

Students' Vehicle Monitoring System using RFID

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Abstract- In today's world controlling the access to vehicles in a particular area, premises or campus is a big matter of concern. Currently there are no specific systems installed at access points or there are traditional pen paper-based gate pass systems which is a slow and tedious process. This project is focused on developing a system that provides a cost efficient, faster and reliable solution for the same problem. We are designing an access channel for the same. In our system every individual will be assigned with RFID tag and details of the individual will be saved in the database. When the individual arrives at the gate or access terminal, he or she must present the tag at the gate reader, reader will send the tag details to the server via Ethernet module and data will be compared allowing only authorized person to enter. We are making use of RFID technology for building this system efficiently and Angular to provide beautiful user interface

Keywords: Monitoring, Raspberry pi, RFID, Students, Vehicle.

I. INTRODUCTION

Problem Statement

The aim of this project is to automate the monitoring of vehicles which arrive at the gate of the college Campus using RFID technology efficiently.

Existing pen-paper based vehicle monitoring system in college is the example for one of the manual systems. In the manual system security guard has to monitor all the vehicles which arrive at the gate which includes checking entry pass of each vehicle every time as it arrives or leaves the campus, note down the in and out time of the vehicles which are time consuming and are not efficient. During the process guard might miss some of the vehicles which might lead to many problems. In order to solve all the problems stated above we are implementing a project which will automate all the processes.

Access control to various campuses or buildings is very important thing to eliminate the security issues faced by the different organizations in world these days. By installing our system at the entrances, we can eliminate security issues by only allowing authorized persons to pass through the access channel. We can also monitor the movement of the authorized person inside the campus by installing this system at various points. In this system no unauthorized person will be granted entrance through the access channel hence increasing the security. The RFID technology is a general term for technologies deploying radio waves for discovering objects. The automatic authentication of vehicle provides the elasticity, accessible, and responsiveness needed in day today life. It gives accurate, up-to-minute information, faster communication, and strong analysis features required to make decisions faster. The proposed model provides an automatic system for monitoring and controlling vehicles in the college campus by using the tags, client sever PCs, and the network connection between them. By creating a central database close system access will also be possible. Through the remote access, the administrators can view the details of the users or add new users and monitor the in and out time of the users at college campus in turn reducing the tedious pen-paper based work.

II. LITERATURE SURVEY

The implementation of vehicle authentication system helps in removing manual processes, overcomes miscommunication and confusions caused while entering the college. It saves the time by making the authentication of vehicles independent of human labor.

Osman Abd Allah et al. [1] has proposed RFID technology to monitor and controlling and registering of an access for security reasons. The application has the ability to control gate entrance, and software which shows record and monitors user details and status of the system. This software has the ability to read and display the username, card

number, user arrival time, how many times we have used the card. It also saves all the data in a text file in a UI configured and designed using a software- LabView.

Cesar Pedraza et al. [2] presented a platform known as PCIV (intelligent platform for vehicular control) for monitoring the traffic, based on RFID and Cloud computing, applied in public transportation systems for road traffic monitoring. The paper shows the experimental validation and design approach of the platform in two dynamic situations: A small city and university campus and. Experiments demonstrated RFID technology is implemented to monitor the traffic in cities.

Edward B. Panganiban et al. [3] focused to develop and design a vehicle monitoring system using RFID. It gives the information of all the vehicles that are registered using RFID module, using GSM which sends message to the database. The outcomes showed that RFID-Based Vehicle Monitoring has fulfilled its requirements by outputting the desired functions and specifications. The application performs good for all the technical tests.

S.Durga [4] proposed a driver and a vehicle identification authentication system consists of a database of registered vehicles with the help of RF tags, TCP/IP, RF tag Reader and Writer. The Tag is placed in vehicles that are at the entrance of a gate. Driver authentication is performed by reading the RF tag.

Saikrishna Chatrati [5] consists of three technologies to detect human-activity: Inactive RFID and computers envisage active sensor beacons. RFID tags and active beacons have same object-identification accuracy, with the benefit battery-free; disparate sensor beacons are not able to detect motion. This system can be used with an automatic attendance monitoring system to monitor students' attendance or other people whose whereabouts are need to be traced.

