

# The RFID-Based Computer Aided School Management System

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**Abstract:** There has been growing attention and diverse applications in RFID technology. One of them is the administration systems for efficient control of school personnel and computer-based students' daily jobs. In this study an automation / management system is implemented which facilitates student supervision and reduces the burden on the employees of schools. A sample school administration system is developed in this study using RFID tags / readers. The system can automatically identify persons, manage classes, workshops, libraries, static / dynamic permissions, provide warnings / announcements, and make the use of the electronic resources, log and report. A more server-independent framework is designed because of robustness and long lasting use. An automation system is needed to get the information quickly and accurately. There are many devices to do this today. One of these support systems is the RFID (radio frequency identification) and RFID is used in this study.

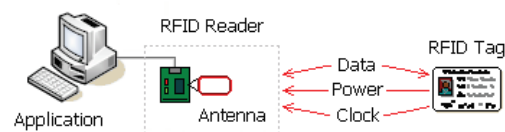
**Keywords:** Computer aided, Educational technology, RFID, School administration, Student supervision.

## INTRODUCTION

The content and administration are not only important in education. The teachers and the employees of school administration need reliable and timely data on the current state of school and students when making decisions. There is no storage method, so access to required information is complicated or time consuming, so the data is not stored in computers. An automation system is required to obtain the information quickly and accurately.

Today, there are numerous technologies to achieve this. One of these assisted systems is the radio-frequency identification (RFID) and RFID is used in this study. RFID is a term for a device that, using radio waves, transmits an object or person's identification in the form of a unique serial number. In Figure 1, three main components containing an antenna, an RFID reader and a RFID tag are presented in a fundamental

RFID system [1]–[3]. RFID reader is usually connected to a host computer that runs an application for processing data.



**Figure 1. A Basic RFID System**

RFID technology is preferred in automation systems because it has several promising features, among them:

- No viewing line is necessary,
- 2. It is possible to achieve long-reading and high read speed,
- 3. It is possible to multiply read / write tags,

- 4. In real time it is possible to monitor people, objects and facilities,
- 5. To order to support in a harsh environment,
- 6. A RFID tag may be encapsulated or inserted into a product. The tag is programmable and thus a portable database can be used,
- 7. No additional power (passive RFID tags) is required. Power comes from the reader.

The advantages include: human identification and tracking, access management, tracking of goods and animals, pumping, contactless and Airport Baggage Tracking Logistics. In addition, the RFID offers advantages and is available in numerous applications [4], [5].

In the field of education, RFID is used for studies such as attendance control.

This study expands the use of RFID to auto-identify individuals, control classes / laboratories / libraries, static / dynamic permits, apply alerts / advertisements and use of e-money to maintain more efficient education administration.

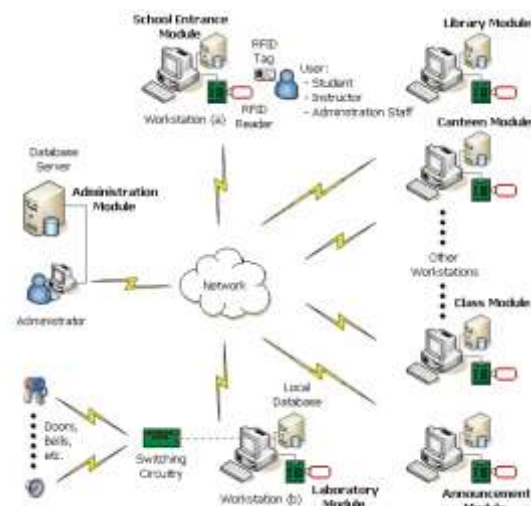
*System Overview:*

The system includes components of software and hardware. There is a server connected to workstations on the hardware side, as shown in Figure 2.

An RFID reader is provided for every workstation. Some of the workstations could be connected to external circuits to power equipment. The software side is designed to ease the management, querying and reporting of an application with a graphical user interface. The developed software also maintains communication over the network between servers and workstations [6]–[9].

In NIT, 1400 students and 65 instructors were employed and tested, with 15 of them also employed as management staff. The system was developed. RFID tags are provided to students, instructors and management. When needed, RFID tags are also provided for security, cleaning staff and school visitors.

When a user passes his / her tag onto the reader, the designed software receives the input and records the data to the local database after processing. For operation such as a bell to be hung, a light to be switched on / off, or a door to be opened. General and local databases are compatible with the enhanced data exchange algorithm at predefined intervals. Although the built application is running in the architecture of server clients, this algorithm prevents system crashes if there is no server or network connection.



