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"IOT BASED PARKING CONTROL SYSTEM"

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ABSTRACT: Over the last few years, with every enhancement in Internet in terms of speed and bandwidth, IOT (Internet Of things) is taking the market on a new node and knocking the door with new opportunities of inventions. The advent of IOT has alleviated major issues of people living in rural and urban areas. It has expanded its feathers almost in all areas of applications such as Smart Homes, Smart Farming, Smart Retail, Smart Health Monitoring Systems, Automobile Industry, and Smart Cities. The proposed work is mainly focused on providing solution to one of the smart city problem which is vehicle parking Management System. The proposed work is implemented using Node MCU, Ultrasonic Sensors, Wi-Fi Module and Google maps. The proposed system is designed to track the vacant parking slots through the IOT technology utilizing mobile application/website. The Wi-Fi Module is used to send the information to the server. The proposed work will reduce the time and exertion of looking for empty parking slots. Finally, detailed results were presented in this paper.

KEYWORDS: Automated Parking, NodeMCU, IR sensors, Ultrasonic sensors, Blynk app, Internet of Things (IOT).

INTRODUCTION

Now-a-days technology is advancing day by day. Electronic devices help to reduce the task to finish work quickly and efficiently. In public places it is difficult to open and close the doors for each individual. As there is widespread of virus which is contiguous, it is necessary to take precautions at every place. It is more important to take precautions at crowded places like malls, public transport stations. It is difficult task to check out everyone and monitor them individually. Both these problems require more manual work and more staff. Now in the current situation it is difficult to have more manual work which increases the cost, in turn decreases safety. Fever is one of the most important symptoms of Covid-19, but due to the contiguous effect, temperature measurement can become a serious problem, so it is important to perform temperature detection of people quickly and possibly without any contact. Main purpose of smart parking system is to reduce time to locate the parking areas, hence to it reduces fuel consumption. Sensors would be deployed in the parking area and through the mobile app, user books for the parking slot and allows online payment option as well. Developing countries like India, face problem for large free parking space management. Conventional parking management systems use sensors and other communication module, but does not address solution for both open and closed parking space. Mobile application that are used to find a parking slot use GPS connect through the Google map API to find free parking space location, but does not find the free parking slot location exactly.

LITERATURE SURVEY

[1] Supriyashinde1, ankitam patial2, psusmedhachavan3, sayali deshmukh4, and subodh ingleshwar5 "iot based parking system using google", i-smac,2017, pp.634636.

Intelligent parking has proposed a system which used Google map application. Ultrasonic sensor and data collected are stored in cloud. Android application map gives client friendly information about vacant slot. Each slot has one LED display which help to seek out the proper parking place. IoT based parking system using Google was proposed to allow the user to reserve the parking place. Mobile application, finds the current parking place. In this system IR sensor is used to find an empty place and is displayed at entry and exit gate. RFID tag issued to authorize an individual entry to the parking place. If the person is permitted signal is shipped to open the gate. Advanced CAR Parking System using Arduino and Raspberry PI to detect the free slots. This system uses web server for booking, Google Maps using GPS. Results are displayed in the mark graphically.

[2] "Hemantchaudhary, prateekbansal., b. valarmathi," advanced car parking system using arduino", icaccss, 2017.

This paper explains the architecture and design of Arduino based car parking system. Authorization of driver or user is the basic rule used to park a vehicle in a parking place. Authorization card will be given to each user, which carries the vehicle number or other details. If the user is authorized and space is available in the parking, then the parking gate will

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open and the user is allowed to park the vehicle in parking place else the user is not allowed even the user is authorized person. If car is allowed to park, then mobile notification will be sent to user about parking. It solves the parking issue in urban areas, also provides security to a vehicle and an unauthorized user is not allowed to enter into a parking place. It helps to park vehicle in multifloored parking also as it will display which floor has free space.

[3]. "Nastaran rezanazarzadeh, jennifer c. dela," Privacy-Preserving Pay-by-Phone parking system " icsce, 2016, pp-370-373.

