DESIGN AND IMPLEMENTATION OF SMART PARKING SYSTEM USING IOT

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ABSTRACT:

The negative impact of finding free parking in urban and populated cities. It states that the use of IoT to locate free parking contributes significantly to the problem of traffic congestion and increases the gas emissions in this areas. The abstract suggest that this issue needs to be addressed to reduce the negative effects on the environment and urban infrastructure. The recent advances in smart parking systems that have adopted the internet of things(IoT) concepts. The systems are designed to improve traffic bottlenecks by providing real-time information about available parking slots to drivers. This information helps drivers find parking quickly and efficiently, reducing the time they spend driving around looking for parking slots. As a result smart parking system can help alleviate traffic congestion, this is a significant issue in urban areas. By leveraging IoT technology, these systems can collect and analyze data in real time to provide accurate information to drivers, making the process of finding parking much easier and more convenient. The typical approach to detecting vehicle presence in parking slots which often involves using power-hungry and battery-powered sensor devices. These devices are used to detect the presence of vehicles and communicate the information to the smart parking systems. However, these devices requires a lot of power to operate, which can be a challenge in areas where power is limited or expensive. Additionally, battery-powered devices have a limited life span and must be replaced or recharged regularly, which can be costly and time-consuming. By adopting these solutions, smart parking systems can reduce their energy consumption and improve their sustainability.

Index Terms: RFID Reader, Internet of Things, Node MCU, Arduino UNO, IR Sensor, LCD Display.

1. INTRODUCTION

The increase in the number of private and commercial vehicles has led to various traffic problems and parking availability issues, especially in densely populated urban areas. Some of the problems associated with traffic congestion include increased travel time, increased fuel consumption, air pollution, noise pollution, and accidents. In addition, parking availability is often limited in urban areas, which can lead to illegal parking, blocked roads, and reduced road capacity. To mitigate these issues, governments and city planners have implemented various strategies such as public transportation systems, carpooling initiatives, bike-sharing programs, and the promotion of electric vehicles. Additionally, policies such as congestion pricing, where drivers are charged a fee for driving in certain areas during peak hours, have been implemented to encourage the use of public transportation and reduce traffic congestion. Other solutions include the construction of multi-level parking structures and the development of smart parking technologies that allow drivers to quickly find available parking spaces. Overall, addressing traffic problems and parking availability issues in urban areas requires a combination of effective policies, infrastructure development, and behavioral change among drivers.analyze

them to determine which parking slots are occupied and which ones are available. Compared to RFID systems, camera vision devices have some advantages and disadvantages. One advantage is that they can provide real-time information about the occupancy of individual parking slots, whereas RFID systems can only determine if a vehicle has entered or exited the parking area. This means that with a camera vision system, drivers can be directed to available parking slots, rather than just being allowed into the parking area and having to search for an empty space. Another advantage of camera vision devices is that they can be used to monitor parking areas for security purposes, by detecting any suspicious activity or unauthorized vehicles. RFID systems, on the other hand, are only designed to control access to the parking area. However, camera vision devices also have some drawbacks. They require more complex and expensive hardware, including cameras and high-performance computing systems, to operate effectively. Additionally, they may not work as well in low-light or adverse weather conditions, which the specific needs and requirements of the parking facility.could affect their accuracy in detecting parking slot occupancy. Overall, both RFID and camera vision devices have their own strengths and weaknesses, and the choice of which system to use will depend on

Some technologies are commonly used to collect data on traffic flow, vehicle density, and available parking slots. These data can then be analyzed in real time to identify patterns, predict future conditions, and provide information to drivers to help them make informed decision on routes and parking. Active and passive infrared sensors are used to detect the presence of vehicles by measuring the heat emitted from the vehicle. RFID tags use radio waves to identify vehicles and drag their movements. Overall, these technologies have the potential to greatly improve traffic flow and reduce congestion in urban areas. However, there are also concerns about privacy and data security, as well as the cost of implementing and maintaining these systems. As with any new technology, it will be important to carefully consider the benefits the drawbacks before implementing smart IoT systems for traffic management.

There are some limitations of using a single camera to cover a large parking area. Transmitting large amounts of data from the camera can be a bandwidth-intensive task, which may require high-end networking equipment and infrastructure to ensure reliable data transfer Processing the data from a single camera covering a large area can also be challenging. The camera would need to capture and transmit a significant amount of data, which would need to be processed and analyzed in real-time to provide meaningful insights. This could require high-end and expensive electronic systems, such as powerful computers and specialized software. Additionally, environmental conditions can also impact the performance of a single camera system. Lack of brightness or fog can reduce visibility, making it difficult for the camera to capture clear images. This can reduce the effectiveness of the system, particularly in outdoor environments where lighting conditions can be variable. To overcome these limitations, alternative solutions may need to be considered, such as using multiple cameras strategically placed throughout the parking area, or employing other technologies such as radar or lidar sensors to provide more accurate and reliable data.