**Figure 2. Block diagram of the Designed System**

*System Implementation:*

The developed application is capable of the following:

- *School entrance Identification Check:*

Towers attached to the RFID reader at the school entrance allow one person to pass simultaneously. The application developed identifies the person when a valid pass is passed using the information sent by the reader. If users are allowed to use their tags in each move, the device will count the number of people in the classroom.

Temporary tags are given to students, and information about themselves and the intent of the school visit is

registered. A sample user interface in the school entrance module is shown in Figure 3.

- *Static/Dynamic authorization management:*

RFID is used as an electronic key for the control of access to the classrooms or laboratories of school building in static authorization management. Authorization for tag-bearers to allow or deactivate your access to the specified area is defined individually or in groups. Curriculum-based student matching with appropriate classrooms or laboratories is carried out by school management personnel or deployed instructors who apply.



**Figure 3. User Interface of School Entrance Module**

The authorization of each student is controlled according to rules in dynamic authorization management. Calculations of attendance for registered students are carried out to check the eligibility to participate in an exam.

- *Class attendance management:*

A RFID reader can be located near the school, laboratory or library door to obtain the attendance information and students are asked to use their tags when entering and leaving. After reading the information gathered by the reader, the attendance of each student against each course is marked as 'present,' or 'absent.' Unauthorized and duplicate entries are also controlled and operations necessary to avoid misrepresentation are carried out [10]–[12].

- *Announcement and electronics information exchange system:*

The RFID reader is used for exchanging information between students and instructors on computers without standard input devices, such as a keyboard or mouse. A student only has to pass his or her tag through the reader in order to get announced information. Grades, homework items, dates and places of review are displayed on the screen over a period of time.

- *e-Money management:*

RFID tags are used to make payment without the use of cash like a credit card. In school building, e-money can be used in canteens, cafeterias and refectories. A student must pass his / her tag in a term in order to make the payment, as shown in Figure 4.



**Figure 4. User Interface of Canteen Module**

- *Library automation:*

Borrowing and return of books can be recorded with RFID tags simply. In this way, information on the use of library information can be recorded using automation.

- *Report creation, Logging, and submission of warnings:*

System can also generate reports with log queries. With every operation logged in the system, an administrator or instructor could query information, class / laboratory use, classroom attendance and unauthorized entries, in real time and downward. Due to the integration of the application, it is possible to obtain and report student grades, student lessons and any stored information about the classes.

If misuse or unlicensed entries are detected, a system generates warning messages to inform school staff.

## International Journal of Engineering Research in Computer Science and Engineering (IJERCSE)

Vol 4, Issue 4, April 2017

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- *Server independent run:*

System can also run independently of the server over a period of time. Due to the programmable nature of the RFID tags, certain information necessary to keep the system alive is saved. Therefore, information kept in the tag is evaluated and processed when workstations (clients) can't connect to the server. When the system is up again, the developed algorithm checks the relevance and resumes the standard run.

### RESULTS

The system was implemented and tested successfully in a real school setting. Observations and test results show that a lot of time and difficult tasks were carried out quickly and problems were easily resolved using the computer-aided system of school management. The systems' reports were used by teachers to monitor the progress of students and to enable staff at the school to make more informed decisions.

In addition to the advantages mentioned above, the system developed provided:

- Security has been strengthened by using identity search at the school entrance. Numbers of people could be determined inside the school building and the visitors' personal information and reasons for their visits recorded.
- Access of unauthorized entries from classrooms and laboratories has been restricted by computer controlled permit.
- Assignment of the attendance of a student's classroom or laboratory. Each student also spent the time in the school library.
- The method of exchange of information on electronics has improved the contact between pupils and teachers. School staff is able to communicate more effectively.
- Shopping and payment within the school have been carried out without using cash with e-Money management system.
- The statistics for library use and book loans were reported using library automation

- The whole system was not influenced by the development of the algorithms when a server crash or a network communication problem occurred.

### CONCLUSION

A successful example of RFID technology use in education is the integrated school administration program. It is hoped that the manual effort to run school will be minimized and the student monitoring should be made easier by providing alternative resources to school administrators. Human-made mistakes are reduced and safety is improved with the help of the system, time consuming and repetitive tasks.

The main purpose of a highly functional program is not to take any care of hardware and software misuse. We hope to strengthen this safety issue in our future studies.

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**International Journal of Engineering Research in Computer Science and Engineering  
(IJERCSE)**

**Vol 4, Issue 4, April 2017**

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