

Smart Parking System With Anti-Theft Detection Using IOT

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Abstract- This paper deals with the challenges that exist with the typical parking system. It also highlights the damage and hassles created due to insufficient parking spots. Not only that, car thefts are rising at an alarming pace all over the globe. The cost of a security system is high, and consequently, an efficient solution is essential. So, in this article, we have built a smart parking system utilising IoT technology in which users may check for a nearby parking area along with the availability of parking slots in real-time using an Android application. Along with it, we also implemented a security function for a vehicle. That is, when someone attempts to steal the automobile, the user receives a notice and controls the car using a bot application from Telegram. This technology boosts the overall efficiency, reliability, and convenience while also reducing time and money spent seeking parking places. It also makes the automobile more secure.

Keywords- IoT (Internet of Things), Node-MCU, Smart Parking, Android application, ESP32 Camera, Sensor, Anti-Theft, Security System.

I. INTRODUCTION

Due to the growing number of automobiles, large business districts such as malls, hospitals, city centres, and residential communities need huge parking lots. A multi-story parking system is a typically prescribed solution for such a system. Users of the multi-story parking must look for an available parking place, wasting time that may be spent more efficiently elsewhere. Users who have come to work in offices or shop in malls must start their day in the parking lot, where they will be irritated by loud automobile honks and breathe dirty air. When users are inconvenienced repeatedly, their quality of life suffers. The whole entrance area is busy during peak hours. The number of cars coming and departing fluctuates, leaving just a few parking spaces completely empty. Multi-story parking spaces need commodities like lighting, air ventilation, and staff to manage traffic at all times. This increases the total cost of power while also increasing energy waste. The expense of expanding parking spaces is significant, which leads to excessive electricity usage. Due to

space limits and increased car volume, the need for an intelligent parking service is continuously expanding.

Many people believe that car theft only happens in shady parts of town, yet it can happen everywhere. People must be cautious not to attract criminals by committing frequent errors. One of the most widespread habits is theft. While the ownership of a physical asset may be changed without the agreement of the legitimate owner, theft prevention is used to claim ownership when the rightful owner is physically absent. Any equipment or approach used to prevent or dissuade the unlawful appropriation of valuable objects is referred to as an anti-theft system. It can also identify accidents in order to offer users security. A message will be sent to the closest police station or hospital in such a scenario.

Our proposed project will address the two issues highlighted in the preceding paragraphs. In the first, we'll make finding, reserving, and paying for parking simple and straightforward. In the second challenge, we'll create a system in which, if someone attempts to steal the automobile, the owner is warned through a snapshot captured by the camera module and may take appropriate action based on what they observe.

II. LITERATURE REVIEW

Many locations have deployed IoT-based smart parking systems. According to one study, IoT-based parking systems include Arduino, ultrasonic sensors, and a cloud server. This research used a mobile application to access a system that determined available slots and provided real-time updates on parking spots [1]. RFID technology is employed at entrance and departure points in the research [2] to decrease human contact and costs. This system transmits a timestamp to the cloud server at both locations. Another research [3] describes a parking system that uses PIR and Ultrasonic sensor technologies to identify the presence of humans or vehicles in any given region. This displays the vehicle's check-in and check-out times and transmits the information to a cloud server to determine parking availability. [4] discusses how to create a proximity sensor and how to utilise it in a parking system. We observed an IoT-based Car Parking Slots

monitoring system utilising Arduino, the (Node-MCU) esp8266 Wi-Fi module, and the Blynk application in [5]. The parking spots may be watched from anywhere in the globe using the (Node-MCU) 8266 WIFI module and the Blynk application.

Anti-theft detection for an automobile is essential nowadays. When the vehicle is accessible with the right password, it sends an SMS to the owner with the address of the accessed place, according to this paper on security systems [6] and [7]. If the wrong password is entered three times, the system sends an SMS to the owner, notifying them that someone is attempting to access the car at a specific location, and the power to the engine ignition system is turned off instantly.

III. METHODOLOGY

The methodology of this project had been divided into two parts

- 1) Parking System along with mobile application
- 2) Security System (Anti-theft Detection)

In the first one, the user needs to reserve the parking space in advance using the smartphone application. In the mobile application, the user needs to login if they have already registered or establish an account by registering in the app, which offers a unique id. Next, the user needs to pick the spot where the parking spots are available. Later, the user needs to complete the form for a certain slot, location, date, and time of entrance and leave the parking area.

After reserving the parking space, proceed to the spot where you booked the parking slot. Show the unique ID which is supplied. It will unlock the access gate. When the car is parked, the IR sensor receives the data and transmits it to Node-MCU, which will send it to the cloud and mobile application. Then it transmits to the user so that the other person will not book the same slot within the specified period. The block diagram of this is given below.

