

RFID BASED ACCESS CONTROL SYSTEM

PROJECT REPORT

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Certificate of Completion

This is to certify that the project report titled “RFID Access Control System” is a bonafide work carried out by:-

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the students of V semester, B.Tech Electrical and Electronics Engineering, National Institute of Technology Karnataka Surathkal. This project has been completed under the guidance of Dr. C M C Krishnan, Assistant Professor, NITK Surathkal, during the academic year 2015-16 as a design and development task in Signal Processing (EE397).

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I. ABSTRACT

Although practiced mainly in educational institutions, attendance is taken even in industries and offices. The very orthodox method of attendance system, wherein entries are written in a book by the people themselves or by an authoritarian, can be extremely time consuming for a large number of people. As technology has advanced, many students in educational institutions prefer studying off the internet rather than attending classes, thereby exacting attendance. In an industry, it is difficult to maintain a log of the workers leaving in and out. A significantly more time efficient attendance system can be employed using RFIDs (Radio Frequency Identifiers). Here, the students/workers can conveniently place a card (containing an RFID transmitter) next to an RFID receiver while entering or leaving the premises, while their attendance is recorded on a computer. Each RFID card has a unique code, which helps us to identify the card holders.

II. INTRODUCTION

Radio-frequency identification (RFID) is a technology that uses radio waves to transfer data from an electronic tag – called an RFID tag or label, which is attached to an object – through a reader for the purpose of identifying and tracking the object. Some RFID tags can be read from several meters away and beyond the line of sight of the reader.

RFID systems have been widely used in many different application areas, such as: product tracking through manufacturing and assembly , control of inventory, parking lot access and control, container tracking, ID badges and access control, equipment tracking in hospitals, etc. Radio waves are classified by their frequencies, which are expressed in kilohertz, megahertz, or gigahertz ^[1].

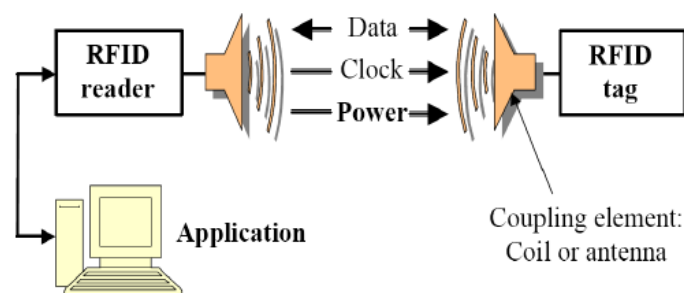


Fig 1: How RFID tags are read

RFID is a very promising technology with significant impact. Following are the reasons for us to use this technology for access management application.

- No line of sight required
- Tags can be read from significant distances
- Multiple tags can be read at the same time
- Since the tags are enclosed, they are much more difficult to tamper
- Many tags are read/write capable, rather than read only

RFID reader is the device capable of reading and retrieving information stored inside the RFID tags. There are two types of RFID reader, which are the active and passive RFID readers. Active RFID reader can detect an active RFID tag while passive RFID reader can only detect passive RFID tag at a few centimetres away from the reader.

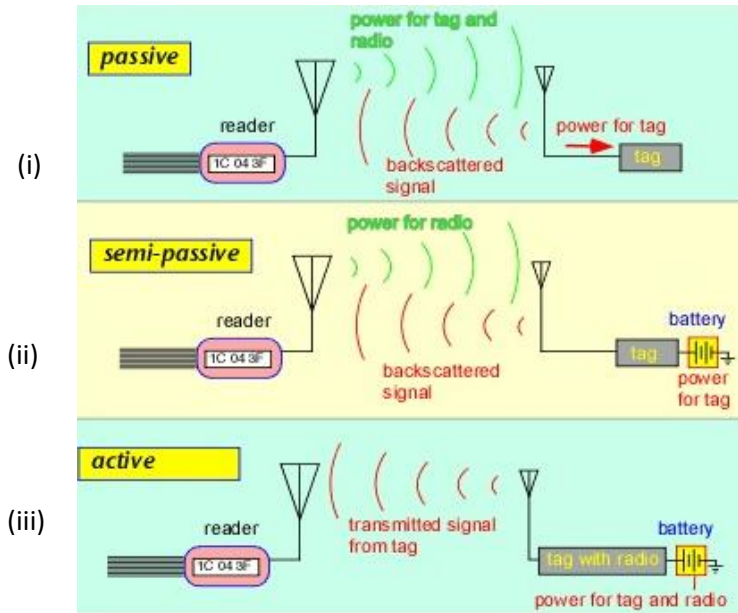


Fig 2: Different types of RFIDs

As passive RFIDs are more compact and require no external energy storage elements and the fact that this project demands the need for a Near Field Communication (NFC) protocol, they were incorporated with the ID cards.

