

SMART PARKING SYSTEM WITH WEBSITE INTEGRATION FOR CONVENIENT PRE-BOOKING AND UPDATES

¹ Dr. L. RaviSrinivas, ²M. Navya, ³A.Jyothsna, ⁴O. Lakshmi Thirapathamma, ⁵B. Sai Krishna.

¹Professor, Department of EEE, SRGEC, Gudlavalluru

² Undergraduate Student, Department of EEE, SRGEC, Gudlavalluru,

³ Undergraduate Student, Department of EEE, SRGEC, Gudlavalluru,

⁴ Undergraduate Student, Department of EEE, SRGEC, Gudlavalluru,

⁵ Undergraduate Student, Department of EEE, SRGEC, Gudlavalluru.

*Corresponding Author Email- navyamorampudi5@gmail.com

Department of Electrical & electronics engineering, Seshadri rao Gudlavalluru engineering college, Gudlavalluru, AP-521356

ABSTRACT: Rapid urbanization and the increasing number of vehicles have led to significant challenges in parking management. The traditional parking systems, including manual and automated parking systems, have become inefficient, resulting in increased traffic congestion, air pollution, and user frustration. This research presents an innovative approach for implementing a smart parking system that provides real-time updates on parking slot duration using RFID technology, a web integration, and a PHP server. The system employs a web integration that runs on the PHP server that communicates the availability of the parking slots. This implementation provides the best information about the empty parking slots and updates on filled slots getting empty in the parking station. The use of a PHP server in this smart parking system has improved the overall parking experience for customers and reduced traffic congestion in the city. Our study demonstrates the effectiveness of using a PHP server in a smart parking system and provides valuable insights for future implementations.

Key Words:- IoT technology, PHP server, RFID technology, Web integration

I. INTRODUCTION

Parking is a major concern for urban residents and visitors, with limited parking spaces and increasing demand leading to frustration and inconvenience. Smart parking systems using RFID technology and web integrations have emerged as a solution to this problem, providing efficient and convenient parking services to customers. However, one of the challenges faced by customers using such systems is managing their parking time effectively, especially when they need to park for an extended duration.

In this paper, we propose a modification to existing smart parking systems that provide pre-booking of the slots, real-time updates on the vehicle which is parked in a slot, and allow customers to monitor and manage their parking time using a web integration. This modification has the potential to improve the parking experience for customers by providing them with timely and accurate information about their parking slot duration, allowing them to plan their time and avoid unnecessary fines or penalties for overstaying in the parking lot.

The proposed modification involves the use of RFID tagging and a sensor network to track the movement of vehicles within the parking lot, and a PHP server to process the data collected by the sensors and provide real-time updates on the duration of time a vehicle is parked in a slot. The estimated time is then updated in real-time in the parking system's web integration, which customers can access from anywhere.

If the customer needs an extension of time beyond the initially booked slot duration, our Smart Parking System allows for easy and convenient extension of the slot duration through the website integration. This feature provides added flexibility to the customers and eliminates the need for them

to worry about overstaying their booked time slot. With the ability to easily extend their slot duration, customers can have peace of mind and avoid unnecessary parking fines.

Customers can monitor their parking slot duration, and receive alerts when their parking time is about to expire, all through the web integration. This modification has several potential benefits, including reducing congestion in the parking lot, improving customer satisfaction, improving the parking experience for customers, optimizing parking slot utilization rates, automating the payment process, and increasing revenue for parking lot operators.

The paper provides an overview of the system architecture, discusses the implementation details, and presents the results of a pilot study that validates the system's performance.

In this research, we focused on the presence of parking lots and real-time updates on the time a vehicle is parked in a slot. Everything from the vehicle's entry to its exit, information will get updated faster in the server, making it easier for the other customer to know the availability of the lots.

II. LITERATURE SURVEY

Many methods previously available in the smart parking system have certain disadvantages like accuracy and reliability. To optimize parking spaces and reduce congestion, parking optimization algorithms should be explored and evaluated for their effectiveness in reducing search time, improving parking space utilization, and minimizing traffic congestion. This survey has highlighted the need for smart parking systems that are user-friendly, efficient, cost-effective, and environmentally sustainable. Our project, a smart parking system with website integration for convenient pre-booking and updates, aims to address these needs by providing a user-friendly platform for parking lot management and reservation, reducing traffic congestion and environmental pollution, and improving the overall user experience.

