



Smart Application Based Parking System Using Internet of Things

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Abstract— Parking is a key issue in today's congested cities. With an ever-increasing population and a scarcity of parking spots, there are just too many vehicles on the road. We require parking management systems that are effective. We use Internet of Things (IOT) technology to demonstrate the deployment of a parking management system that allows for efficient parking space utilization. We use infrared sensors to demonstrate the notion. To detect the presence of a parking spot for internet access, a Wi-Fi modem is employed, and the system is controlled by a microcontroller. For verifying the status of parking spaces, we used an open application programme. With the use of infrared sensors, the system recognizes occupied parking spaces. With the open application software installed, the device updates data stored on the smart phone by reading the number of open and occupied parking spaces. This allows customers to conveniently search for available parking spaces online and find unrestricted parking. As a result, the technology aids in the resolution of the parking problem and provides users with an effective IOT-based parking management system.

Keywords— Blynk App, Internet of Things (IoT), Modem, IR sensor, Parking system.

I. INTRODUCTION

Presently, Parking slots need to be searched by moving around the Parking area. So, it creates unnecessary traffic and disturbance is created to the driver and future of the Metropolitan Cities will face lot of problems in space areas.

In this new proposed system, we inform the users about parking slots vacancy in advance. There will be IR sensor in each parking slot and when a user occupies a slot then the NodeMCU that is configured with IR sensors updates this information to the mobile application where we will be noticing that the slot has been occupied and the slots that are not occupied by vehicle will also be updated in this app. So, the user now can choose any unoccupied slot to park his car without any waste of time [1]. The mobile app we use here is blynk app which is an open application software.

II. REATED WORK

In the last few years, a few articles under consideration have effectively differed from the technologies that they

employed. The following lists the articles that have been submitted on this topic.

(i) Arduino-based IoT vehicle parking detection

The Arduino IDE can easily configure and programme the NodeMCU Development Board since it is so simple to use. Using the Arduino IDE software, programming the NodeMCU will take very few minutes. The things needed to achieve this objective are Arduino IDE software, universal serial bus which is also called as USB, a cable, and a NodeMCU device/module [2].

The IOT based Smart Parking system using a mobile application to reduce the traffic in smart cities is presented in this Paper. Hence, the Users can easily check which slot is available for them before going to Paring Place. The mobile application aims to provide information to the end User. An Arduino is combined with IR sensor at the place of Parking. This sensor detects whether the slot is occupied or empty for Parking. The work of Arduino is to keep track of how many cars are parked in the parking slot and present in the application.

(ii) Smart Parking Service Using Wireless Sensor Networks

This paper's proposed system is based on the Wireless Sensor Networks. This system allows the driver to check the parking slot available at the place of Parking. Thus, a wireless sensor network, embedded system, Arduino and the blynk application are part of this system. In this particular system each slot is equipped with a sensor with sends the data gathered to the specified mobile application. The status of parking is directly sent to the mobile application by NodeMCU that is connected to the sensors [4]. The NodeMCU can provide current data to a mobile application that allows each user to check the availability of each slot using WIFI.

(iii)RFID in Preventing Theft.

The goal of this paper is to find a solution to this problem. Typically, the user loses time and effort looking for a free parking place in a specific parking slot. The user receives a notification with the parking information. As a result, the user's time spent looking for a parking spot is reduced. To prevent car theft, RFID technology is being employed.

III. MATERIALS AND METHODS

The presented prototype concentrates on the available spaces in the parking slot. We use IR sensors in each parking space. Each parking slot gets one IR sensor. All sensors are connected to nodeMCU which is an IOT based module. Whenever there is vehicle parked in the slot the IR

sensor senses and sense the data to nodeMCU. NodeMCU connects to the blynk app which is installed in our smartphone and updates the data there. In our smart phone there will be LED's glowing for each parking slot. A led blinking indicates that there is an empty space in that slot. The proposed system block diagram is show in Fig. 1.

