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Implementation of Smart Vehicle Parking System

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ABSTRACT

In today's era one of the most common problems which the world is facing is an exponential increase in population. This has indirectly increased a lot of other issues; one of them being the quantity of vehicles on the road. The increased number of vehicles results in shortage of parking areas. This project aims to present an intelligent parking system for vehicles that identifies the parking slot automatically through sensors and displays it without making the drivers to circle around the parking area. The availability of parking slots will be displayed to the drivers at the entrance. It also captures the number plate of vehicles by using camera and recognises the number using image processing and stores it in the server at the entrance and also at the exit of parking area for ease of payment purposes. All the information's will be simultaneously updated in the IoT server and can be used for future use. It is found that the system decreases the manual work and provides high efficiency and high accuracy.

Keywords: Intelligent Parking, Raspberry pi, Image processing.

1. INTRODUCTION

In past days individuals use the general public mode of transportation as Bus and Train for moving from one place to a different. But because of globalization the individuals move from geographical area to urban areas for employment and different wants the Individual transportation are improved plenty ease. Owing to these increase in vehicle the parking become very complicated and the people can park their on the either sides of the roads results in heavy traffic. At present there's no systematic approach. The manual management may be enforced in many areas. The parking problem in big cities, especially the mega-cities, has become one of the key causes of the town holdup, driver frustration and air pollution. The need for parking and parking facilities is constantly on the rise. On average, 30 percent of traffic is caused by drivers wandering around parking spaces. This paper shows a intelligent and user friendly automated parking system.

We have implemented some techniques to ensure the effortlessness of traffic at car parking zones. These process can be done by image processing with the help of IoT. The concept of Internet of Things (IoT) started with things with identity communication devices. The image may be captured and that they may be allowed to Image segmentation and edge detection through boundaries with some methodology. All the slot information is updated to server.

2. EXISTING SYSTEM

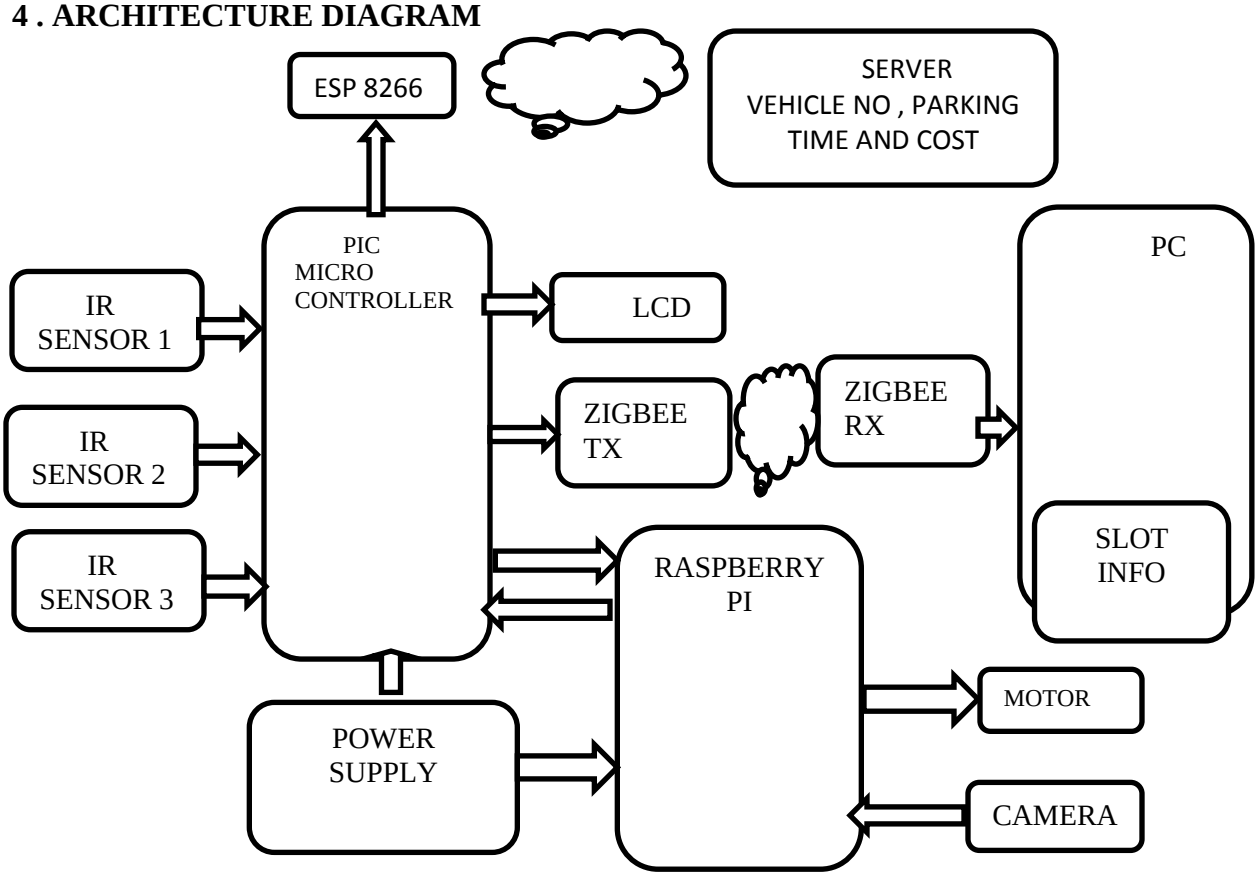
In parking area, the customer enters into parking area to park their vehicles. The existing

