

# Design and Implementation of the Recording Processing Supporting System using RFID

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**Abstract**— RFID technology is one of the verification technology that use radio frequency. Use and study of RFID are on the increase because RFID is a one of main technologies in ubiquitous. In this paper, we address to develop a Record Processing System using RFID. The purpose of this paper is improvement of accuracy and efficiency on Record Processing System by applying RFID. Later, this paper will be able to help to establish of u-Campus.

**Index Terms**— RFID Reader API, RFID Middleware, EPCIS, RFID Network

## I. INTRODUCTION

WE are currently heading toward a ubiquitous society where information is communicated in real time. With the addition of location recognition, the information society in which we live is becoming intelligent and connected by networks, anytime and anywhere. Radio Frequency Identification (RFID), an automatic recognition technology, is regarded as key in achieving a ubiquitous society[1]. RFID technology involves the use of a tag containing object information attached to an object. Object information is retrieved by radio frequency to serve a user[2].

This study is organized as follows. Chapter 2, Related Studies, deals with knowledge necessary for the realization of an RFID system, focusing on middleware. Chapter 3 describes RFID-based system design and composition to support automatic recordation of student attendance, showing the system's diagram and components and illustrating them with a scenario. Chapter 4 examines a real setting environment and the experimental results. Finally, Chapter 5 provides conclusions and suggests objectives for future studies.

## II. RELATED STUDIES

### 1) RFID Reader API

The RFID reader API (Application Program Interface) is a language or a library in the form of messages to be used for communication between the RFID reader and an

application program or between upper-level systems[3].

### 2) RFID Middleware

RFID middleware exists between the reader and the upper-level system to overcome inoperability between disparate RFID reader systems and to enable en bloc communication with the upper-level system.

Middleware is software that supports and manages the reader and gathers and filters data from the disparate readers to send them to the application system[4].

### 3) EPCIS

Electronic Product Code Information Services (EPCIS) is a business standard interface for sharing EPC data and information among businesses that are gathered using RFID. Past to present product information from EPCIS data is captured, managed, and provided in Physical Markup Language (PML), if requested or queried, for the production of the information[5].

### 4) RFID Network

An RFID network is a directory system to pool information for the management of an RFID system, providing the necessary service using a business's own information server. Using an RFID network, the memory limitations of an RFID tag can be overcome and economic, fast, and real-time recordation of information is possible[6].

## III. RFID-BASED DESIGN OF GRADE PROCESSING SYSTEM PROVIDING AUTOMATIC RECORDATION OF ATTENDANCE

### 1) Diagram and Operation of the Suggested System

This study adapted the existing RFID staff management and gate monitoring system to a school system for the purpose of student management, attendance recordation, and grade management. The design of the system consists of an RFID component to process RFID attendance and an application processing component to process grades after receiving attendance information.

The RFID system consists of an RFID tag and reader, middleware and application program, and a server. Figure 1 is a diagram showing the suggested grade processing application system using RFID attendance.

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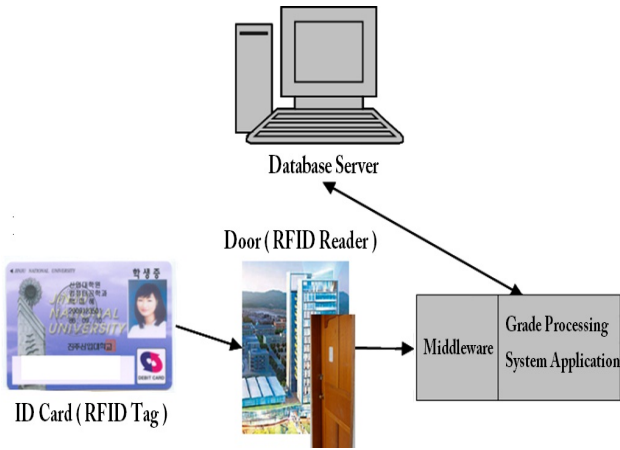


Fig. 1. Configurations of Record Management System

2) Database Design and ER Diagram

The database is comprised of student, class, professor, grade, and attendance tables. The tag contains personal information about the students in the table. Attendance table is recorded when the reader retrieves tag information, and the grade management system uses all the tables.