III. WEB INTEGRATION

A. PHP (HYPERTEXT PREPROCESSOR) SERVER

A PHP server is a web server configured to execute PHP scripts used to build dynamic web pages and web integrations. In the context of a smart parking system, a PHP server can be used to host a cloud-based database that stores parking slot information, such as availability, booking status, and parking duration. The PHP server can also be used to host the web integration that customers can use to book and manage their parking slots.

This web server uses PHP programming language to process and generate dynamic content for web integrations. In the context of a smart parking system, the PHP server works as the backend component that processes the data collected by the RFID sensor network and updates the web integration in real time.

The PHP server is responsible for receiving and processing the data from the sensors, calculating the estimated time of how long the vehicle is parked in the slot, and updating the web integration with the latest information.

The PHP server acts as the middleware between the sensor network and the user interface. The sensor network sends the collected data to the PHP server, which processes the data and updates the web integration. The web integration communicates with the PHP server to retrieve and display the updated data to the user.

The benefit of using a PHP server in this project is that it provides a platform for developing dynamic web integrations that can interact with a database. In this smart parking system, the PHP server processes data from the RFID sensors and updates the cloud-based database in real time. It also allows for the creation of a web integration that customers can use to book parking slots, monitor their parking duration, and extend their parking time if needed.

By using a PHP server, the system can provide real-time updates to customers and efficiently manage parking slots, leading to a more convenient and organized parking experience. Additionally, PHP is a widely used programming language, making it easier to find developers who can work on the project and provide ongoing support and maintenance.

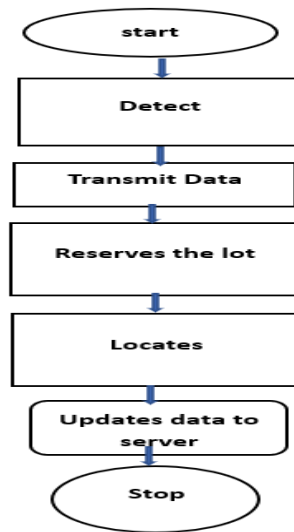


Fig 1: Block diagram of PHP server Working

The PHP server can also handle the payment processing and parking slot allocation functions in a smart parking system. When a customer books a parking slot through web integration, the PHP server allocates the slot and updates the database accordingly.

When the customer leaves the slot, the sensor network sends the data to the PHP server, which calculates the parking duration and calculates the parking fee. The customer can then pay the fee through the web integration, which is processed by the PHP server.

Overall, the PHP server plays a crucial role in the smart parking system by facilitating real-time updates on parking slot duration and handling payment processing and parking slot allocation functions.

B. INTERNET OF THINGS AND RFID

The Internet of Things (IoT) has revolutionized the way we interact with devices and systems in our daily lives. By connecting everyday devices to the internet, we can remotely control and monitor them, making our lives easier and more efficient. In this chapter, we discuss the use of the IoT, and RFID with a PHP server in this smart parking system...

IoT (Internet of Things) is used to connect the different components of the system and make it work in a coordinated manner. IoT technology is used to enable real-time updates on parking slot duration. This Network consists of different devices such as sensors, gateways, and cloud servers that work together to collect, process, and transmit data over the internet.

The system is equipped with RFID (Radio-Frequency Identification) sensors placed at each parking slot... RFID tags are attached to each vehicle, and the RFID sensors installed in the parking slots detect the presence of a vehicle and transmit this information to a central control unit. This information is then processed by the control unit and sent to the cloud-based database.

The web integration, which is accessible by customers through their mobile devices, interacts with the cloud-based database to provide real-time information about available parking slots, booking slots, and the estimated time of how long the vehicle is parked in the slot. The customer can use the application to book a parking slot, make payments, etc.

