

The Research and Design on the Management System of Laboratory Access Base on RFID

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Abstract—For traditional laboratory access, a key was required for a door. To control the access of staffs and record the access manually, there will be a lot of management workload, and always some errors. For staffs, which access to different laboratories frequently, the access becomes very inconvenient. With advanced RFID technology, this kind of problems would be resolved effectively. The use of RFID technology to management system of laboratory access simplified the procedures of access and increased the work efficiency, so to achieve the record of access, automatically and intelligently. As one of the top ten technologies in 21 century, RFID has been widely used in retail, logistics, manufacturing, transportation, medical treatment, education, environment and service, etc.

Keywords- FRID; Access; Management System

I. INTRODUCTION

For traditional laboratory access, a key was required for a door, and different keys were required for different doors. To record the access manually, there are a lot of management workload, and always some errors. For staffs, which access to different laboratories frequently, many keys will be provided for different doors, it makes access inconvenient. [1] With RFID technology, the basic data to be written into the radio frequency card. The limit of access is under control, and many doors would be accessed with one same card. The use of advanced RFID in laboratory access management, simplified the access procedure, increased the work efficiency, and reduced the workload of manual management, so to achieve the record of access, automatically and intelligently.

RFID (Radio Frequency Identification) is one of the advanced non-contact automatic identifying technologies. In the past 30, 40 years, with the popularization and application of radio and mass Integrated circuit, RFID technology developed rapidly all over the world. The fundamental principle of RFID is: To communicate through the electromagnetic coupling between the reader and radio frequency card, so to identify the radio frequency card and the target represented.[2] RFID technology is of many advantages, such as, fast read, large storage, strong anti-interference, long life and high confidentiality. RFID

technology is widely used in ID identification, manufacturing, communications and transportation, and public security territory, etc. The international retail magnate -Wal-mart adopted RFID technology comprehensively, and all the top 100 suppliers were requested, since Jan. 2005, to use RFID technology on the pallets and cartons delivered to Wal-mart, so to increase the efficiency of retail procedure further. [3] The project of second generation ID card in our country makes the 1.3 billion Chinese people get in touch with RFID in zero distance.

II. SYSTEM CONSTRUCTION

A. General System Constructure

As shown in Fig. 1, the laboratory access system is composed of access controller (Integrated by wire, reader and controller), electronic controlling lock, radio frequency card and host, the access controller is connected with host through RS-485. When the radio frequency card approaches to the access controller by staffs, the reader is to recognize the data stored in the card through the radio frequency signal given out by the wire, and transfer to the host through the channel. The host obtains the data in database, judge and identifies the availability and security of the data, subsequently, feedback orders to the controller, which decides whether the electronic controlling lock will be opened or not.

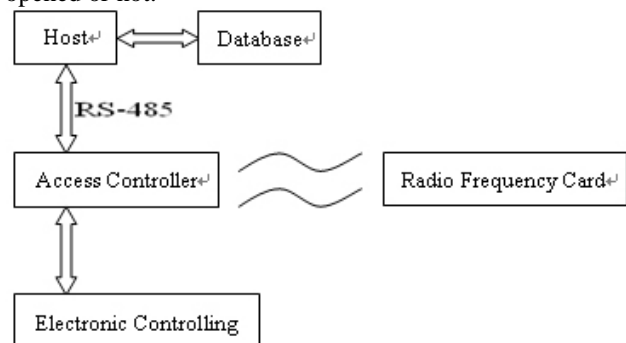


Figure 1. General System Constructure

B. System Characteristics

1) This system adopted the management as “one man, one card” and “one card, many doors”. That means one can

have only one card. In the same time, one card can be authorized for many doors, so to open different doors.

2) Based on RFID technology, combining the database management, you can increase the levels and effect of management effectively. With the functions of access controlling, security and theft-prevention, attendance, alarms, etc, the internal staffs are allowed to access freely, and the access of outsiders are eliminated.

3) With RFID technology, the radio frequency card can be only issued by the laboratory access system. There will be an exclusive serial number for each card, it is impossible to modify, difficult to forge, and of high confidentiality.

4) With advanced non-contact automatic identifying technologies, there's no physical contact between the radio frequency card and the reader. It will not be affected by the orientation, humidity, temperature and sound, etc. Reading will be finished without any pause.