Figure 2 shows the suggested system’s five database tables: class, professor, grade, attendance, and year of the class tables. Figure 3 shows a table’s ER diagram indicating the relationships between the tables.

Figure 4 shows the data flow; a tag recognizes student information once a student enters and records attendance information to the database so that an administrator can check and manage the status and the professor can process grades after logging on to the grade processing system.

Class Table			
Column Name	Data Type	Allow Nulls	
LectureNumber	int		<input type="checkbox"/>
LectureName	char(20)		<input checked="" type="checkbox"/>
ProfessorNumber	int		<input type="checkbox"/>
LectureClass	char(20)		<input checked="" type="checkbox"/>
LecturePoint	int		<input checked="" type="checkbox"/>
CompletionClass	char(20)		<input checked="" type="checkbox"/>

Professor Table			
Column Name	Data Type	Allow Nulls	
ProfessorNumber	int		<input type="checkbox"/>
ProfessorName	char(10)		<input checked="" type="checkbox"/>
Major	char(20)		<input checked="" type="checkbox"/>

Student			
Column Name	Data Type	Allow Nulls	
StudentNumber	int		<input type="checkbox"/>
StudentName	char(10)		<input checked="" type="checkbox"/>
Grade	int		<input checked="" type="checkbox"/>
Major	char(20)		<input checked="" type="checkbox"/>

Attendance Table			
Column Name	Data Type	Allow Nulls	
LectureNumber	int		<input type="checkbox"/>
StudentNumber	int		<input type="checkbox"/>
Week	int		<input type="checkbox"/>
Attendance	int		<input checked="" type="checkbox"/>

Grade Table			
Column Name	Data Type	Allow Nulls	
LectureNumber	int		<input type="checkbox"/>
StudentNumber	int		<input type="checkbox"/>
MiddleExamine	int		<input checked="" type="checkbox"/>
EndExamine	int		<input checked="" type="checkbox"/>
Report	int		<input checked="" type="checkbox"/>
Attitude	int		<input checked="" type="checkbox"/>
Attendance	int		<input checked="" type="checkbox"/>
Others	int		<input checked="" type="checkbox"/>
TotalLectureTime	int		<input checked="" type="checkbox"/>
TotalofMarks	int		<input checked="" type="checkbox"/>
Grade	char(10)		<input type="checkbox"/>

