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SMART PARKING SOLUTIONS – IT'S NOT ABOUT THE PARKING

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ABSTRACT

Now a day's Car parking is a major issue in modern congested cities from public places to various shopping malls due to the increase of numerous cars. There are simply too many vehicles on the road and not sufficient parking space. This has led to the need for efficient parking management systems. By addressing this issue, the use of IOT based parking management system has been demonstrated that allows efficient way of parking and results in proper space utilization. The system detects status of parking slots whether occupied or not by using ultrasonic sensors and send the commands to NodeMCU which acts as a server thus allowing edge sensors (IR sensors) directly communicate with the end server like blynk. By using the blynk application in the mobile phones, the end user can easily connects with the server created by the NodeMCU. The designed system will senses the number of parking slots available and updates the data along with the location by fetching the coordinates from GPS module to the blynk server which allows the users to check for the availability of parking slots by monitoring in the blynk application. It also includes the slot booking option by clicking the desired slot in the blynk application and once done, the blynk server updates the Node MCU server and makes the light at the parking slot to turn red (indicates the slot has been booked), green (indicates the slot is empty). Thus the system resolves the parking issue for cities and get users an efficient IOT based parking management system.

KEYWORDS — *: IOT, blynk, NodeMCU, ultrasonic*

1. INTRODUCTION

The proposed model is applicable in the places where the problems of parking persists a lot especially at shopping malls, movie theatres etc. Specifically this work can make the people choose their right parking slot without thinking about the exhausting of slots before reaching the spot. This makes the process simple and most affordable by the users. Once the app is installed in the phone, the users be able to see the predefined parking slots at the selected malls. The blynk app can be easily installed and can be supported with any operating system (os) on the mobile phones and having a better user interface. On summary, even though the application areas is limited to shopping malls and movie theatres, this work can also be extended to restaurants, metro station parking and other public places.

2. EMBEDDED SYSTEMS

As its name suggests, Embedded means something that is attached to another thing. An embedded system can be thought of as a computer hardware system having software embedded in it. An embedded system can be an independent system or it can be a part of a large system. An embedded system is a microcontroller or microprocessor based system which is designed to perform a specific task. For example, a fire alarm is an embedded system; it will sense only smoke.

An embedded system has three components −

- It has hardware.
- It has application software.
- It has Real Time Operating system (RTOS) that supervises the application software and provide mechanism to let the processor run a process as per scheduling by following a plan to control the latencies. RTOS defines the way the system works. It sets the rules during the execution of application program. A small scale embedded system may not have RTOS.

An embedded system as a Microcontroller based, software driven, and reliable, real-time control system.

3. INTERNET OF THINGS (IOT):

The Internet of Things (IoT) is the network of physical devices, vehicles, home appliances and other items embedded with electronics, software, sensors, actuators, and connectivity which enable these objects to connect and exchange data. Each things uniquely identifiable through its embedded computing system but is able to inter-operate within the existing Internet infrastructure

Devices and objects with built in sensors are connected to an Internet of Things platform, which integrates data from the different devices and applies analytics to share the most valuable information with applications built to address specific needs. These powerful IoT platforms can pinpoint exactly what information is useful and what can safely be ignored. This information can be used to detect patterns, make recommendations, and detect possible problems before they occur. The figure 1 shows the architecture of IOT.

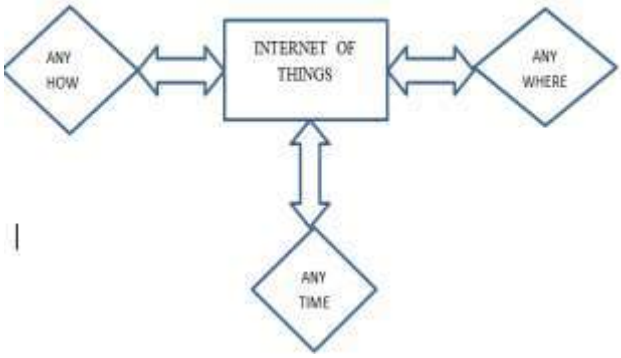

Fig 1: Architecture of IOT

The information picked up by connected devices enables me to make smart decisions about which components to stock up on, based on real-time information, which helps me save time and money. With the insight provided by advanced analytics comes the power to make processes more efficient. Smart objects and systems mean you can automate certain tasks, particularly when these are repetitive, mundane, time-consuming or even dangerous.

