IoT Based Smart Parking System

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***Abstract*: Traffic congestion is the one of the major problems faced in day to day life. The rate of number of vehicle is increasing drastically, also the parking space is congested. In recent times the concepts of smart cities have gained great popularity. The evolution of Internet of things in the idea of smart city now seems to be achievable. Consistent efforts are being made in the field of IoT in order to maximize the productivity and reliability of urban infrastructure. Problems such as, traffic congestion, limited car parking facilities and road safety are being addressed by IoT. In this paper, we present an IoT based cloud integrated smart parking system. The proposed Smart Parking system consists of an on-site deployment of an IoT module that is used to monitor and signalize the state of availability of each single parking space. A mobile application is also provided that allows an end user to check the availability of parking space and book a parking slot accordingly. The parking slot availability is checked and monitored by ultrasonic sensors and the current availability is sent to the cloud data is monitored via android app. This app allows people to book slots and the payment it also done via online in the app. This approach saves a lot of time than the traditional parking system. It also describes a high-level view of the system architecture.**

INTRODUCTION

The concept of Internet of Things (IoT) started with things with identity communication devices. The devices could be tracked, controlled or monitored using remote computers connected through internet. IoT extends the use of internet providing the communication, and thus inter-network of the devices and physical objects, or 'Things'. The two prominent ways in IoT are"internet" and "things".Internet means a vast global network of connected servers, computers, tablets and mobile using the internationally used protocols and connecting systems. Internet enables sending, receiving, or communicating of informations. Thing in English has number of uses and meanings.Dictionary meaning of 'Things'is a term used to reference to a physical object, an action or idea, situation or activity, in case we donot wish to be precise.

IoT, in general consists of inter-network of devices and physical objects, number of objects can gather the data at remote locations and communicate to units managing, acquiring, organizing and analysing the data in the process and services.

EXISTING SYSTEM

The existing system uses ultrasonic sensors to monitor parking slot information. Each slot has one ultrasonic sensor that gives information whether that particular slot is occupied or vacant at given instant of time. The data is serially transmitted from Arduino to Raspberry Pi which acts as a client for Cloud MQTT. Parking slot availability information is updated real-time and continuous data is stored in the cloud instance. The user can access the real-time car parking scenario via an android application developed that subscribes the data from the cloud.

PROPOSED SYSTEM

Receives the data from HCSR-04 to
Send it to the ESP 32ESP connects to the internet with the inbuilt Wi-Fi and performs the required task and the information is sent to the cloudSlot availability displayed in the appUser can book the slot with the time required to park the vehiclePayments to be done online for pre-booking Man power is reduced. Receives the data from HCSR-04
Send it to the ESP 32
ESP connects to the internet with the inbuilt Wi-Fi and performs the required task and the information is sent to the cloud
Slot availability displayed in the app
User can book the slot with the time required to park the vehicle
Payments to be done online for pre-booking
Man power is reduced

FEATURES

Cloud Service pulled the computing resources to provide services to multiple customers with the help of a multi-tenant model. There are different physical and virtual resources assigned and reassigned which depends on the demand of the customer. The customer generally has no control or information over the location of the provided resources but is able to specify location at a higher level of abstraction

It is one of the important and valuable features of Cloud Computing as the user can continuously monitor the server uptime, capabilities, and allotted network storage. With this feature, the user can also monitor the computing capabilities.

BENEFITS OF CLOUD APPS

Cloud computing offers your business many benefits. It allows you to set up what is essentially a virtual office to give you the flexibility of connecting to your business anywhere, any time. With the growing number of web-enabled devices used in today's business environment (e.g. smartphones, tablets), access to your data is even easier.

Moving to cloud computing may reduce the cost of managing and maintaining your IT systems. Rather than purchasing expensive systems and equipment for your business, you can reduce your costs by using the resources of your cloud computing service provider. You may be able to reduce your operating costs because:

WI-FI WORKING

WiFi works off of the same principal as other wireless devices - it uses radio frequencies to send signals between devices. The radio frequencies are completely different say from walky talkies, car radios, cell phones, and weather radios. For example your car stereo receives frequencies in Kilohertz and Megahertz range (AM and FM stations), and WiFi transmits and receives data in the Gigahertz range.

To break it down even further, Hertz (Hz) is simply a unit of frequency. Let's say you're standing on a pier watching waves come in. As you look down at the waves you can see the crest of each wave roll on by. If you counted how many seconds between each wave crest this would be the frequency of the waves. So if the time between each crest was 1 second that would meant the wave frequency was 1 hertz or one cycle per second.

Comparing sea waves to Mhz and Ghz, these waves are moving at 1 million and 1 billion cycles per second in the air! And to receive the information found in these waves, your radio receiver needs to be set to receive waves of a certain frequency.

ULTROSONIC SENSOR

The sensor used for detecting the distance to an object using sonar.

The HC-SR04 uses non-contact ultrasound sonar to measure the distance to an object, and consists of two ultrasonic transmitters (basically speakers), a receiver, and a control circuit.

