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IOT BASED CAR PARKING APPLICATION

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Abstract: As the number of vehicles grows, so does the difficulty of finding a suitable parking spot, particularly for cars. This indirectly leads to traffic congestion. This is due to the fact that current transportation infrastructure and parking facilities are incapable of accommodating a significant number of vehicles on the road. To alleviate the aforementioned problem, a Smart Parking Management System is proposed that helps users to automatically find a free parking space with a smaller amount. The proposed Smart Parking involves the use of an IR sensor, Arduino Uno, ESP8266-01 Wi-Fi Module, Cloud server. IoT-based new parking platform enables to connect, analyze and automate data gathered from devices and execute smart parking possible. Smart parking would enable vehicle occupancy, monitoring, and managing of available parking space in real-time that reducing environmental pollution.

Keywords-- *Smart parking system, Parking slots, Arduino, Sensor*

I INTRODUCTION

Traffic congestion caused by vehicles is an alarming problem on a global scale and it has been growing exponentially. The car parking problem is a major contributor and has been still a major problem with confined parking spaces in urban cities. For many people in cities around the world, looking for a parking spot is a common and often tedious task. Every day, this search consumes nearly one million barrels of oil from throughout the world. According to a report as shown in Figure1 Smart Parking could result in saving 2, 20,000 gallons of fuels till 2030 and approx. 3, 00,000 gallons of fuels by 2050. Approximately 30% of traffic is caused by people waiting for a parking spot. Drivers spend 3–14 minutes on average looking for a parking spot. Smart parking solutions can help to mitigate these problems.

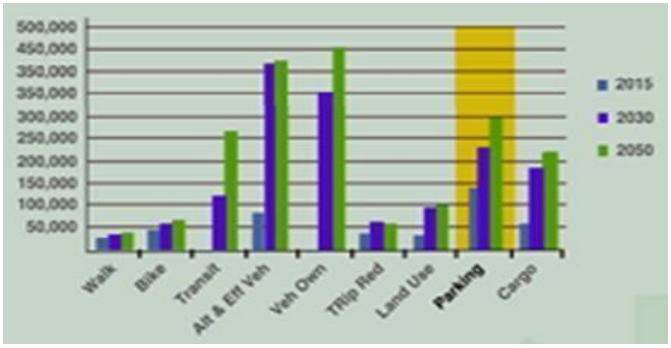


Figure 1 Estimation of fuel saved (in gallons)

This study concentrates on placement algorithms that are used in smart parking applications. As previously said, a smart parking location plan allows for greater utilisation of parking spot resources. This is a real-time method for placing vehicles at available positions. It entails the collecting of real-time data utilising low-cost sensors. Smart car parking systems accurately sense and predict spot/vehicle occupancy in real-time. It guides residents and visitors to the available parking spot. It helps the free flow of traffic in the city by leveraging IoT technology. It enables intelligent decisions using data, including real-time status applications and historical analytics reports. Smart Parking plays an important role in creating a better urban environment by reducing the emission of CO2 and other pollutants. Amir o. kotb [1], "A new smart car parking system based on dynamic resource allocation and pricing" stated, Mixed-integer linear programming which is cost-efficient. This gives a solution for reservation time constraints and pricing. Burak kizilkaya [2], "Binary search tree-based hierarchical placement algorithm for IoT based smart parking applications" stated Binary search tree algorithm. In this, Time and energy consumption are low. It is superior in terms of search time and energy efficiency. TajudTajudeen Olawale Olasupo [3], "Path loss model for low power, Low Data rate sensor nodes for smart car parking system" stated Wireless Sensor Network (WSN) is a flexible network and can adapt to the changes. Wei shao [4], in "Managing car parking violations efficiently using sensor data" proposed for indoor and outdoor car parking environments. It uses Greedy algorithm. It is used to solve the Multiple Travelling Officer Problem(TOP). From the literature survey, it has been observed that existing research works have been achieved to produce the lower output, High cost, and take a lot of time. In order to avoid these problems, the smart car parking system is proposed. The rest of the paper is organized as follows: The proposed works are discussed in Section 2. Section 3 presents the experimental setup and expected result of the system. Section 4 will conclude the paper. The future scope is discussed in Section 5.