Traditional pay-and-display ticket machines are currently coexisting, but will probably be replaced in the near future, with pay-by-phone applications. Such applications facilitate the payment for parking in regulated areas. Companies providing this service collect and manage information about all the parking transactions performed by drivers. That information is very sensitive and can be used to generate reports on the parking history of drivers, posing a threat on their privacy. This paper proposes a pay-by-phone parking system in which the service provider is prevented from being able to track the parking transactions of drivers. The new proposal requires drivers to be connected only at the beginning of a parking transaction, or at the moment of indicating that a parking transaction took less time than expected. Prototype experiments have shown that the new proposal is much more efficient, in terms of computational cost, than the most complete previous existing system, while providing the same functionalities and higher security.

1.In the near future, open in-vehicle platforms may allow the inclusion of these functionalities just by installing an additional software to the car.

2.Valued e-coins will usually be acquired in batch so that a single payment for the overall amount will be performed.

3.Extrapolated from 12coins10ms·1000ms1s·8=9600coinss

4.Extrapolated from 12ticket99ms·1000ms1s·8≈969tickets

[4] "Pavan kumarjogadaand vinay akwarad, "effective car parking reservation system based on internet of things technologies". bijsesc, 2016, vol. 6, pp.140-142.

Nowadays with the rapid increase in urban population, there is a major problem with the parking system in almost every major city across the globe. Many of us get highly disturbed when there is no proper space for parking space for our vehicles. In this article, we have proposed a smart parking application, where users will be able to park their automobiles by finding an empty parking lot through Android Application or can even park their automobiles directly through Embedded Hardware. An Intelligent Parking System is implemented based on Slot Allotment. There are two modes using which the Android user can book the parking slots easily like Advance & Current Booking. Using these modes, the application user can also choose the easiest and nearest route and destination. The Android Application itself will serve as a payment gateway. Embedded Hardware is implemented for Direct Parking. Server will monitor the Slot Allotment dynamically.

