CAR PARKING SYSTEM USING RFID

An Engineering Project in Community Service

Phase – II Report

Submitted by

Team Members List

Aditi Santosh Patil 19MIM10045

Sakshi Pathak 19BEE10004

Jayant Verma 19BCY10106

Oishik Paul 19BCY10122

Himanshu Goyal 19BCY10138

Isha Anand Runijha 19BCY10151

Rahul David Singh 19BCY10171

Somil Athole 19BCE10278

in partial fulfillment of the requirements for the degree of

Bachelor of Engineering and Technology

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Madhya Pradesh

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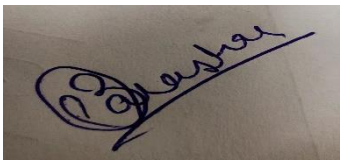
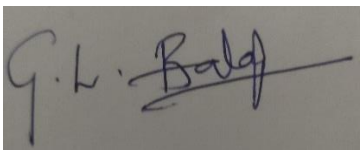
Bonafide Certificate

Certified that this project report titled "CAR PARKING SYSTEM USING RFID" is the bonafide work of **Aditi Santosh Patil 19MIM10045, Sakshi Pathak 19BEE10004, Jayant Verma 19BCY10106, Oishik Paul 19BCY10122, Himanshu Goyal 19BCY10138, Isha Anand Runijha 19BCY10151, Rahul David Singh 19BCY10171, Somil Athole 19BCE10278** who carried out the project work under my supervision.

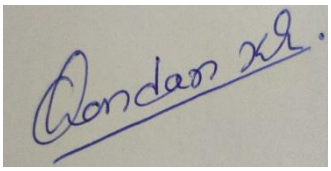
This project report (Phase II) is submitted for the Project Viva-Voce examination held on 26/02/2022



Dr. Bhakti Parashar
Supervisor



Dr. G L Balaji
Comments & Signature (Reviewer 1)



Dr.Chandan Kumar
Comments & Signature (Reviewer 2)

1.INTRODUCTION

Nowadays, there is a critical problem of car parking in many public venues such as malls, multiplex systems, hospitals, businesses, and market areas. There are many lanes/slots for car parking in the [1-3] area. To park an automobile, one must first search for all available lanes. Furthermore, this necessitates a significant amount of manual labor as well as financial expenditure. As a result, an automatic parking system that displays the availability of vacant parking spaces in any lane right at the entrance is required. It consists of an infrared transmitter-receiver pair in each lane, as well as a display outside the car parking entrance. As a result, the individual looking for a parking spot is adequately informed on the state of available parking spaces. Conventional parking solutions are ineffective, do not have any intelligent monitoring system and the parking lots are monitored by security guards.

A lot of time is wasted in searching vacant slot for parking and many a times it creates jams. Conditions become worse when there are multiple parking lanes and each lane with multiple parking slots. Use of parking management system would reduce the human efforts and time with additional comfort. In the proposed system, the display unit displays a visual representation of the parking and it shows the empty and occupied slots which help the user to decide where to park their car. The system would not only save time but the software and hardware would also manage the Check-in and check-outs of the cars under the control of RFID readers/ tags with additional features of automatic billing, Entry exit data logging. The users go through a onetime registration process where there are asked to fill in their personal details and an account is created for them, this account has information about them and also has money in it which they can recharge at kiosks present in the vicinity. In this system, the users are guided to the vacant slot for parking using Video Displays at the entrance of the parking floor, these displays show a visual representation of the parking lot with empty and occupied slots which are green and red respectively. The user is provided with a tag which he receives on registration, this tag is linked with his prepaid account and includes his personal information, and this tag uses Radio Frequency identification (RFID) technology and is placed on the top of the user's windshield. The parking charges are automatically deducted from the user's account based on the time spent inside the parking area.

