International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 07 Issue: 05 | May 2020 www.irjet.net p-ISSN: 2395-0072

RFID/Barcode Scanner Half Height Tripod Turnstile

Cdt. Anay Mulik[1], Prof. Lalit Kumar[2],

[1]*Student, Dept. of ECE, MIT School of Engineering, Pune, Maharashtra, India*
[2]*Assistant Professor, Dept. of ECE, MIT School of Engineering, Pune, Maharashtra, India*

Abstract - *The problem of security at institutions, organizations etc from restricting any unknown individual from entering the premises is the widely known problem and a major concern for threat for the organization. Deploying of only security forces proves to be un-satisfactory to ensure high rate of secure environment within the premises. Control Access Gates are widely used for their ability to help organizing and securing different events and activities which are made to make the daily life of humans more smooth and secure. The aim of the project is to build a low cost fast and flexible RFID/ Barcode Scanner Half Tripod Turnstile (A Smart Control Access Gate) with a secure encrypted database and entry audits.*

Key Words: RFID, Barcode, Arduino Uno, Tripod Turnstile, Security, Control Access Gates

1. INTRODUCTION

The control access gates such as turnstiles are widely used for their ability to help organizing and securing different events and activities which are made to make the daily life of humans more smooth and secure. The aim of the project is to build a low cost fast and flexible RFID/Barcode Scanner Half Tripod Turnstile (A Smart Control Access Gate) with a secure encrypted database and entry audits. As a credential is presented to the RFID it sends the information to the processer which compares this information with the access control list and based on that it will either accept or deny the given input. If it denies the input the door remains locked. If there is a match between the credential and the access control list, the control panel operates a relay that in turn unlocks the door. The screen is an output device which prints anything you need (outputs, statement, numbers, etc.). In this project it is used for: displaying a counter for the number of entries and for welcoming anyone who enters the gate. There are two LEDs used in this circuit: red LED which will turn on when the gate is closed otherwise it is off and a Green LED which will turn on when the gate is open otherwise it is off. An electromechanical solenoid valve which consists of an electromagnetically inductive coil, wound around a movable steel or iron slug is used. The main function of this solenoid is to act as a locking mechanism to lock the door, and only opens when the ID card is used on the RFID.

2. LITERATURE SURVEY

2.1 Wireless Authentication of Smart Doors using RFID[1]

In this paper they have designed a low cost effective way to replace metal keys and use RFID tags for door locking/unlocking system. In order to eliminate the inconvenience of opening doors and alleviate faculty concerns about losing the master key, this project strived at creating an affordable and secure system that could be scaled up to the infrastructure level. This project served primarily as a means of investigating this potential, with a particular emphasis placed on controlling overall system cost while offering security. The importance of this consideration is in direct response to the perceived over inflation in price of professional RFID solutions for offices, businesses and universities. It is the position of the team undertaking this project that a system with many of the convenient features of a professional solution could be built for a small fraction of the cost. Each lock in the system is independently Internet enabled to eliminate the need for a dedicated connection to a central network controller device. Instead, each lock is permitted to communicate directly over the Internet to a central cloud based database server, provided by Amazon Web Services. This server is maintained by a door administrator who is able to use the web interface to manage user access profiles, remotely disable lost RFID cards, view door access logs and suspicious activity, and easily send messages to other administrators within the system. The web interface for the door administrator allows for advanced system control without the need for expensive proprietary software, advanced knowledge of the system's architecture, or the high installation and maintenance costs associated with dedicated communication wiring. Security is also an important consideration that was addressed in this project. AES128 CBC encryption has been implemented to enhance the resilience of communication between each RFID module and the central server against man in the middle attacks. Of particular concern is the interception of RFID card ID numbers being transmitted in the clear when the RFID module attempts to poll the online database, and when the database sends a positive authentication message to the RFID module in order to open the door. It is on these two communication branches that encryption would be applied. Additionally, the system has been insulated against denial of service attacks through the use of free Cloud Flare services, which dynamically blacklist IP addresses that attempt to hog server resources through excessive http requests. Several solutions for door authentication that take advantage of

modern technologies include magnetic stripe cards and integrated cell phone applications.

