page and interactive usage. Thus Html DOM transfers the conventional web page from ordinary to intelligent document. Therefore the document can be

capable of doing more action and presenting the response in the page as well without re-uploading whole page again (Document Object Model 2012).

2.3. XMLHttpRequest

XMLHttpRequet is an interface between web server and internet browser to transfer text or XML information. It is also an application used in web browser script language. To access data is possible in a synchron or asynchron manner by XMLHttpRequest (Wikipedia 2012).

XHMHttpRequest is used to bring data from database or to rewrite data to database at background. XMLHttpRequest is main part of the technology to develop web page by using ajax method. Most of the web pages developed by ajax such as Google Map and facebook use XMLHttpRequest.

3. Multiple Choice Examination

This section gives detail about new Questions production mechanism presented in this paper. After that the database framework of the developed system will be given.

3.1 Question Production Mechanism

To make an exam, question bank is required. Developed system is capable of creation question bank easily. The novel mechanism has shown in Figure 1.

As shown in Figure 1a, it is possible that each question may have multiple text as well as mutable correct answers with many incorrect answers. While questions are being created by developed mechanism, firstly one of the possible question frames is selected, then one of the possible question texts of the frame is chosen, after that one of the correct answers of the frame is chosen, finally desired numbers of incorrect answers of the frame are chosen. Each question is created by using the method explained above. Therefore it is possible to create many different questions even if same frame is used. Moreover order of the questions is different for every candidate. Thus it is almost impossible to cheat.
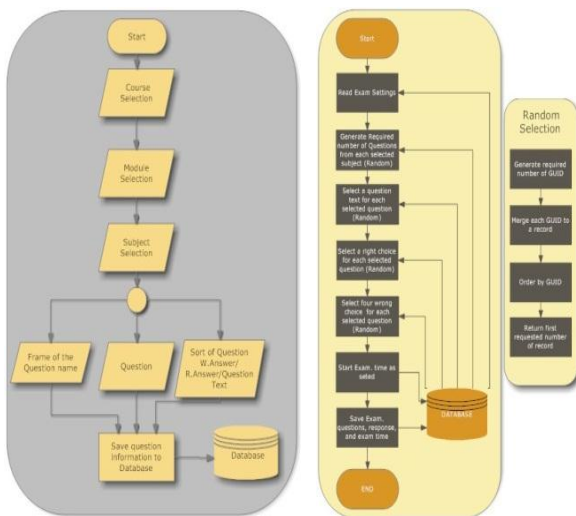

Figure 1. Question Production Mechanism: a- creation of question bank and entering questions, b- creating exam and random question section)

The next step of the mechanism is the creation of question bank. The block diagram of creating of question bank is shown in Figure 1b. As seen from Figure 1b clearly, exam starts by using "start" button. Firstly examination setting is read from database, and then selected number of question is prepared by using "Random Selection" algorithm.

3.2 Feature of the Application

Most important item of the examination is the answers of the students. These must be preserved in case of any problem such as connection lost. To ensure writing answers into database, recording is archived in three ways. These are;

- Record every data as soon as selected by using ajax
- Record all selected data at every time period
- Record all data when "END" button is pressed

Another point is to prevent user from cheating. To this, every student sees all questions in different order. In addition "Hide" button is also available for students to keep away their answers to be seen. In the application, to achieve above features, there are 7 modules are implemented. These are;

- Course process,
- Module process,
- Subject process,
- Question process,
- Examination process,
- Student process,
- Exam evaluation process

3.3. Screen shot of the Application

To enter the system, login name which is student name and password is requires as shown in Figure 2.

Figure 2. Login Screen

If your account has administrator privilige than Figure 3 is appeard.

Figure 3. Administrator Screen

To add course, "Ders Ekle" button is pressed then Figure 4 is shown.

Figure 4. Course addition screen

To delete a course "Ders Sil" button is pressed than Figure 5 is shown by the developed program.

Figure 5. Course deletion screen

To add or delete a module/subject to selected course, "Modül/Konu İşlemleri" bottom must be pressed. To add/delete a subject can be done as sown in Figure 6 .
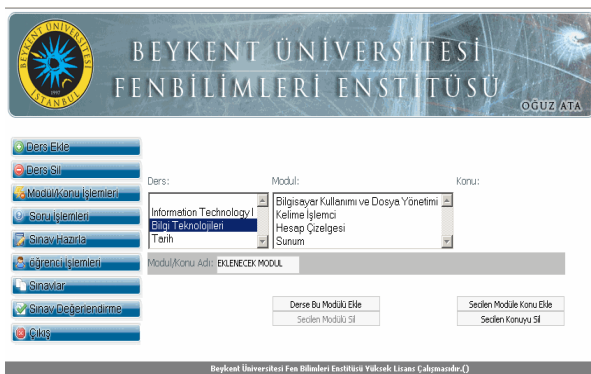

Figure 6. Addition of modure or subjet to selected course

To add/delete a question frame to selected module of the selected course, "Soru İşlemleri" button must be pressed then Figure 7 appears.

It is impossible to shown all modules developed by the authors, therefore only a few number of modules are given in this contribution.
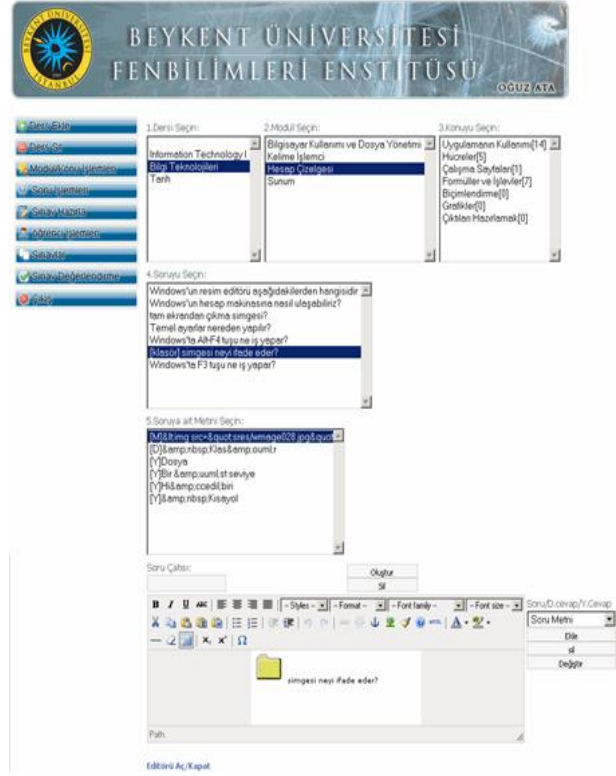

Figure 7. Creation of the questions

4. Conclusion

In this paper, new multiple choice examination system which uses available band width efficiently as well as having new mechanism was presented. Developed program is used at Beykent University and efficiency is approved.

References

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