Fig. 2. Database Table

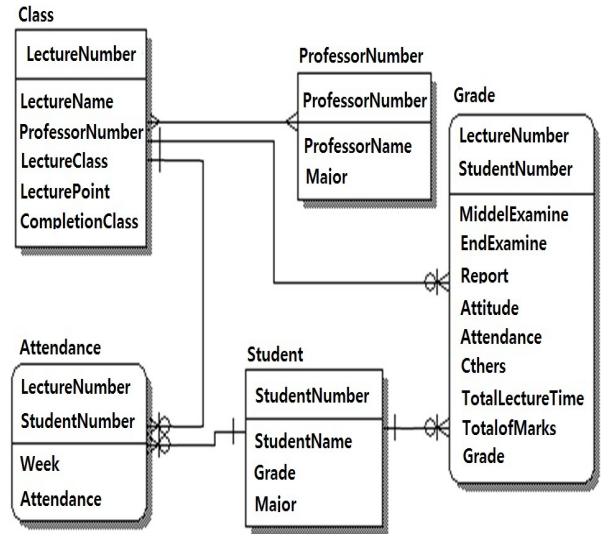


Fig. 3. ER-Diagram of Record Management System

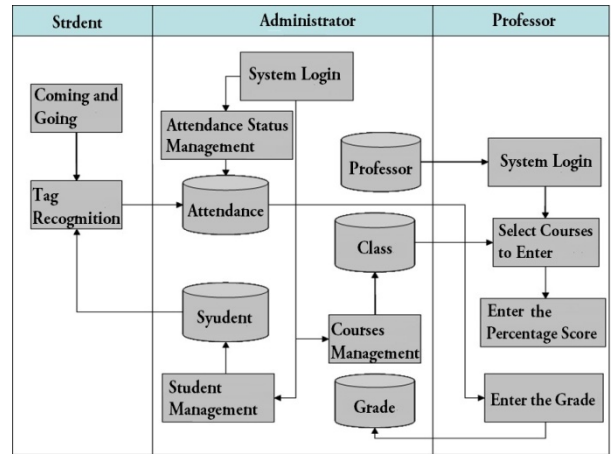


Fig. 4. Data Flow Chart of System

IV. Experiments and Implications

1) Development Environment

The system in this study consists of hardware, communication modules, and a grade processor. For the hardware, an RFID module of HBE-RFID-REX equipment manufactured by Hanbag Electronics and a 125KHz tag were used. For the devices, ATmega128 was used for the CPU, and as program languages, C++ was used for the reader and tag connection and Visual Basic 2010’s WPF based C# was used for the grade processing system.

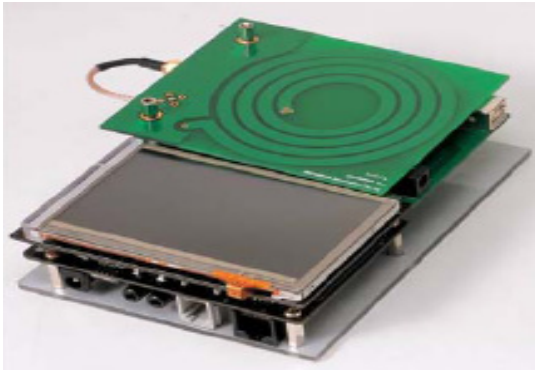


Fig. 5. Used Reader

2) Simulation

The suggested system consists of the recognition component of the reader and a grade processing component based on the recognized information. The tag recognition component of the reader is an RFID processing module to recognize tagged ID cards—it recognizes the identification number in a student ID from the RFID reader to process a hardware tag.

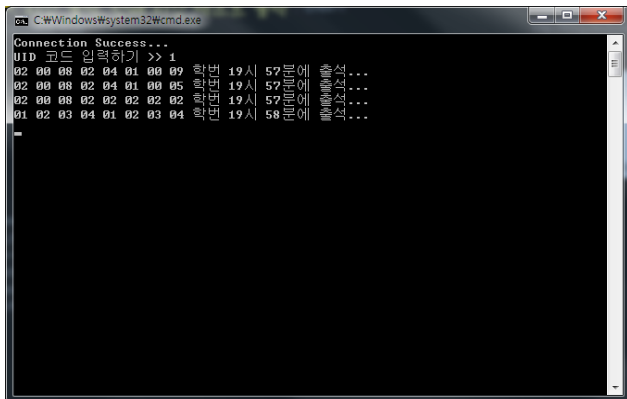


Fig. 6. Tag recognition

Figure 6 shows the reader recognizing tag information. It illustrates the attendance of four students.

An administrator inputs a password into the password section and can add or delete classes and manage students, as in Figures 8. He can also check and manage attendance information, as in Figure 9. Figure 10 is automatically recorded by Figure 6's tag recognition.

Figure 11 shows a client user screen. After a professor has logged on using his code, the attendance grade is calculated from the attendance information retrieved from the server and the final grade is calculated after grade processing ratios suitable for evaluation rate, assignment grades, and exam grades are inputted.