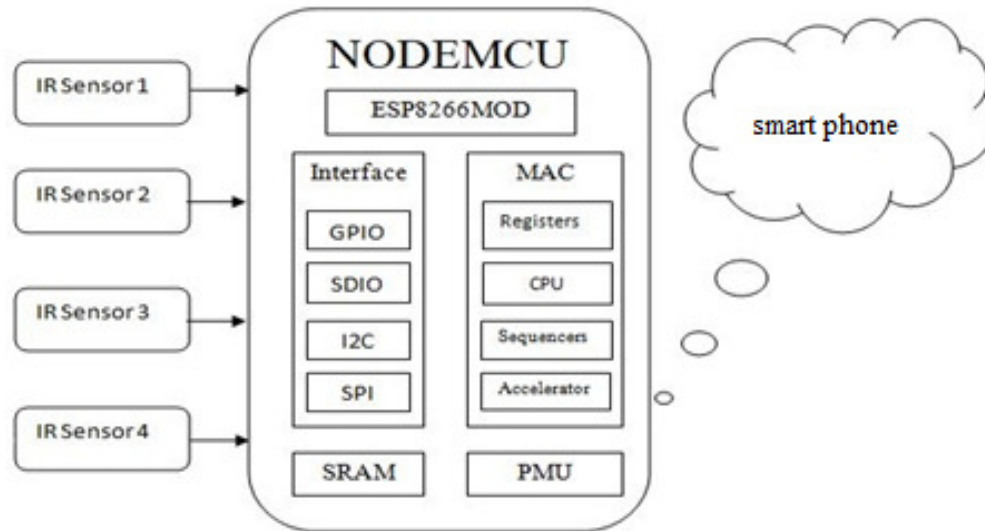


Fig. 1: Proposed system block diagram

Block Diagram Description

A.) IR Sensor module:

An infrared sensor is known as an “Light Emitting Electrical diode”. This also can detect the motion of an object and predict the temperature of the same. Radiation of heat is observed at each IR sensor. These radiations cannot be seen by a human-eye. With the help of IR sensor the radiations can be easily captured.

“A practical IR-sensor can used as emitter source, whereas Infrared Photo-diode can be used as an detector”. Infrared light emitting diode is has an equal sensitivity as compared to that of a photo-diode. The magnitude of the output voltage depends on the intensity of the light [6].

B.) NodeMCU module:

NodeMCU module is an Lua-based firmware which is an open source environment and it is especially built for the applications that require IOT. It includes software for ESP8266 Wi-Fi SoC Espressif Systems in addition to the ESP-12 module's hardware.

The ESP8266 features robust on-board processing and capability of storage, enabling it to be coupled with detectors and other unique or special applications components via its

GPIOs with minimum design and runtime loading. Because of its high level of on-chip integration, it requires very little external circuitry, and the complete solution, and on the front end module, is designed to take up as little PCB space as possible [7].

How to Programme NodeMCU with Arduino IDE

Programming NodeMCU is simple with the following steps

1. Firstly, NodeMCU must be connected to the computer.
2. Serial Port driver must be installed to upload the code into the ESP8266.
3. Download the Arduino IDE Software and ESP8266 BOARD.
4. With the help of ESP8266 support, we can use NodeMCU for Coding.

C.) Blynk application software

IOT is the major factor which leads in development of this application. This application can show the activity of sensor can access the hardware remotely and show the sensor results to the user.

Features: All supported hardware and devices have the same API and UI. Use the following to connect to the cloud:

- WiFi

- Bluetooth with BLE (Bluetooth Low Energy)
- Ethernet
- USB port (Serial)
- GSM
- Widgets that are simple to utilize
- No code writing, just direct pin manipulation
- Using virtual pins, it's simple to integrate and add new functionality.
- Data tracking in the past with the Super Chart widget.

The platform is made up of three primary components:

1. Blynk Application - This app enables users to develop a variety of IoT projects.
2. Blynk application is the interface between the user and the Hardware. Similarly blynk application is used to for developing a Cloud interface of own choice. Thus, Blynk can be considered as an "Open source that is available for everyone to design IOT applications.
3. Libraries in Blynk establish the communication with the server and process incoming as well as other commands for particular system.

Every time when button is clicked in app, the message is delivered to the hardware. Hence we observe "everything happens in a blink of an eye". [3] proposed a secure hash message authentication code. A secure hash message authentication code to avoid certificate revocation list checking is proposed for vehicular ad hoc networks (VANETs). [5] proposed a novel method for secure transportation of railway systems has been proposed in this project. In existing methods, most of the methods are manual resulting in a lot of human errors. This project proposes a system which can be controlled automatically without any outside help.