2. Motivation

The main motivation for making Car Parking System is because of the huge amount of time people have to take in order to park their cars in malls, multiplex systems, hospitals, offices and super markets. In the existing system, one has to spend ample time before they find out an empty parking spot and also the conventional payment method requires the user to spend a lot of time to complete their transaction. Creating
an automated system which not only helps users to make parking much more efficient and faster but also automates the payment gateway using RFID thus saving the user a lot of time.

3.Objective

Now days in many public places such as malls, multiplex systems, hospitals, offices, market areas there is a crucial problem of car parking. The car-parking area has many lanes/slots for car parking. So to park a car one has to look for all the lanes. Moreover, this involves a lot of manual labor and investment. So, there is a need to develop an automated
parking system that indicates directly the availability of vacant parking slots in any lane right at the entrance. It involves a system including infrared transmitter- receiver pair in each lane and a display outside the car parking gate. So the person desirous to park his vehicle is well informed about the status of availability of parking slot. Conventional parking systems do not have any intelligent monitoring system and the parking lots are monitored by security guards. A lot of time is wasted in searching vacant slot for parking and many a times it creates jams. Conditions become worse when there are multiple parking lanes and each lane with multiple parking slots. Use of parking management system would reduce the human efforts and time with additional comfort. In the proposed system, the display unit displays a visual representation of the parking and it shows the empty and occupied slots which help the user to decide where to park their car. The system would not only save time but the software and hardware would al[1]so manage the Checking and check-outs of the cars under the control of RFID readers/ tags with additional features of automatic billing, Entry exit data logging.

4.Existing Work / Literature Review

Alsaferyet and colleagues (2018). In Smart Cities, a Smart Car Parking System Solution for the Internet of Things is available. 10.1109/CAIS.2018.8442004. The Internet of Things (IoT) may connect billions of devices and services with a variety of applications at any time and in any location. The Internet of Things (IoT) is a relatively new technology. The smart car parking is one of the most important current research discussion topics in the IoT.

- The article suggests a smart car parking system that will help users address the problem of locating a parking space and reduce the amount of time they spend looking for the nearest available parking spot.
- It informs users about the current state of traffic congestion on the highways. Furthermore, the suggested system captures raw data locally and extracts features using data filtering and fusion algorithms to reduce network data transmission.
- To limit the amount of data carried over the network, the suggested system captures raw data locally and extracts features using data filtering and fusion algorithms. The converted data is then uploaded to the cloud, where it is processed and evaluated using machine learning techniques.

Website

https://www.researchgate.net/publication/326997495_Smart_Car_Parking_System_Solution_for_the_Internet_of_Things_in_Smart_Cities

2

Chechi et al. (2012). THE RFID TECHNOLOGY AND ITS APPLICATIONS: A REVIEW. International Journal of Electronics, Communication & Instrumentation Engineering Research and Development (IJECIERD). 2. 109-120. Radio Frequency Identification (RFID) is one of most exciting technologies. The purpose of this paper is to review the RFID technology and its applications.

- This paper provides a brief overview of RFID fundamentals, RFID tag and reader classification, frequency usage, current applications, and advantages and limits.
- One of the most intriguing technologies is radio frequency identification (RFID). The goal of this study is to provide an overview of RFID technology and applications. The purpose of this study is to examine the current state of this technology as well as its potential future applications.
- RFID has a fast-reading speed and can operate in the presence of a barrier. When a larger read range, quick scanning, and flexible data carrying capability are required, this technology is more effective. RFID technology is gaining traction in a variety of industries, including manufacturing, agriculture, transportation, and industry.

Website

https://www.researchgate.net/publication/232575248_THE_RFID_TECHNOLOGY_AND_ITS_APPLICATIONS_A_REVIEW

Muhammad et al., Mazlan et al., Mazlan et al., Mazlan (2018). Car Parking System Using Radio Frequency Identification (RFID). 2. 10.30630/joiv.2.4-2.173 in JOIV: International Journal on

Informatics Visualization. RFID technology is widely employed in a variety of applications, including attendance systems, tracking systems, monitoring systems, and parking systems. It has the ability to increase security for both security officers and users.[3]