The smart parking system which will implement on internet of things to facilitate the real time availability of parking spaces. IoT describes a system where items in the physical world, and sensors within or attached to these items, are connected to the Internet via wireless and wired Internet connections. These sensors can use various types of local area connections such as RFID, NFC, Wi-Fi, Bluetooth, and ZigBee. Sensors can also have wide area connectivity such as GSM, GPRS, 3G, and LTE.

4. METHODOLOGY

The Block Diagram of smart parking is shown in figure 2 gives a general idea to design. The over view of this designing purpose is given in the block diagram. The important hardware parts which are used in the system are Node MCU, IR sensor, GPS module, BLYNK application. The main part of the system is the Node MCU is the heart of the design and blynk application is used for graphical user interfacing (GUI) which is used to check availability status of the parking slot.

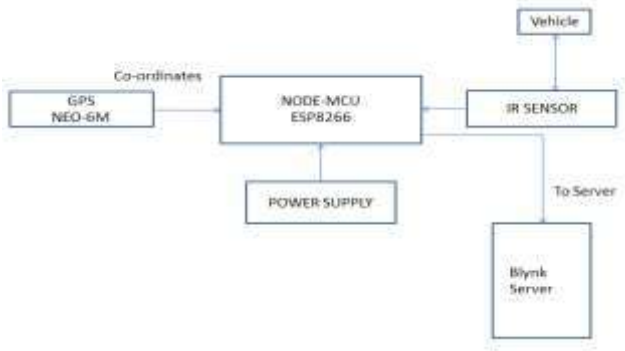

FIG 2: BLOCK DIAGRAM OF SMART PARKING

The figure 2 shows the circuit diagram of the Design and how the different components of the device 1can be connected. IoT refers as any physical thing that is connected to internet or exchanging information or data between internet and physical device. NODE MCU is an open source IoT platform used in smart parking. It is used for building digital devices and interactive objects that can sense and control physical devices. Smart parking will be implemented using Arduino IDE and NODE MCU to connect parking area with BLYNK app. By using this automated parking system, a user can save much time for searching free parking space. An infrared sensor has to be employed in each slot to check that a particular plot is vacant or not. Searching smart parking system helps people to search parking space accessible with the ease of IoT automation by supplying parking slot free information.

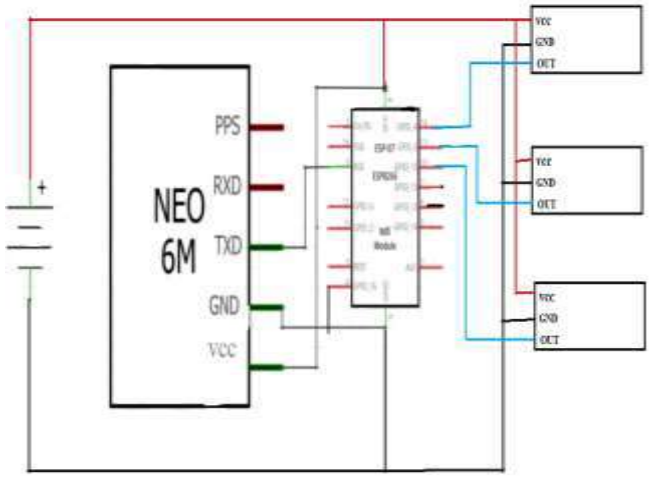

Fig 3: Node MCU

In this implementation, four IR sensors have been used in the parking slots. The IR sensor is switched on when a vehicle is parked in that particular slot and remains off when the slot is empty. The Blynk app is installed in the mobile and an authentication token is sent to the mail which is updated in the program. A new project is created in the Blynk app and LED's are used to indicate if the slot is empty or occupied. When the parking slot is occupied, the IR sensor is switched on and automatically the LED in the app gets switched off and vice versa.