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FLOW CHART

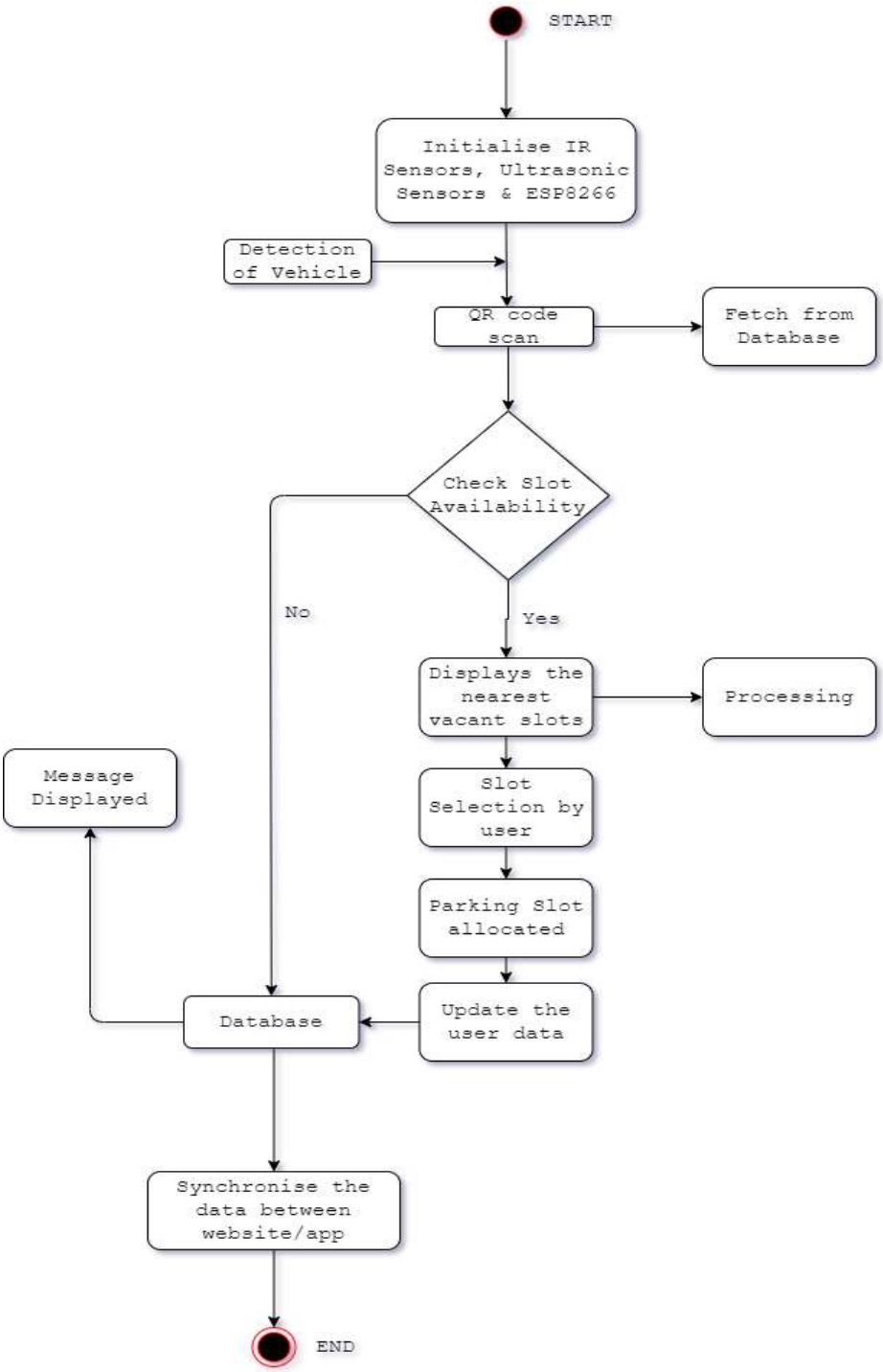

Figure 1 Flow Chart

METHODOLOGY

Step 1: Scan the QR code at the entrance from the mobile device, which redirects to the website/app.
Step 2: Browse through the various parking slots available in that parking lot.
Step 3: Allot the chosen parking slot and get vehicle details from the user.
Step 4: Navigate to the selected parking slot.
Step 5: After successfully parking the vehicle, the real-time data of vehicle occupancy is confirmed in the website/app.

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Step 6: The Parking duration of the vehicle is noted and the estimated amount is calculated and updated.
Step 7: Payment of the parking charges should be done either through online or cash/card at the exit.

WORKING

• The IR Sensors detect the presence of the vehicle by transmitting the IR radiations by the transmitter.
• The IR Sensors detect "1" when there is a vehicle and detect "0" when it is empty. Simultaneously in the app/website a new project is created by the author and LCDs are used to detect the empty and occupied slots.
• A QR code is displayed at the entrance of the parking, which redirects to the website/app.
• When the vehicle enters the parking zone, user needs to scan the QR code from their mobile, then the data about the slots is available for the user in the app/website to know which slot is empty and which is occupied, the user can choose a favorable slot and user should enter the details of the vehicle in the website/app.
• After choosing the slot, the website/app navigates the user to the selected slot.
• When the vehicle is parked the ultrasonic sensor detects the vehicle and then timer starts, when the vehicle is moved the Ultrasonic sensor detects there is no vehicle, and stops the timer.
• When the user exits, the sensor notices that there is a state change from blocked to vacant and sends a notification to the server, which updates to the database.
• On the basis of duration of parking time, the amount to be paid is estimated and notified to the user through the website/app.
• The user has to pay the estimated amount through online mode or through cash/card at the exit.
• This application solves the problem of parking during busy days by knowing the empty slots prior to park the vehicle.

