

## RFID based Security System for Visitors in a Gated Area

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**Abstract:** The requirement for cutting edge Security systems has always been in demand. A low cost and reliable system is preferred by every customer. With the world facing the pandemic due to a deadly virus which is spreading by touch, it becomes more important to rely on touchless technology. This project focuses on the key aspect that the prevention of an unwarranted activity in a campus can be avoided if the visitors in-time and out-time is checked and documented. And can be compared if a pattern of activity is followed by the visitor. Most of the campuses rely on an old system of pen paper or the more recent app-based permission, BUT none of them really check on the amount of time spent by a visitor inside the campus, → did the visitor leave after meeting the host? The increasing need for safety and prevention checklist for visitors in a gated area is the key aspect of the project.

### 1. Introduction

Radio Frequency Identification, RFID with its small size, cost effective and simple and efficient wireless and touchless communication is the need of the hour. The RFID detection circuit consists of three main components – a reader, an antenna and a tag or a transponder. RFID cards do not need direct LOS with the card reader, they can be detected easily without any hassle, since they can be detected through clothes, cardboard, or plastic. RFID cards are ubiquitous in every industry – security, industrial, retail, medical etc. Based on the application, the RFID cards can be used for detecting, identification, authentication, tracking and sorting of goods.

This paper discusses about the use of RFID cards and GSM module for security system in a gated community. According to statistics about 46% of the world's population owns a smart phone and the number is expected to increase exponentially. A security system which integrates a mobile phone will prove time efficient and more reliable. In this system a visitor is tracked once he exceeds the allotted time duration of the stay. Simultaneously a SMS text message containing the real time location of the visitor will be sent to the SECURITY system and to the mobile phone of the host person concerned. The purpose of this device is to help locate and track the over-staying visitors in a gated area.

### 2. Literature survey

RFID tags are used in almost all fields of automation. These cards provide a very low-cost, easy, efficient, and hassle-free way of reading information. Moreover, the cards have a sufficiently high memory space to store a lot of information. The RFID cards have been used as access cards in a lot of industries [1][6], to provide access through the door. These cards have also been used to maintaining an inventory for the livestock, the logistics and the asset inventory of a factory. Hospitals are also using the RFID cards to keep inventory of the equipment. Hospitals use these cards for a much more important application, tagging the card to a patient will help monitor the medication [5], allergies or any other relatable information which may be of use while treating him. An RFID tag is also tied to the new-born babies to prevent any chance of any illegal incident. The RFID cards are slowly replacing the barcode [6] method in the retail industry, the garment industries are using these tags on the clothes, any unbilled item will make the sensor beep at the store exit. The ticket slips at gaming events, conferences, concerts, industrial exhibitions are being replaced by an RFID ticket to avoid any hassle at the entrance and more important to check the identity of the attendee. This also reduces the fake ticket scam. This method was successfully employed in Beijing Olympics [2][6]. Most of the countries are employing the RFID tag system for collecting toll tax and even for assistance in car parking.

### 3. Proposed implementation scheme

This Security System works on the basic principle of RFID system consisting of the reader, antenna, and the tag. In this Security System passive RFID tags are used, which are powered up by the reader. The exchange of information is through the electromagnetic waves. When an RFID tag comes in the range of the reader, the data is exchanged between the reader and the transponder tag. The reader can detect a card from a distance very efficiently and then the encrypted data can be used for tracking or authentication. Based on the geographical size of the gated area, multiple readers can be placed. A reader can simultaneously detect a multiple number of tags

so real time tracking of all the visitors is possible. The location of a missing visitor can be efficiently tracked between two readers.

1. Visitor reports to main gate security, to meet person A
2. Security calls person A and verifies.
3. Security person enters details of visitor, time duration of the visit and punches into RFID tag1 and hands over the tag to visitor.
4. Visitor enters campus.
5. His RFID tag is read by various card readers placed at certain strategic locations in the campus. All card readers are connected to main server accessible by the security personnel.
6. **Ideal scenario:** Visitor reaches person A , meets him and returns back , hands over the RFID tag1 to main gate security and leaves.
  - a. RFID tag1 is ready for another visitor.
7. Visitor reaches person A ..... time duration over.
  - a. Main gate security alerted → sms goes to person A for confirmation.
  - b. Further action by person A → extend time limit or raise concern about visitor.
  - c. If visitor is missing, start reading the location of the RFID tag1 based on the nearest card reader.
8. Security system is alerted about the missing visitor and his tracking starts.
9. By end of the day, the main server confirms all in-coming visitors have left the campus based on the RFID tags data.