Each RFID tag has a unique serial number or ID. There are three types of RFID tags which are active, semi-passive and passive. The main difference between these RFID tags is that active and semi-passive RFID tags require internal battery while passive RFID tags do not use any internal battery. This project concentrates on using passive RFID tags/cards [5].

III. WORKING PRINCIPLE OF A PASSIVE RFID SYSTEM

- The reader sends a modulated carrier signal to the tag.
- The tag extracts power and the transmitted message.
- The induced current in the tag causes a transmission.
- The re-transmission of these tags can be used to send data back to the reader. This principle is called backscattering. (Refer Fig. 3)
 - This is done by modulating the tag antenna load via a switch (transistor). This modulates the current and with that the re-transmitted wave.

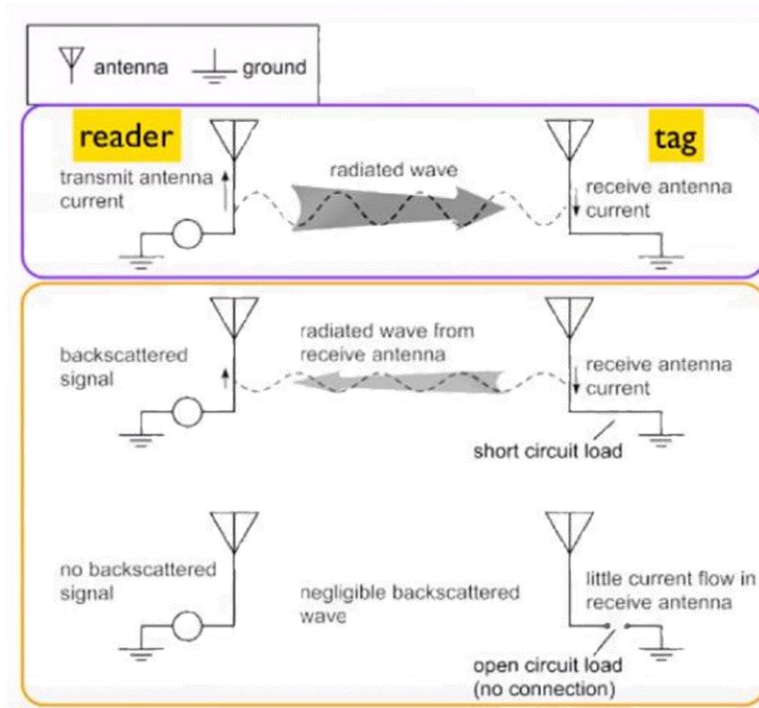


Fig 3: Backscattering effect produced from the current induced in the passive RFID Tag.

- The reader emits a carrier wave that is amplitude modulated with the transmitted data.
- The tag has two circuits :
 - One circuit smoothens the incoming stream into a DC supply.
 - The other uses a shorter time constant to achieve envelope detection - this yields a digital signal that can be interpreted by the processor [5].

