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ACATMS An Overall Solution for Educational Management in Institutes and Universities

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Abstract

In this paper, we present an educational management model for applying in large scale universities. Students' information files will be managed from their entering university until their graduation. Biometrics technology is used to identify and record the time students check in and check out the class room. The list of eligible students for examination will be generated automatically according to total attending time reported by the system. The exam questions will be generated based on questions bank and list of eligible students. Imaging recognition is used to evaluate the answer sheets and results will be published on our website. We named the system ACATMS. Finally, we describe some initial results and our future work.

Introduction

With the rapid growth of educational institutes and universities in both quantity and quality, the amount of information which need to be processed and managed increases dramatically. The most important factor which contributes to the success of educational institutes or universities is the process of control and management, especially in large scale and complex educational systems. However, most existing institutes and universities in Vietnam have applied information technology in management at low level. Therefore, departments of each institute need many staff to process large amounts of work which cost much time with file-based or even paper-based documents.

Currently, there is no perfect solution that merges discrete educational information of different sections at universities. Each portion of information is collected and processed separately. The students' information files are inputted when students enter the university by the training bureau. The files are subsequently sent to the appropriates departments via email attachments or file copy. The attending class time of students is recorded manually. Every study session, one of the inspectors goes to every class to deliver notes for students to write their names, collect the notes and summarize the total hours the students take part in class at the end of each semesters. This boring work costs much time as well as manpower and is not accurate in recording the total real time students take part in class. The lists of eligible students for examination are created manually by training staff based only on the students' status of paying tuition. After examinations are held, teachers have to evaluate the answer sheets manually and submit the results to the training bureau to summarize and send to the students. At the end of academic year, we have to take a summary of the teaching hours for every teacher. This work costs much time and is done by all teachers. Each teacher

spends several business days for reminding, listing and calculating total teaching hours. The results which are not accurate, are collected and sent to the training bureau.

In this paper, we propose an efficient management system called ACATMS (*Auto Control And Training Management System*) which has been applied for testing and evaluating the training programs of HOU and the International Joint Training Program HUT - Genetic Singapore. The system manages all students' information from the time they enter the university until their graduation. Information is centrally stored and shared for all departments to mine and process. In order to enhance the control of students' study time, the system uses fingerprint recognition to record the attending class time of students according to the timetable. Evaluating answer sheets is conducted by of imaging recognition. This will be presented in another paper. In addition, ACATMS can exchange data with the E-learning system of HOU (*E-HOU*) by importing and exporting data. By testing and evaluating this system, we have proved that the proposed system, ACATMS, can help educational institutes and universities operate more effectively by improving the time consumed and the quality of work at an acceptable price. The system was designed and developed based on experiences of professors and educational mangers who have been doing for many years; therefore, it will be suitable for using ACATMS in a lot of educational centers and universities.