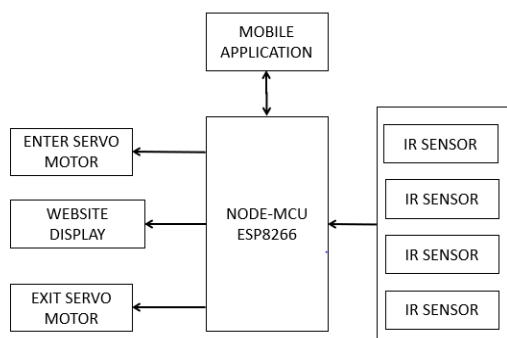


Figure 3.1 Block Diagram of Parking System

In the second one, when no spots were accessible at that moment and the user was hurried and parked outside. Then this will work. So, when someone comes into the vehicle (car), the motion (PIR) sensor detects it and transmits it to the ESP-32 camera module. This camera module takes a picture and transmits it to the telegram bot in the telegram app. When the user or owner realises this and takes action by starting or not starting the car, The block diagram of this is given below.

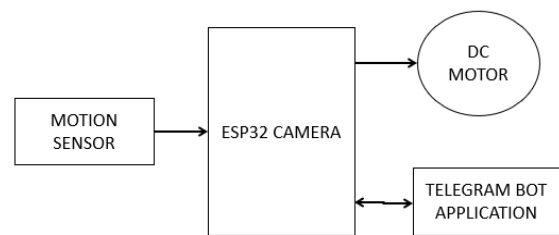


Figure 3.2 Block Diagram of Anti-Theft Detection

IV. FLOW CHART

In the following figures shows the flow of the project which is divided into three diagrams.

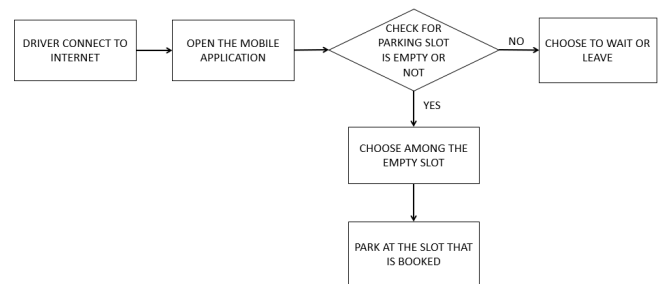


Figure 4.1 Flow chart of Mobile Application

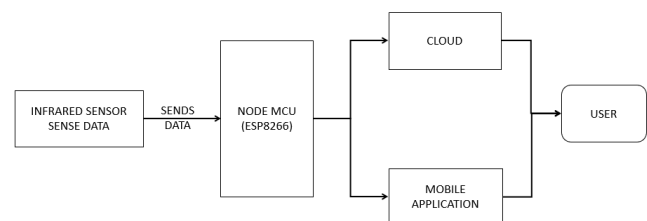


Figure 4.2 Flow chart of Parking System

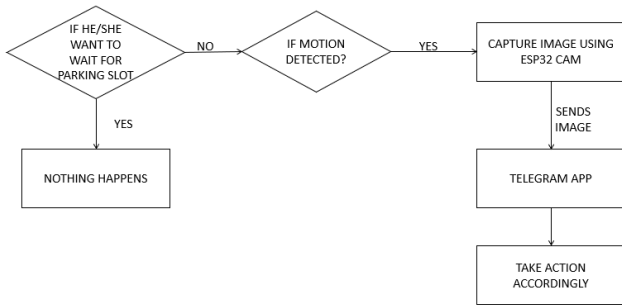


Figure 4.3 Flow chart of Vehicle Security System

V. HARDWARE REQUIRED

5.1 IR SENSOR

An infrared (IR) sensor is a light-emitting electrical device that detects items in the surroundings. This sensor utilises to detect a car’s movements and provides the status of the parking spaces.



Figure 5.1 IR Sensor

5.2 NODE-MCU

The ESP8266, a low-cost System-on-a-Chip, is the basis for the Node-MCU, an open-source software and hardware development environment. The ESP8266 has all of the required computer components, including a CPU, RAM, wireless networking, and even a contemporary operating system and SDK. This one collects data from sensors and sends it to a server. This is built on the concept of the Internet of Things. Sensors and a computer board that communicates with each other through the internet.



Figure 5.2 Node-MCU

5.3 SERVO MOTOR

A servo motor is a motor that rotates with a high degree of accuracy. At the entry and exit points, the servo motor serves as a gate for the parking system.



Figure 5.3 Servo Motor

5.4 ESP32-CAM

The ESP32-CAM is a tiny, low-cost ESP32-based development board with an embedded camera. The camera module is used for capturing photographs and transmitting them to the telegram bot of the telegram application.



Figure 5.4 ESP32 CAM

5.5 ARDUINO

Arduino is a programming language that allows you to create computers that can perceive and control more of the physical environment than a standard desktop computer. Because the ESP-32 camera does not have a USB port, Arduino is utilized to communicate with it.



Figure 5.5 Arduino UNO

5.6 PIR SENSOR

A motion sensor or passive infra-radiated detects movement on the device or in the surroundings. A motion sensor detects the movement of the item.



Figure 5.6 PIR Sensor

5.7 DC MOTOR

A DC motor is a rotating electric motor that converts direct current (DC) electricity into mechanical energy. This is used to indicate whether or not a vehicle has begun utilising a telegram bot using the telegram app.



