

# Smart Parking System Using IoT

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## ABSTRACT

The problem of urban parking has become a major concern in cities worldwide due to the increasing number of vehicles and limited parking spaces. This leads to frustration among drivers who spend significant amounts of time searching for a parking spot and contributes to traffic congestion and air pollution. To address this issue, the Smart Parking System using IoT proposes an innovative solution that leverages the capabilities of IoT technology to optimize parking management and improve the parking experience for drivers. The system consists of several components, including sensors, a wireless network, a central server, and a mobile application. The sensors are installed in each parking space and are responsible for detecting the presence or absence of vehicles. The data collected by these sensors is then transmitted to a central server through a wireless network. This server analyzes the data in real-time and provides drivers with information on the availability of parking spaces in the vicinity. The Smart Parking System using IoT promises to be a significant improvement over traditional parking management systems. By providing drivers with real-time information on parking availability and enabling them to reserve a spot in advance, the system can significantly reduce the time and frustration associated with finding a parking space.

**Keywords:** Smart Parking, IR Sensor, Arduino UNO, Servo Motor, Parking space

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## I. INTRODUCTION

The increasing number of vehicles on the road has led to a growing problem of urban parking. Finding a parking spot in a busy city can be a frustrating and time-consuming task for drivers, often resulting in traffic congestion and air pollution. To address this problem, the Smart Parking System using IoT proposes an innovative solution that utilizes the capabilities of the Internet of Things (IoT) to optimize parking management and improve the parking experience for drivers. The Smart Parking System using IoT is a network of sensors installed in parking spaces that detect the presence or absence of vehicles and transmit this information to a central server through a wireless network. This information is then analyzed in real-time to provide drivers with information on the availability of parking spaces in the vicinity. Additionally, a mobile application is provided to enable drivers to reserve a parking space in advance and guide them to the reserved spot using GPS technology. The proposed system promises to improve traffic flow and reduce congestion in urban areas while providing a seamless and hassle-free parking experience for drivers. By providing real-time information on parking availability and enabling drivers to reserve spots in advance, the system can significantly reduce the time and frustration associated with finding a parking space. Additionally, the system has the potential to reduce carbon emissions and improve air quality by reducing the time spent searching for parking spaces. The Smart Parking System using IoT is an innovative solution to a growing problem and has the potential to revolutionize the way parking is managed in cities.

## II. LITERATURE REVIEW

The Automatic Smart Parking System using IoT is a technology-based solution that uses sensors, cameras, and IoT technology to monitor and manage parking spaces in real-time. It can reduce traffic congestion and save time and fuel for drivers, and improve the parking experience while reducing the environmental impact of traditional parking systems.[1]

The Smart Parking System uses sensors, cameras, and mobile applications to provide real-time information on available parking spaces. It helps drivers find parking spots easily and can be integrated with payment systems. It also uses cameras for security purposes.[2]

The Car Park Management system using wireless sensor networks is a technology-based solution that uses wireless sensors to monitor parking spaces in real-time, improving parking space utilization, reducing

congestion, and providing a better parking experience for drivers. It includes a mobile application and can be integrated with payment systems.[3]

The Automatic Parking Management System is a technology-based solution that uses Number Plate Recognition (NPR) to manage and collect parking fees. The system works by using cameras to capture the number plates of entering and exiting vehicles, and the NPR system automatically identifies the vehicle and retrieves its information from a database. The system also includes a fee collection system that automatically calculates the parking fee based on the duration of stay and the vehicle's information. The fee can be paid using a mobile app or at a kiosk located in the parking lot.[4]

### III. A) HARDWARE SPECIFICATION

#### a) Arduino UNO

Arduino Uno is an open-source microcontroller board based on the ATmega328P microcontroller. It has 14 digital input/output pins, 6 analog inputs, a 16 MHz quartz crystal, a USB connection, and a power jack. The board is easy to use and can be programmed using the Arduino Integrated Development Environment (IDE), which is a software platform used to write and upload code to the board. Arduino Uno is widely used in the field of electronics and robotics due to its flexibility, ease of use, and cost-effectiveness. It is suitable for beginners and experts alike and is used in a wide range of projects, from simple LED blinking to complex robotics and automation systems.

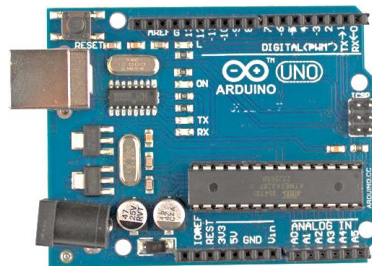


Fig 3.1 Arduino UNO

#### b) LCD

LCD stands for Liquid Crystal Display, a type of display technology commonly used in electronic devices such as smartphones, laptops, televisions, and digital clocks. The display consists of a layer of liquid crystal material sandwiched between two transparent electrodes. When an electric current is applied to the electrodes, the liquid crystal material changes its orientation, allowing or blocking the light to pass through the pixels. LCD displays offer several advantages such as low power consumption, high contrast, and a wide viewing angle. They are widely used in various applications due to their versatility, including display screens for appliances, digital signage, computer monitors, and consumer electronics.