System Model

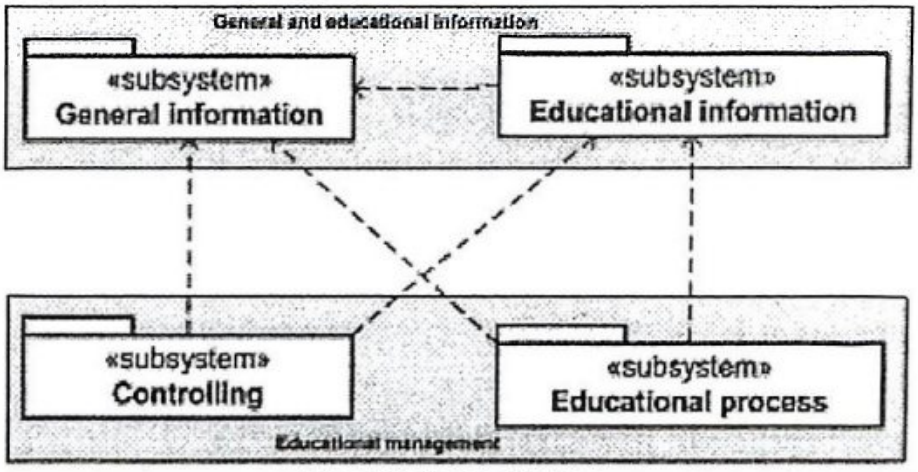


Figure 1: System architecture

A. System Architecture

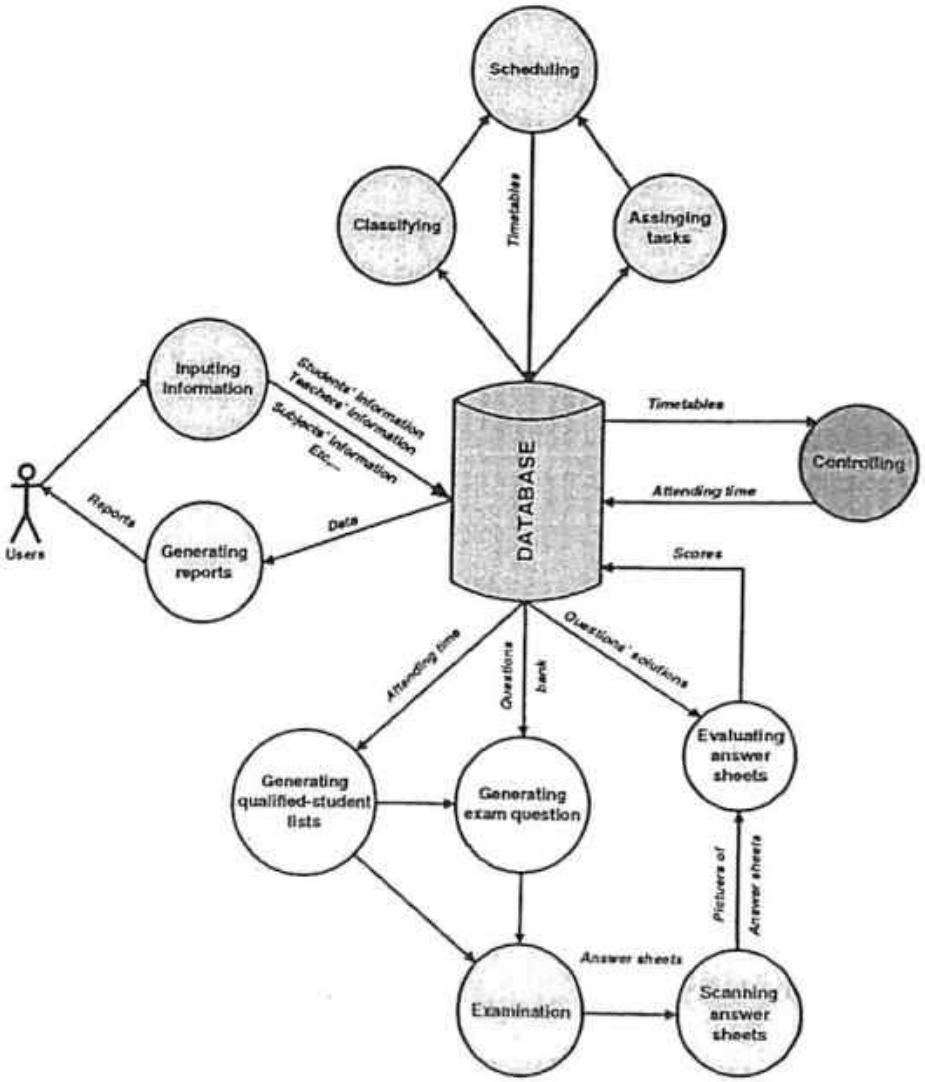
The ACATMS consists of four subsystems classified into two groups. The General information subsystem and Educational information subsystem are in the group of general and educational information, the Controlling subsystem and the Educational subsystem are in the group of Educational management. Each subsystem includes related functions supporting the overall operation of the system. The first subsystem, General information, covers functions related to managing static information which rarely changes during the operation (e.g.: students' and teachers' information,). The educational information includes functions that help managers in classifying students into classes, managing schedules, making reports and statistics, etc, Based on student's information and schedule, the controlling subsystem authenticates students and teachers, controls the gates and recording time getting in/out of classes. The last, educational process subsystem, helps the staff create a list of eligible students for examination, generating exam questions and evaluating answer sheets.

