

Online examination system for Microsoft Office software operations

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Abstract—online examination is an effective solution to the level evaluation problem for computer basic operations. This paper proposed an online examination system for computer basic operations, especially, Microsoft Office software operations. The system mainly achieved functions including making exams intelligently, collecting and marking documents submitted automatically in the exam by the database, socket, ado and VBA program methods. This system supported some kinds of Microsoft Office software including Word, Excel, PowerPoint and Access. The actual running result showed the system could help teachers to improve work efficiency and students to improve software operations by the way of online actual operation in computers. The system has been running in the USTL university computer lab center for some times which has already proved that it was very valid to solve level evaluation problem for Microsoft Office software operations.

Keywords-online; examination; Microsoft Office;VBA

I. INTRODUCTION

The computer network, especially LAN, develops very rapidly now. There is very important influence in the way to teach computer course and will be greater in the future.

To encourage students to do more own learning and get more opportunities to access information from different kinds of sources than other traditional methods mentioned in papers. [1, 2, 3]

There are some assessment methods proposed and software systems developed in the past years. With the new IT appears and develops, some of them have been replaced or improved from the way of paper-and-pencil to the way of LAN-based supported by computers in the recent years.

According the actual situation in USTL, it is very necessary to develop a LAN-based exam system to solve effectively the question of exam evaluation of undergraduate education, especially for the institutions where there are many students who need to study Office software due to requirement of profession training plan.

It is very urgent to design and achieve an exam system which can finish automatic grading of operating questions in OFFICE software of as well as the objective ones. However, exam systems are difficult to deal with functions accurately [4]. Testing the students through the LAN is also one of the most difficult challenges in E-learning, as part of the modern development in the technology of education systems. [5]

LAN-based exam system could be used via intranet for manages student examination [6]. LAN-based evaluation method has been used to provide new learning way to

students and promote them to be closer to the learning goals. In some universities, teachers encourage students to do evaluation by self and let them determine whether they have necessary knowledge and abilities to finish the whole course with very excellent score or better evaluation.

Exam systems has also been applied to evaluate the learning process itself such as some management systems courses, especially in environments with better network devices and terminal devices. By the self-evaluation, students can get some information or feedback about their learning process. Exam systems are very important for teachers and students in the whole process of course teaching.

For the teachers:

(1) Exam papers are made automatically and quickly support by computer selecting exam questions in random from Database. So the teachers are relieved from the works which need much time and energy.

(2) Exam papers are sent, collected, marked automatically according to the need of evaluation in teaching and learning process.

(3) Questions in exam papers are easily added modified, deleted by the technology of Database.

(4) Questions in Database are easily reorganized or selected according to some random method or specially requirement to make some different kinds of exam papers for different students or different exam level.

For the students:

(1) Students can finish exam tests in anytime.

(2) Students can finish exam tests in anywhere.

(3) Students can finish exam tests in stress-free environment without invigilating because that adjacent students use different kinds of exam papers with the same difficulty level.

(4) Students can finish exam tests in a simple personal computer.

II. SYSTEM FUNCTIONS AND ARCHITECTURE

The LAN-based exam system has achieved some functions including automatic paper-making, automatic paper-selecting, automatic grading, automatic exam-archiving, and exam administration. The questions in exam papers selected are to get learning outcome of students for the courses objectively. So it is very important to judge and evaluate the students' answers objectively and accurately according to the standard answers in the questions Database.

