A Web-Based Learning Quizzes Providing Server

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Abstract
A kind of web-based CAI server system is reported. This system has a database storing teaching materials for quizzes written by teachers or editors via www in support of WebQP and, when accessed from students or learners, sends them pages containing quizzes constructed from the database, making them learn by means of answering the quizzes and reading explanations sent after answered. For each learner and for each quiz, the learner's answer is recorded and used for selecting quizzes hereafter sent. WebQP has now three types of quizzes: word-meaning, single-choice, and answer-writing. After teaching, WebQP serves for teachers to make students review and soon to know how much they learned.

1. Introduction

Internet/Intranet technology is able for us to make a new type of client/server systems. Developing, conserving and updating of this type of system are easier than usual ones because it is necessary only for server-side software to be developed, conserved and updated. Client-side machines are only needed to have web browsers.

Since 1997, we have tried to develop various web-based applications as the university intranet information systems supporting education and researches, working on our web site managed by IIS (Internet Information Server) on a Microsoft Windows NT server and using a database Microsoft Access. They are systems for searching books, for seeking employment, for university bulletin boards and for distributed data-input and automatic publishing of home pages with unified specification such as teaching staff information, syllabuses and so on. They are shown (in Japanese) at the web site of our laboratory URL:

http://anzlabo.elec.kyukyo-u.ac.jp/

On the same web-site environment, a web-based CAI server system called WebQP has been developed. This system stores teaching materials sent from teachers/editors via www from their web browsers into a database, and when accessed from students/learners, the system sends web pages containing quizzes constructed from the database. When the system accepts answers they return, it sends soon pages to know them whether the answers are correct or not and to describe detailed explanations concerned with the quizzes.

In this paper, it is described how the WebQP works for teachers and students/learners via www through their web-browsers.

![Figure 1. WebQP system as a c/s system on the www](image)

2. Outline

The system WebQP is given as two sets of ASP files, HTML page files, image files and so on. One of the sets is for authoring and the other for learning. Namely, the former, Authoring Management Part, makes teachers or editors input teaching materials into the web database through internet/intranet from their web browsers on their machines. The latter, Learning Management Part, makes students or learners learn by solving quizzes written in pages that are generated from the web database and sent to web browsers on their machines. In the web site server, Authoring Management Part is stored in a folder named WebQPM and Learning Management Part is stored in a folder named WebQP.

As a web-site database, we have used Microsoft Access. In the database, there are five kinds of management tables and many data tables called “quiz dictionaries” that contain teaching materials for quizzes.

Thus, in order for authoring, each teacher/editor has
access to Authoring Management Part by the following URL:
http://<URL of the web-site server>/WebQPM/
and sends it quiz materials through a web browser. Then
the system writes the materials to a table of the web-site
database.
On the other hand, each student/learner has access to
Learning Management Part by the following URL:
http://<URL of the web-site server>/WebQP/
and learns by means of responding quizzes derived from
the database.
Functions of Authoring Management Part are
- to register editors/teachers in the system for
  managing them,
- to define quiz tables, to open/close them to learners,
  and to insert items into quiz tables and to update or
  delete them in the tables.
Functions of Learning Management Part are
- To register learners/students for managing them,
- To manage the learning processes,
- And to save learner’s results for analyzing
  afterwards.
The database has the following two kind sets of tables:
a. A set of tables for management such as
   Editors Table
   for registration and management of editors
   Learners Table
   for registration and management of learners
   Dictionaries Table
   for registration and management of quiz
dictionaries
   Process Table
   for management of learning process for each
   learner and for each dictionary.
   Log Table
   for storing each learner’s result.
b. A set of quiz dictionaries defined by editors for each
   branch of learning.

3. Types of quizzes

WebQP has now the following three types of quizzes:
Type 1. For a given sentence and some given words, it
is asked which word has the sentence as its meaning.
Type 2. For a given problem and some given answers, it
is asked which answer is correct.
Type 3. For a given problem and a given text area, it is
requested that a correct answer is written in the text area.
An example of the type 1 quiz page is shown in
Figure 2.
For all quiz pages, the left under part always shows a
learning result until now as shown in Figure 2. Furthermore,
an animation character called MS Agent can appear as shown in Figure 3 if it is requested. This
character speaks various messages in balloon and voice in
accordance with various situations where it is placed.
As shown in Figure 2, the type 1 quiz page has

Figure 2. A type 1 quiz page

Figure 3. MS Agent

Figure 4. A response for the quiz page in Figure 2.