system to park the vehicles is not well organized. Everything in the existing system is manually managed. As when the drivers enter the parking area they have to search around for vacant spaces to park their vehicles. The concerned work cheers for the availability of slots for the vehicle. This process involves multiple chains of asking co-workers at different slots. If there is no slot available to park they have to go back and search for slot in some other parking area. This majorly causes difficulty and frustration to the drivers which leads to congestion in parking area and due to this emission from vehicles is majorly increased. The data and records are being manually organized. Thus to overcome from the above stated problems and also to reduce the man power we introduce a proposed system.

3. PROPOSED SYSTEM

The proposed work is about creating a reliable parking system that takes over the task of identifying free slots in parking area and keeping the records of vehicles parked very accurately. The number of availability of vacant slots is displayed in the entrance of the parking area. This is a free, automatic article rewriter that will once when the parking area is entirely filled the entrance of the parking area is automatically closed and it will not open until at least one vehicle is exited. When the vehicle enters the parking area the camera captures the image of the license plate and the image is processed to extract the vehicle number using the image processing algorithm. The extracted information is sequentially passed to the server automatically and stored. From that moment the timer gets started. Each vehicle is allocated to a particular slot available automatically through data from the infrared sensors and transmitted to zigbee and displayed to the drivers. The same process is performed again on exit. In this time the processor automatically calculates the parking amount depends upon how many hours they spend their time in parking slot with respect to the entry and exit time. The amount is also updated in the server. The slot and its cost detail are updated to the thingspeak server. These data is updated to server and used for future purposes.

4 . ARCHITECTURE DIAGRAM



The proposed methodologies architecture diagram is shown above as this system is integrated with sensors on each slot which sends data as 0 or 1 to the pic microcontroller. When the vehicle enters the parking area the camera captures the license plate and sends the information to raspberry pi. This recognises the number plate by using image processing algorithm and sends information to the pic microcontroller. Then the LCD displays slot for each vehicle in which the vehicle to be parked. When the vehicle number is recognised it also sends information to zigbee transmitter and zigbee receiver will show up number of available vacant slots. All the information is then sequentially updated to the server with help of ESP 8266.

5. COMPONENTS USED

5.1 HARDWARE COMPONENTS

The required hardware components are Pic Microcontroller, Infrared sensor, Zigbee, Raspberry Pi, Camera, LCD, ESP 8266.

PIC MICROCONTROLLER

PIC (usually pronounced as *"pick"*) is a family of microcontrollers made by Microchip Technology, derived from the PIC1650 originally developed by General Instrument's Microelectronics Division. The name PIC initially referred to Peripheral Interface Controller, then it was corrected as Programmable Intelligent Computer.