- This study examines a parking system that employs RFID technology to track vehicle movement as it enters or leaves a given region or location by scanning the RFID tag.
- This parking system can help users with access control and traffic flow during peak periods. User registration, car registration, RFID tag, personnel, and report generating are the five modules of the proposed parking systems.
- Currently, the existing parking system requires a security guard to enter the premises manually. As a result, the corporation will need to engage a security guard to keep an eye on the premises. In addition, security personnel must keep an eye on any vehicle or person who enters or exits the premises. As a result, an illegal vehicle or person can get easy entry to the structure. To overcome this issue, researchers proposed an RFID-based parking system that can track vehicle movement when it enters or leaves a given region or location by scanning the RFID tag.

Website

https://www.researchgate.net/publication/327575252_Radio_Frequency_Identification_RFID_Based_Car_Parking_System

5.Topic of the work

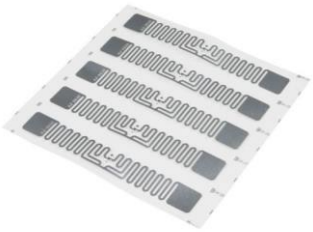
a) System Design/Architecture:

RFID stands for Radio Frequency Identification, and it is a wireless system made up of three parts: tags, antenna readers, and a base station.

- **Key components of RFID**

- **RFID tag**

A microchip in an RFID tag is programmed with information about the object being tagged. Typically, the data is used to identify the object, but some tags have the ability to incorporate extra data, such as the item's date of manufacture or a location code.



ii. RFID antenna

Antennas on tags and readers allow them to communicate with one another. The read range refers to how far apart they can be and yet communicate. The size of the tag antenna and the design of the reader antenna define the read range in part.

iii. RFID reader

RFID tags are read by RFID readers, which gather data from them. What we're attempting to track, where we're trying to monitor it, the materials around it, and what we want to know about it all influence the type of reader we use. RFID readers do not need to "see" a tag in order to read it. Even if tags are hidden by wood, plastic, or other materials, they may gather data from them.

iv. RFID station

A radio transponder, a radio receiver, and a transmitter make up an RFID system. The tag transmits digital data, generally an identifying inventory number, back to the reader when activated by an electromagnetic interrogation pulse from a nearby RFID reader device. This number can be used to keep track of your inventory.

- **Required hardware:**

- Arduino
- Servo motor
- RFID Modu[4]le

- **Arduino UNO**

The Arduino board perceives the world by accepting information from a variety of sensors and then controls lights, motors, and other actuators to influence their surroundings. The Arduino board is a microcontroller development platform that will be central to your projects.

When developing anything, you'll be constructing circuits and interfaces for interaction, as well as instructing the microcontroller on how to communicate with other components.

2) **Servos (Tower Pro MG996R):**

The MG996R is an improved version of the well-known MG995 servo, with improved shock-proofing and a revised PCB and IC control system that makes it considerably more accurate than its predecessor.

- To increase dead bandwidth and centering, the gearing and motor have been modified.
- This basic servo with strong torque can spin around 120 degrees (60 in each direction).

3)RFID Module (Generic):

- RFID (radio-frequency identification) is a technology that employs electromagnetic fields to identify and track tags attached to items.
- The tags include data that has been saved electronically.
- Passive tags gather energy from probing radio waves emitted by a nearby RFID reader. Active tags function hundreds of meters away from the RFID reader and have a local power source (such as a battery).
- The tag, unlike a barcode, does not need to be in the reader's line of sight, therefore it can be embedded in the monitored object. RFID is a type of automated data collection and identification system.

o Working principle

- The project demonstrates how to create an RFID-based automobile parking system using an Arduino uno, in which only authorized individuals with a valid RFID card are permitted to park.
- The authorized user with an RFID tag can enter after the circuit is turned on.
- When the reader detects the ID card, it sends a unique card number to the microcontroller.
- If the card number matches a number registered in the microcontroller or database, the microcontroller will enable the automobile to park in the restricted area. If this is not done, the matching gate will not open for the automobile to park.