5) The system is of high expansibility, which could be linked seamlessly with HR, monitor, communication and other related information.

6) The system is of high security, strong reliability, it is easy to install, debug and maintain. [4]

III. SYSTEM WORK PROCEDURE

A. Entrance Work Procedure

As shown in Fig. 2, when a staff approaches to the gate, the radio frequency card sways through the reading area of access controller. If a legal card, the screen of access controller will show the name, picture, employee number, with a sound "di", the door opens automatically. The door will close automatically when the open time reaches the established limitation. If an illegal card (unregistered or out of date), it will be shown "Out of Authority", with alarm "dididi".

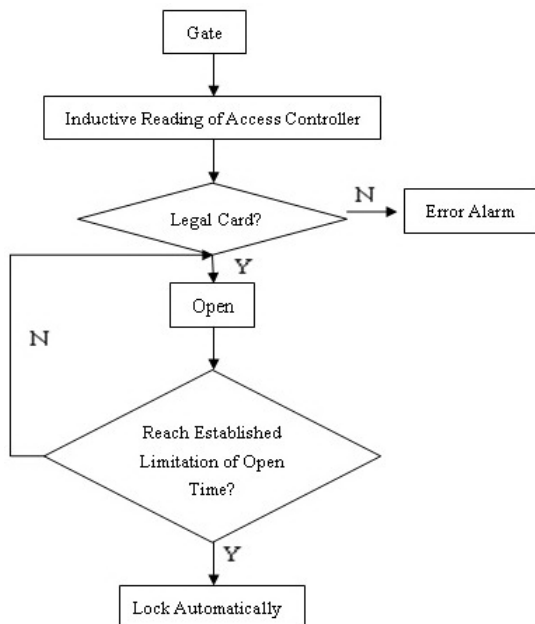


Figure 2. Entrance Work Procedure

B. Exit Work Procedure

As shown in Fig. 3, a staff is to leave, press the button installed inside the door directly when it is unidirectional access system. Door opens and locks automatically after staff's leave. If bidirectional access system, the radio frequency card sways through the reading area of access controller. If a legal card, the screen of access controller will show the name, picture, employee number, with a sound "di", the door opens automatically. The door will close automatically when the open time reaches the established limitation. If an illegal card (unregistered or out of date), it will be shown "Out of Authority", with alarm "dididi". [5]

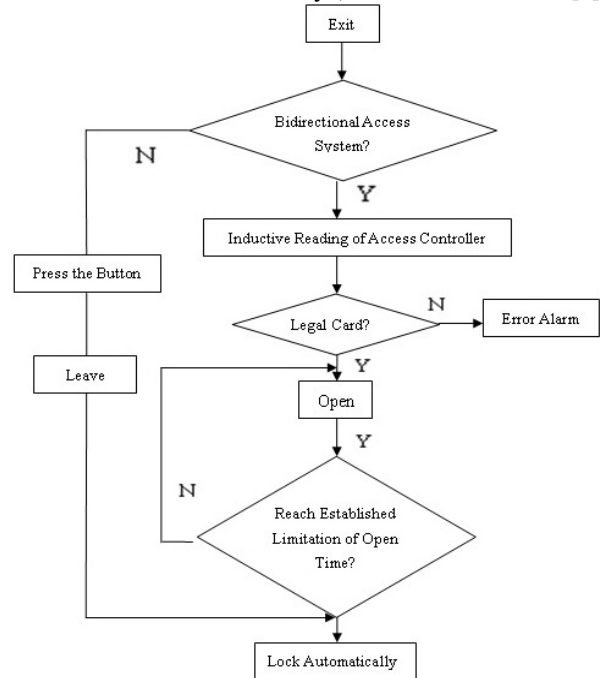


Figure 3. Exit Work Procedure

IV. SYSTEM DESIGN

A. System Hardware

The laboratory access system is composed of radio frequency card, access controller, card sender, electronic controlling lock, communication converter, hub and button, etc.

Radio frequency card is composed of reading microchip and inductive wire. It is packed and sealed in a standard PVC card, with dimension 0.76mm×86mm×54mm, same as credit card. The personal data will be shown on the card, such as name, department, employee number, etc.