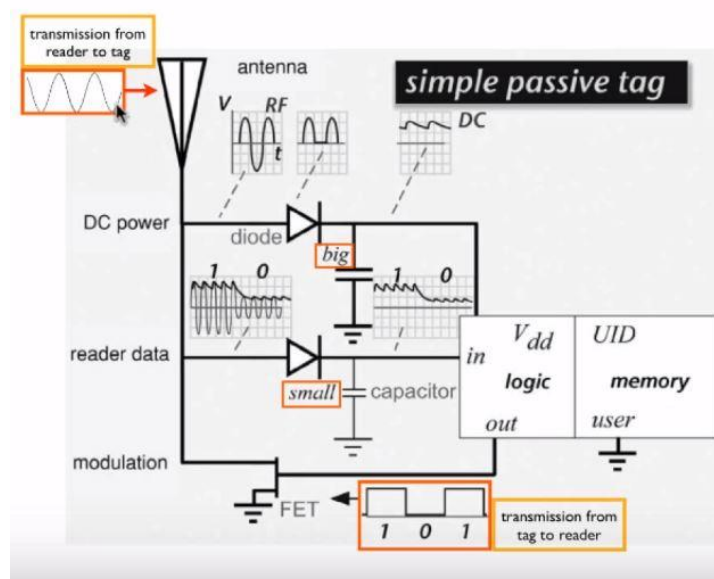
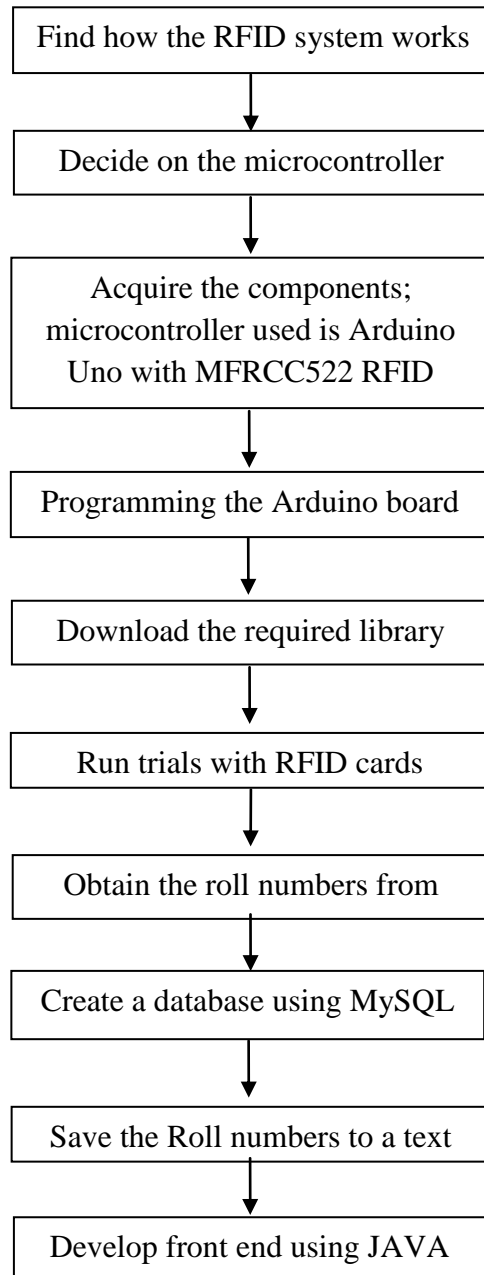


Fig 4: A circuit diagram that briefly describes the structure of the passive RFID Tag. There are two units: a rectifier section for powering the device and the reading section achieves the envelope detection. The FET provides the switching load required for modulation

IV. PROCESS FLOW



V. ALGORITHM

1. Start
2. Connect the circuit properly. Knowledge of Arduino pin connections is important to code.
3. Import required library files
4. Initialize objects of the respective libraries with appropriate Arduino pin numbers.
5. Initialize the SPI Bus
6. Initialize objects of the respective libraries with appropriate Arduino pin numbers.
7. Validate the reader version
8. Display when to read the Card
9. Search for a card
10. If a valid card is found, get Roll number (stored in 5th Register block of RFID Card).
11. Display Roll number on the serial monitor
12. Go to Step 8.
13. Using Processing to read from serial input and write to a text file.
14. Repeat till serial input shows data
15. The text file contains all the entries for the day. The file is then uploaded to the database containing the details of the students.
16. The Admin's unique identification number in the text file indicates the end of a single day. From that point on, attendance is updated as usual.
17. Repeated entries are forbidden and only one entry per card is allowed.
18. The entries are updated in the MYSQL database and the front end displays the Table of attendance.
19. On one login, only one update can be carried out.
20. A choice to enter new entries is also provided at the front end and inserts a tuple in the back end.