Fig 3.2 LCD Display

#### c) IR Sensor

IR sensor stands for Infrared Sensor, a type of sensor that detects infrared radiation to measure distance, detect motion or presence, and temperature. It works by emitting an infrared light and measuring the reflection of the light that bounces back from an object. IR sensors are widely used in various applications such as security systems, automation, robotics, and medical equipment. They offer several advantages such as low power consumption, high sensitivity, and fast response time. IR sensors can be used in different forms, including passive infrared sensors (PIR), active infrared sensors, and thermal infrared sensors. Each type of sensor has its unique features and applications.

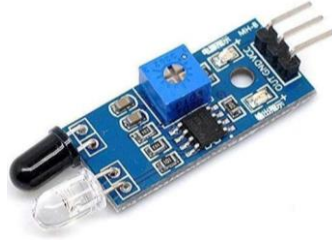


Fig 3.3 IR Sensor

## B) SOFTWARE DESCRIPTION

### ARDUINO IDE:

The Arduino IDE is a piece of software that offers a simple user interface for creating, developing, and uploading code to Arduino microcontroller devices. It has capabilities including a code editor, serial monitor, library manager, and board manager. It is open-source and free to download, making it simple for newcomers to begin programming with Arduino.

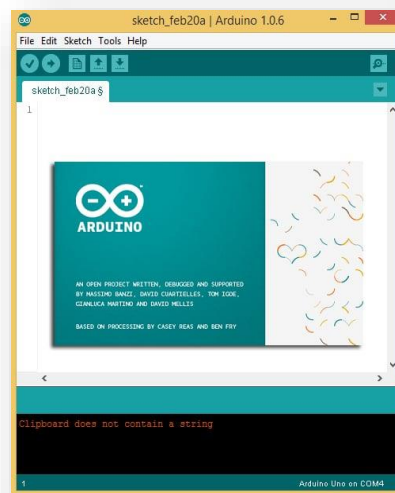


Fig 3.4 Arduino IDE

## IV. WORKING PROGRESS

The Smart Parking System using LCD, IR Sensor, and Arduino Uno works as follows:

1. The IR Sensor detects the presence of a vehicle in a parking spot by emitting infrared rays and receiving the reflected signals. If there is a vehicle in the parking spot, the IR sensor sends a signal to the Arduino Uno.
2. The Arduino Uno processes the signal received from the IR Sensor to update the status of the parking spot. If the parking spot is occupied, the Arduino Uno sets the corresponding status bit to 1, indicating that the spot is occupied. If the parking spot is vacant, the Arduino Uno sets the corresponding status bit to 0, indicating that the spot is vacant.
3. The LCD display is updated with the status of each parking spot. The LCD displays the number of parking spots available and the status of each spot, indicating whether it is vacant or occupied. The LCD display is updated in real-time as the status of each parking spot changes.
4. When a vehicle enters or leaves a parking spot, the IR Sensor detects the change in status and sends a signal to the Arduino Uno. The Arduino Uno updates the status of the parking spot and updates the LCD display accordingly.
5. If a driver wants to park their car, they can check the LCD display to find an available parking spot. Once they find an available spot, they can park their car and the IR Sensor detects the presence of the vehicle and updates the status of the parking spot.
6. If the parking spot is equipped with a payment system, the driver can pay for parking through a mobile app or a payment kiosk located in the parking lot. The payment system is integrated with the Smart Parking System to ensure that drivers only pay for the duration they use the parking spot.
7. The system is regularly maintained to ensure that it is functioning correctly. This may include replacing faulty IR sensors, updating the Arduino Uno program, or repairing the LCD display.

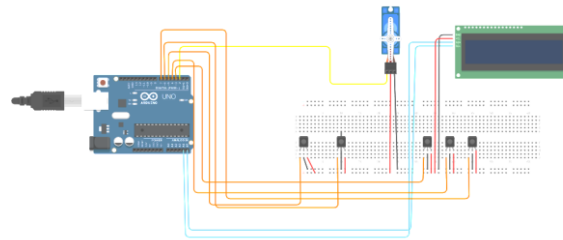


Fig 4.1 Circuit Diagram

### V.CONCLUSION

After doing study on smart parking project it is found that this system can be introduced in our country and it will be beneficiary in the context of our country. The main benefits are time and fuel saving. It can also provide sustainable parking management in an eco-friendly manner. There is less maintenance cost for this system so it helps the property developer in cost saving. It provides security to the parking ground. It reduces the hassle in parking grounds and traffic jam. It will also encourage Automation Engineering in our country which will make advancement in increasing usage of technology. Therefore, we should implement this project and help to develop our city.

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