



Available Online at www.hithaldia.in/locate/ECCN
All Rights Reserved

ORIGINAL CONTRIBUTION

RFID BASED SMART PARKING SYSTEM

¹Pinaki Satpathy, ²Sumit Ranjan, ³Sonu Kumar Roy

¹*Department of Electronics and Communication Engineering, Haldia Institute of Technology, Haldia, Purba Medinipur, West Bengal*

^{2,3}*UG student, Dept. of Electronics and Communication Engineering, Haldia Institute of Technology, Haldia, Purba Medinipur, West Bengal*

ABSTRACT

The main objective is to avoid the cramming in the car parking area by implementing an efficient car parking system along with a user-friendly application for an ease of use. Normally at public places such as multiplex theatres, market areas, hospitals, function-halls, offices and shopping malls, one experiences the discomfort in looking out for vacant parking lot, though it's a paid facility with an attendant/security guard. The parking management system is proposed to demonstrate hazard free parking. The proposed system uses infrared transmitter-receiver pairs that remotely communicate the status of parking occupancy to the raspberry pi and displays the vacant slots on the display at the entrance of the parking so that the user gets to know the availability /unavailability of parking space prior to his/her entry into the parking place. Implementation involves minimal human interaction and provides a seamless parking experience thereby reducing a lot of time wasted by the user in parking his/her vehicle.

The RFID Park System is an innovative solution designed to enhance the efficiency and convenience of parking management. The system utilizes Radio Frequency Identification (RFID) technology to automate various parking processes, including vehicle entry, exit, and payment. By integrating RFID tags and readers, the system eliminates the need for manual ticketing and reduces the time spent on parking transactions.

In the RFID Park System, each vehicle is equipped with an RFID tag containing unique identification information. As a vehicle approaches the parking entrance, the RFID reader detects the tag and grants access automatically, eliminating the need for physical tickets or access cards. The system also records the entry time for each vehicle, providing accurate data for parking duration calculation.

Overall, the RFID Park System revolutionizes parking management by streamlining the entry, exit, and payment processes through RFID technology. Its automation and accuracy enhance user experience, optimize parking operations, and pave the way for smarter and more efficient parking solutions in the future.

KEYWORDS: RFID, Sensors, Pi, Slots, ARDUINO.

1. INTRODUCTION

Car parking is a major issue in many public locations these days, including malls, multiplex systems, hospitals, workplaces, and market areas. There are numerous parking lanes and slots in the [1–3] region. Therefore, one must search for every lane in order to park a car. Additionally, this requires a significant amount of investment and manual effort. Therefore, an automatic parking system that shows the

availability of open parking spaces in any lane at the entry is required. A display outside the vehicle parking gate and an infrared transmitter-receiver pair in each lane are part of the system. Therefore, the person who wants to park his car is aware of the current parking slot availability. Security personnel keep an eye on the parking lots in conventional parking systems, which lack an automated monitoring system. Searching for a

parking space takes a lot of time and frequently results in traffic bottlenecks. When there are several parking lanes and several parking spaces in each lane, the situation gets worse. With more comfort, using a parking management system would save time and human labor. The display unit in the suggested system helps the user choose where to park their automobile by providing a visual representation of the parking lot, including both occupied and empty spaces. In addition to saving time, the system's hardware and software would control the cars' check-in and check-out processes using RFID tags and scanners. It would also have extra capabilities like automatic billing and entry-exit data tracking. Following a one-time registration process, customers are requested to provide personal information and an account is created for them. This account contains information about them and money that they may use to recharge at nearby kiosks. This system uses video displays at the parking floor entry to direct people to the available parking space. The displays visually depict the parking lot with empty and occupied slots which are green and red respectively. After registering, the user is given a tag that employs Radio Frequency Identification (RFID) technology and is installed on top of his windshield. This tag contains his personal information and is connected to his prepaid account. Depending on how long the user spends in the parking lot, the parking fees are automatically taken out of their account. The RFID Smart Parking System revolutionizes traditional parking methods by utilizing Radio Frequency Identification (RFID) technology. This innovative system provides a seamless parking experience by automating entry and exit processes. Vehicles are equipped with RFID tags that communicate with sensors installed at parking entrances and exits. As a vehicle approaches, the RFID tag is detected, allowing for swift access to the parking facility. The system also enables real-time monitoring of parking occupancy, ensuring efficient space utilization. With its ability to streamline parking operations, enhance security, and optimize parking management, the RFID Smart Parking System offers a modern solution to address the growing demands of urban mobility.