II.PROPOSED WORK

A. INTERNET OF THINGS

Moving towards a smart city, smart parking is a very good example for a common citizen of how the Internet of Things (IoT) can be efficiently and effectively used in our daily lives, we supply a variety of services to a variety of people. The proposed application is user-friendly and even non-technical people can use it through mobile devices. Through this

application, users can search for free parking slots from anywhere in the world. Conventional based car parking method has a limitation of space and time. The proposed smart parking system providing the free parking slot efficiently which saves time and fuel and reduces atmospheric pollution and congestion in cities. IoT-based new parking platform enables to connect, analyze and automate data gathered from devices, and execute efficiently that makes smart parking possible.

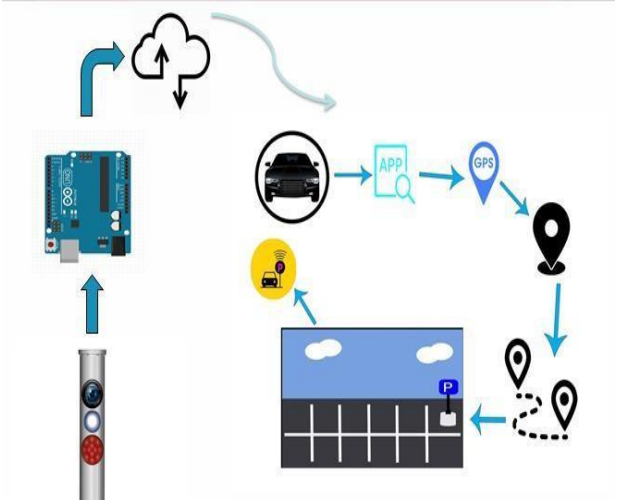


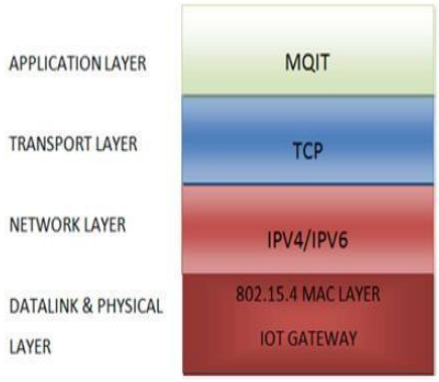
Figure 2 Proposed Model

The proposed system is shown in Figure 2. It has an IR sensor, Arduino Uno, ESP8266 Wi-Fi Module, Cloud server i.e. www.thingspeak.com, and blackgoldparking application. The infrared sensor is used to determine the availability of the vehicle in the parking spot. In the proposed system model five infrared sensors have been installed. Each sensor is used to detect the presence of the car in the slot. These infrared sensors are connected to the Arduino. So when a car is parked in the slot, the Arduino sends a command to the ESP8266 Wi-Fi module, then the Wi-Fi module sends the command to the blackgoldparking application. To collect data from the local car park, the Arduino Uno module is connected to the cloud server via an internet connection. On the webpage, the user can see the live feed of the availability of the slots in the car parking area. The website named blackgoldparking. tech is also being created. The user has to log in to blackgoldparking. tech website on their smartphones. The blackgoldparking application can be installed by scanning the QR code.

B.APPLICATION

The endpoint in the IoT system is the Cloud-based service provided by Thingspeak which is essential to see the true output of the project or the output of the data send forward end nodes. Users can easily alter and change the data on this node, and they can use a variety of approaches to make its representation more effective. This parking system uses Thingspeak tools on the website page to view the output. It consists of Application, Transport, Network, Data Link and Physical Layers as shown in Figure 3

Figure 3 Layering Architecture of IoT



III.EXPERIMENTAL RESULTS

Figure 4. Homepage

Figure 4 describes the home page of the website. This is the first page that opens up when entered into the site.

