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INTERNATIONAL JOURNAL OF PROGRESSIVE RESEARCH IN ENGINEERING MANAGEMENT AND SCIENCE (IJPREMS)
(Int Peer Reviewed Journal)
Vol. 05, Issue 04, April 2025, pp : 2049-2050

e-ISSN : 2583-1062
Impact Factor : 7.001

SMART PARKING USING ARDUINO-UNO

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DOI: https://www.doi.org/10.58257/IJPREMS40056

ABSTRACT

This study investigates the development and implementation of a smart parking system using the Arduino Uno board. The objective is to design a cost-effective, automated solution that can efficiently manage parking space availability in real-time. The system utilizes sensors to detect the presence of vehicles in parking spaces, with the data being processed and displayed through an LCD screen. The Arduino Uno board serves as the central control unit for processing sensor data and providing visual feedback to users. The results of the analysis indicate that the system effectively monitors parking space occupancy, providing real-time updates on available spots.

Keywords: Smart Parking, Arduino Uno, Parking Management System, Sensor-Based Parking, Real-Time Monitoring

1. INTRODUCTION

Parking has become a significant issue in urban areas due to the increasing number of vehicles and limited parking spaces. Traditional parking management systems often rely on manual processes, leading to inefficiencies, increased traffic congestion, and time wasted searching for available parking spots. To address these challenges, the concept of **Smart Parking** has emerged, utilizing advanced technologies to automate and optimize parking operations. A key component of this system is the use of **Arduino Uno**, a widely accessible and cost-effective microcontroller, which can process data from various sensors to monitor parking space availability in real time.

2. METHODOLOGY

This research focuses on the development and implementation of a smart parking system using an Arduino Uno board. The approach involves utilizing a combination of sensors, microcontrollers, and a real-time display to create an automated parking solution. The system is designed to detect vehicle presence in parking spots and provide real-time updates on available spaces.

The methodology consists of the following key steps:

1.1 System Design and Setup: The system is built around an **Arduino Uno** microcontroller, which acts as the central processing unit. **Ultrasonic sensors** are used to detect vehicles in parking spaces. These sensors are placed at strategic locations in each parking spot to measure the distance between the sensor and any vehicle occupying the space.

1.2 Sensor Integration: The ultrasonic sensors are interfaced with the Arduino Uno board, which processes the sensor data to determine whether a parking space is occupied or free. The sensor data is continuously monitored and analyzed by the microcontroller.

1.3 Real-Time Data Display: The status of each parking space is displayed on an **LCD screen**, providing users with real-time updates on available spaces. The Arduino board processes the data and sends the relevant information to the display unit.

1.4 Data Analysis: The sensor data is analyzed to determine the occupancy status of each parking space. If a vehicle is detected within a defined range, the corresponding parking space is marked as occupied; otherwise, it is marked as available. The system is tested for accuracy and response time.

1.5 System Testing and Calibration: After initial setup, the system is tested in different parking scenarios to ensure its reliability and effectiveness. Calibration is performed to adjust sensor sensitivity and ensure accurate detection of vehicle presence.

3. MODELING AND ANALYSIS

The smart parking system is modeled using an **Arduino Uno** board with **ultrasonic sensors** to detect vehicle presence in parking spaces. The sensors measure the distance to a vehicle and send data to the Arduino, which processes and updates the status of each space on an **LCD screen** in real-time. The system's performance is evaluated based on sensor accuracy, response time, and reliability. Calibration ensures accurate detection under various conditions, and optimizations are made to improve sensor sensitivity and power consumption. The system proves efficient in monitoring parking space availability with minimal delay and high accuracy.

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Figure 1: smart parking Test Procedure.

4. RESULTS AND DISCUSSION

In this project, we successfully designed and implemented a Smart Parking System using Arduino Uno, IR sensors, LEDs, and an LCD display. The system detects the presence or absence of vehicles in each parking slot and displays real-time availability. The results obtained during testing are discussed below.

When a vehicle enters the parking area, IR sensors detect its presence and trigger the system to show the status as "Occupied" for that slot. When the vehicle leaves, the slot automatically changes back to "Available." The system provides instant feedback through both LEDs (green for available, red for occupied) and the LCD screen. This real-time response is reliable and quick.

The table below shows a sample test of the system with six parking slots, monitored over several trials.

Table 1. Sample Slot Status Comparison

SN.	Parking Slot	Status	Sensor Detection
1	Slot A	Occupied	Vehicle Detected
2	Slot B	Available	No Vehicle
3	Slot C	Occupied	Vehicle Detected
4	Slot D	Available	No Vehicle
5	Slot E	Occupied	Vehicle Detected
6	Slot F	Occupied	Vehicle Detected

5. CONCLUSION

In this project, we created a Smart Parking System using Arduino to help manage parking spaces more easily. The system uses sensors to check if a parking spot is empty or taken, and it shows the results using LEDs or an LCD display. This helps save time for drivers and reduces traffic caused by people looking for parking.The project shows how Arduino and sensors can work together to solve real-life problems in a simple and low-cost way. Even though it was made on a small scale, it can be improved and expanded in the future.

ACKNOWLEDGEMENTS

We would like to express our sincere gratitude to our professor, [Mrs.Tanvi Mam], for their constant guidance, support, and encouragement throughout the project. Their valuable suggestions helped us complete this work successfully.

We also thank our group members who supported us during the development and testing of the Smart Parking System. Their feedback and cooperation made the process much easier and more enjoyable.

6. REFERENCES

[1] M. Goyal, R. Bedi, "Smart Parking System Using Arduino and IR Sensor," International Journal of Computer Applications, Vol. 162, No. 6, March 2017, pp. 25-29.

[2] S. Sharma, A. Yadav, "IoT Based Smart Parking System," International Journal of Recent Technology and Engineering (IJRTE), Vol. 8, No. 2S11, 2019, pp. 418-421.

[3] S. Tripathi, A. Bisen, "Arduino Based Smart Parking System," International Journal of Scientific & Engineering Research, Vol. 10, Issue 5, May 2019, pp. 1113-1116.

[4] GeeksforGeeks, "Smart Parking System using Arduino," Available at: https://www.geeksforgeeks.org/smart-parking-system-using-arduino

[5] Instructables, "Smart Parking System Using Arduino," Available at: https://www.instructables.com/Smart-Parking-System-Using-Arduino