IR SENSORS

An infrared sensor is an electronic instrument that is used to sense certain characteristics of its surroundings. It does this by either emitting or detecting infrared radiation. Infrared sensors are also capable of measuring the heat being emitted by an object and detecting motion**.** Infrared technology is found not just in industry, but also in every-day life. Televisions, for example, use an infrared detector to interpret the signals sent from a remote control. Passive Infrared sensors are used for motion detection systems. The key benefits of infrared sensors include their low power requirements, their simple circuitry and their portable features.

ZIGBEE

The technology defined by the Zigbee specification is intended to be simpler and less expensive than other wireless personal area networks(WPANs), such as Bluetooth or more general wireless networking such as Wi-Fi. Zigbee devices can transmit data over long distances by passing data through a mesh network of intermediate devices to reach more distant ones. Zigbee is typically used in low data rate applications that require long battery life and secure networking.

RASPBERRY PI

The Raspberry Pi is open hardware, with the exception of the primary chip on the Raspberry Pi, the Broadcomm Soc(System on a Chip), which runs many of the main components of the board-CPU, graphics, memory, the USB controller, etc. many of the projects made with a Raspberry Pi are open and well documented as well and are the things you can build and modify yourself.

CAMERA

The word camera comes from camera obscure, which means “dark chamber” and is the Latin name of the original device for projecting an image of external reality onto a flat surface. The modern photographic camera evolved from the camera obscure. The functioning of the camera is very similar to the functioning of the human eye. A camera is an optical instrument to capture still images or to record moving images, which are stored in a physical medium such as in a digital system or on photographic film.

Liquid Crystal Display Screen

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. Liquid crystals do not emit light directly, instead using a backlight or reflector to produce images in color or monochrome. LCDs are available to display arbitrary images (as in a general-purpose computer display) or fixed images with low information content, which can be displayed or hidden, such as preset words, digits, and seven-segment displays, as in a digital clock.

5.2 SOFTWARE COMPONENT

The required software components are Pic C Compiler, Thingspeak, Putty,VNC Viewer.

PIC C COMPILER

PIC C compiler is fully optimised for use with PIC microcontrollers. Build in functions make coding the software very easy. The integrated C development gives developers a fast method to produce efficient code from an easily maintainable high level language. This integrated C development environment gives developers the capability to quickly produce very efficient code from an easily maintainable high level language.

THINGSPEAK

Thing Speak is an open-source Internet of Things (IoT) application and API to store and retrieve data from things using the HTTP protocol over the Internet or via a Local Area Network. Thing Speak enables the creation of sensor logging applications, location tracking applications, and a social network of things with status updates. Thing Speak was originally launched by iot ridge in 2010 as a service in support of IoT applications.

PUTTY

PUTTY is a free and open-source terminal emulator ,serial console and network file transfer application. It supports several network protocols, including SCP, SSH, Telnet, rlogin and raw socket connection. It can also connect to a serial port. The name has no official meaning. PuTTY was originally written for Microsoft Windows, but it has been ported to various other operating systems. Official ports are available for some Unix-like platforms, with work-in-progress ports to Classic Mac OS and macOS, and unofficial pots has been contributed to platforms such as Symbian ,Windows Mobile and Windows Phone.

VNC VIEWER

Virtual network computing (VNC) is a type of remote-control software that makes it possible to control another computer over a network connection. Keystrokes and mouse clicks are transmitted from one computer to another, allowing technical support staff to manage a desktop, server, or other networked device without being in the same physical location.

6. IMPLEMENTATION AND RESULTS

6.1 PROGRAMMING THE PIC MICROCONTROLLER

The following steps should be followed to embed the code into the PIC microcontroller,

STEP 1: Download and install the PIC C Compiler
STEP 2: Open the software and select File->New->Source File
STEP 3: Write the code, compile it and run.
STEP 4: Then dump the code into pic microcontroller using pic kit loader.

