Radio Frequency Identification Security System

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ABSTRACT

This paper describes the working of a RFID System i.e. how a RFID based security system works.In a RFID system a RFID tag is used in which the entire details of the user are stored.A RFID tag is swiped over a RFID reader and if the details are matched with that stored in the central database the door opens with the help of a motor attached to the door.A passive tag is used in our RFID security system. A passive tag is lighter and works on the principle of electromagnetic induction passive tag has a upper hand on active tags' centralized system is used to manage the controlling,transaction and operation task.The system also creates a log-in and log-out of each user along with the user's basic information.

Keywords: Door Locking System, RFID, Security System

1. INTRODUCTION

Radio-frequency identification (RFID) is the wireless use of electromagnetic fields to transfer data, for the purposes of automatically identifying and tracking tags attached to objects. The tags contain electronically stored information. Some tags are powered by electromagnetic induction from magnetic fields produced near the reader. Some types collect energy from the interrogating radio waves and act as a passive transponder. Other types have a local power source such as a battery and may operate at hundreds of meters from the reader. The tag does not necessarily need to be within line of sight of the reader and may be embedded in the tracked object.

A digital door locking system is also implemented and governed by RFID reader which authenticate and validate the user and open the door automatically. It also keeps the record of check-in and check-out of the user. It's very important to authenticate the user before entering into a secure space and RFID provide this solution. The system enables user to check-in and check-out under fast, secure and convenient conditions. The system include door locking system which open when the user put their tag in contact with reader and the user information matched with the information already stored in database. The RFID controls the opening and closing of the door. In this study we utilize RFID technology to provide solution for secure access of a space while keeping record of the user. We used passive type of RFID here. The passive types of RFID are battery-less and they obtain power to operate from reader. The major advantages of passive RFID are its cost effective and small in size.we also have a storage system integrated in RFID system which keeps a record of all the check-in and check-out of every individual
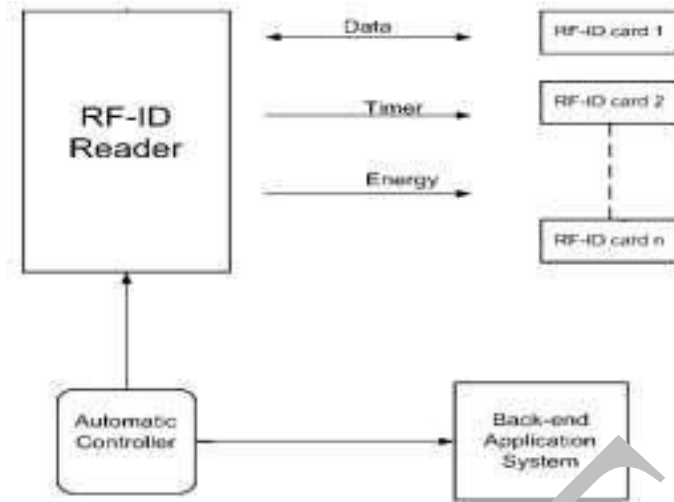
Figure 1: RFID Security System

TABLE: Comparision of Active and Passive Tags

Attribute	Active Tags	Passive tags
Power Source	Built in Battery	Electromagnetic Induction
Reading Distance	High (20-100 m)	Low (upto 3m)
Reqd. Signal Strength	Low	High
Size	Large	Small
Weight	Large	Small
Tag Life (3-8 yrs)	Small (upto 10 yrs)	Large
Tag Readers	Lower in cost	Higher in cost
Tag Cost ($15-$100)	High ($0.15-$5)	Low
Data Storage data	Large read\write data	Small read\write

2. RFID System Design and Structure

In our research Papers there is a security system possessing a door locking system using passive type of RFID tags. The system is implemented in three spaces using central database system. Different RFID tags and readers are implanted in different floors of buildings as illustrate in figure1. The system is used hardware as well as software. The hardware components are RFID reader, tags, USB connections and connecting cables etc. We also have a IC motor driver attached to the door of our system.

The detail of the proposed scheme is showing below:

Step 1: The RFID reader retrieve the information contains by tag as it come in the range of few millimeters from reader.

Step 2: after receiving the tag information, reader send this information to database for conformation. If it holds, the information stored for further operation.

Step 3: The central server queries to database and retrieve corresponding information after receiving the query from the reader.

Step 4: The reader computes timestamp (date, time) after receiving the reply form server and create a log.

Step 5: Once the tag information verified, the system generates a control signal through parallel port which controls the opening and closing of door by means of steeper motor.