In this page, when one of the words is clicked as the
answer, this information is sent to WebQP. Then WebQP soon returns a web page containing the right answer and detailed explanation as shown in Figure 4. In the upper right part, if the answer is correct, a red round circle appears, or else a red cross does.

An example of the type 2 quiz page is shown in Figure 5. For the page, when an answer is sent to WebQP by clicking one of the words, WebQP soon returns a page such as Figure 6 where it is written whether the answer is correct or not and detailed explanation concerned with the quiz.

As mentioned above, the type 1 and type 2 look the same. The difference between them is how to construct pages from a dictionary, which is explained in detail afterwards.

An example of the type 3 quiz page is shown in Figure 7. In the page, when an answer is written in the text area and then a button “send the answer” is pushed, a content of the text area is sent to WebQP as an answer. WebQP soon returns a page such as Figure 8 where it is written correct solutions and detailed explanation concerned with the problem.

4. Types of quiz dictionaries

According to the three types of quizzes, there are three types in quiz dictionaries (tables). Each type of dictionaries is characterized by what kinds of fields each record of the dictionaries has.

The type 1 has two fields each named “word” and “meaning”.
The type 2 has six fields each named “problem”, “correct sol”, “pseudo sol1”, “pseudo sol2”, “pseudo sol3” and “pseudo sol4”.

The type 3 has six fields as “problem”, “sol1”, “sol2”, “sol3”, “sol4”, and “sol5”.

Furthermore, all the types of quiz dictionaries have fields such as ID, explanation, class, order, evaluation and use.

The “explanation” field contains a detailed explanation that is placed in a page sent after answering as stated above.

The “class” and the “order” field are used for classifying contents of quizzes.

When accessed from a teacher or an editor via www through his/her web browser, WebQPM, Authoring Management Part of the WebQP system, sends to him/her web pages for inputting quiz materials into quiz dictionaries. There are three types in these web pages according to the above-mentioned three types of quiz dictionaries. An example of a web page for input to the type 1 dictionary is shown in Figure 9. When one of words in “registered word” column in the left part of the page is clicked, contents of all fields of the record containing it are shown in the right of the page.

An example of a web page for input to the dictionary of type 2 is shown in Figure 10. Similarly, an example of a web page for input to the dictionary of type 3 is shown in Figure 11.

5. Authoring Management Part

When accessed from an editor/teacher, WebQPM sends him/her a web page introducing to login to Authoring Management Part of the system. When an already registered user writes his/her login name and password and pushes the “send” button, the system returns a page showing matters concerned with the user as in Figure 12.

In the right under part of the page, we have entries going to pages where each specified operation to dictionaries is done. Namely there, an editor creates a new dictionary, opens or closes dictionaries for Learning Management Part or deletes a dictionary.

In the right upper part of the page, there are shown names of quiz dictionaries already created. When one of them is clicked, there appears a title page of the dictionary as shown in Figure 13. In the left column of the page, when any one of words is clicked, we have a page showing fields of the record that represents information of the clicked word as shown in Figure 9, Figure 10 or Figure 11. These pages are used for updating contents of fields representing the word. When a button “registration”
is pushed after changed the contents, they are sent to the system and stored in the dictionary.

![Image of a dictionary and operations]

**Figure 12. A list of dictionaries and operations.**

![Image of a dictionary entry]

**Figure 13. A title page of a type 1 dictionaries.**

In order to add a new item (record) to a dictionary, a menu string “new registration” in the upper side of the left column is clicked. Then we have a page like Figure 9, Figure 10 or Figure 11 except that all areas are blank. When text areas for inputs in the page are written and the “send” button is pushed, they are sent to the system and the words are shown in the left column. There we can write HTML tags. For example, a HTML tag `<HEAD>` is recognized by writing `@<HEAD>@`.

6. Learning Management Part

6.1. Login to Learning Management Part

When a learner accesses WebQP, there appears a login page entering into Learning Management Part. The page draws out a page Figure 14 for selection of branches (theme) to learn. Then the learner is able to arrive at a title page for the selected branch to learn. The page shows the learner's result obtained until previous stage. When a button named “start” is pushed in the page, there appears a quiz page Figure 1, Figure 4 or Figure 6 according to the types of quizzes.

6.2. Learning Management Table

For each learner and for each dictionary, Learning Management Part manages his/her learning process by means of using a table called the learning management table of which main key is a pair of a learner and a dictionary.