The typical questions include document typesetting in Word, cell computing in Excel, presentation design in

PowerPoint and database design in Access etc. This system is built based on Microsoft's technology mainly including SQL Server as database, VB as programming language, VBA as Office program technology. The system mainly includes four modules: exam paper-making module, exam monitoring module, exam grading module and examination engine module. The system architecture uses three-tier Client/Server technology including Database server, Exam server, and Client application. The system architecture is described as Fig.1:

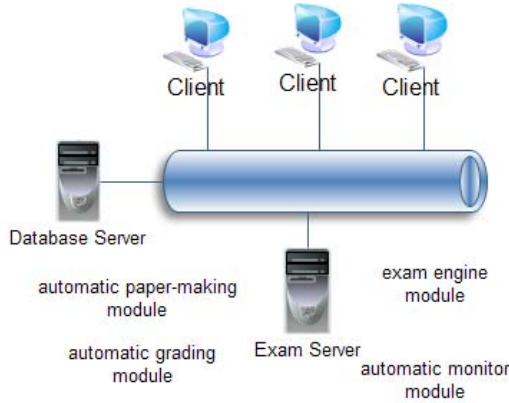


Figure 1. System architecture.

III. MAKING PAPER STRATEGY

A paper has its particular constraints, if it can't satisfy these constraints, the paper will not be a qualified paper not to evaluate students objectively. Some symbol definitions are shown as:

- Q_i*: No. i question.
- Q_{ij}: No. j property of No. I question
- Q*₁: serial number property of question
- Q*₂: score property of question
- Q*₃: time property of question
- Q*₄: type property of question
- Q*₅: difficulty property of question
- Q*₆: division degree property of question
- Q*_n: No. n property of question

These constraints and their mathematical models are simply summarized:

(1) Question uniqueness constraint. For a paper tow questions are not same and should be distinguished by question serial number.

$$\bigcap_{i=1}^m Q_{i1} \notin \{Q_{11}, Q_{21}, \dots, Q_{m1}\} - \{Q_{i1}\} \quad (1)$$

(2) Paper total score constraint. The sum of all questions score of a paper should be equal to the specified score, typically 100 points. Each question score can be statically assigned can also be dynamically assigned.

$$\sum_{i=1}^m Q_{i2} = SC, SC(score) \quad (2)$$

(3) Paper exam time constraint. The sum of estimated time of all questions should be equal to the specified exam time,

typically the general difference of not more than 5%. Estimated time of each question is proportional to its difficulty.

$$\sum_{i=1}^m Q_{i3} = T, T(time) \quad (3)$$

(4) Question type distribution constraint. The number of question type in a paper should to in accord with set given by instructor.

$$\sum_{i=1}^m C_i Q_{i4} = QT, QT(question\ type) \quad (4)$$

$$C_i = \begin{cases} 1, & Q_{i4} = QT \\ 0, & Q_{i4} \neq QT \end{cases} \quad (5)$$

(5) Question difficulty distribution constraint. The difficulty of a paper should be in accord with set given by instructor.

$$\sum_{i=1}^m Q_{i2} Q_{i5} / SC = AS(Average\ Score) \quad (6)$$

(6) Distinguishing degree constraint. Questions distinguishing degree should be accord with set given by instructor. The constraint indicates whether the problem can distinguish the students mastering knowledge in different levels.

$$\sum_{i=1}^m C_i Q_{i6} = QD(Question\ Division) \quad (7)$$

$$C_i = \begin{cases} 1, & Q_{i6} = QD \\ 0, & Q_{i6} \neq QD \end{cases} \quad (8)$$

IV. GRADING OFFICE OPERATION

The Visual Basic for Applications® (VBA) Programming Language is used to program codes which can be imbedded in other applications as a macro language and build conjunction with other applications in the same host such as Word, Excel, PowerPoint and Access. So an application can use the VBA language to program codes to access data or control function in other host applications.

There are three steps to finish automatic grading of Office software operation:

(1) Use VBA technology to open the documents edited by students, and find some properties of some objects according to different question type. In some cases, need to finish computing based on the above properties.

A. For example in Word

Judge whether font colour of n line in m paragraph is red:
Word.Application.Documents(1).Paragraphs(m).Range.Select

```
Selection.HomeKey
Selection.MoveDown unit:=wdLine, Count:=n - 1
Selection.HomeKey
Selection.EndKey unit:=wdLine, Extend:=wdExtend
if Asc(Right(Selection.Text, 1)) = 13 then
```

```

        Selection.MoveLeft unit:=wdCharacter, Count:=1,
Extend:=wdExtend
    end if
    if Word.Application.Selection.Font.Color= wdColorRed
then
    .....
    end if.