B. *Process of Operation*

At the beginning of every school year, student information files are collected and stored in the database. After classifying students into classes, the training staff arrange schedules and save these in the database. The information of schedules and classes is used to authenticate teachers as well as students at the beginning of each session and control the state of gates in order to allow or deny students to enter to class. At the end of every semester, total attendance time of students and some other criteria (such as tuition fee, assignments, etc) are used to generate a list of eligible students for examination. Questions bank is inputted directly from teachers or imported from available materials in an appropriate format. Sets of questions for each examination session will be selected randomly from the questions bank. All students who take part in one subject will have the same set of questions with different order in questions as well as in choices of each question. After examination, answer sheets will be automatically scanned into images in accurate resolution. Based on the solution of questions in the questions bank, images of answer sheets will be evaluated automatically and the number of correct answers will be converted into a scale from 0 to 100 (this scale can be customized by changing system parameters). Reports of mark will be generated by subject for each class. There may be some subjects that students study remotely over internet. The attendance time of students who study these subjects is recorded by E-HOU system (an e-learning system of HOU) through login/logout operation on the official web site of E-HOU and being sent to ACATMS. After finishing the examination of all subjects, ACATMS will generate and export result to E-HOU in order to be published on the web site for students to get their results as soon as possible. In the end of every academic year, reports of total teaching hours of all

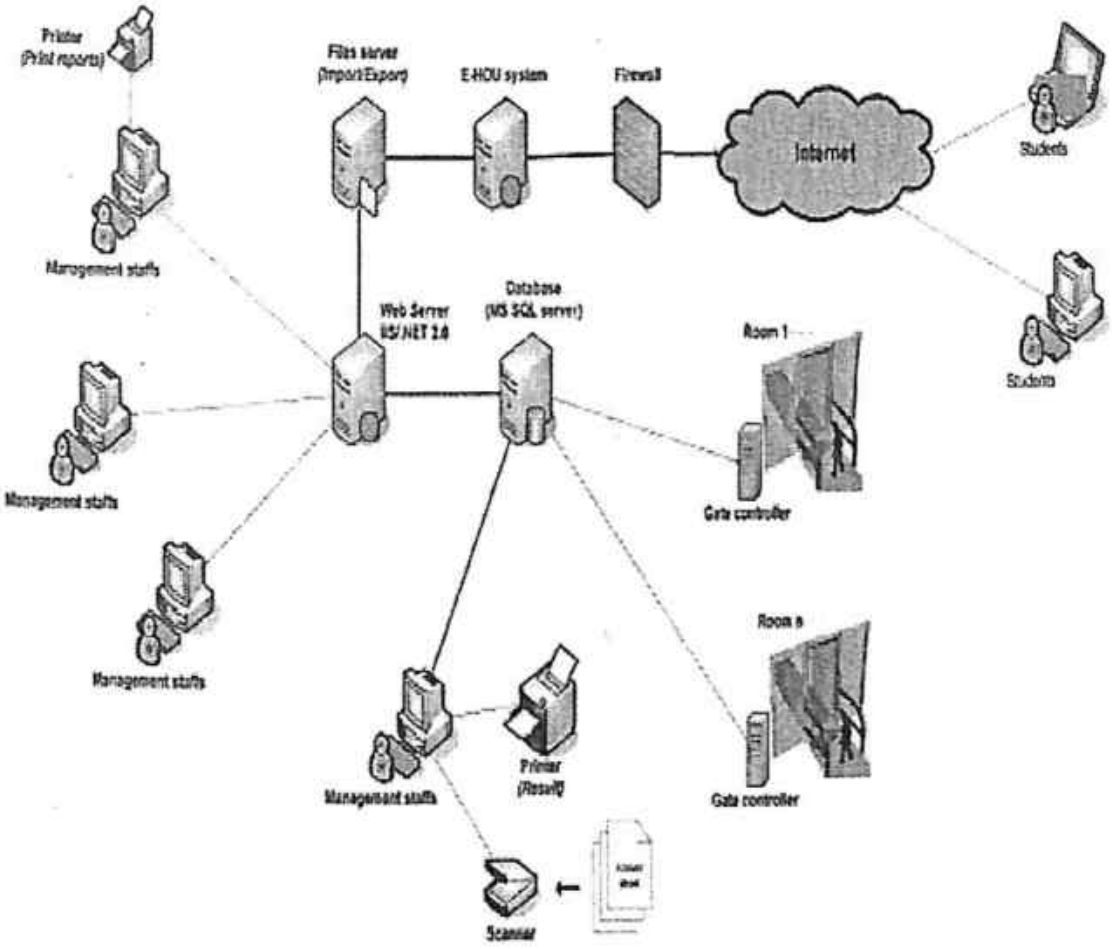
teachers will be generated automatically with all relevant information, such as required minimum hours, percentage of overload hours, number of sessions each teacher was absent, etc... In addition, reports of questions used in the examination will be generated with difficulty-level analysis.