2.2 Home Security System for Automatic Door [2]

In this paper they mainly worked to create a security system which is utilizing RFID technology to scan RFID keys at the door knob for automatic door lock purposes. This system is also connected with servo motor to perform a function of physical lock as well as there is a liquid crystal display attached which shows the welcome message on screen in case of authorized and unauthorized user attempts. This type of systems can be used in any type of doors and gates for high class and fastest accessible security with ease of use. In this system user will wirelessly scan the card at the RFID antenna and door knob will rotate automatically for the user. It will also display the name of the person on the screen and welcome sound through the speaker. Users will have significantly portable RFID tags that they will scan at RFID antenna. Software integrated hardware will determine if the user is authorized or not and then system will proceed accordingly. In this paper, it also projects about the future work of such products. In future there can be a smart phone application enhancement for this project that is, creating a smart phone app to give access to guests when person is away from his/her home will enhance this project numerously. The others extensions within the app could also be viewing who is passing through the door by adding the camera to Arduino and sending stream directly to mobile device. This can also extends to, if someone is trying to break in the door, alarm will start beeping on mobile device as well. In short there can be tons of enhancements one can implement in this system as this system is very easy to understand for both consumers and developers.

2.3 GSM Based Door Lock System[3]

In this paper they have analyzed the door lock and unlock system using GSM.

This paper represents a GSM based door lock system to controlling of door lock by short message service. In this security system we are using ARDUINO microcontroller, GSM module, Keypad, LCD display, Motor drive, DC motor and Buzzer. Interface Matrix Keypad is the main aspect of the project. ARDUINO microcontroller is controlling the whole driver unit. It is used for communication. The GSM system for sending the alert message on mobile for unsuccessful attempts of password. A keypad module is used for entering the password for authentication. Once the password entered is incorrect the unsuccessful message will be displayed on the LCD screen. GSM module gets triggered and the registered user gets a message, the buzzer connected will be initiated to alert the people or the security official in the surroundings. GSM module is the most secured mode in which the owner has to enter the password through his mobile via text message to open or close the lock the main advantage of GSM module is that it enables user to lock/unlock the door from remote location. The main advanced feature in all three modules is that if unknown person enters three consecutive wrong passwords, it will send an alert message on GSM mobile number of the owner which is stored in ARDUINO program and also start the buzzer alarm for security alert of the society. In the conclusion, it was seen that the door locks or unlocks system using GSM module was implemented successfully. The design can be used for security based systems and procedures. It is a safe and secure system. The system can be used in residential and commercial development. The following improvements can be suggested for further improvements of system:-

1) Face recognition

2) Designing based on the individual need

3) Integrating with thumb impression

4) Integrating with CCTV network

2.4 QR CODE FOR SAFETY AND SECURITY APPLICATIONS [4]

In this paper, it specifically focuses on the security concern of the automobile using QR code and Arduino Microcontroller. Vehicle security is a major feature that is making advancement as any other body domain feature in automotive industry. In case of losing or misplacing the car keys, one faces difficulty in accessing the car. In this work, an embedded system is designed and implemented that provides key-less unlock feature using a smart phone while preserving security. This paper details the functionality aspect of the embedded system implemented to control the vehicle doors using existing gadgets and apps: QR code, mobile Bluetooth and Android application. This system provides security against unauthorized access to the car by providing a three level security. Smart phones have replaced most of the electronic gadgets these days and are user-friendly. They even provide enough privacy to its users. In case of theft or mishandling, smart phones can be easily locked and made unusable, thus preventing unauthorized access. In this work, an embedded system is developed to unlock car using an authorized smart phone. This work aims at realizing an embedded system that is designed to be implemented in the car to provide key less unlock mechanism for the car doors using the car's unique QR code [4] and smart phone (app). The electronic system realized in this work has the following objectives:

- Provide a cost effective, user-friendly alternative to the conventional auto cop feature available today.
- Give extra functionality to the smart phone at no additional cost.
- Provide a three level security to automobiles and avoid all unauthorized access.