```

B. For example in Excel

```

Judge whether "XY" cell formula type is SUM.
Excel.Application.Workbooks(1).Sheets(1).Select
Excel.Application.Range(x:y)
if InStr(1, Excel.Application..Formula, "=SUM",
vbTextCompare) = 0 then
.....
end if

```

C. For example in PowerPoint

```

Judge whether layout type of n slide is "layouttitle":
PowerPoint.Application.Presentations(1).Slides(n).Select
if
PowerPoint.Application.ActiveWindow.Selection.SlideRange
e.Layout= ppLayoutTitle then
.....
end if

```

D. For example in Access

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Get table structure named of "tablename" including type,
name and size of each column:
With ADOX.Catalog.Tables(tablename)
For i = 0 To .Columns.Count - 1
...
.Columns(i).Type
.Columns(i).name
.Columns(i).DefinedSize
.....
Next i

```

(2) Use "execute" function of ADO connection object to execute "insert" SQL statement to upload some properties or computing result as answers to database. ADO objects mainly include connection object, command object, recordset object, and parameter object.

(3) Compare the answers of students with the answers of questions according to question serial number and compute sum of correct answers score as the final grade of students.

V. SYSTEM EVALUATIONS

In order to evaluate whether exam system can improve teaching of instructors and increase scores of students, use the application three times at three different months for about 40 students from one class selected at random. The exam system provides score of every student, average score of every question. The instructors can analyze the above scores and find what kind of knowledge points about questions answered badly and adjust the teaching methods. The students can also find what kind of knowledge points not studied well and enhance studying of such knowledge points.

The average scores are shown as Fig.2 according to the classification of Word, Excel, and Access and PowerPoint operations. Word, Excel, PowerPoint and Access are each 25 points.

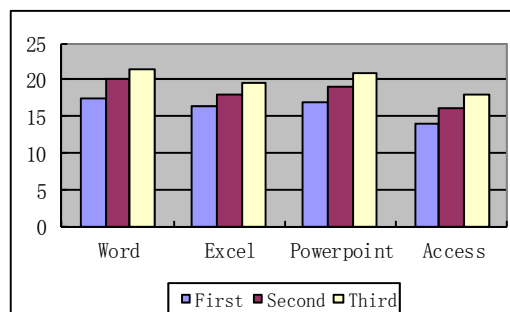


Figure 2. Average scores of three evaluations.

From the Fig.2, the average scores of every software increase and Word is the same as PowerPoint in difficulty while Access is the most difficulty, Excel is the medium, Word and PowerPoint are the easiest.

In order to evaluate system in bigger scale, use the application for about 3000 students from more than 20 classes in college computer basic course exam. The students fill a survey after evaluation in order to get their feedbacks about the application and analyze possible improvements. Summarize the comparison between examination by paper with pen and online examination by actual operations in computers shown as Table I.

Table I. Paper And Online Examination.

	Paper	Online
paper-making method	person	computer
paper-making numbers	generally 2	no limited
paper-making speed	slow	fast
paper-making rationality	instructor experience	algorithm
paper-making modification	difficult	easy
paper selection	designated	random
answer-making method	write with pen	online operation
examination monitor	person only	computer
examination scale	small	big
answer document collection	person	computer
paper-grading method	person	computer
paper-grading speed	very slow	very fast
paper-grading accuracy	perhaps	impossible
score report generation	person	computer
paper problem analysis	difficult	easy
paper score analysis	difficult	easy
examination recycle	long	short
personal work load	very big	very small
personal work efficiency	very low	very high
self-study support	no	yes

VI. CONCLUSIONS

It is proved that the self-evaluation application can evaluate knowledge level of the students objectively and accurately and improve the teaching process. Most students think that the application is very useful for them and that they intend to use it if it is available. Not only teachers teaching computer science courses support to use the application, but also other teachers can also understand the

benefit of using the application. In the future, more exams would use this form.

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