Yan Qiu [6] focussed to improve the campus securities and to get the personnel details, and campus control system. TCP/IP, HTTP, PPP, POP3, HTML3 and SMTP are used to constitute the basic network and transport layer to transmit real-time access information. Network Connection Element (NCE) are used to access the real-time access information. NCE's used are like radio frequency devices, computers and routers, surveillance camera devices.

Prof. A. A. Pandit [7] presented the project of tracking system of vehicles aims at using RFID for developing vehicle's tracking system. This paper shows 3 major problem that are theft of vehicles, congestions on roads and traffic signal timings. The solutions for these problems are: the signals of the traffic are made dynamic which are based on the regression. This also contains the detailed set of time and traffic quotient.

Ting-Kao Liu [8] proposed the system to access control and safety of the traffic during the in and out time. The duty of traffic service team which are consists of students or the security service personnel and military training instructors. This project helps in introducing a campus gate control system, and it also provides the cardholder with the privacy details which is highly protective to enhance the security of application.

In paper[11] authors focused on detecting and spraying on weeds by using drone with RFID technology.

III. DESIGN

The proposed model uses RFID technology to solve the stated problem in the campus. Each vehicle is mounted with unique RFID tag. As a type of wireless identification technique, Radio frequency identification can identify automatically the objects and get the related data from radio frequency without the human interference. RFID readers mounted near college access channel will read the RFID tag fixed on the vehicle's windshield. All the required details of the individual will be saved in the database which is mapped to each unique RFID tag. When the individual arrives at the gate or access channel, he or she has to present the tag at the reader. Reader will send the tag details to the server. When the server receives this data, it compares with the database. If the individual is an authorized person then he is allowed to enter the campus. In addition to authenticating the individual our system also saves the in and out time of the vehicle each and every time it arrives or leaves the campus. By doing this we can check the presence of the individual in the campus.

Figure 1 shows the overall system design, the various components involved in this system which highlights on elements or components of a structure and equates them into a functional and coherent according to a specific approach in getting the objective(s) under the given limitations or constraints

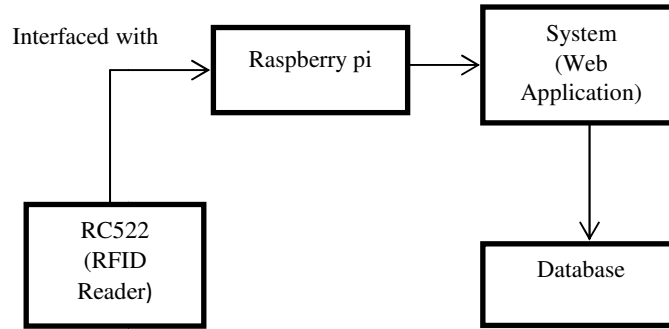


Figure 1. Architecture Diagram

A flowchart is a kind of diagram which represents a process or workflow. It can be stated as a step-by-step approach for solving a task and diagrammatic way of an algorithm. Figure 2 shows the flow of activities of the system. Initially the system waits for an RFID to read. When the tag is detected, it compares the RFID with the RFID present in the database. If it is present in database, then that person is allowed inside the campus. This process continues.

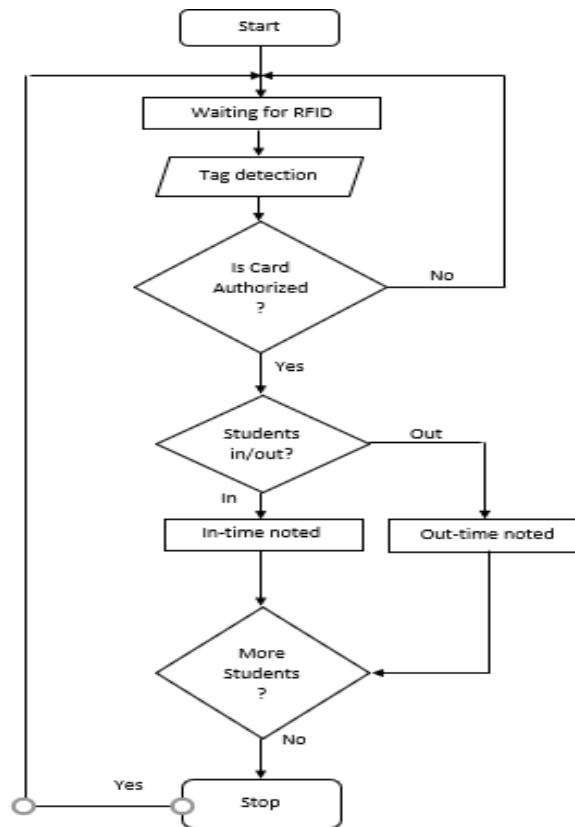


Figure 2. Control flow diagram

Admin can login using the UI and is only for the admin to login. When student approach the college gate he/she has to show RFID provided, to the RC522 Reader. The reader will read the ID of the given RFID and compare the data with RFIDs in the database. If the data is registered in database, then he/she is allowed inside the campus.