COMPONENTS

I2C Module

The I2C communication bus is very popular and broadly used by many electronic devices because it can be easily implemented in many electronic designs which require communication between a master and multiple slave devices or even multiple master devices. The easy implementations come with the fact that only two wires are required for communication between up to almost 128 (112) devices when using 7 bits addressing and up to almost 1024 (1008) devices when using 10 bits addressing. The two wires, or lines are called Serial Clock (or SCL) and Serial Data (or SDA). The SCL line is the clock signal which synchronize the data transfer between the devices on the I2C bus and it's generated by the master device. The other line is the SDA line which carries the data. The two lines are "open-drain" which means that pull up resistors needs to be attached to them so that the lines are high because the devices on the I2C bus are active low. Commonly used values for the resistors are from 2K for higher speeds at about 400 kbps, to 10K for lower speed at about 100 kbps.

Figure 2 I2C module

IR Sensors

IR sensor can measure the heat of an object as well as detects the motion. These types of sensors measure only infrared radiation, rather than emitting it that is called as a passive IR sensor. Usually in the infrared spectrum, all the objects radiate some form of thermal radiations. These types of radiations are invisible to our eyes that can be detected by an infrared sensor. The emitter is simply an IR LED and the detector is simply an IR photodiode which is sensitive to IR light of the same wavelength as that emitted by the IR LED. When IR light falls on the photodiode, the resistances and these output voltages, change in proportion to the magnitude of the IR light received. An infrared sensor circuit is one of the basic and popular sensor modules in an electronic device. This sensor is analogous to human's visionary senses, which can be used to detect obstacles and it is one of the common applications in real time. This circuit comprises of the following components: LM358 IC IR transmitter and receiver pair, Variable resistors, LED. Smart parking model, the IR Sensor is switched on and off according to the presence of the vehicle. When IR Sensor is off it means vehicle is not present and is indicated by switching on the respective LED in the blynk app When IR Sensor is on it means vehicle is

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present in the slot and is indicated by turning off the LED in the blynk app. This makes it easier to park the vehicles without searching for an empty slot.

Figure 3 IR Sensor

Ultrasonic Sensor

An **ultrasonic sensor** is an electronic device that measures the distance of a target object by emitting **ultrasonic** sound waves, and converts the reflected sound into an electrical signal. **Ultrasonic** waves travel faster than the speed of audible sound (i.e., the sound that humans can hear).

Figure 4 Ultrasonic Sensor

NODE MCU (ESP8266)

An open-source firmware and development kit that helps you to prototype your IoT product within a few Lua script lines. The input from the IR Sensors is taken by the NODE MCU. The NODE MCU is connected to the Wi-Fi. After taking the values from IR Sensors they are automatically updated in the blynk app by the connection of Wi-Fi. The sensor values are automatically updated in the app through the Wi-Fi connection and authentication token. The Arduino integrated development environment (IDE), which is a cross-platform application written in the programming language Java. It originated from the IDE for the languages Processing and Wiring. It includes a code editor with features such as text cutting and pasting, searching and replacing text, automatic indenting, brace matching, and syntax
highlighting, and provides simple one-click mechanisms to compile and upload programs to an Arduino board. It also contains a message area, a text console, a toolbar with buttons for common functions and a hierarchy of operation menus.

Figure 5 Node MCU ESP8266 module

Servo Motor SG90

Micro Servo Motor SG90 is a tiny and lightweight server motor with high output power.
Specifications of Servo motor
Pulse Width: 500µs - 2400µs
Rotation/Support: Bushing
Shaft Diameter: 4.5mm
Speed: 0.32 oz (9.0 g)
Torque: 4.8V: 25.0 oz-in (1.80 kg-cm)
Gear Type: Plastic
Modulation: Analog
Motor Type: 3 Pole Servo Motor
Range: 180°
Phase Voltage: 5V
The heart of a servo is a small direct current (DC) motor, similar to what you might find in an inexpensive toy. These motors run on electricity from a battery and spin at high RPM (rotations per minute) but put out very low torque . An arrangement of gears takes the high speed of the motor and slows it down while at the same time increasing the torque.