In the conclusion, they proposed a safe and secure product for automobile security replacing key unlocking for door locks with QR code and Bluetooth module. QR Code based car unlock system is designed and a new customizable android app to scan the QR code is developed. Vehicle's keyless secure access system is designed to work with the existing Bluetooth module of the car by establishing connectivity between an authorized smart phone and the car. The appropriate code is

sent from the smart phone to the unlock system in an encrypted way. If the code matches the door opens. Similar method has been used to lock the car as well. This feature provides authorized access to car/s at no extra cost. This can be a safe replacement to the existing RFID based locking system wherein car users need not carry an extra gadget with them. Smart phones of car owners can be given extra feature at no additional cost. Further safety of the vehicle is ensured using a three level authentication in the lock/unlock process.

2.5 Modelling of a Control Access Gate[5]

In this Paper, it discusses about the importance of Control access Gates and the different types of the gates specifically Turnstiles. Access control gates can be used to make different places more secure and well organized. They are used in airports, museums, public transports, stadiums and many other different applications. In addition, access control gates provide more benefits other than securing and organizing, namely, they can be utilized to count the number of people passing through them and also to monitor the process of entering into and exiting from certain places. Gates for disabled people are found next to turnstile gates to help them pass through with convenience. Turnstiles can also be used to control the process of charging money. These advantages make this technology an attractive system to be looked into in terms of its types and its components.

Access control gates come in a vast amount of categories. One of the most common types of turnstiles is the half-height or the waist-height turnstile. This type of turnstiles is known with its user friendly design. It usually comes with a sensor and a motor when the user pushes the arm with a certain force the sensor decides at which speed the arm will rotate. The half-height turnstile like other turnstiles can be connected to a bar code reader or it comes with a token slot to allow access only after payment. One of the disadvantages of this technology is that some users might jump over it to avoid paying the charge. The latter disadvantage can be eliminated by using the full height turnstile which is more heavy, costly and bulky than the half-height turnstile and is somehow close in shape to the revolving door. It is usually made from steel and it has two types: high entrance/exit turnstile (HEET) and exit-only turnstile. The difference between the two is that the (HEET) allows direction in both ways, while the exit-only allows the flow of pedestrians in one way only. The exit only technology is useful in crowded places where the flow of pedestrian is quite intense.

A third type of access control gates is the optical turnstile which relies primarily on electronic infrared beams. Such type of turnstiles does not rely on physical barriers rather it issues an alert (a sound or a light) to warn security guards or staff in charge of an entry or an exit of an unauthorized people or items.

3. METHODOLOGY

As a credential is presented to the RFID it sends the information to the processer which compares this information with the access control list and based on that it will either accept or deny the given input. If it denies the input the door remains locked. If there is a match between the credential and the access control list, the control panel operates a relay that in turn unlocks the door. The screen is an output device which prints anything you need (outputs, statement, numbers, etc.). In this project it is used for: displaying a counter for the number of entries and for welcoming anyone who enters the gate. There are two LEDs used in this circuit: red LED which will turn on when the gate is closed otherwise it is off and a Green LED which will turn on when the gate is open otherwise it is off. An electromechanical solenoid valve which consists of an electromagnetically inductive coil, wound around a movable steel or iron slug is used. The main function of this solenoid is to act as a locking mechanism to lock the door, and only opens when the ID card is used on the RFID.

4. BLOCK DIAGRAM

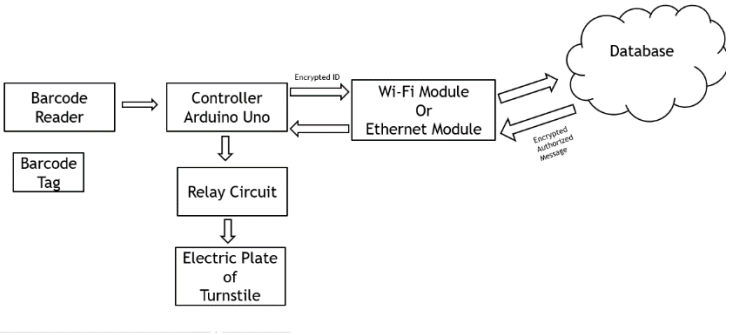

Fig -1: Block Diagram

5. SYSTEM ARCHITECTURE

Three main mechanical parts were used: a wood base, a 30 mm diameter bearing and the metal gate which consists of the arms and the base. In order for the gate to rotate it is fitted into the bearing and the bearing is clamped at the bottom in the center of the wood base