The detected data from RFID is then transmitted to the cloud-based database through the IoT gateway device. The IoT gateway device acts as a bridge between the RFID sensors and the cloud-based server. It collects the data from the sensors and sends it to the server for processing. The server, which is powered by a PHP (Hypertext Preprocessor) programming language, processes the data in real time and updates the parking system's web integration.

The web integration is accessible to customers, who can monitor their parking slot duration from anywhere. The application can also send real-time alerts to customers when their parking time is about to expire, allowing them to extend their parking time if necessary.

In this project, the RFID reader acts as a sensor, while the cloud server acts as the gateway that connects the sensor network to the cloud-based database.

Overall, the combination of RFID and IoT technologies provides a reliable and efficient method for tracking parking slot duration and updating the information in real time. It enhances the user experience by providing accurate and up-to-date information on the parking duration, making it easier for customers to manage their parking time effectively.

In this way, IoT technology makes it possible to create a seamless and efficient parking system that can be accessed and managed from anywhere. The data collected by the system can also be used for analytics and optimization, allowing the parking system to be continuously improved and optimized for better performance.

IV. HARDWARE

This section provides a description of the model's intended layout and design. The next section provides an in-depth look at the model and all of its constituent parts.

A. ARDUINO UNO-328

The Arduino organisation is in charge of creating the microcontroller that is found in the Arduino Uno board. The main source of inspiration for this open-source microcontroller platform for electrical projects was the AVR Atmega328. Six analogue input pins and 14 digital I/O ports are included on the most recent Arduino Uno board, which also has a USB connector.

Users can connect the board to a variety of different electrical circuits using these ports. From a total of 14, PWM output is possible.

from six of the I/O ports It enables the designers to manage and keep an eye on any electrical equipment that is located in an outdoor setting in real time. This board includes every part required to operate the controller and can be quickly linked to a computer using a USB wire. It also has all the features required for the controller to function effectively. The IDE software, which was created specifically for using with Arduino, is used to send code from the computer to the controller. This software was created especially to allow for Arduino programming. The code for the IDE was created using C and C++ during the development phase. If one of those alternatives is employed, the circuit board may additionally receive power from a battery or an AC-to-DC converter in addition to a USB connection. The Arduino Uno is the model that is thought to be the most official. It already has a 32KB of RAM and an Atmega328 8-bit AVR Atmel CPU installed.

B. RFID MODULE

Using radio waves, RFID (Radio Frequency Identification) is a wireless device that automatically Specify and follow objects. Reader, antenna, and tag are the three primary parts of the system.

The tag responds by delivering its specific identification information back to the reader in response to a radio signal that the reader puts out and the antenna receives and communicates to the tag. There are several different kinds of RFID tags, including passive, active, and semi-passive tags. Active tags have their own power source to broadcast information over long distances, whereas passive tags don't need one and rely on the energy from the reader to do so. Semi-passive tags have a power source of their own, but they only need it to run the circuitry within; they rely on the reader for communication. Retail, logistics, and transportation are just a few of the industries where RFID technology is widely used. RFID technology is used in parking systems to detect and identify vehicles, streamline payment processing, and give consumers real-time information. Smart parking systems can increase productivity, save labour costs, and provide a better customer experience by utilising RFID technology.



Fig2:RFIDModule

Despite its many advantages, RFID technology has some drawbacks and difficulties, including the necessity for appropriate tag positioning and orientation, signal interference, and security issues. However, RFID technology continues to be a significant and pervasive solution in many applications, such as intelligent parking systems.

C. IR SENSOR

A developer board and open-source firmware called NodeMCU are used to create Internet of Things (IoT) gadgets and programmes. It includes a microcontroller, Wi-Fi module, and other necessary components for IoT development. NodeMCU is programmable using the lightweight Lua scripting language and features a built-in Wi-Fi module for easy internet connectivity. Its large developer community provides support through forums and online resources, making it an attractive option for building smart parking systems and other IoT projects

