The Design and Implementation of Intelligent Assessment Management System

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Outlines

• Introduction
• System Design
• System implementation
• Conclusions
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Introduction (1/3)

• Online education has become one of the popular subjects in higher education research and application.

• Typical online learning systems existing are based on web-based system and these systems are usually comprised of some functional subsystems.
  – Such as Web Course System, Online Q&A (Question and Answer) System, online Testing System.
However, typical online learning systems have some disadvantages listed below.

- Learning activities are mainly through **virtual interactions and environments**.
- It is hard to **confirm the personal identification** effectively, and monitor students’ activities during the exam.
- Students’ learning results which generated from the typical online learning system are **lack of the correctness and the fairness**, and a great deal of data accumulated during the teaching and learning process have not been made full use.
• In the paper, we propose a system that aimed to the practice of current summative examination. The new system provides a hybrid structure for integrating virtual online assessment management system and in-classroom examinations.
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Design Concepts

• To improve the fairness and effectiveness of assessment, and provide personalized remedial education to the student
  – Confirm the personal identification effectively
  – Reduce the possibility of violating the exam regulations
  – Use the assessment management tools that are handy to operate and can be processed in time

• We apply the following objects to design our system
  – i-Tag (Intelligent tag) : for location management
  – Digital certificate and signature: for identity authentication
  – Personalized exam and question items : for reducing cheat
  – Invigilator APP : for double check the examinees’ identity
Features

• Intelligent Assessment Management System (IAMS) has the following features:
  – Comprehensive and integrated framework
  – Adaptive evaluation module for students and invigilators
Comprehensive and integrated framework

• “Comprehensive” means
  – different technologies and applications
  – NFC-enabled tablet, digital certificate and signature technique, NFC technology and various management APPs for better performance in the IAMS.

• “Integrated” means
  – system gets information from students, course instructors and invigilators during the assessment time.
Adaptive evaluation module for students and invigilators

- The IAMS gets meaningful data
  - **static information**
    - Ex: exam result
  - **dynamic information**
    - Ex: users’ behavior and actions in the assessment time.
System Design

Relationship between managed objects

Users
- Course Instructors
- Students
- Invigilators
- Examination Space Managers

Links
- i-Tag
- Digital Certificate
- Digital Signature

Resources
- Examination Space
- Examination Seat
- Assessment
Application Context

System Design

Assessment Management APP

Qualified Examination Rooms

i-Tag (NFC Tag)

Invigilator APP

NFC-enabled tablet

Student APP

qualified examination room
System Architecture of IAMS

System Design

Intelligent Assessment Management System

- Assessment Management APP
- Student APP
- Invigilator APP

Intelligent Assessment Management Framework

- Location Management Module
- Authentication Module
- Assessment Management Module
- Examination Space Management Module

Database

Course Instructor Assessment Manage

Examination Activities

ITLab

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System Components (1/3)

Assessment Management APP
Student APP
Invigilator APP

Intelligent Assessment Management System

Intelligent Assessment Management Framework

Location Management Module
Authentication Module
Assessment Management Module
Examination Space Management Module
System Components (2/3)

• Examination Space Management Module
  – Arranges available examination time, rooms and seats
  – Corresponds i-Tags of each room and seat

• Authentication Module
  – Provides services for user login, verification of digital certificate and signature, and user profile management.
System Components (3/3)

• Assessment Management Module
  – provides functions of question bank establishment, test developing, test grading, and results analysis and feedback.

• Location Management Module
  – Provides information of user location and related location records.
System workflow

**Exam Space Configuration**
- Configure i-Tag of examination rooms
- Allot i-Tag of examination seats

**Arrange Exam Affairs**
- Develop test items of different courses
- Arrange affairs of examination

**Proceed Examinations**
- Students choose any one of examination rooms to take test
- Invigilators check student identification and report violations during the exam
- Course instructors monitor test information of their courses

**Follow-up Activities**
- Calculate test score
- Gather statistics and analysis of effectiveness of learning and teaching
- Provide resources of remedial learning
Examination space configuration

- Examination space managers need to use Exam space management APP to configure the exam space.
Exam space management
Arrange examination activity