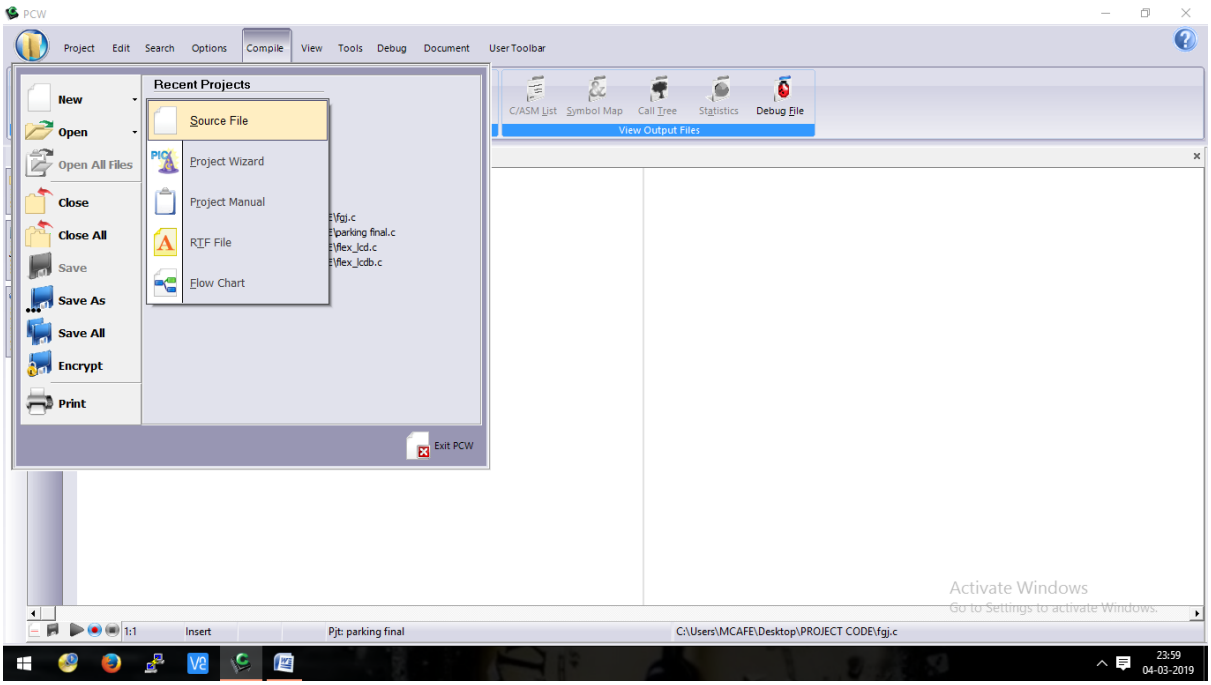


Fig 1. Opening new source file

6.2 PROGRAMMING THE RASPBERRY PI

The following steps should be followed to program the raspberry pi

STEP 1: Establish the cloud connection, signup for an Real VNC account

STEP 2: Download VNC viewer and use same credentials to signup.