2. HOW DOES RFID WORK IN SMART PARKING?

RFID (Radio Frequency Identification) smart parking systems are designed to automate and streamline the parking process. These systems utilize RFID technology to enable efficient management of parking spaces and provide convenience for both parking operators and users.

The system consists of three main components: RFID tags, RFID readers, and a central management system. Each vehicle is equipped with an RFID tag, which contains unique identification information. The RFID readers are installed at entry and exit points of the parking lot, as well as at individual parking spaces. These readers communicate wirelessly with the RFID tags to identify and track vehicles.

When a vehicle approaches the entry point, the RFID reader scans the RFID tag on the vehicle and transmits the information to the central management system. The system then checks the availability of parking spaces and determines whether the vehicle is authorized to enter. If there is an available parking spot and the vehicle is authorized, the system automatically opens the gate for entry.

Once inside the parking lot, the RFID reader at each parking space detects the presence of a vehicle and updates the central management system accordingly. This real-time information allows the system to accurately monitor the occupancy status of each parking space.

When a vehicle exits the parking lot, the RFID reader at the exit point scans the RFID tag again and communicates the information to the central management system. The system updates the availability of the parking space, and if necessary, calculates the parking fee based on the duration of the stay.

The central management system plays a vital role in the RFID smart parking system. It collects and processes data from the RFID readers, maintains the parking database, and provides real-time information to parking operators and users. This system can generate reports, monitor parking occupancy, and enable online booking and payment options for users.

Overall, RFID smart parking systems leverage RFID technology to automate parking processes, improve efficiency, and enhance the overall parking experience for both operators and users. By accurately tracking vehicle movements and occupancy, these systems optimize parking space utilization and reduce congestion, leading to a smoother parking operation. For business prosecution, prediction and prevention has already established itself as an emergent avenue to envisage the business spectrum.

3. MOTIVATION

People have to wait a long time to park their automobiles in malls, multiplex systems, hospitals, offices, and supermarkets, which is the primary reason for creating car parking systems. It takes a long time to discover an empty parking space under the current system, and using the traditional payment method takes a long time to finish the transaction. In addition to helping users park more quickly and efficiently, the automated system uses RFID to automate the payment gateway, saving the user a significant amount of time. RFID (Radio Frequency Identification) smart parking systems provide a solution to the increasing challenges faced by traditional parking management. This technology-driven approach offers numerous benefits and serves as a significant motivation for its implementation.

Firstly, an RFID smart parking system improves efficiency and convenience. It eliminates the need for manual ticketing and searching for available parking spaces, streamlining the entire process. With RFID tags attached to vehicles and readers installed at entry and exit points, the system automatically identifies and records vehicle information, allowing for seamless entry and exit without any human intervention. This not only saves time but also reduces congestion and improves traffic flow within parking facilities.

Secondly, RFID smart parking systems enhance security. Traditional parking systems often involve the risk of theft or unauthorized access. With RFID technology, each vehicle is uniquely identified, and any attempt at theft or unauthorized entry triggers an alert. This deters

potential criminals and provides a safer parking environment for users.

Furthermore, RFID smart parking systems offer effective data management and analysis capabilities. The system collects and stores data on vehicle movements, occupancy rates, and parking duration, providing valuable insights for parking facility operators. This information can be utilized to optimize parking space allocation, identify patterns and trends, and make informed decisions regarding pricing, staffing, and infrastructure improvements.

Additionally, RFID smart parking systems support environmental sustainability efforts. By reducing the time spent searching for parking spaces, vehicles consume less fuel and emit fewer greenhouse gases. The optimized utilization of parking spaces also helps minimize the need for constructing additional parking facilities, thus reducing land consumption and preserving green spaces.

In conclusion, the motivation behind implementing RFID smart parking systems lies in their ability to enhance efficiency, convenience, security, data management, and environmental sustainability. These benefits make them an attractive solution for addressing the challenges faced by traditional parking management systems, ultimately improving the overall parking experience for users.