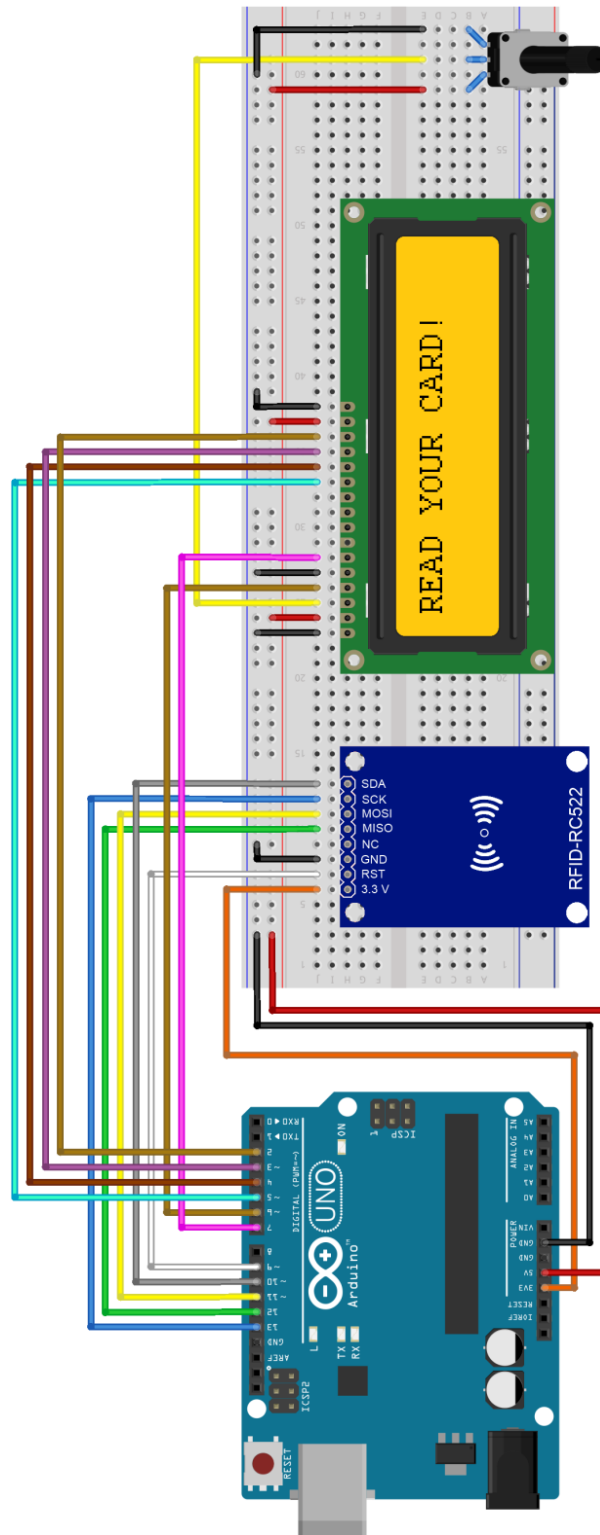


Fig 5: Circuit Diagram

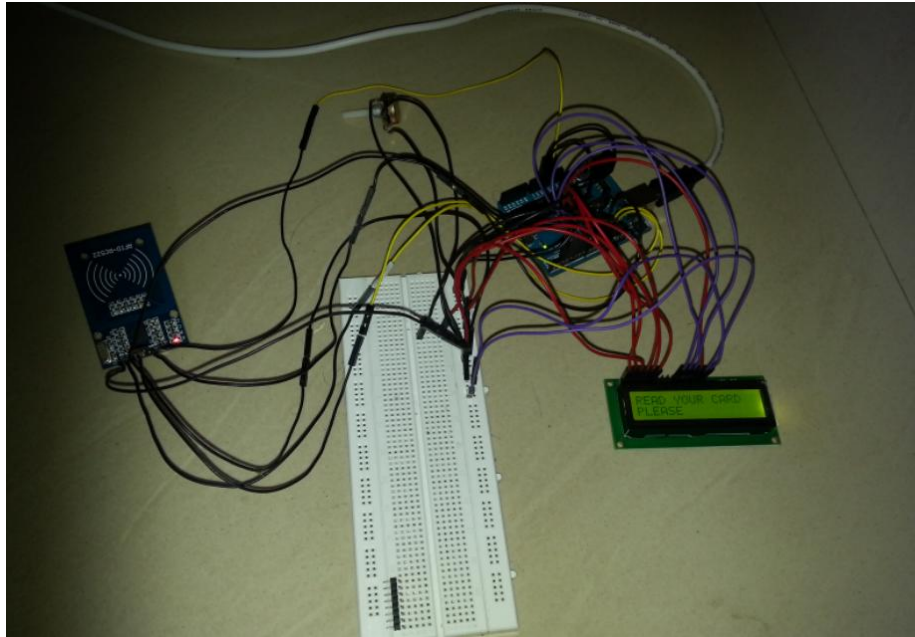


Fig 6: Working prototype

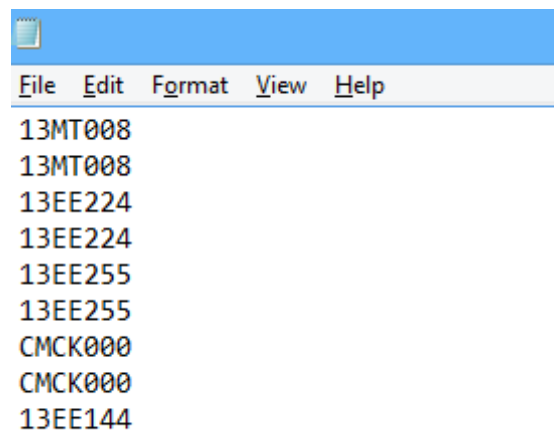


Fig 7: Serial Data flushed to text file

VI. RESULTS AND CONCLUSIONS

This project aims to build a small scale attendance system prototype. RFID tags are used to serve the purpose of marking attendance for the subjects that may be considered. The register blocks in the RFID cards are accessed and student data are fed into the same. The Roll numbers that are being displayed on the LCD module are transferred to the Processing GUI simultaneously from the serial input of the Arduino. The Processing code flushes the Roll numbers read into a text file [6].