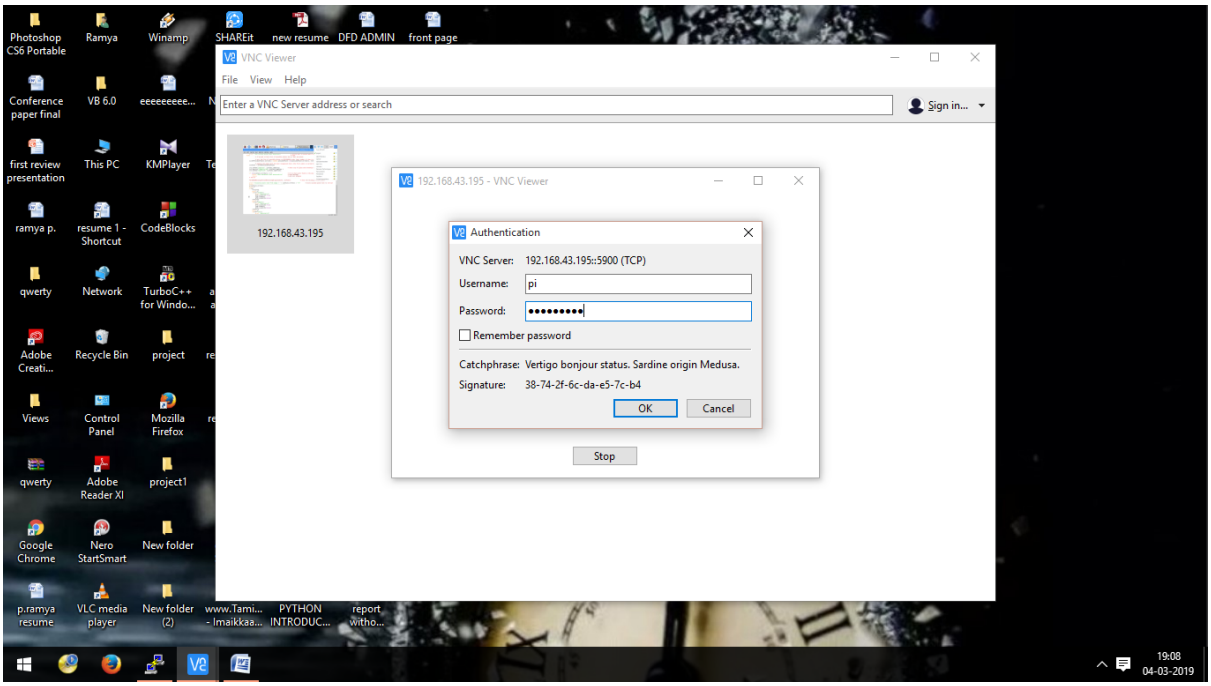


Fig 2. Authentication of VNC viewer

STEP 3: On the raspberry pi , run vnc server and make note of the IP address and then enter into the host.

STEP 4: Enable the features that we need.

STEP 5: Then the raspberry pi is coded in the VNC viewer using python.

6.3 OPENING PUTTY

STEP 1: Download and install the putty software
STEP 2: Open the putty software and specify the serial line as connection type
STEP 3: Then it enters into putty and it is just like a hyper terminal
STEP 4: The data from the zigbee receiver is displayed here when it is connected with the system.

6.4 IMAGE PROCESSING ANALYSIS

As the number of vacant spaces will be displayed in software as the sensor sends the data and vacant spaces will get reduced when it captures the number plate. When the vehicle enters the parking area the number plate of the vehicle is captured and recognised with the help of camera and raspberry pi respectively. When the number plate is recognised it is automatically allocated to the vacant slot available. The recognition of the number plate produces the image thresh in which it is segmented. After this in the VNC Viewer it displays the command in the python shell as license plate is detected

```
license plate read from image = H14EU3498

----------------------------------------
H14EU3498
U349
detected V1
EU349
U34
>>>
```

Fig 3. Detection of license plate

6.5 RESULTS IN PUTTY

As when the license plate is detected it sends data to the putty software and displays the detected number plate and also shows the slot number in which the driver has to park their own vehicle from that time the timer gets started for payment purposes.

When the vehicle is parked in the allocated slot and when it exited from the parking area the same image processing is made. After this the timer gets stopped and displays the amount to be paid. These timing and the payment details are updated to the server.

Fig 4. Slot allocation detail

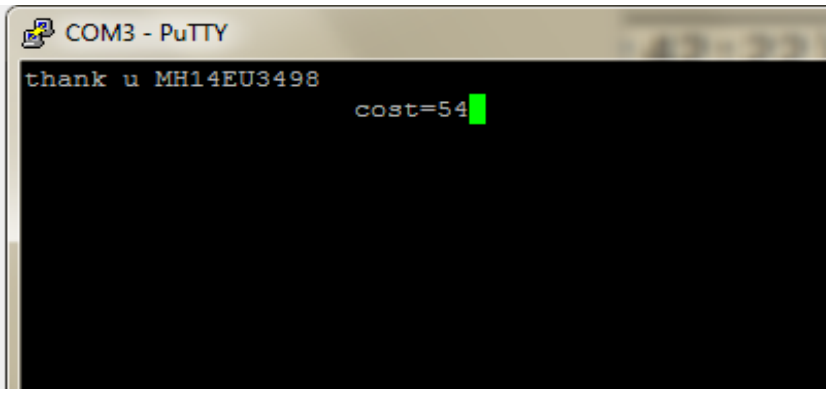


Fig 5.Displays payment detail

6.6 UPDATION IN THE SERVER

When the information is sent from the sensors and the raspberry pi to the pic microcontroller and the same data is updated to the IoT server. We can login to it to find the slot information such as number of entries and its corresponding cost that to be paid.