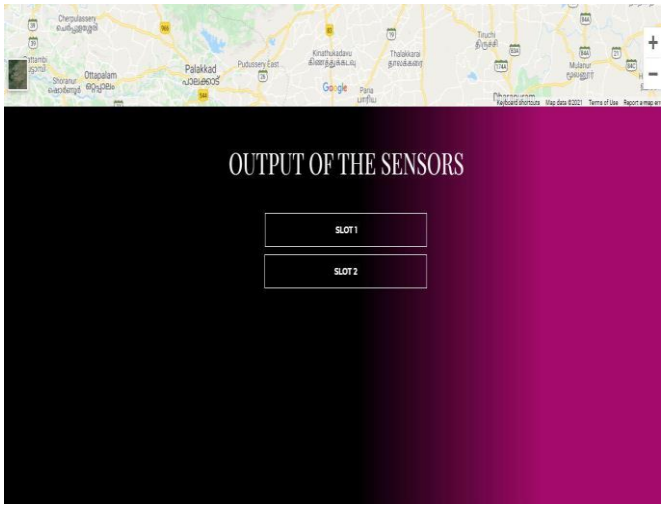


Figure 5 Web view of parking slots

Figure 5 describes the web view of parking slots. In this image, the five sensors categorized as slot 1 and slot 2 is displayed.

Figure 6 Slot 1 result

The Figure 6 is the output of sensor 1 and indicates that the slot is full.

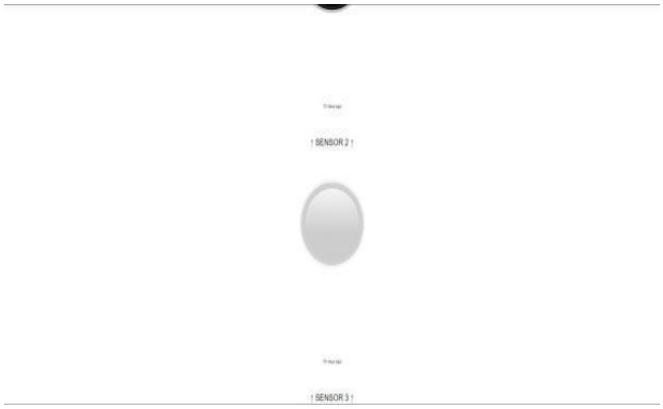


Figure 7 Slot 1 result

The Figure 7 it shows the sensor 2 indicates that the slot is full and sensor 3 indicates the slot is free.

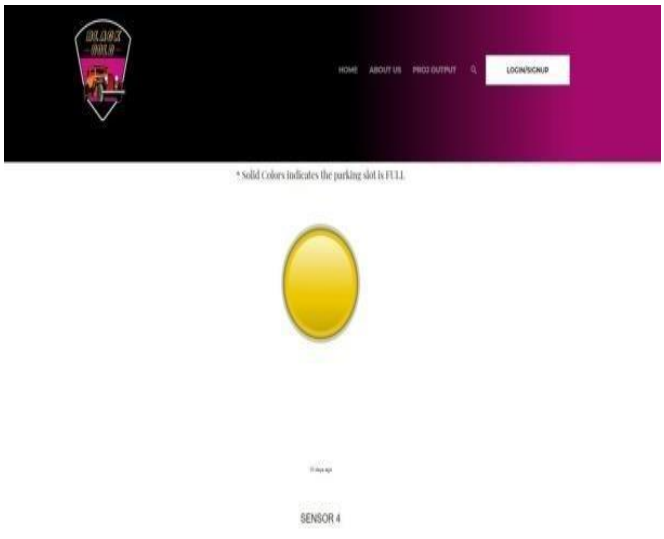


Figure 8 View of slot 2

Figure 8 shows the output of sensor 4 and it indicates it is full. The data collected from the parking slots by infrared sensors is been transmitted to the cloud. The availability of the slots can be viewed through the website named blackgoldparking.tech. The proposed system includes two slots. Slot one has three infrared sensors and slot two has two infra-red sensors when the slots are filled then the indicator circle colour changes to black colour in slot one and yellow colour in slot 2, which denotes the presence of the car in the car parking slot.