Figure 5.7 DC Motor

VI. MOBILE APPLICATION

Mobile Application is developed which is supported on Android only. This app will enable the user to register and book a parking slot in advance. This app is made with a

combination of web pages. The programming language used to build the app are HTML, CSS, PHP, and SQL.

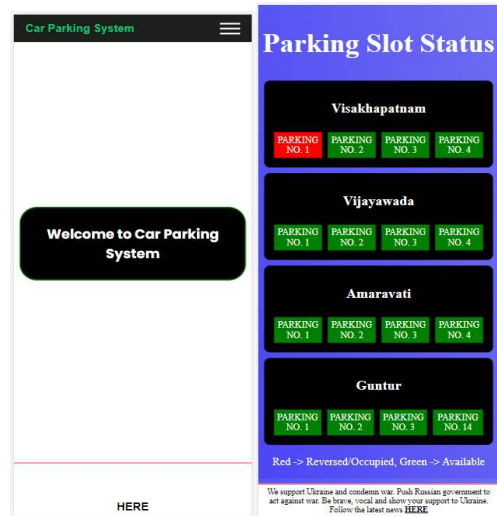


Figure 6.1

Figure 6.2

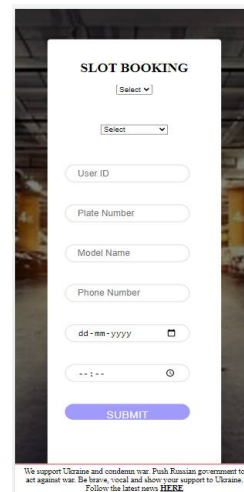


Figure 6.3

The above figures show the mobile application of the parking system. Fig 6.1 illustrates the UI when it starts the app. Fig 6.2 displays the parking spots available at various locales. Fig 6.3 illustrates the booking of slots available at that moment.

VII. RESULTS AND OUTPUTS

The results obtained are shown below

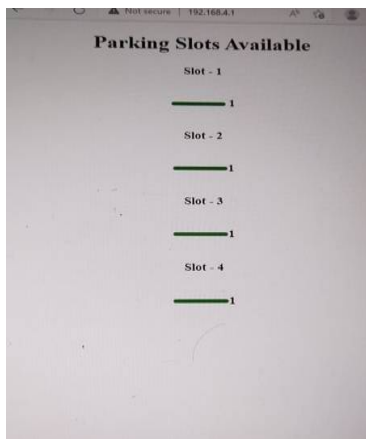
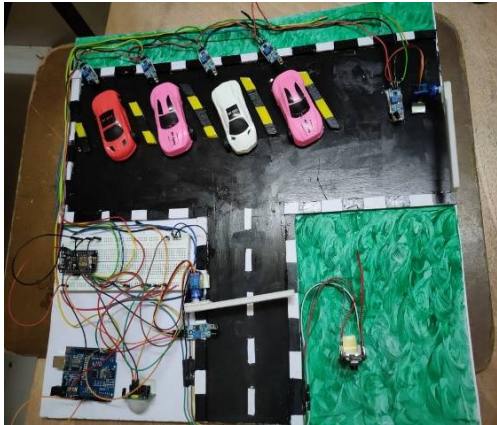


Figure 7.1 Parking System final output

Fig. 7.1 depicts a parking system with all of the automobiles parked and the matching availability of parking spaces. If the automobile is parked, the meter bar will be green (marked as 1), and if it is not parked, it will be white (indicated as 0).

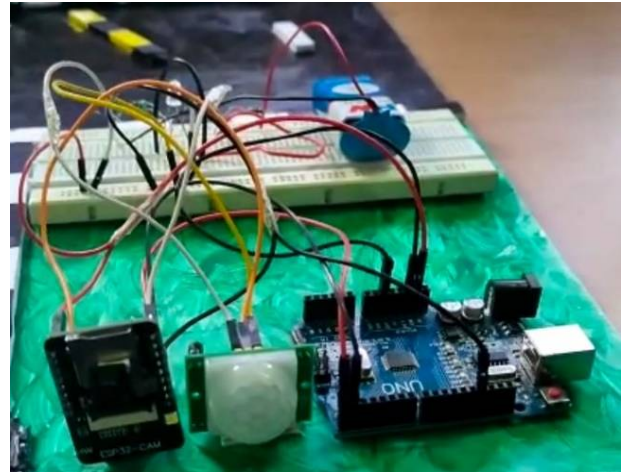


Figure 7.2 Security System Final Output

The above diagram indicates that when the motion sensor detects any motion it sends an image to the telegram bot. With the telegram bot, the user should perform essential action.

VIII. CONCLUSION

This project displays a Smart Parking System with Anti-Theft Detection utilizing the Internet of Things and mobile application. The project is roughly separated into two sections, first one is the pre-booking, monitoring of the parking spots, payment, and deployment of IoT module at entrance and departure. Another one is the security of the car from being stolen. This idea's unique characteristics will assist people to solve their parking challenges and make the car secure. Also, it will be possible to decrease the traffic and time. This technology will guarantee that seamless check-in and check-out of parking spots and delivers security to the car.

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