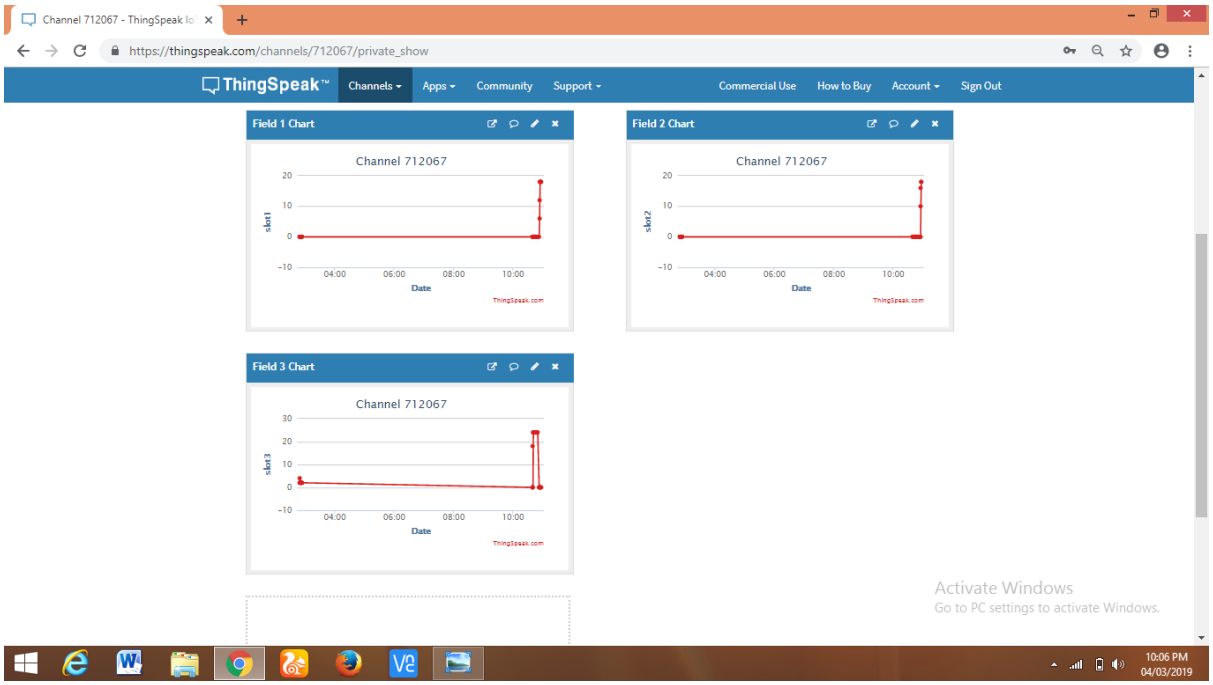


Fig 6. Field chart in the server

In this field chart the slot information is displayed based on the entry and the exit of the vehicle. The x-axis shows the time and the y-axis shows the cost. We can have the data which is stored in the server for future purposes.

The field data feed can be extracted into various formats like csv and xml format. Each field can also be extracted individually.

7. CONCLUSION

The model for the smart vehicle parking system has been developed. This model majorly reduces the human effort to a greater extent which was a drawback in existing system where the driver enters the parking area and circles to find the vacant parking slot and they also get frustrated and everything is manually organised. But in this system when particular vehicle is entered into parking area knowing that there exist vacant slots for parking their own vehicle. Then the vehicle number is captured and recognised using image processing and each vehicle is

automatically allocated to particular slot which is displayed in LCD screen. When the vehicle is exited it does the same process and shows the amount to be paid automatically to the driver. Slot information is updated to the IoT server. This system makes the user more comfortable to park their vehicles in parking area without wasting their time.

8. FUTURE WORKS

Our system has been implemented in particular parking area in certain places. In future it can be implemented in every parking area to lessen the human effort. This system can be interconnected with all the parking area and these availability of vacant slot from various parking area can be updated and user can see that through their mobile through some application and they may can use map to know the directions to the destination. These can also allow the drivers to reserve parking slot by knowing the vacant slot in various parking area. They can also use online payment services in all parking area where such implementation is not made in this system. By these implementations everything can be automatized and drivers can know about information of all parking area.

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Conflict of Interest

None of the authors have any conflicts of interest to declare.