The transmitters emit a high frequency ultrasonic sound, which bounce off any nearby solid objects, and the receiver listens for any return echo. That echo is then processed by the control circuit to calculate the time difference between the signal being transmitted and received.

This time can subsequently be used, along with some clever math, to calculate the distance between the sensor and the reflecting object

The HC-SR04 is great, as it's low cost, can be powered via the Raspberry Pi's 5V output, and is relatively accurate. The HC-SR04 has a 5V output (which needs to be reduced to 3.3V to work with the Raspberry Pi).

NODE MCU ESP 32-S

The Node MCU ESP-32S is one of the development board created by Node MCU to evaluate the ESP-WROOM-32 module. It is based on the ESP32 microcontroller that boasts Wifi , Bluetooth, Ethernet and Low Power support all in a single chip.

Node MCU is famous for the ESP8266E module with LUA programming language. It is the more powerful Node MCU with ESP32 on it.

ESP32 is the big brother of ESP8266. It comes with dual core 32-bit processor, built-in WiFi and Bluetooth, more RAM and Flash memory, more GPIO, more ADC, and many other peripherals :)

Node MCU ESP32 is ESP-WROOM-32 module in breadboard friendly form factor, you can develop your project in using this compact microcontroller on breadboard.

WORKING

When sufficient voltage is applied to the electrodes the liquid crystal molecules would be aligned in a specific direction. The light rays passing through the LCD would be rotated by the polarizer, which would result in activating/highlighting the desired characters. The power supply should be of +5v, with maximum allowable transients of 10mv. To achieve a better/suitable contrast for the display the voltage at pin 3 should be adjusted properly.

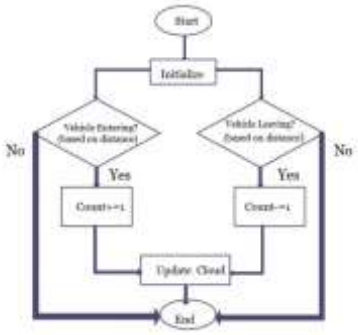
The ground terminal of the power supply must be isolated properly so that voltage is induced in it. The module should be isolated properly so that stray voltages are not induced, which could cause a flicking display.

LCD is lightweight with only a few, millimeters thickness since the LCD consumes less power, they are compatible with low power electronic circuits, and can be powered for long durations. LCD does not generate light and so light is needed to read the display. By using backlighting, reading is possible in the dark. LCDs have long life and a wide operating 28 temperature range. Before LCD is used for displaying proper initialization should be done. LCDs with a small number of segments, such as those used in digital watches and pocket calculators, have individual electrical contacts for each segment. An external dedicated circuit supplies an electric charge to control each segment.
This display structure is unwieldy for more than a few display elements. Small monochrome displays such as those found in personal organizers, or older laptop screens. The pixels are addressed one at a time by row and column addresses. This type of display is called passive-matrix addressed because the pixel must retain its state between refreshes without the benefit of a steady electrical charge. As the number of pixels increases, this type of display becomes less feasible.

Very slow response times and poor contrast are typical of passive matrix addressed LCDs. High-resolution color displays such as modern LCD computer monitors and televisions use an active matrix structure. A matrix of thin-film transistors (TFTs) is added to the polarizing and color filters. Each pixel has its own dedicated transistor, allowing each column line to access one pixel. When a row line is activated, all of the column lines are connected to a row of pixels and the correct voltage is driven onto all of the column lines.

The row line is then deactivated and the next row line is activated. All of the row lines are activated in sequence during a refresh operation. Active-matrix addressed displays look "brighter" and "sharper" than passive-matrix addressed displays of the same size, and generally have quicker response times, producing much better images. A general purpose alphanumeric LCD, with two lines of 16 characters. So the type of LCD used in this project is16 characters * 2 lines with 5*7 dots with cursor, built in controller, +5v power supply, 1/16 duty cycle.

METHOD DIAGRAM



CONGESTION DUE TO IMPROPER PARKING

FEATURES

ESP32 is power packed with hardware features. The high speed dual core processors along with the numerous built in peripherals it is set to replace micro-controllers in connected products. The WiFi, Bluetooth Classic and BLE make it great choice to build anything connected. Even if a project does not require a particular feature initially, it could be utilized as required. The built-in hardware accelerator enables secure code storage and securely connecting to the Internet with TLS (SSL). Apart from this the "out of the box" peripheral like the Infrared Remote Controller will be used in numerous hacks! 22

The software/firmware will be key to success of ESP32. It uses free RTOS to handle multitasking. The number of peripherals, wireless connectivity, dual core processors and the overall architecture needs to be understood

CONCLUSION

In this paper, we present a method to smartly enable the parking system or the trend in a more effective way by using an app to book and search for parking slots before reaching the destination. In this way it is a hassle free method to manage time and parking troubles in the last minute. So an easy and an effective way to make parking better is been implemented.

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