IV. MODEL IMPLEMENTATION

The model characterized as Hardware and Software. First, considering the hardware part assembled with the IR sensors, Wi-Fi module and microcontroller. For internet connectivity, we have used a Wi-Fi modem, and the system is controlled by a microcontroller then, the software comes into action. Here we are using Arduino IDE, in this software we create a programme for NodeMCU to connect with smartphone via application software using some related libraries in Arduino IDE, The microcontroller is accessing and processing sensor values so that data can be sent through the internet. Using the Wi-Fi system, the sensor data is displayed on the mobile application called blynk. We use an infrared sensor to determine if a slot is occupied or available, and then communicate the information to the microcontroller. The data is sent from the microcontroller to

the smart phone via application software. Users can use this to look for unoccupied parking spots online.

FLOWCHART:

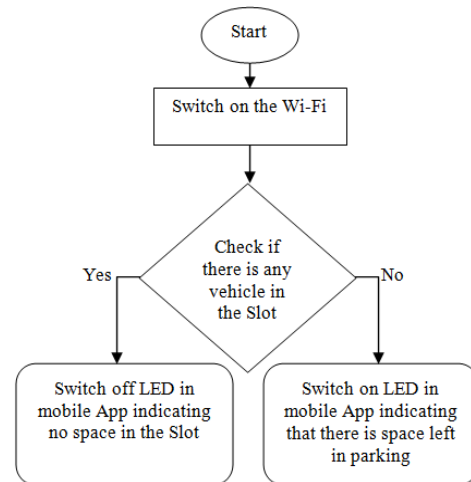


Fig. 2: Flow chart

The flow chart in Fig. 2 depicts the work flow of the established prototype. After the system is turned on, that is, Wi-Fi is turned on; the application software can be used to check the parking slots. When checking slots in the mobile app, if there is a vehicle in the slot, the LED is turned off, suggesting that there is no room in that slot, and the LED is turned on, showing that there is space remaining in the parking slot, indicating that the slot is empty.

V) RESULT AND DISCUSSION

The implementation and results of "Smart Parking system" is shown in Fig. 3 and Fig. 4. This system is used to check the vacancy of the slots present in parking area through sensors connected to nodeMCU and update the following in a given web application.

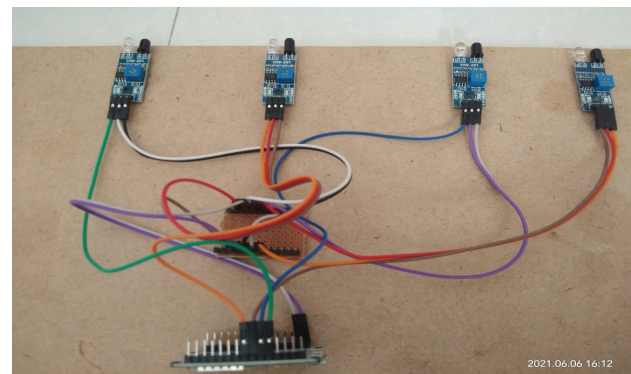


Fig. 3: Hardware setup for the proposed system

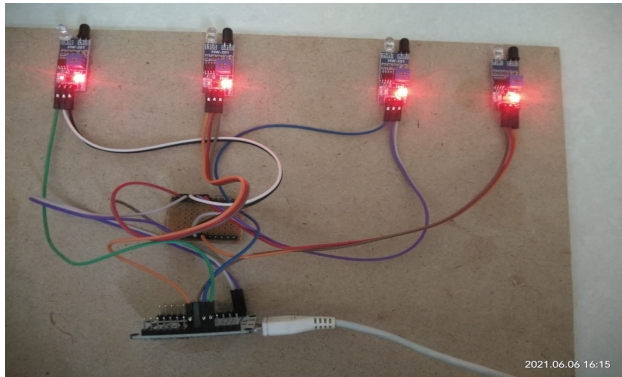


Fig. 4: Hardware part with no object in front

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sketch_may21a | Arduino 1.8.10
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#define BLYNK_PRINT Serial
#include <ESP8266WiFi.h>
#include <BlynkSimpleEsp8266.h>
WidgetLED led1(V1);
WidgetLED led2(V2);

char auth[] = "9nQBNwbJAALbxwWie_31VjamaesD6sgK";
int ledPin = 12; // connect D6 pin of nodeMCU
int inputPin = 13; //IR sensor connect D7 pin of nodeMCU
int ledPin1 = 14;
int inputPin1 = 15; //IR sensor connect D8 pin of nodeMCU
int val = 0;
int val1 = 0;

char ssid[] = "project"; // Your WiFi credentials.
char pass[] = "parking";