When an academic year ends, his or her reports of time hours of every teacher are automatically generated based on his or her teaching time which was recorded when the teacher got in or out of class.



Process of operation

IMPLEMENTATION AND BENCHMARK



Deployment diagram

The ACATMS system has been deployed for testing at the International Joint Training Program HUT-Genetic Singapore as shown in the figure above. Required environment for deploying includes one server which will host database and website of ACATMS, a secured network infrastructure, some staff PCs, a PC used for scanning answer sheets, PCs used for controlling gates, a scanner with document feeder. The following table will list the configuration of each item.

Item	Configuration	Description
Database server Web server	Pentium D 3.2GHz/4M cache/ 2GB DDR/ 160GB HDD SATA Windows 2003 server SQL server 200	Web site and Database server
PCs	Pentium III 800MHz/512Kb cache/256 DRAM/30GB HDDWindows XP professional SP2IE6, Office XP,	Minimum configuration for staffs' uses
Scanner	Document Handling: Sheet fed, 50 Sheet Auto Document Feeder Resolution: 600 dpi x 600 Optical Maximum Scan Size: 11" X 17" Bit Depth: 24-bit Color, 8-bit Grayscale Color Scanning Speed: 10 ppm, 20 ipm Grayscale Scanning Speed: 20 ppm, 40 ipm Connectivity: 1 USB 2.0 and 1 SCSI-II	Canon DR2050C
Gate controller	Pentium IV 1.3GHz/1MB cache/256 DRAM/20GB HDDWindows XP professional SP2IE6, Office XP,	
Printers	HP1100	Print reports

In the testing period, information of all students including finger print templates is inputted and stored in the system's database. A 30-students class was chosen for testing the auto control subsystem, another class with the same size was tested with traditional methods. The following tables show the comparison between ACATMS and the old method.

Task	Old method	ACATMS	Unit
Recording Time	15	5	Minutes/session/class
Summary time	30	0.2	minutes per class
Generate list of	40	0.2	minutes per class
eligible students			
Accuracy	20	99	%
Manpower	1	0	Staff(s)/session/class

The evaluating answer sheets was used for the subject of "Object oriented design". The question set contains 30 multi-choice questions. The total number of students who took part in tests was 480 in 12 classes. The following table shows ACATMS in comparison with manual evaluating.

Task	Manually	ACATMS
Total time of evaluating &	24 hours	20 minutes
convert scores	(3 business day)	(include scanning time)
Creating Report time	10 minutes/class	1 minutes for all class
Manpower	6 teachers	1 staff
Accuracy	80%	100%

Calculating total teaching hours of each teacher.

Task	Manually	ACATMS	Unit
Total teaching hours	100-120	05	Minutes
Manpower	Every teacher	1 staff	per teacher

Conclusions and Future Work

This paper has discussed several aspects of designing and implementation of an Auto Control And Training Management System. The main result of this project is an overall solution for educational management in institutes and universities including systematical management of all information related to the training organization. In this system, we successfully integrate biometrics based identification – finger prints recognition – in controlling and recording class-attending time of students and automatically generating eligible students lists for examination as well as automatically evaluate the answer-sheets by image recognition; solving the unsystematic management at universities; evaluating the performance of the system. The issues addressed in this paper would be useful for developing similar systems.

We are continuing to develop and upgrade the system that will target the following goals:

- Develop an embedded system which will be applied to prevent substitution in examination rooms.
- Design and develop answer-sheets for evaluating both multi-choice questions and written questions in the same exam session.
- Add more conditions to generate lists of eligible students such as tuition, assignments, etc...
- Support multi answer sheet formats.
- Find solution for evaluating answer sheets in failure.

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