Fig. 7. Log-in Screen of Manager

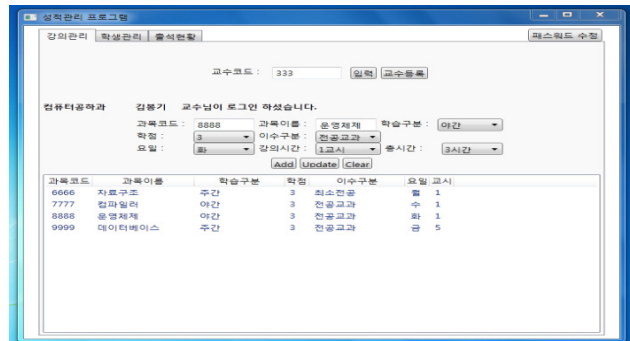


Fig. 8. Class Management of Manager

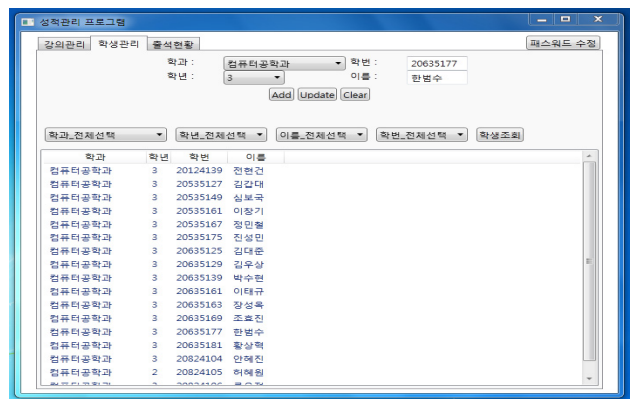


Fig. 9. Student Management

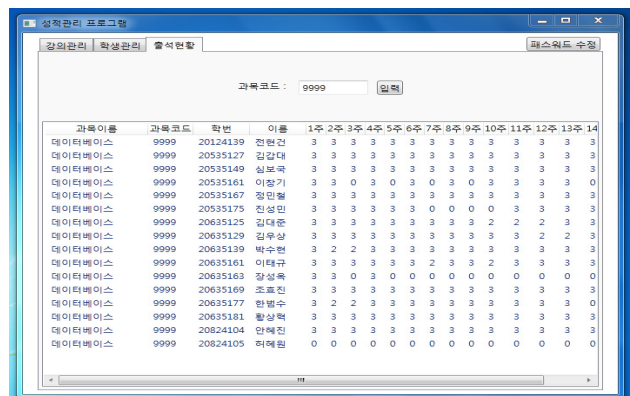


Fig. 10. Attendance Information Identify

The screenshot shows a software interface titled 'MainWindow'. At the top, there are input fields for '교수코드 입력: 333' and '교수님입니다.'. Below this is a table with columns: '과목코드', '과목이름', '학수구분', '학점', and '이수구분'. The table contains four rows of course data.

Below the course table, there are input fields for '중간고사:', '기말고사:', '학수태도:', '레포트:', and '기타:'. There are 'Update' and 'Reload' buttons.

Below these fields, there are several statistics: '평가방법 중간평가: 35', '기말평가: 35', '출석평가: 10', '학수태도: 10', '과제출평가: 10', '기타: 0 (%)', '성적 등급별 비율 A+: 20', 'A: 20', 'B+: 20', 'B: 20', 'C+: 20', 'C: 20', 'D+: 20', 'D: 20', 'F: 20 (%)'. There are also buttons for '성적발산' and '성적입력'.

At the bottom, there is a table titled '학수상태: 현재기준' with columns: '학과', '학년', '학번', '이름', '중간평가', '기말평가', '출석평가', '학수태도', '과제출평가', '기타', '총합', '등급', '석차'. The table contains 10 rows of student records.

Fig. 11. Record Processing Screen

#### IV. CONCLUSIONS

In this study, a recording processing system was implemented using the RFID attendance information. Existing attendance recordation using a paper roster is replaced by an RFID-based system to be applied to a recording processing system.

For efficient management of the experimental equipment and automatic attendance recognition, class attendance recognition was added to the existing student ID, which was already being used for library entrance recognition.

For a better system and realization of a u-Campus, studies on an automatic assignment grading system with a tag attached to paper and automatic grade input are necessary.

#### ACKNOWLEDGMENT

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