Access controller is simple, artistic, secure, supporting off line and on line management, with function of voice prompt and LCD (liquid-crystal display). Access controller is of storage and calculating function, that is to say, the access controller can store the data downloaded to it, record the access of staffs automatically, independent to host. Access controller is connected with the computer through RS485, with strong background software support, to manage the

access of staffs efficiently, achieve the secure management of access controlling (Including: card issuing authority, on-time monitoring, access inquiry, statistic and collect, sheet printing).

The card sender is used to issue and make blank radio frequency card, to write the staff data into the card through authorized software.

The working voltage of electronic controlling lock is 12V, locking tab is Anti-drawing, anti-prying, automatically locking. It can lock and unlock with Power failure.

With access controlling system, it can be used to wood door, metal door and glass door in any situation.

RS485 communication converter is equipped with wiring terminal, which can be inserted and pulled out. It is flexible, with low cost and small volume.

The hub is to enlarge the transfer distance of network, to revive, reshape and enlarge the signal received, in the same time, to put all the nodes in the center of it.

A staff is to leave, press the button installed inside the door directly, door opens automatically. [6]

B. System Function

The structure of laboratory access system is shown as Fig. 4. Function module is constituted of system setting, card management, staff data management, access management and system maintaining. [7]

1) Restricting definitely the authority of staff access. For league cards, the electronic controlling lock will open automatically. Illegal cards will be prohibited accessing. For abnormal or forcible access, the system, through security linkage, start linkage monitor system, issue sound signal alarm.

2) Conveniently and perfectly issuing, supplementing, reporting loss, removing reporting loss and logout.

3) Single or batch data and photos of staffs can be added or imported, so to achieve the matching of staff- radio frequency card-data, collecting data automatically, updating the data on time, ensure the accuracy and high-efficiency of system.

4) System can set up flexibly, one card can access to specific doors in a specific period, record in detail the access time, date, house number, card number, inquiry and print the summary sheet for any period.

5) Taking the facilities of security, light and fire fighting, etc. in control, enhancing system interaction, start the alarm device automatically when the lock is destroyed by force. The lights in related rooms open automatically when the access open. The passageway of related area opens when there's a fire.

6) The super account of software is administrator, who is provided with most authority. He can set, inquiry, change the password and authorize the operators with different authority with different function, so to manage the access system efficiently.

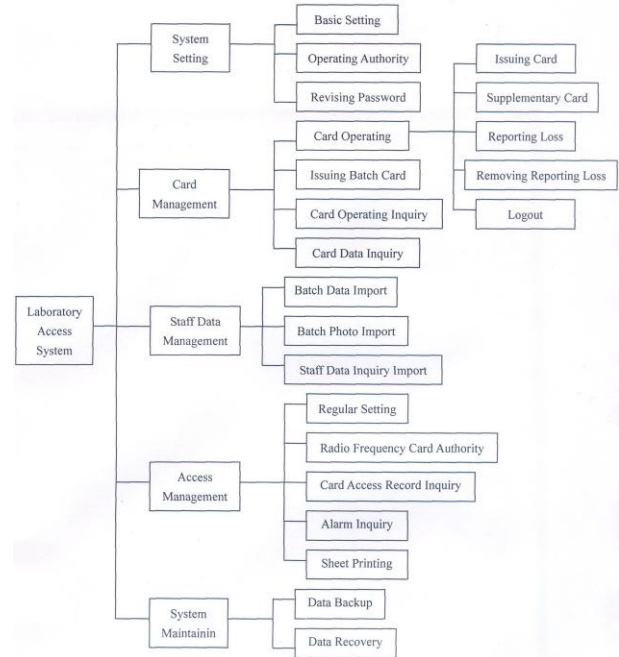


Figure 4. System Structure Design

V. CONCLUSIONS

This paper is to analyze the problems of traditional access management, raise a new laboratory access system based on RFID technology, and introduce in detail the system structure, working procedure and system design. This system is with the functions of access controlling, security and theft-prevention, attendance, alarms, etc. It increased the levels and effect of management effectively, realized the management of pluralism, informatization and intelligitization. With the development of RFID technology, the Prospect of application will become more and more promising.

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