A database is created using MySQL in NetBeans, an Integrated Development Environment, which records the attendance and tabulates them in the database [7].

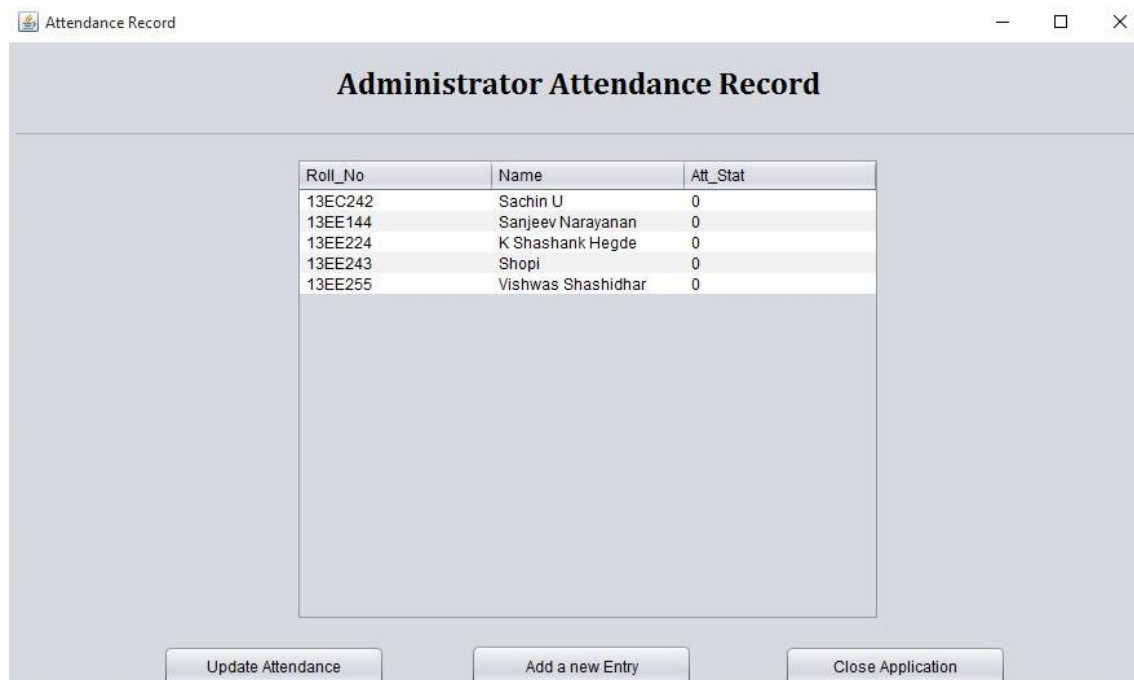


Fig 8: A record of students present in the database. MYSQL database is accessed through JAVA using JDBC Drivers. Here, options to update attendance and adding new student entries are offered to the administrator.



Fig 9: Updated record of student attendance. Once updated, the option to update again is disabled till another login is encountered, which is assumed to be done only on another session.

A master card is provided that can be used to reset the attendance recorded during a set period, say a day. Chances of multiple attendances being recorded are always high since the RFID keeps reading as long as the cards are in the vicinity. Delays and other conditions are enforced in the Java code such that multiple recording of the same are overruled.

VII. SCOPE AND FUTURE WORK

The field of study in RFID is extensive and vast and has immense potential in world today. The upcoming theories and ideas on the “Internet of Things (IoT)” have its roots in RFID technology. This project can be extended further and can be implemented on an institution/ industrial level. An immediate need to improve this project would be to enable it to update the database on a real time basis by connecting it to an Ethernet port or a Wi-Fi connection. This was attempted in our project but was found to give problems relating to requirement of the same IP address on about three devices. Further interfacing onto an android platform is also a future plan. This module can be applied to record attendance of students and employees, keep a count on cattle and even be integrated on a small scale to be used in keychains and smartphones for tracking purposes. Passive RFID systems can also be used in money transfer applications, where it'll offer faster and a relaxed way of transferring money.

VIII. REFERENCES

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