Figure 2: Design of RFID System
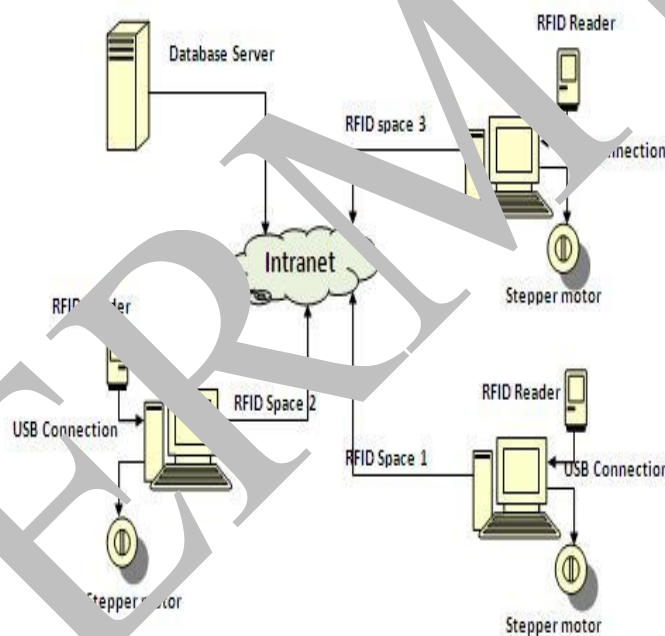
We implement the system using passive tags. The RFID tag is detected when touched or come in the range of few millimeters from reader. The tag is automatically detected by RFID reader in every mille second and reader sent the information containing by tag to the central control though serial port. The central controls already have information of different users registered with system. The signal information coming from RFID reader is matched with the stored information in local as well as central control. When the information matched with the stored information, system displays the information. The information contains details of user as name, id no, category, check-in time, check-out time, date and photo as well. All the coming information of RFID tag gets stored by central control server. System can also generate report of a single user as well as multiple users according to the date, time. Once the tag user authentication is performed, system generates a control signal through parallel port. This control signal goes to a control circuit.

RFID reader was connected to the system through USB port to provide communication between system and RFID reader. The output control signal is generated by system through parallel port which controls the opening and closing of door by means of steeper motor. The specifications of various components of our RFID System are as

follows-
- ■Power: SMPS Supply AC Adapter(12V-1A)
- ■Read speed: 0.5 ~ 1.0 second
- ■Capacity: 100 different cards
- ■Maximum reading rang: RFID card: less than 30mm
- ■Card format: For ID card EM.125K
- ■Door Lock: L293D Motor Driver IC
- ■Battery life: AC Adapter
- ■Low voltage warning: When CPU working voltage is less 5.0V, the lock can still be opened 100 times before the batteries are replaced
- ■Door thickness request: 25-45 mm

3. RFID System in a working condition

The system stores all the necessary information about the user. A new user is first registered with the system and the corresponding information is burn in RFID tag. This RFID tag will be accessible through the system. When a registered user comes to the entry point, and put the tag into reader, the system checks whether it is registered user or imposter. If the user is registered one then the tab information is matched with the user information stored in system. The door is open to entry of the user after successful authentication and close automatically after a specified time interval. The check-in information is also stored in the database with date and time. A log is also generated by the system according to check-in information. User check-in process is depicted in figure 3. Card detection setting is shown in figure 4. Database search is illustrated in figure 5 and output of database entry is illustrated in figure

Figure 3: User check-in process
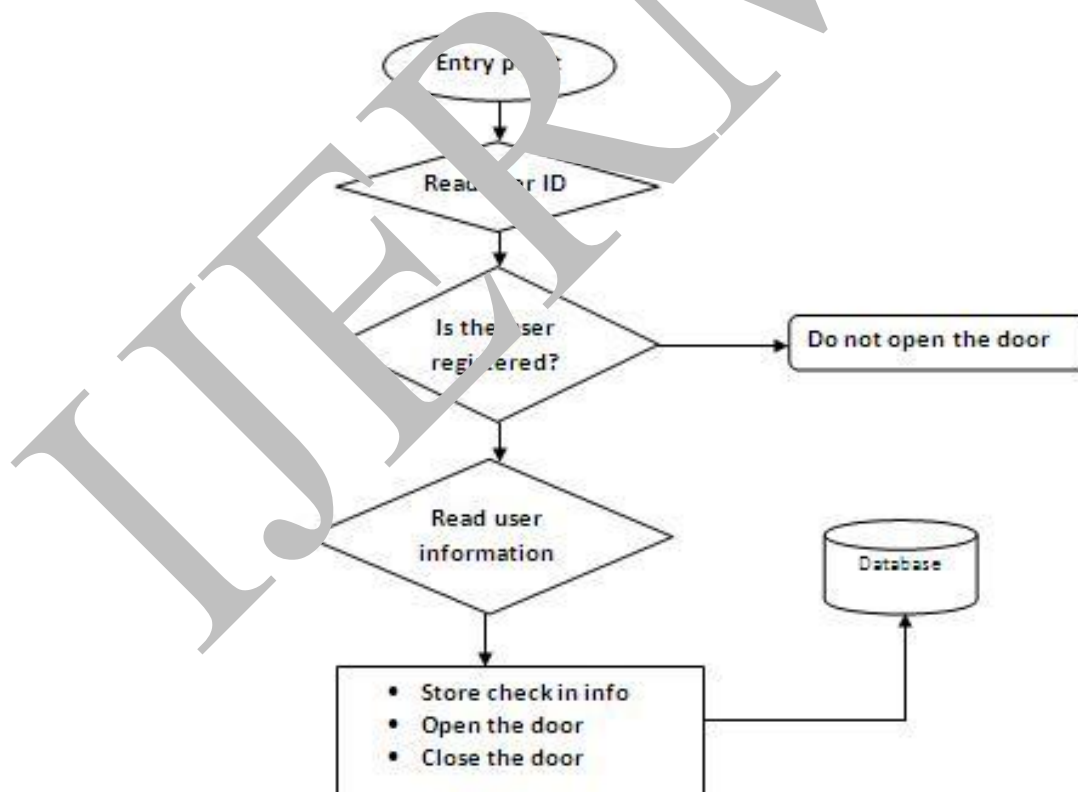
3.1. System Components