Figure 9 QR code for application downloading

The black gold parking application has been created by using Android studio. The user can install the app, by scanning the QR Code that is mentioned in Figure 9. QR codes carry information for a location, identifier, or tracker that links to a website or app. It delivers quick decoded information in response to a scan using a QR Code reader.

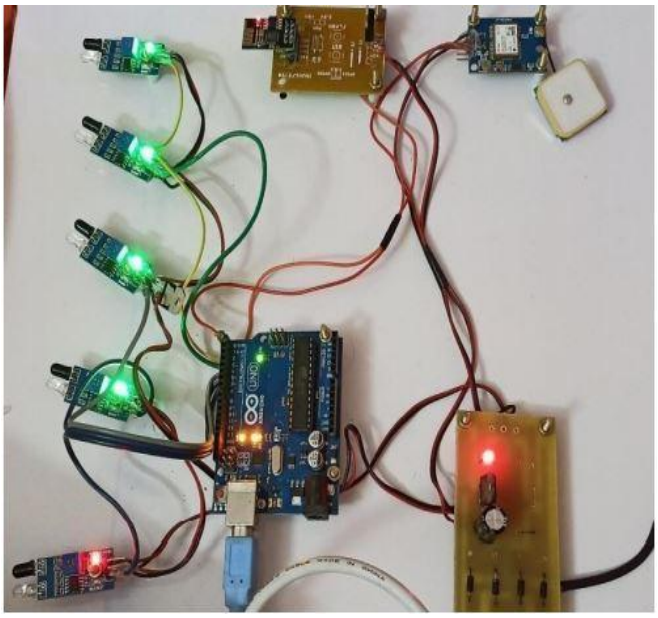


Figure 10 Hardware connections.

Figure 10 shows the hardware connections. The hardware part consists of five sensors that are connected to the Arduino Uno board. The ESP8266 Wi-Fi module cannot be powered up with the Arduino's five volts. In order to regulate the voltage LM7805 voltage regulator is been used. When there is an obstacle the LED of the IR sensor glows. The output can also be viewed in the Arduino IDE serial port monitor. In serial port monitor, the results are displayed in the form of slot vice i.e. Whether it is full or free. It also displays in binary format as 0s and 1s. Free or 1 indicates that the slots are not occupied. Full or 0 indicates the availability of the slots.

IV.CONCLUSION

Smart parking facilitates the problems of urban liability, transportation mobility, and environmental sustainability. Smart Parking technology is utilised in operations to increase productivity and service levels. It also has advantages in terms of reducing operational costs, increasing revenues, and increasing the value of the facility. It involves the use of an IR sensor, Arduino Uno, ESP8266-01 Wi-Fi Module, Cloud server. Such integration allows users to monitor available and unavailable parking spots that lead to improved efficiency, accuracy, and economic benefit. The proposed smart parking system providing the free parking slot efficiently which saves time and fuel and reduces atmospheric pollution and congestion in cities.

V.FUTURE SCOPE

The smart parking management system can be broadly applied for many future applications. Apart from its primary function of auto parking management, it may also be used to handle planes, ships, and fleets. With the ever-growing field of the Internet of Things, many concepts can be interfaced along with our system. Smart Parking system can be modified into fleet management of ship and plane with very few external hardware changes and almost with the same software. For residential and domestic parking systems the device can be interfaced with a Home Automation system which can control the various home appliances by sensing whether the user is arriving or departing from the parking space.

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