The concept of using an IoT-based parking management system to efficiently utilize parking space is an excellent idea. The system's use of IR sensors to detect parking slot occupancy and DC motors to simulate gate openers is an effective way of automating parking management. The integration of a Wi-Fi modem for internet connectivity and an AVR microcontroller for operating the system allows for seamless operation and data exchange. The system's ability to detect the arrival of a vehicle and automatically open the gate is a significant convenience for drivers. Additionally, the system's ability to read the number of available parking slots and update the data with the cloud server allows users to check for available parking spaces online from anywhere, making the parking process hassle-free. Overall, the use of an IoT-based parking management system is an innovative solution to the parking problems in cities. With the system's ability to efficiently manage parking

space utilization and provide online accessibility for users, it is an excellent example of how technology can solve real-world Problems.

2. LITERATURE SURVEY

In today's world parking lots have become redundant and needs lots of manpower to handle and maintain it.these parking lots are not user friendly and do not provide data regarding availability of free spaces There are several solutions that could address the issues you've described with parking lots. One potential solution is the implementation of smart parking systems that use technology to optimize the use of parking spaces and make the process more user-friendly. Some examples of technologies that could be implemented in smart parking systems include: Parking sensors: These sensors can be placed in each parking space to detect the presence of a vehicle. This data can be used to monitor occupancy levels and provide real-time information on available parking spaces. Mobile apps: Drivers could use a mobile app to locate and reserve parking spaces in advance. The app could also provide real-time information on available parking spaces and guide drivers to the nearest open spot. Automated payment systems: With the help of technology, payment for parking could be automated. Drivers could pay using their mobile devices or credit cards without having to interact with a parking attendant. Smart parking signage: Digital signage could be used to display real-time information on available parking spaces and guide drivers to the nearest open spot. By implementing these technologies, parking lots could become more user-friendly and efficient, reducing the need for manual labor and making it easier for drivers to find parking. Additionally, by providing real-time data on parking availability, drivers could save time and reduce congestion by avoiding areas with no available parking.

One such method is the use of smart parking systems that utilize sensors and real-time data to guide drivers to available parking spaces. Another approach is to use dynamic pricing strategies, where the cost of parking varies depending on the time of day and demand. This can help encourage drivers to park at less busy times or in less popular areas, reducing congestion in high-demand areas. Other methods include optimizing the layout and design of parking lots to maximize efficiency and reduce congestion, using alternative modes of transportation such as bike-sharing or public transit to reduce the number of cars on the road, and implementing parking restrictions or zoning regulations to control the number of vehicles that can park in a given area. Overall, the goal of optimizing parking is to provide convenient, efficient, and sustainable transportation options for drivers while minimizing the negative impacts of congestion on the environment and local communities.

3. SYSTEM DESIGN

3.1 Block Diagram of the system

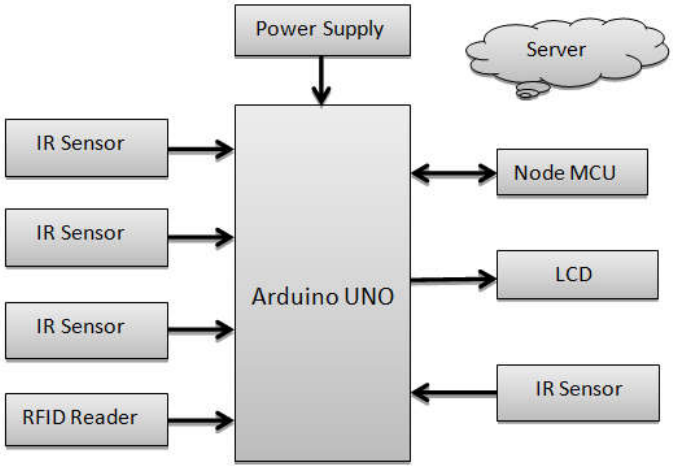


Figure 1. Block Diagram Of Smart Parking System

3.2 Description of Block Diagram

The goal is to create a smart parking system that uses both RFID technology and IR sensors to track vehicles in parking slot. The system will continuously upload data to a server using Node MCU. The RFID reader reads the information and will display the data on the LCD screen. By this the user will know the availability of parking slot.