5. EXPERIMENTAL RESULTS

After checking all the connections and adding all the required library files to the Arduino IDE. Then, successfully done compiling and uploading the project code into the hardware. Users able to know the whether the parking slot is available or not and they can successfully book the parking slot before go to the shopping mall, cinema and supermarkets etc. The prototype of the system having three parking slots is shown in figure 4.

Testing on Different Conditions:

The prototype has been tested in different cases and the cases are explained below

Case 1:

When parking slot 1 is reserved by turning on or pressing on the segmented switch in smart phone by using blynk app LED presented in the particular slot is in ON condition indicated by indicating the slot is reserved by someone.

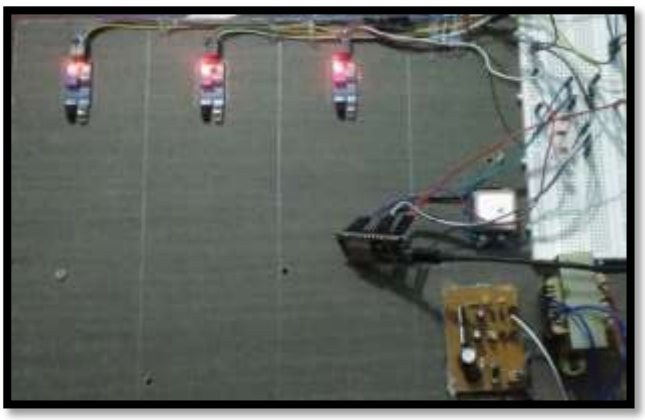

Fig 4: Three Parking Slots

Case 2: When parking slot 2 is Reserved by turning on or pressing on the segmented switch in smart phone by using blynk app LED presented in the particular slot is in ON condition indicated by indicating the slot is reserved by someone.

Case 3:

When parking slot 3 is Reserved by turning on or pressing on the segmented switch in smart phone by using blynk app LED presented in the particular slot is in ON condition indicated by indicating the slot is reserved by someone.

When observe in the blynk app there are three parking slots in the blynk application in smartphone. The

three parking slots can be observed in black coloured ring shapes, like here to check availability status of the parking slot in the particular shopping mall etc.,.it is as shown in figure 5.1.

Fig 5.1: Smart parking app showing availability status of the slots

Rings indicate that the three slots are available in that particular area. Infrared sensor are used for the sensing the vehicles. When any vehicle comes in to the slot the IR sensor Detects and sends the date to the Node MCU, then it sends the date to the blynk app through the blynk server. the particular slot disappear or vanish from the avaibility status in the map present in the smart parking app representing that the particular slot is occupied by someone.

In this again three cases are they are non-availability of slot 1, slot 2 and slot 3 as shown in below figures 5.2, 5.3 and 5.4 respectively. Also it sows in the serial monitor which slot already reserved.

Fig 5.2: Showing unavailability status for slot 1

Fig 5.3: Showing unavailability status for slot 2

Fig 5.4: showing unavailability status for slot 3

6. CONCLUSION

This proposed system is used to find out the free parking slots in the malls and pre-booking can be done using this system by suitable graphical user interface (GUI) .this can be implemented in real-time environment and the corresponding data can be computed and displayed in the web page or mobile application (Blynk app).this system can reduce man power and it I the effective solution for the real time problem. Thus, this device finds applications in many cases.

FUTURE SCOPE:

In future enhancement payment for parking time corresponding to particular car can be calculated and payment through online by connecting banking account to the mobile application. The solution for the parking time is by using camera. This captures the incoming cars in the mall; the captured images can be converted into the bar code. The barcode contains image of the car have the date and time of the car entered into the mall. While the car exists the mall parking, the barcode retrieves the image and calculates the amount spent for parking.

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