IV. IMPLEMENTATION

4.1. Hardware Interfaces

1) *Raspberry Pi 3 Model B+* [9] is a single board computer. The Figure 3 below is of power rating of 5V, 700mA. It is much cheaper than actual computer. The boards are of different models. Models consist of on chip GPU and broad com system on chip (SoC) with an integrated ARM compatible CPU. The processor speed varies from 700MHz to 1.4GHz for raspberry pi 3. The on-board memory varies from 256 MB to 1 GB RAM. The program memory and operating system are stored in SD cards. It is stored either in SDHC or MicroSDHC sizes. The boards have 1 to 4 USB ports. Composite video and HDMI are supported for video as output, with the standard 3.5mm phone jack for audio as output.



Figure 3. Raspberry Pi 3 Model B+

2) *RC522 Reader and Tag*: Figure 4 shows the RC522 Reader and writer. RC522 RFID Reader/Writer 13.56MHz with cards kit which includes 13.56MHz reader/writer modules that uses RC522 IC and also 2 S50 RFID cards. Figure 4 below is a highly integrated transmission module for contactless communication at 13.56MHz. RC522 supports ISO 14443A/MIFARE mode. RC522 RFID reader produces a good modulation and demodulation for effortless Radio Frequency communication at 3.56MHz. The module uses SPI to communicate with other devices.



Figure 4. RC522 Reader and Tag

4.2. Software Interfaces

1) *PuTTY*[10] is a terminal emulator application which can act as a client for the Telephone network, rlogin, SSH and raw TCP computing protocols and as a serial console client. It is free and opensource. It is a useful application which can be used to connect to Secure Shell (SSH) and serial ports to Raspberry Pi.

2) *Angular*: Angular is also called as a single-page application. It is a good platform for building applications with the help of TypeScript and HTML. Angular is written using TypeScript. Angular components are the building blocks of the Angular framework. Components illustrates views, which are sets of screen elements. Angular can choose any screen from the same set according to the business logic and modify. It is helpful in providing beautiful user interface.

3) *VS Code*: Visual Studio Code is considered to be a free editor designed by Microsoft for Windows, macOS and Linux. VS Code has the simplicity of an editor. It also combines powerful developer tooling, debugging and code

completion. In our project we have made use of VS code since this is the best available option for us to use Angular. Extensions available in this editor makes it easier to work with Angular.

4) *MongoDB*: MongoDB is a, document-based, general purpose distributed database which is built for the cloud era and modern application developers. It is leading NoSQL database and open-source document database. MongoDB is written in C++. It is easy to connect with Angular and students' data will be stored in this database.

V. RESULTS

Figure 5 shows the UI login page. Here the admin can enter user id and password to login to the website and perform operations like adding/removing/viewing students' details.

Figure 5. Login Page of Control System

Figure 6 shows the part of UI where admin can view the in and out time log along with features of adding a student.

Figure 6. Addition of students and log view

Figure 7 shows the part of the UI where admin can delete a student by giving USN of that particular student.

Figure 7. Removal of an entry

VI. CONCLUSION

The proposed model aims at designing an RFID based vehicle authentication system, which is convenient, user friendly and has an attractive user interface. The proposed vehicle authentication system avoids miscommunication between the guard and the students entering the college. In the manual process guard might miss some of the vehicles which may lead to the security problems. The proposed vehicle authentication system makes the authentication process of vehicles compulsory at the gate and thereby overcomes the security problems by allowing only the authorized vehicles. The system also records the in and out time of the vehicle so that one can track vehicle movement and also can check the presence of an individual in the campus.

All industries are getting automated to improve productivity and reduce time consumption on manual processes. So, there is very good scope for Industrial automation in India. The vehicle authentication automation is a revolutionary concept and is sure to take people by surprise.

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