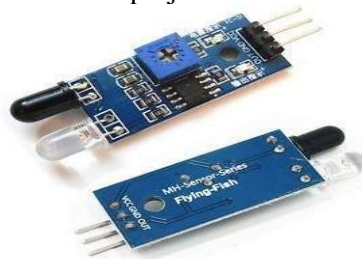
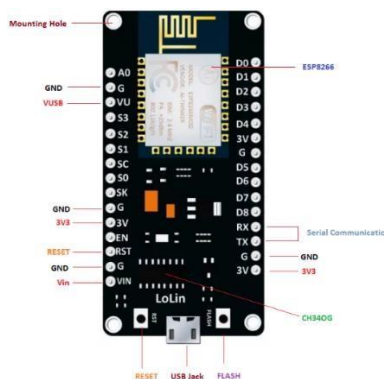


Fig 3: IR sensor

D. Node MCU

NodeMCU is an open-source firmware and development board designed for building IoT devices and applications. It includes a microcontroller, Wi-Fi module, and other necessary components for IoT development. NodeMCU is programmable using the lightweight Lua scripting language and features a built-in Wi-Fi module for easy internet connectivity. Its large developer community provides support through forums and online resources, making it an attractive option for building smart parking systems and other IoT projects.



E. Arduino IDE Platform

Fig 4: Node MCU

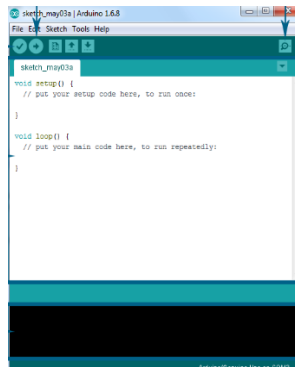


Fig 2: ARDUINO SOFTWARE

The Arduino Software (IDE), also referred to as the Arduino Integrated Development Environment (IDE), contains a code editor, a message area, a text terminal, a toolbar with simple action buttons, and a menu system. It establishes a connection with the Arduino device and downloads programmes

V. PROPOSED SYSTEM

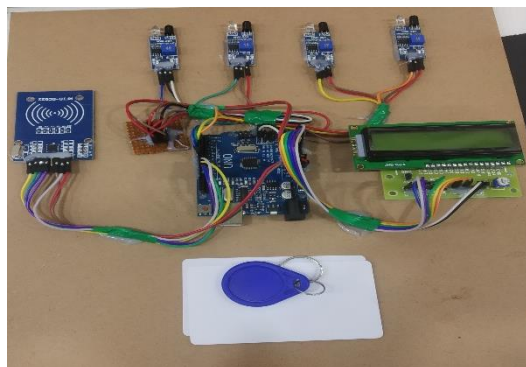


Fig 5: figure showing the proposed Hardware system



Fig6: Figure displaying the empty slots

VI. WORKING OF PROJECT

The presented new approach addresses a Smart Parking System which is a state-of-the-art solution designed to revolutionize the way we park our vehicles. This innovative system utilizes cutting-edge hardware and software components to streamline the parking process and provide drivers with a hassle-free parking experience.

At the heart of the system are high-tech sensors and cameras installed in the parking lot, which continuously monitor and track the availability of parking spots. These sensors are connected to a central server that processes and analyzes the data in real time, enabling drivers to access up-to-date information on available parking spots through a user-friendly website or mobile application.

With the Smart Parking System, drivers can not only find available parking spots in real-time but also pre-book their parking spots in advance, ensuring they have a guaranteed spot waiting for them when they arrive. The system sends updates and reminders to drivers leading up to their parking reservation, ensuring a stress-free experience from start to finish.

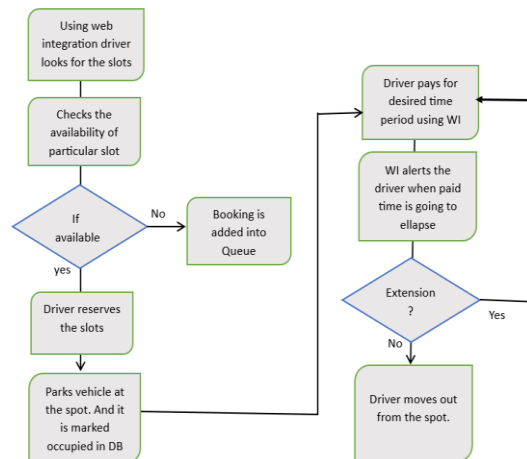


Fig 7 : Figure showing the proposed flow

This cutting-edge technology offers numerous benefits to drivers and parking lot operators alike. Drivers can save time and avoid the frustration of searching for a parking spot, while parking lot operators can optimize space usage and increase revenue. Plus, with the convenience of pre-booking and updates on the status of their parking reservation, drivers can focus on their daily activities without worrying about the hassle of parking.