➢ Vehicle Parking Management System using use PHP and MySQL

In VPMS we use PHP and MySQL database. This is the project which keeps records of the vehicle which is going to park in the parking area. VPMS has one module i.e. admin.

- Dashboard: In these sections, admin can briefly view the number of vehicle entries in a particular period.
- Category: In this section, admin can manage category (add/update).
- Add Vehicle: In this section, admin add vehicle which is going to park.
- Manage Vehicle: In this section, admin can manage incoming and outgoing vehicle and admin can also add parking charges and his/her remarks.
- Reports: In this section admin can generate vehicle entries reports between two dates.
- Search: In this section, admin can search a particular vehicle by parking number.

Admin can also update his profile, change the password and recover the password.

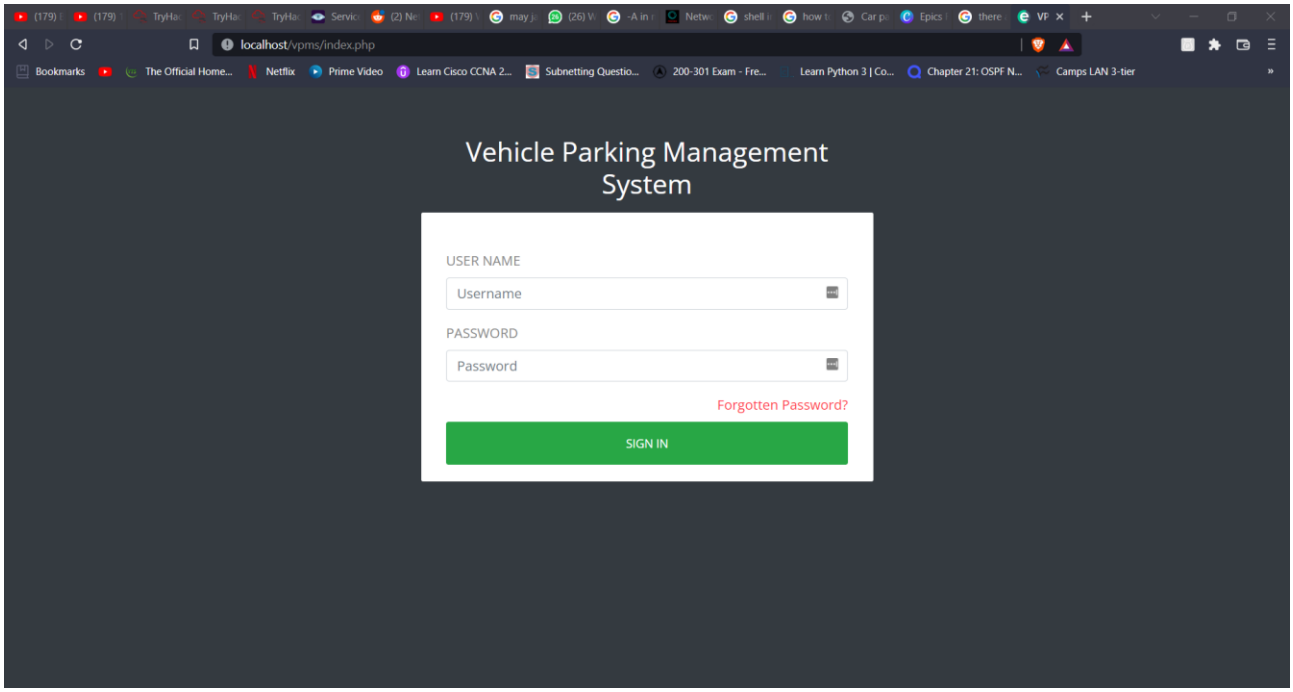


Fig 1. Login window

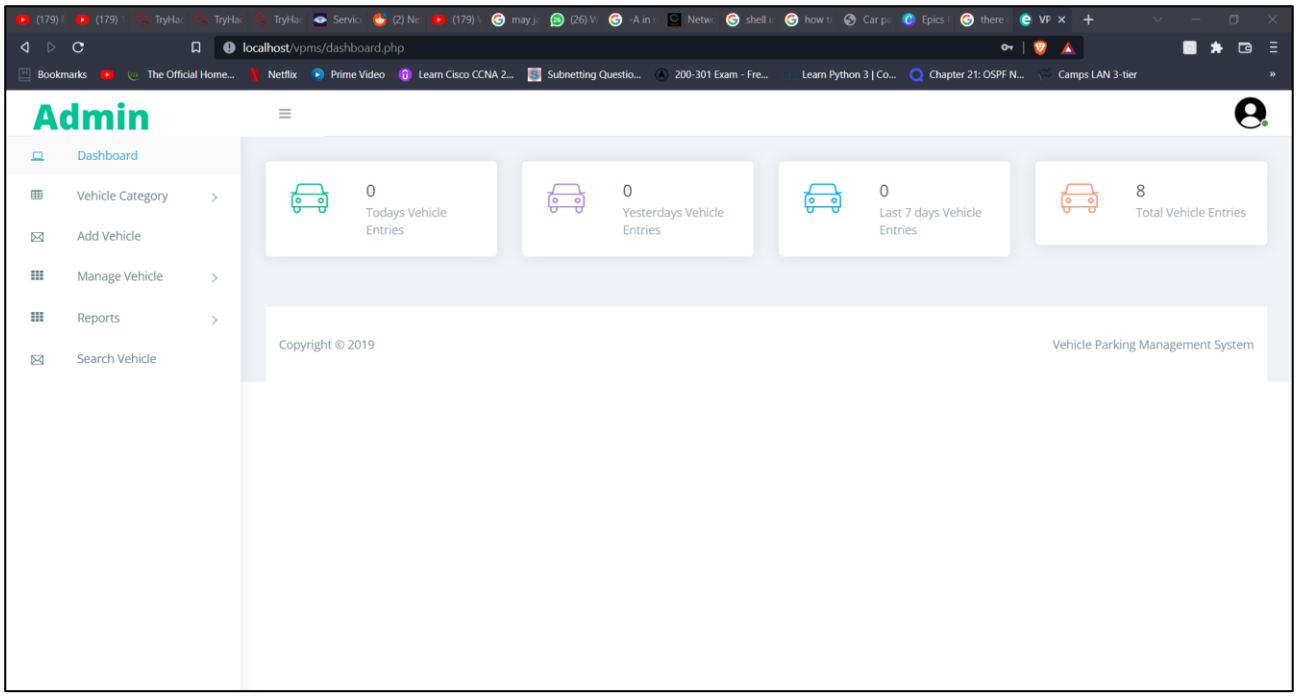


Fig 2. Home page

➢ Smart Car Parking System Using Java and Google Firebase

In car parking app, we use Java and Google Firebase. This app is for the users, in which they can check:
Available parking slots: Users can check the nearest available parking slots in the parking area.
Current Location Tracking: Users can track their vehicle's location, at any given time.
Entry & Exit time: Users can check their entry and exit timings.
Payment options: Users can choose from various payment options, like - Cash, UPI, Net-banking, etc.
Payment tariff: Here, users can view the payment rates.
Payment history: Users can [5]check their past payment activities.
Account details: Users can view the account, they have created on this app.