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The gear design inside the servo case converts the output to a much slower rotation speed but with more torque (big force, little distance). Gears in an inexpensive servo motor are generally made of plastic to keep it lighter and less costly.

Figure 6 Servo Module

LCD Display

A **liquid-crystal display** (**LCD**) is a flat-**panel display** or other electronically modulated optical device that uses the light-modulating properties of liquid crystals combined with polarizers. Liquid crystals do not emit light directly, instead using a backlight or reflector to produce images in color or monochrome.

Figure 7 LCD Display

BLYNK APP

Blynk will get you online and ready for the IoT. Blynk app and server in order to use blynk app we would need: • Hardware that works with Blynk. Check the full list of supported hardware. • If your hardware doesn't have connectivity on board, you can use shields like Ethernet, Wi-Fi, GPRS and many others. Blynk also works over Bluetooth and USB. The following steps are to be followed:

1. Download the blynk app for android or OS.
2. Get the auth token:
• Create a new account in Blynk App.
• Create a New Project. Then choose the board and connection you will use. After the project was created, we will send you Auth Token over email.
• Check your email inbox and find the Auth Token.
3. Install the Blynk library. Blynk library should be installed manually, the following steps should be followed:
• Download the latest release .zip file. Unzip it. You will notice that archive contains several folders and several libraries.
• Copy all these libraries to your_sketchbook_folder of Arduino
IDE. To find the location of your_sketchbook_folder, go to top menu in Arduino IDE: File -> Preferences (if you are using Mac OS - go to Arduino → Preferences)
4. Create your first example sketch code.
• Choose Your board (for example: Arduino UNO)
• Choose your connection (Wi-Fi, Bluetooth, USB.) Now, the connection is established between the board and the blynk app.
5. Paste the auth token.

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RESULTS

The parking Control system is designed. The aim of parking Control system is to reduce time and increase efficiency of the current parking control system. The system provides details of the vacant parking slots in the vicinity and reduces the traffic issues due to illegal parking in the vicinity.