5.1 Hardware Components:

- **Arduino Microcontroller**: A microcontroller that can be attached with breadboard and functioned accordingly. It's programmable and comes with its own programming language called "Arduino IDE Environment" which is based on Java/Verilog/VHDL and mixture of other script languages.
- **RFID Reader/Module**: A microchip which can be attached to Arduino to enable radio frequency identifications by generating magnetic fields. It can be used to read/write RFID cards/tags/keys.
- **RFID Antenna**: This will help generating magnetic field within specific area. Also this is being used to read RFID cards/tags/keys.

- **RFID Cards and Tags**: These are the cards/tags that can be read by RFID Antenna and use as security keys. They store globally unique digital key in them.
- **Barcode Reader**: A barcode reader is an optical scanner that can read printed barcodes, decode the data contained in the barcode and send the data to a computer. Like a flatbed scanner, it consists of a light source, a lens and a light sensor translating for optical impulses into electrical signals.
- **USB Host Module**: The SL811 USB Board is an accessory board that features a USB Host/Slave controller SL811, USB Type A receptacle, and pinheaders connected to control interface. It provides your microcontroller prototype system a USB HOST communication interface, makes it possible to read/write USB flash drive, catch movements of USB mouse, etc. USB Host Module is used to link the Barcode Reader with Arduino.
- **Breadboard**: A board that helps creating electrical projects with electrical components. It is being used to connect speaker and LCD panel with microcontroller.
- **8 Ohm Speaker**: Breadboard compatible speaker that can make noise for security purposes.
- **Servo Motor/ Electrical Plate**: A motor that represents a function of turning knob. This is an essential hardware being used as an actual physical lock.
- **LCD Screen**: A liquid crystal display screen which is being used to display message to users about authorized and unauthorized attempts.
- **Resistors & LEDs etc**: These are other electrical components which are being used in this project.

5.2 System Description

An RFID card receives its power wirelessly from the RFID reader located at the door. This allows the RFID card to wirelessly transmit its identification information to the reader. The reader then passes this information to the Atmega328P microcontroller of the Arduino Uno 6R3.Next, the RFID unique identifier (UID) is encrypted in Javascript by Node.js which is run by the Linux operating system, OpenWrt, on the Yún shield. After the encrypted UID is sent to the server, the server decrypts it in order to compare it to the registered UIDs that are stored in the database. If the transmitted UID corresponds to a user who has access rights to the door that polled the server, the database sends an encrypted positive authorization message back to the RFID module which is first received by the Yún shield through the same process that made the request. After the authorization message is decrypted, the Uno can interpret the information and decide whether or not to unlock the electric strike plate. For example, a positive authorization message that was set as "202" would be interpreted by the microcontroller to send a logic 1 to the input of the NPN Darlington switch circuit which amplifies the current and unlocks the electric strike plate for an arbitrary amount of seconds, thereby allowing the door to be pushed open. After the preset number of seconds has passed, the electric strike plate will lock.