4. CIRCUIT DIAGRAM AND FLOWCHART

The circuit mainly comprised of Arduino and RC module 522 and passive tags. We make connection using the jumper wires. We have also used buzzer to inform the authorities about the incoming vehicle. Led are used to signify the operation of door. The servo motor will be used to control the opening and closing of gate. RC module are connected to all the sensors and it give the instruction to the sensors to sense the environment after that it display the current status of vehicle on the the display board.

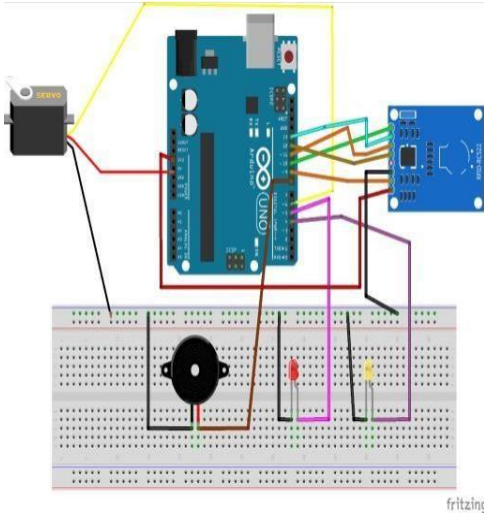


Fig 1. Circuit Diagram

This is basically flow of and execution of programming part of our project. It is pictorial representation of our model and how we can achieve it in real life. We can conclude that this is logically the low level system design (LLD) of our project.

5. CONCLUSION

RFID technology offers autonomous, continuous access control, parking, and security solutions. Only approved vehicles can enter thanks to this technology, which gives communities and companies hands-free control. One of the few real-time locating systems with a quick return on investment (ROI) is the RFID park lot management system. The system improved parking lot use and helped users spend less time searching for parking spaces.

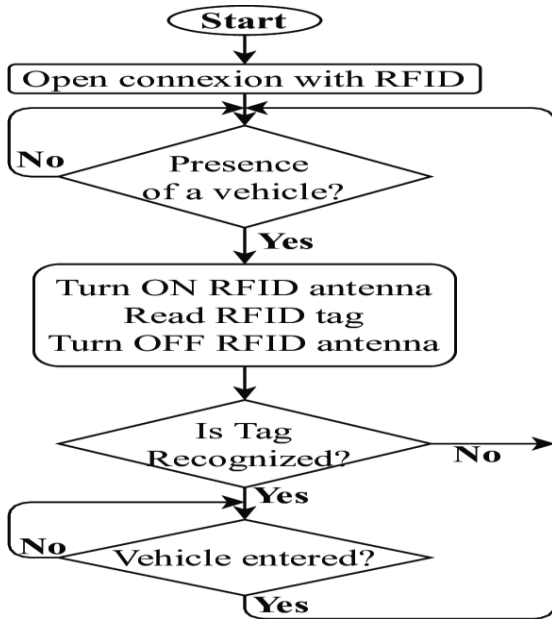


Fig 2. Flow Chart

REFERENCES

- [1] B.Waraich, RFID-Based Automated Vehicle parking system.
- [2] P Joshi, M.R Khan and L Motiwalla, Global Review of Parking Management System and Strategies. Volume, 2 Issue 6, June-2011 1 ISSN 2279-5141.
- [3] Car Parking System (2011-12).
- [4]. A.A Kamble and A Dehankar Review on Automatic Car Parking Indicator System, In-
- [5] Ternational Journal on recent and innovation trends in computing and communication, Vol 3 no.4 pp 2158-2161. [6]. K Sushma, PRaveendraBabu and J.Nageshwara Reddy, Reservation Based Vehicle Parking System using GSM and RFID Technology, International Journal of Engineering Research and Applications Vol 3 no.5 2013.
- [7] R.Khan, Z.Khan, Y.A Shah, K.Ahmed, A.Manzoor and A.Ali, Intelligent Car Parking Management System on FPGA, International Journal of Computer Science issues Vol 10 no.3 2013.
- [8] A.Wafa, N.Zeba, Automated Car Parking, 2012. Volume 2, Issue 3, April 2015.
- [9] C.Patel, M.Swami, P.Saikia, S.Shah, Rotary Automated Car Parking system ,International Journal of Engineering Science and Innovative Technology (IJESIT) Volume 4, Issue 2, March 2011.