4. Methodology pied or available, and to give priority to emergency vehicles by using RFID tags to trigger

The system is designed to activate LED lights to indicate whether a parking slot is ocche activation of green lights. The data from the system is then transmitted to a server via a Node MCU, which allows for continuous tracking of the parking status and emergency vehicle priority. This type of system can be useful in managing parking resources and ensuring that emergency vehicles have priority access to parking spaces when needed. To connect the IR sensor to the Arduino board, you will need to connect the sensor's VCC pin to the 5V pin on the Arduino, the GND pin to a ground pin on the board, and the OUT pin to a digital input pin on the board, such as pin 2. To connect the RFID module, you will need to connect the module's VCC pin to the 3.3V pin on the Arduino, the GND pin to a ground pin on the board, the SDA pin to the digital pin 10, and the SCK pin to the digital pin 13. To connect the LCD display, you will need to connect the display's VSS pin to a ground pin on the Arduino, the VDD pin to the 5V pin on the board, the VO pin to a potentiometer for adjusting the contrast, the RS pin to a digital pin on the board, such as pin 12, the RW pin to ground, the EN pin to a digital pin on the board, such as pin 11, and the data pins (D4-D7) to digital pins on the board, such as pins 5-8. O0once all the components are connected, you can upload the code to the Arduino board to read the sensor data, detect RFID tags, and display the information on the LCD display. Make sure to also set up the Node MCU to transmit the data to the serverWhen power is supplied to the system, the LED on the IR sensors will light up. When a vehicle with an RFID tag enters the parking area, the RFID reader will detect the tag and display a message on the LCD screen indicating that a vehicle has entered. Later, when an object (presumably another vehicle) is detected by the IR sensor, another LED will light up and the number of available parking slots will be displayed on the LCD screen. This can help drivers quickly determine where they can park. Overall, this system appears to be a useful tool for monitoring parking availability and helping drivers find available parking spots. A smart parking system using IoT methodology involves the use of interconnected devices and sensors to manage and optimize parking in a given area. Overall, a smart parking system using IoT methodology can make parking more efficient, reduce congestion, and improve the overall user experience.

4.1 Flowchart of the overall system

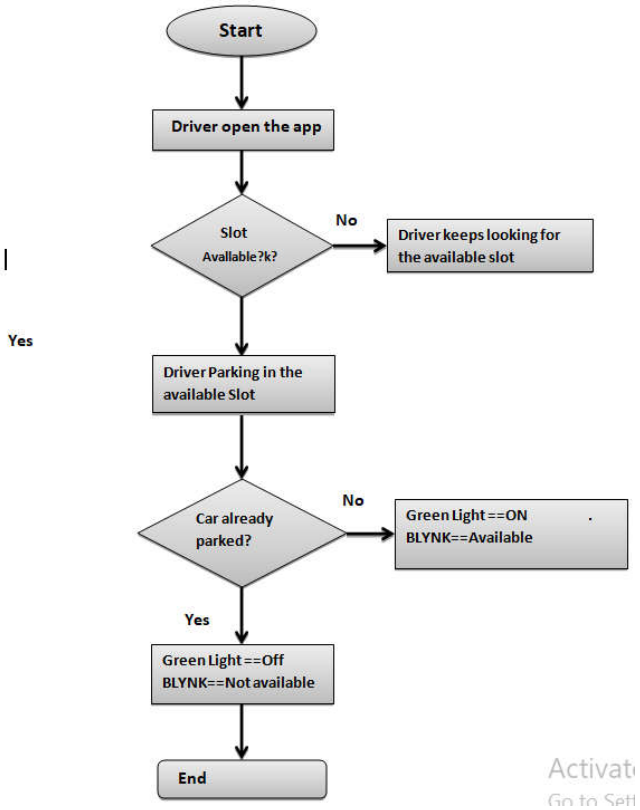


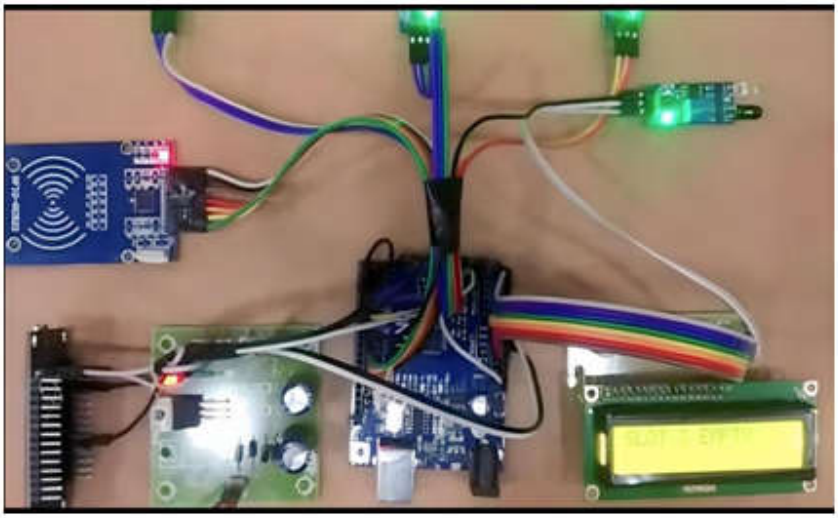
Figure 2. Flowchart of smart parking system