A. RFID Tag

IPC80 passive RFID tag operating at a frequency of 125KHz is issued to the user. The tag transmits information to the reader in ASK format.

B. RFID Reader

IP10 proximity card reader with operating frequency of 125KHz and reading distance up to 4 inches is used. The reader can be easily installed on metal doors, provides the tag information serially in RS232 format and is suitable for indoor as well as outdoor operations. Three such readers are installed for hostel security: hostel entrance gate, hostel exit gate and mess entrance gate.

C. Door Locks

Solenoid operated door locks are used in entrance, exit and mess gates of hostels. A relay is used to energize the solenoid to open the gate.

D. Alarms

An alarm is installed; at the entrance gate. These alarms are turned on if an illegal person tries to enter the hostel premises.

E. Microcontroller

AT89C52 microcontroller is selected because it is a powerful microcomputer which has low power consumption and provides a highly flexible and cost-effective solution to many embedded control applications. It has 8K bytes of in system reprogrammable flash memory, 256 bytes of internal RAM, 32 programmable I/O lines, three 16 bit timers/counters, eight interrupt sources and a programmable serial channel. It has 40 pins in total.

F. Nonvolatile RAM

368K Nonvolatile RAM (NV -Ram) DS1230Y-85 is used for storing passwords against registered RFID numbers. NV-RAM is selected because it combines the best of RAM and ROM: the read and write ability of RAM and non-volatility of ROM. The DS1230 Nonvolatile SRAM is 262,144-bit, fully static, nonvolatile SRAM organized as 32,768 words by 8 bits. Each NV SRAM has a self-contained lithium energy source and control circuitry which constantly monitors V_{CC} for an out-of-tolerance condition. When such a condition occurs, the lithium energy source is automatically switched on and write protection is unconditionally enabled to prevent data corruption.

4. Result

The system has a controller PC which contains the record of the check-in and check-out of the user. User must have RFID tag which contains the personal information of that particular user. A door along with locking system is driven by stepper motor. Stepper motor acts as actuator, which is able to open and close the door in real-time. The RFID Reader detects tag in real-time and open door automatically and closes it again after a specific time interval. In this application, user authentication information is searched on the database first. If the user does not have any previous record registered to the database, the door will not be open thus unauthorized entries will be avoided.

In this work we have successfully implemented security system which can be apply to record attendance in class room of institute or can deploy in secured zone so that only authentic person can enter in secure space. Once the user information matched with information stored in central database system, then user only can enter within the confined place as the door will open only when the tag information match with the database. The system can be deploying in various secure places within a building. The system is also able to maintain the record of a user such as how many time and what time user check-in and which area. All the databases are stored in database server as well as local server. Administrator can access database server remotely through internet or intranet and can see all

the records

Future Use

1. We can send this data to a remote location using mobile or internet
2. We can add the module of voice alarm system to indicate valid or invalid card entry.
3. Access Management

5. CONCLUSION

In our research paper, we have introduced a digital security system containing a door lock system using passive RFID. A centralized system is being deployed for controlling and transaction operations. The door locking system functions in real time as when the user put the tag in contact with the reader, the door open and the check-in information is stored in central server along with basic information of the user. We utilize RFID technology to provide solution for secure access of a space while keeping record of the user. Using RFID security in various organizations is enhanced. RFID system ensures a secure and safe door lock system ensuring the privacy of employees.

6. REFERENCES

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