// the setup function runs once when you press reset or power the board
void setup() {
  // initialize digital pin LED_BUILTIN as an output.
  Serial.begin(9600); // Debug console
  Blynk.begin(auth, ssid, pass);
  pinMode(ledPin, OUTPUT);
  pinMode(inputPin, INPUT);
  pinMode(ledPin1, OUTPUT);
}

```

Fig. 5: Code setup for the android application

The above equipment arrangement used to sense the vacant space through sensor, whenever there is object in front of the sensor, we see two lights glowing whenever the object is only one light is ON.

5.1 Android application:

The android app represents the available and non-available parking slots in the respective area. The code setup for the android application is shown in Fig. 5 and the selection of LED and slots is shown in Fig. 6.

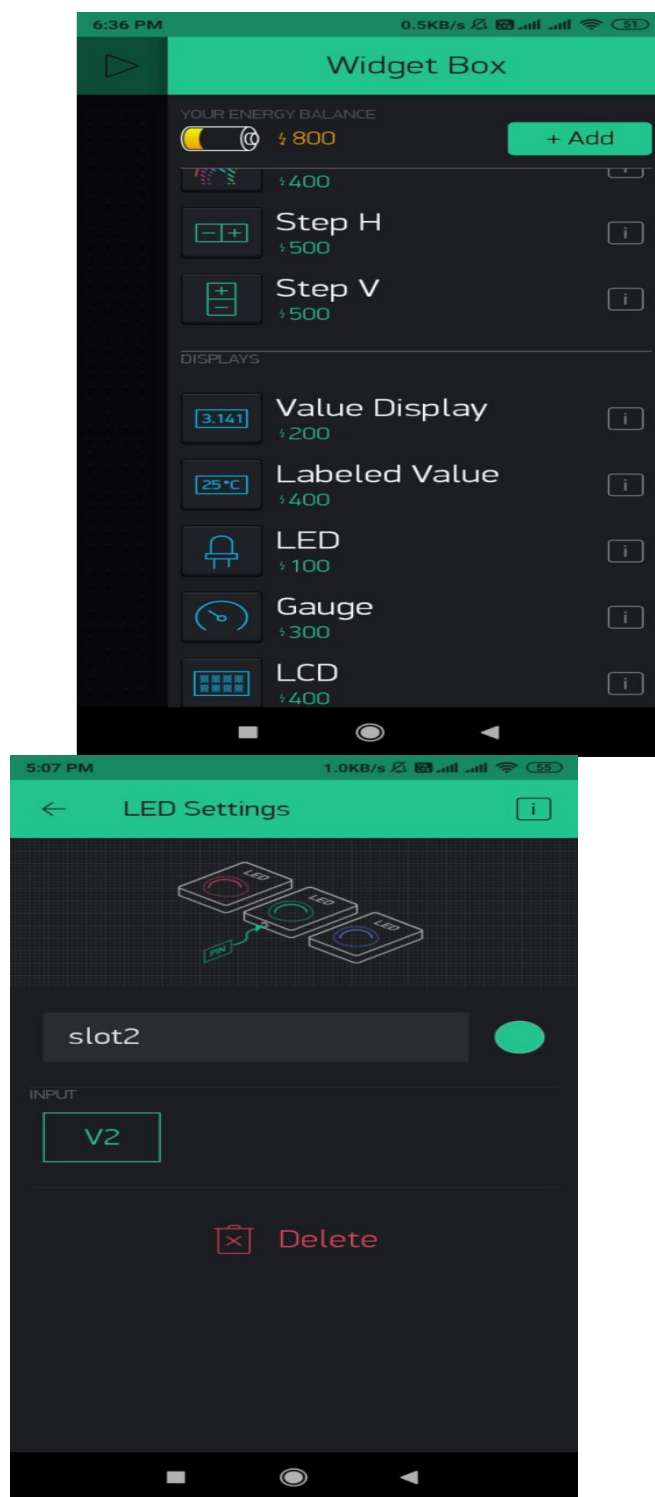


Fig. 6: Selection of LED and slots

5.2 Results in Android application:

The Fig.7 represents the Android app result when there is no object placed in front of any sensor. We can see

only one light at all of the sensors and all the circles in right the right side figure that says all the parking slots are vacant.

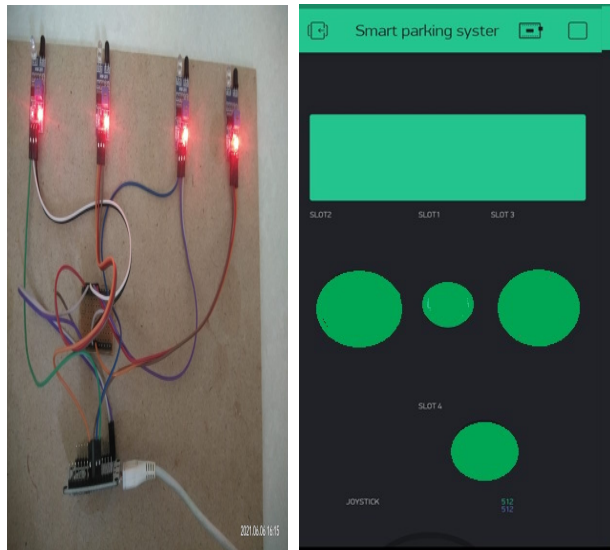


Fig. 7: The respective App Results w.r.t to Hardware device

From the Fig. 8, whenever two objects are placed in front of two sensors, it is seen that two LED lights are in off state. As seen there are no objects in front of other two sensors, hence LED lights doesn't disappear.