![Image of a learning management table]

**Figure 14. A page for selecting a theme to learn.**

A record of the table has fields such as a learner code, a dictionary code, a registered date, a previously used date, times, finished times, use, result, log and so on. For each learner and for each dictionary (branch), times field contains the number of opening the title page of the branch. The finished times fields is initially set 0. When all quizzes derived from the dictionary are solved, there appears a congratulation page, the finished time is increased by one, the learning state is changed to the initial state after storing necessary information such as the learner's result and the learner is called to challenge again.

A “use” field concerned with a learner and a branch is placed a check when the learner starts to learn the branch. When the learner ceases to learn the branch, the check is removed. This is used for inhibiting that one learner processes from two or more web browsers simultaneously the same course.

The content of the “result” field is given by a sequence consisting of numbers 0, 1 or 2 where elements of the sequence and quizzes of the dictionary are associated with each other in one to one manner from the first.
numbers of the sequence is initially set 1. After started to
learn, if an answer for a given quiz is correct, the number
associated with the quiz is decreased, otherwise increased
by one. Any quiz whose associated number in the “result”
field becomes 0 is never sent thereafter to the learner.
However, any quiz whose associated number is not 0 is
sent again until the number becomes 0.
The content of the “log” field is given by a sequence of
numbers 0, 1, …. 9 where elements of the sequence and
quizzes of the dictionary are associated with each other in
one to one manner from the first. Initially the numbers are
all set 0, and when an answer to a quiz is replied and is
not correct, the number associated with the quiz is
increased by one if it is not yet 9. Namely the “log” field
contains for each quiz the number of times that the learner
returns an incorrect answer. When the learner finishes
correctly all quizzes of the dictionary, the content of the
field is copied into the log table and initialized.

6.3. Quiz pages derived from a dictionary

When a learner has an access to the system WebQP
and selects a branch (i.e. dictionary) to learn, the
learning management part of the system contacts to the
dictionary (table) and derives records (items) of which
each value of the “result” field is “0”. Then it makes
quiz pages from the records and sends to the learner.
When the dictionary (table) is the type 1, a pair of a
word and its meaning is randomly extracted from the
record and the meaning is placed in a quiz page at the
problem-written side and the word is put into the
solution group in the page. And then, a few record are
randomly extracted from the dictionary and contents in
the word fields of the records are put into the solution
group. When the dictionary is the type 2 or the type 3, a
quiz page is constructed from only the record extracted.
The order of sending quizzes is globally from the
first to the last in the quiz dictionary. However it is
randomized locally. This is done following a simple
algorithm: For each learner, a small number of records
(quiz materials) are brought at the same time into the
server from a dictionary and the order of the quizzes is
randomized there. They are then sent to the learner one
by one in this order in spite of whether his/her answer
for each quiz is correct or not. After all the quizzes in
the server are sent, the results of the answer are stored
into the associated digits of the state fields and the log
field in the record associated to his/her login name and
currently learning theme in the learning management
table. This process is repeated as long as possible. Each
client machine has thus the different order of a quiz
sequence from ones of its neighboring client machines
although each machine is sent quizzes in order from the
basic to the higher.

7. Remarks

This paper reported that we have been developing
and using a kind of web-based CAI server system that
makes a teacher or an editor input quiz materials via
www to a web-site database and, when a learner or a
student has an access to the server, sends him/her
quizzes composed from the database.
The system offers teachers the following services:
To support to write problems to a database,
To give students problems without papers,
To make them dynamically review after or in
teaching,
And to know how much they learned.
And the system offers students or learners the
following services:
To learn interestingly by means of answering
quizzes and reading detailed explanations sent after
answered.
And to learn at such speed that adapts to each
learner.
As this kind of web-based CAI server system, we
have developed many versions. This paper introduces a
fundamental version for the purpose of being used by a
teacher or a few. In one of the others, there is added a
part for teachers called Teaching Management Parts.
When a teacher has an access to this part, he/she is able
not only to select some from the registered quiz
dictionaries for his/her each teaching class but also to
indicate to use some parts of each selected dictionary.
Thus according to progress of his/her each teaching
class, he/she is able to change the previous selection of
parts in the selected quiz dictionary.

After teaching a class, we have made students in the
class review the lesson by using this system. In process
of successively applying quizzes given by the system,
we expected the students to effectively learn by
carefully reading the explanation sent after answered.
As result, we had been very pleased to find the students
working earnestly with WebQP in spite of enriching the
contents of the lessons.

8. References

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