The fig1 illustrates the Block Diagram of the Visitor Tracking Security System. All the RFID readers are connected to the main server and can communicate to it. The system architecture of the wearable is based and controlled by Arduino with an Arduino Uno boot loader. The main gate RFID reader and writer will write the details of the visitor on one of the tags using MFRC522 which is compatible with the Arduino-uno. The Arduino Uno will collect various types of data from the different modules interfaced to it. The RTC counter stops and activates the GSM module upon being triggered by the Arduino GSM shield. The audio sensor also gets triggered at the main gate and security personnel are alerted to take further action.

This System allows multiple tags to be read simultaneously so the real time tracking of all visitors is possible. The RFID tags used will be rewritten and reused multiple times so the Security System is a onetime investment. Additional tags can be added as the need arises.

#### 4. Result

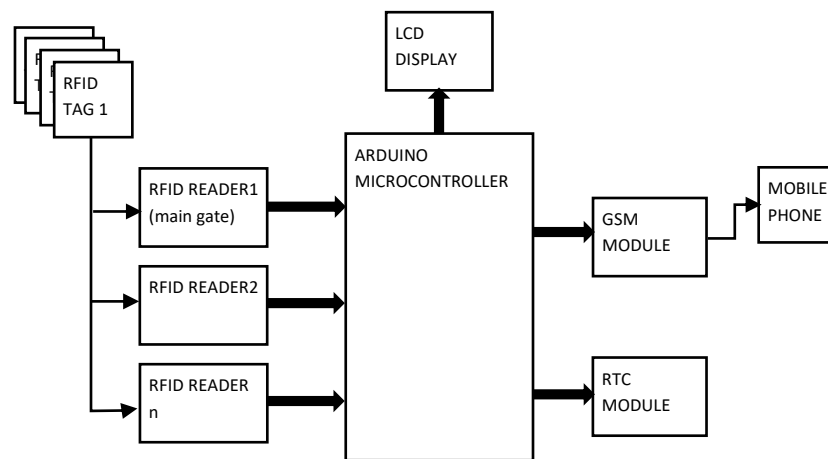


Fig1: Block Diagram of the System

Through this project a security system prototype is designed for the visitors in a gated community. By

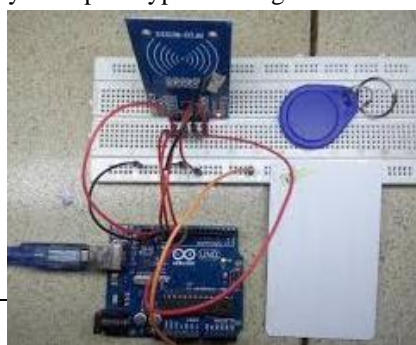


Fig2: Experimental setup of the system

integrating the mobile phone into this system, the interaction between the main gate security and the host person about the future course of action is very quick and hassle free. With the strategically placed card readers, the exact location of the visitor can be traced accurately. The reaction time reduces considerably because the Security is alerted the moment the visitor jumps over the time limit. Through this project the Security System works in real time with the visitor instead of back tracing the footprints. Moreover, the system no-where compromises on the identity of the visitor unless called for. Fig2 shows the experimental set-up of the Security System setup.

## 5. Conclusion

RFID tags are used in a variety of applications nowadays and even form the basis of a lot of IoT applications. They offer a lot of advantages in terms of their size, cost, speed, reliability, reconfigurability, wireless, no-touch operation. They can be seamlessly integrated with other systems of sensors. Security systems using RFID are common everywhere, this project just takes an extra step towards solving the security concerns of residents from a potentially malicious visitor. The concern where the security can be compromised is the damage of the RFID tag by the visitor. The possibility of changing the RF tag to a tamper-proof wrist band will make the system more efficient.

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