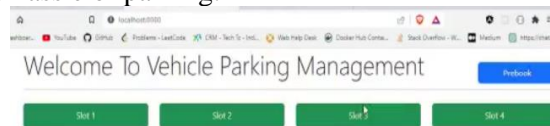


Fig 8: Vehicle Management Dashboard

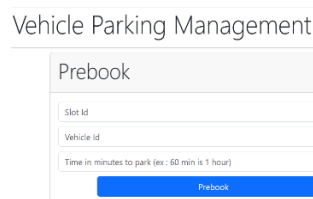


Fig 9: Pre-booking dashboard

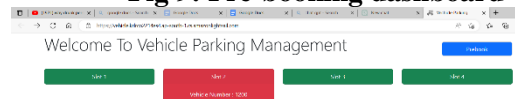


Fig 10: Shows slot Reserved

In summary, the Smart Parking System with Website Integration for Convenient Pre-Booking and Updates is a game-changing solution that offers a streamlined and convenient parking experience for drivers while also providing parking lot operators with an efficient and profitable management tool.

VII.ADVANTAGES

- Convenience
- Real-time updates

- Improved space utilization
- Reduced carbon footprint
- Enhanced security
- Data analysis
- Improved customer experience

VIII. APPLICATIONS

- Urban Parking Management
- Shopping Center
- Corporate Parks
- Airports
- Hospitals

IX. CONCLUSION

The Smart Parking System with Website Integration for Convenient Pre-Booking and Updates, in conclusion, is a cutting-edge solution that offers drivers a convenient and stress-free parking experience while assisting parking lot operators in streamlining their processes and boosting profitability. All parties involved can gain from this cutting-edge system's many advantages, which range from increased customer satisfaction and a less carbon footprint to better security and data analysis capabilities.

As the world continues to embrace technology and digital solutions, the Smart Parking System represents a promising future for the parking industry, providing a streamlined and efficient parking experience that meets the needs of both drivers and parking lot operators. By investing in this cutting-edge solution, parking facilities can stay ahead of the curve, improve their operations, and provide an outstanding parking experience to their customers.

X. REFERENCES

- [1] J. W. Park and J. H. Kim, "Smart parking system using ultrasonic sensor network and IoT technology," 2017 IEEE International Conference on Consumer Electronics (ICCE), Las Vegas, NV, 2017, pp. 178-179. doi: 10.1109/ICCE.2017.7889272
- [2] R. Aggarwal and P. Sharma, "Design and development of smart parking system using internet of things," 2018 5th International Conference on Signal Processing and Integrated Networks (SPIN), Noida, India, 2018, pp. 429-432. doi: 10.1109/SPIN.2018.8474262
- [3] M. S. Shaaban, A. S. El-Soudani and S. H. Tantawy, "Smart parking system using RFID technology," 2016 13th International Conference on Computer Engineering and Systems (ICCES), Cairo, Egypt, 2016, pp. 292-297. doi: 10.1109/ICCES.2016.7807988
- [4] "Smart Parking System," Bosch Global, <https://www.bosch-mobility-solutions.com/en/products-and-services/parking-solutions/smart-parking-system/>. Accessed 3 April 2023.
- [5] "Smart Parking Systems Market Size, Share & Trends Analysis Report By Type (Off-street, On-street), By Technology (IoT, Ultrasonic, RFID), By Application, By Region, And Segment Forecasts, 2021 - 2028," Grand View Research, <https://www.grandviewresearch.com/industry-analysis/smart-parking-systems-market>. Accessed 3 April 2023.