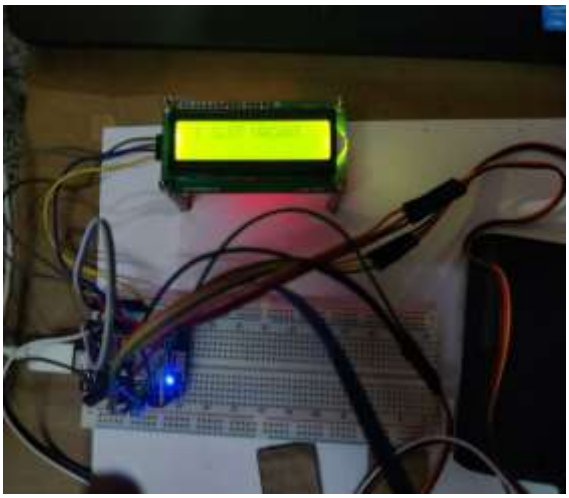

Figure 8 LCD Display when parking slot is vacant

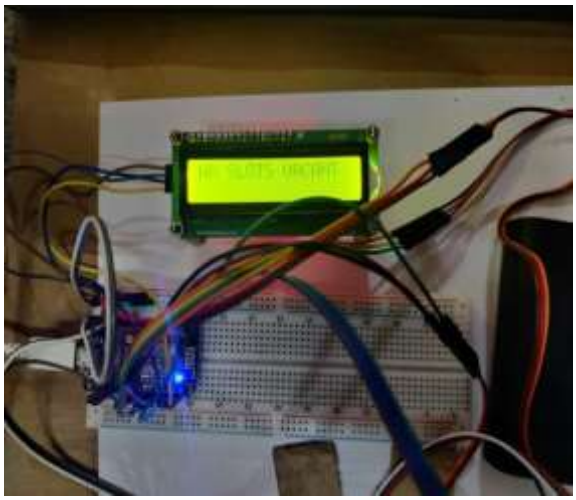

Figure 9 LCD Display when parking slot is occupied

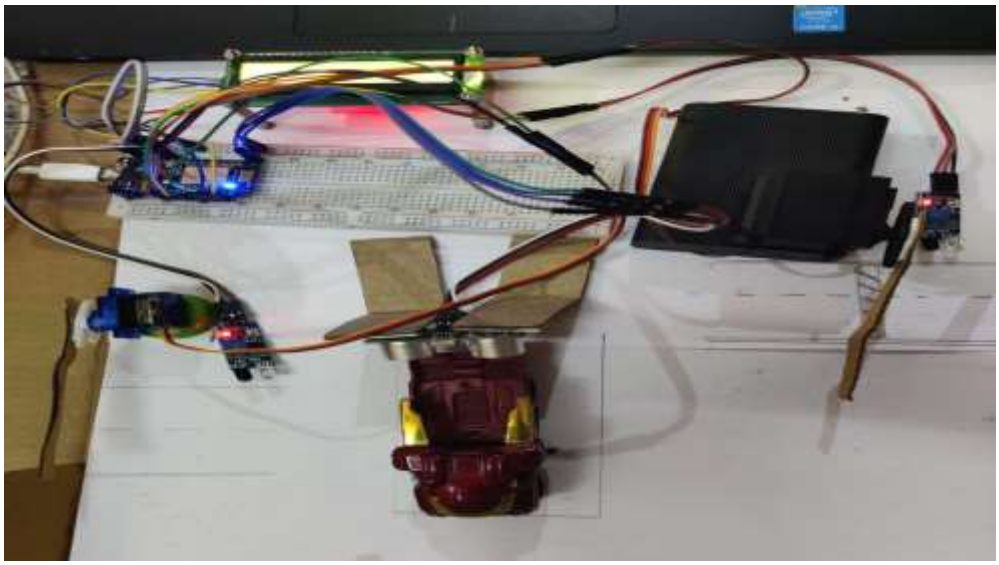

Figure 10 Prototype of IoT based Parking control system

CONCLUSION

The demand of smart parking system is increasing significantly. This allows user to involve real time access of the availability of the parking space. The existing system in today's world doesn't contains the facilities of parking reservation and parking slot availability checker. The existing system was vision-based monitoring system which estimates the number of the parking slots available in the area by counting the number of incoming and outing cars which consumes lot of time and efforts. The next existing system was sensor-based system which uses ultrasonic sound waves for detecting the presence of vehicles and then two-tier parking came into existence which used the concept of parking cars one above another. The result of the paper is to make the parking area connected with the world as well as reduces time and can be

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cost effective for the user. The result of this paper is to reduce car theft. This paper reduces overall fuel energy of the vehicle which is consumed in the search of the car.

FUTURE SCOPE

The concepts of smart cities have always been a dream. There have been advancements made from the past couple of years to make smart city dream to reality. The advancement of internet of things and cloud technologies has given rise to the new possibilities in terms of smart cities. Smart parking facilities have always been the core of constructing smart cities. The system provides a real time process and information of the parking slots. This paper enhances the performance of saving users time to locate an appropriate parking space. It helps to resolve the growing problem of traffic congestion. As for the future work the users can book a parking space from a remote location. GPS, reservation facilities and license plate scanner can be included in the future. To achieve full automation, a real-time system should be employed and a Closed-Circuit Television (CCTV) system provided for proper monitoring and security purposes. This can be helpful in detecting the presence of vehicles before the system is activated. Upgrading the system using higher bit microprocessors for speed optimization. By using GSM module alert messages can be sent to authorized persons. Alarms can also be implemented. This idea can be further extended by building a full-fledged parking app, in which the user can pre book the parking slot before reaching the destination.

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