- Course instructors use Assessment Management APP to arrange information and questions of the exam.
Workflow of add a new exam activity

1. Add New Exam Activity
2. Set up Exam Info
   - Set up Questions
     - Scope and Partition
   - Manual Selection
   - Random Selection
   - Set up Exam Parameters of Time and Location
3. Submit New Exam Activity
4. Assessment Management Module

Course Instructor
Add a new exam activity
Workflow of adding new questions

Figure 12. Workflow for Adding New Questions

System Implementation
Adding new questions

An _____ a day keeps the doctor away.
Proceeding Examinations

- Students use Student APP to log in the system and start to exam.
- Invigilators use Invigilator APP to check the identity of the examinee and report the violation if needed.
- Course instructor uses Assessment Management APP to get real-time information of the course student.

System Implementation
Workflow of students participate exam
Student choose his digital certificate
System Implementation

Student login to use digital certificate
Start the exam
Invigilator identify examinee
Invigilator report exam violation
Course instructor gets real-time info of the examinees
Follow-up Activities

- **Course instructors**
  - Use Assessment Management App to do online check
  - System provides the statistics and analysis information of answers to the instructors
  - The statistics information help instructors to modify the teaching activities and provide remedial learning.

- **Students**
  - Get personal exam grade and all correct answer of the exam.
  - Remedial resource will be provided to the student automatically.
Statistics of the exam result

Quiz Maker - 作答情況

三角形的內角和是多少？
- 120°: 0
- 180°: 8
- 270°: 1
- 360°: 2

以下哪些選項中的三邊邊長可以構成直角三角形？
- 2cm, 3cm, 4cm: V
- 3cm, 4cm, 5cm: V, V
- 8cm, 15cm, 17cm: V, V
- 5cm, 12cm, 13cm: V, V
- 20cm, 21cm, 29cm: V, V
- 17 3

1/2+(1/3+2/3)+1/4+2/4+3/4)+...+(1/12+2/12+...+11/12)=?
- 33: 7
- 20: 2
- 沒有作答: 2
Remedial material in Student app
• Introduction
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Conclusions

• The paper proposed a hybrid structure that integrates both advantages of digital and traditional assessments and also guarantees fairness.

• The IAMS system can improve the effectiveness of assessment, and instructor can recognize each student’s needs more accurately and providing personalized remedial education.
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Near Field Communication (NFC)

- NFC is a non-contact short-distance transmission technology evolved from radio frequency radio (RFID) technology. NFC technology is developed by Sony and Philips. NFC currently meet the international standards (ISO 180921, ECMA 3402 and the ISO 14443).

- NFC features:
  - The frequency that NFC used is 13.56MHz.
  - The transmission distance for NFC is only 10cm.
  - Low power consumption
  - Connect to a device once a time
  - High confidentiality and security.
A wide range of applications

- Micro payment
- e-Ticket
- NFC
- LBS service
- Education
- Authentication

Examples:
- Google Wallet
- Foursquare
- ITLab
IAMS Workflow (1/5)

• **Phase 1: Examination Space Configuration**
  – Available and administrable examination room should be configured before examination.
  
  – Examination Room Managers configure i-Tags in each examination room and seat.
Phase 2: Arranging related affairs of examination

- After allotting available and administrable rooms, course instructors can generate an exam using IAMS.

- Course instructors decide the scope and questions of the exam to generate an exam, then choose available examination time and rooms to reserve the exam event.
• Phase 3: Proceeding examinations
  – Students:
    • During examination period, students can choose any of available examination room and seat to take an exam.
    • After induct the i-Tag of the seat, students’ identity are checked using digital certificate.
    • Students’ answers will be signed with digital signature and upload to the system after finishing the examination.
IAMS Workflow (4/5)

• Phase 3: Proceeding examinations
  – Invigilators:
    • Responsible for keeping fairness and stability of the examination
    • Verify students’ identification and personal information, and return verified results to the system
    • Report violation of exam regulation
  – course instructors:
    • Inquire the location of the student taking the course exam.
Phase 4: Follow-up activities after the exam

- When examinations come to the end of the stage, course instructors can use IAMS to do online checking (if necessary).

- Students attending the exam can get personal grade and all correct answer of this exam for remedial education.