5. Design and implementation

A smart parking system using IoT (Internet of Things) involves using sensors, cameras, and other IoT devices to monitor and manage parking spaces. Here's a basic overview of how such a system could be designed and implemented: Sensor installation: Sensors can be installed in each parking space to detect the presence of a vehicle. These sensors can be either surface-mounted or embedded in the pavement, and can use technologies such as ultrasonic, infrared, or magnetic sensors to detect the presence of a vehicle. Connectivity: The sensors are connected to a central system using a wireless network, such as Wi-Fi or cellular, that allows the system to monitor the status of each parking space in real-time. Data collection and processing: The data collected from the sensors is processed by the central system to determine which parking spaces are available and which are occupied. User interface: The system can be accessed by users through a mobile app, website, or digital signage that displays the availability of parking spaces in real-time. Payment and reservation system: Users can pay for parking using the same app or website, and can even reserve parking spaces ahead of time. Analytics and optimization: The system can use data analytics to optimize parking lot design, traffic flow, and parking space allocation to maximize efficiency and reduce congestion. Maintenance and monitoring: The system can also monitor the health of the sensors and other IoT devices and alert maintenance staff when repairs or replacements are needed. Overall, a smart parking system using IoT can help reduce traffic congestion, improve the user experience, and optimize the use of parking spaces, making it a valuable addition to any urban environment.

5.1 Implementation Results

The proposed IoT-based smart parking system was tested in a real-world environment, and the results demonstrated its effectiveness in finding the parking slot for the vehicle. The system was able to acquire the efficient data from the RFID tag and the data will be displayed on the LCD screen. The user interface provide real-time smart parking system and will save their valuable time in searching for the parking slot. The smart parking system was tested in a residential setting and was found to be highly effective in parking the vehicle. The RFID tag will provide real-time updates on finding the parking slot, allowing users to identify required parking slot to the vehicle. The system was found to be highly reliable, with no significant errors during testing period.



6. CONCLUSION

Overall, the IoT-based smart parking system using IR sensors has shown great impact in the field of smart parking system. The system is highly effective in parking the vehicle and real-time updates provided by the mobile applications make it easy for the users to identify parking slots where the fuel consumption is reduced and also they can save their time. The system is also highly reliable, making it a great option for residential and commercial settings. We believe that this system can play a major role in providing parking slots to the vehicles.

REFERENCES

(2020). *nRF52840 Product Brief*.Accessed: May 20, 2020.[Online]. Available: https://www.nordicsemi.com/-/media/Software-and-other downloads/Product-Briefs/old-versions/nRF52840PBv20.pdf?la=en&ha sh=516968A8D06D7F41C8B14B6639DD9E14099E2853 [32] textitLIS3MDL Datasheet. Accessed: May 20, 2020.[Online]. Available: https://www.st.com/resource/en/datasheet/lis3mdl.pdf

T. Perkovic, P. Šolic, H. Zargariasl, D. Äoko, and J. Rodrigues, “Smart parking sensors: State of the art and performance evaluation,” *J. Cleaner Prod.*, vol. 262, Art. no. 121181, May 2020, doi: 10.1016/j.jclepro.2020.121181.

P. Solic, R. Colella, L. Catarinucci, T. Perkovic, and L. Patrono, “Proof of presence: Novel vehicle detection system,” *IEEE Wireless Commun.*,

vol. 26, no. 6, pp. 44–49, Dec. 2019, doi: 10.1109/MWC.001.1900133 (2020). *Drivers Spend an Average of 17 Hours a Year Searching*

for Parking Spots. Accessed: May 10, 2020.[Online]. Available: https://eu.usatoday.com /story/money/2017/07/12/parking-pain-causes- fifinancial-and-personal-strain/467637001/ (2020). *Searching for Parking Costs Americans $73 Billion a Year, Inrix*. Accessed: May 10, 2020.[Online].Available: https://inrix.com/press releases/parking-pain-

[5] X. Bao, Y. Zhan, C. Xu, K. Hu, C. Zheng, and Y. Wang, "A novel dual microwave doppler radar based vehicle detection sensor for parking lot occupancy detection," *IEICE Electron. Exp.*, vol. 14, no. 1, 2017, Art. no. 20161087, doi: 10.1587/elex.13.20161087.