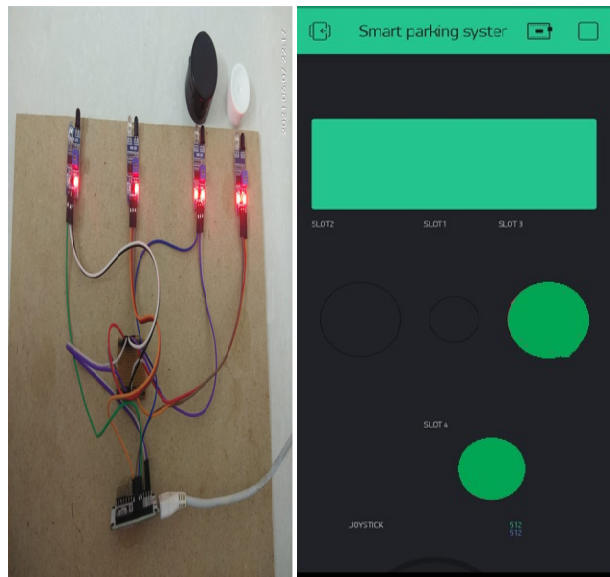


Fig. 8: The respective app representation when two objects are placed

In the Fig. 9, it is shown that when an object is present in front of single sensor, The LED light gets disappeared and there is no vacant space for any other object.

Easily one can check the vacant space available to them without any disturbance.

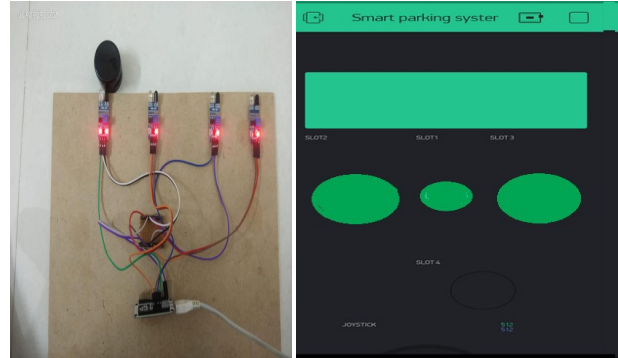


Fig. 9: An object placed in front of sensor, respective app result

V. CONCLUSSION

Smart city is the future of every city .We have seen several new advancements and technologies in last few decades .In the same way the development of IOT and embedded systems has huge effect on smart cities . Traffic management using is the major concern for developing the smart cities. In this study paper, we have discussed regarding the difficulties we face in the parking and provide a solution to that. The system that we have proposed gives real-time information on parking space availability in a certain parking area. So, the user can easily check whether which slot is available to him without any disturbance and tardiness at any time available. By this we can improve the parking facilities and reduce the disturbance caused to driver in searching a parking slot for him.

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