Fig 3. Admin Log-in Window

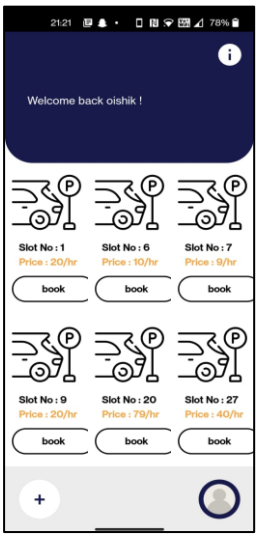


Fig 4. Admin Home Screen

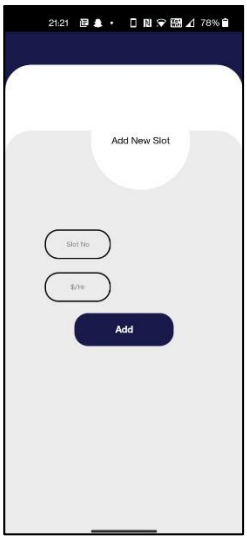


Fig 5. Parking Slot Adding Option for Admin

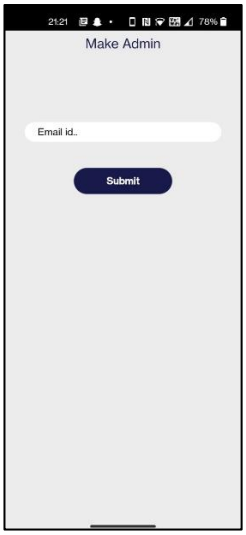


Fig 6. Add admin option for master admin

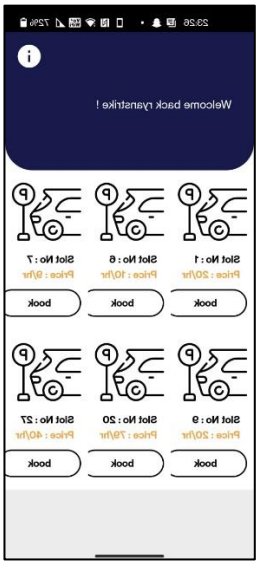


Fig 7. User login window

Fig 8. User home screen

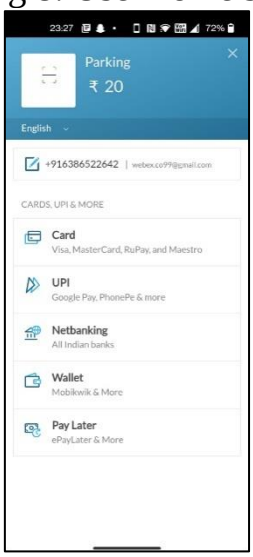


Fig 9. Payment window for user

Fig 10. Payment options window for user

Fig 11. Payment History

c) Expected result

RFID technology continues to advance, resulting in greater memory capacity, broader scanning ranges, and faster processing. With more parking joining the trails, interest in RFID as a way to improve further the automation and tracking of papers is growing at a rapid rate. "RFID is gaining traction in the parking industry, since early adopters have demonstrated that it saves money for both large and small parking lots."

6.MY CONTRIBUTION

I, Sakshi Pathak (19BEE10004), have contributed in developing the parking app mainly. In regards to the app I built the overall structure of the app including the segregation of the user payment options and Current Location Tracking. I also implemented the databases that contains the info about the user and admin respectively using Google Firebase. The coding that was involved for the successful development of the app has been done mainly on Android Studio using Java.

7. CONCLUSION

RFID technology is rapidly gaining traction in a variety of settings, including malls, libraries, and other public spaces. Though many businesses are using this technology today, communities are becoming more active in its development as a result of its configurable features and ongoing improvements. It's possible to imagine that the RFID tags' contents will get more powerful, costs will fall, and the tag's efficiency and accuracy will improve.

RFID technology enables self-contained, non-stop security, parking, and access control systems. This technology allows companies and communities to regulate access to just approved cars without having to use their hands. One of the few real-time locating systems that provides a quick return on investment is the RFID park lot management system (ROI). The system assisted the user in saving time spent looking for a parking spot and increasing parking lot use.

Because of the information given by the system, vehicle travel time and search time are greatly decreased, making the system more efficient. With the information supplied, drivers may easily avoid parking places that are completely filled and discover available parking spaces nearby.

The visual definition of the system is to avoid traffic and save time. This system will assist you in locating local parking lots in your region, as well as allowing you to reserve a parking spot. It also allows you to make payments online. As a result, we conclude that by using the proposed approach, we will be able to save time and minimize traffic. This system has been suggested, along with its functional requirements.

8. Reference:

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