5.3 RFID Module Flowchart

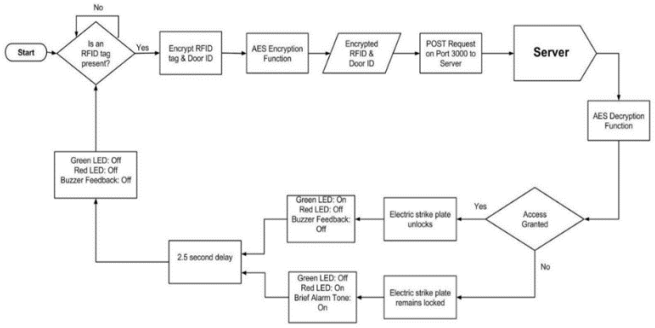

Fig -1: RFID Module Flowchart

6. CONCLUSION AND FUTURE SCOPE

6.1 Conclusion

The model for controlling access gates of RFID Half Height Tripod Turnstile was studied. The system represents a great demonstrative experiment for university students towards mechanical, mechatronics, industrial and electrical engineering. It also sets the background as a bench mark model for further developments and advancements. In addition, today's RFID technology offers improved methods of access control, especially when compared to magnetic stripe technology which is starting to become antiquated just as much as metal keys are. All the more surprising, metal keys are still being used in the electrical engineering department. One key per lock is unnecessary, inefficient, and unsafe considering that thousands of dollars accrue in both metal key and magstripe systems due to proprietary maintenance and upgrades which could lead to a serious flaws in the system if avoided.

6.2 Future Scope

a. In future there can be a smart phone application enhancement for this project that is, creating a smart phone app to give access to guests and creating a barcode or QR code.
b. For this project, Face recognition unlock system and/or Voice recognition system can also be developed.
c. The others extensions within the app could also be viewing who is passing through the turnstile by adding the camera to Arduino and sending stream directly to mobile device.

d. This can also extends to, if someone is trying to jump through the turnstile, alarm will start beeping on mobile device as well. In short, there can be tons of enhancements one can implement in this system as this system is very easy to understand for both consumers and developers.

REFERENCES

[1] Wireless Authentication of Smart Doors using RFID by Austin A. Hentrup from Loyola Marymount University. A thesis submitted in partial satisfaction the requirements of the University Honors Program of Loyola Marymount University

[2] Home Security System for Automatic Door presented ABDUL S.. RATTU as Capstone Design Project Final Report, Spring 2013 School of Engineering, The State University of New Jersey, USA May 1st, 2013 ECE 468

[3] GSM Based Door Lock System published by Najma, B. Mohana, A. Mohan Babu International Journal of Innovative Technology and Exploring Engineering (IJITEE) ISSN: 2278-3075, Volume-8 Issue-6S, April 2019

[4] QR CODE FOR SAFETY AND SECURITY APPLICATIONS published by the Students of BMS College of Engineering by Pragna P Rao1, Pushpa Bai G2, Sneha K3, K.P.Lakshmi4 1,2,3 Student, ECE, BMS College of Engineering, Bangalore, India 4Associate Professor, BMS College of Engineering, Bangalore, India IJRET: International Journal of Research in Engineering and Technology.Volume: 06 Issue: 06 | Jun-2017

[5] .International Journal of Applied Engineering Research ISSN0973-4562 Volume 11, Number 18 (2016) pp 9400-9402. Modelling of a Control Access Gate. The Omar Akashaa and Moh'd Sami Ashhab b,c aRAK Research and Innovation Center, American University of Ras Al Khaimah, UAE bMechanical and Industrial Engineering Department, American University of Ras Al Khaimah, UAE. cMechanical Engineering Department, The Hashemite University, Zarqa, Jordan

[6] https://www.researchgate.net/figure/Figure-4-Flowchart-for-solenoid-door-lock-programming_fig3_292624568

[7] https://www.researchgate.net/figure/Proposed-system-block-diagram-V-MODULE-COMPONENT-DESCRIPTION-A-Arduino-Uno-Arduino_fig1_325598823

[8] https://www.elprocus.com/automatic-door-lock-system-using-rfid-and-arduino/

BIOGRAPHIES

Cdt. Anay Mulik is studying in 2nd year pursuing B.Tech (Electronics and Communication Engineering), MIT- School of Engineering, Pune. His interest of research is Embedded systems, renewable energy.

Prof. Lalit Kumar received B.E. Degree in Electrical engineering from R.T.M. Nagpur University and MTech. degrees in electrical Power System from BVDU COEP, and Currently pursuing Ph.D. Degree from VIT University, Chennai. He is working as an Assistant Professor in the MIT School of Engineering, MIT ADT University, Pune, India. His interest of the research is power system ,Electrical machines and control system