Real Time Parking Guidance System

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ABSTRACT: The objective of this project is to design a real time parking guidance system based on Raspberry pi ARM 8 which also enables use of Internet of things for additional features. Basic goal of the system is to detect incoming vehicles in parking space and to upload the information of the same on webserver. The system provides real time information of vacant parking spaces so that the efforts of drivers for finding empty parking slots will be reduced at high rate. A raspberry pi board is the main part of the system which controls on overall performance of system. Infrared sensor is used to detect the vehicles and the information is send to raspberry pi controller and then it is uploaded to a local webserver. The system also contains two more security measures which are fire alarm and safety/emergency switch. So basically it is advanced and real time system with security measures which not only is a parking guidance system but also acts as a basic security system for parking spaces.

KEYWORDS: Raspberry pi, IR sensor, Fire sensor, Buzzer, Emergency switch, Ethernet

I.   INTRODUCTION

Now-a-days increase in civilization has increased number of vehicles. But because of limited places for parking, problem of parking a vehicle is occur. Also while searching for empty parking places drivers get frustrated and waste of time, waste of fuel occurs. Because of waste of fuel, CO2 is emitted and hence increases pollution in environment. To avoid this problem an intelligent system which gives real time information about empty parking slots is required. Use of parking area will also get optimized because of using this system.. Presently available parking systems are not having facility of IoT (Internet of things) and other advanced additional security applications. So an attempt is made to design a real time parking guidance system using raspberry pi microcontroller. This system can be very useful in parking areas such as institutes, offices, malls etc.

Main working principle of the system is to detect vehicles which are coming from outside in parking area and send the information of vacant and taken parking slots to microcontroller. Then this information will upload on the local host server. Every user will be provided a user ID and password to access the website. By using this logic, staff at the certain parking premises can handle and manage the problem of parking. This information can be visible to drivers by using a display board or as a future work one can design an app for this parking system.The system also contains two more security applications, fire alarm and emergency switch. Fire alarm is used to sense the change in temperature and after certain point if temperature is increased then it will detect fire and then buzzer will turn ON and alert message will display on server screen. For emergency switch, if someone in parking area is in trouble especially any women then they can press the switch and buzzer will turn ON and 'Emergency detected' will display on the server so that related staff will get to know about it and they will take care of the situation. Also IoT (Internet of things) feature is added to this system. In which LDR module is connected to raspberry pi and when it is getting dark, it will send signal and lights in the parking premises will be turned ON automatically. In future work one can also make use of the IoT to achieve desired outputs. So it is an advanced parking guidance system with these security applications and IoT. Approximate cost of this system is 8000 Rs.-10000 Rs.

II.   BACKGROUND

Because of increased civilization many other sources are important for human beings to live. This leads to limited and congested space for parking slots in most of the cities. Congested parking slots cause problem of parking a vehicle and frustration of drivers. Drivers may leave the parking area without knowing if parking slots are available or not. For this purpose drivers should know about the available places for parking. Many concepts are invented for this. Presently available systems such as inductive loop based system; RFID card based systems etc. are so complex to use it in institutes, colleges or in regular parking areas. Also they don't have additional security applications like this system. The

counter detector types of systems also count people going in the parking area and thus introduce error in detecting vehicles. But in this system there is no such disadvantage of error. Also the use of raspberry pi board provides advantage of IOT (Internet of things). Using this we have designed prototype of parking guidance system with fire alarm and safety switch.

III. PROPOSED WORK.

A.Block diagram of the system

Fig. 1 shows block diagram of the system. System uses ARM 8 Raspberry pi controller as a main controller which gives 1.2 GHz speed and operates on +5V with current of 700 mA. Infrared sensor which is also known as IR sensor is used for sensing of vehicles. Multiple numbers of IR sensors are required for this purpose. IR sensor senses the incoming vehicle as an obstacle and it will send signal to raspberry pi and it will then upload information on website through webserver. User will be given a user ID and password to log in. Then it will enable them to the access of the parking information.
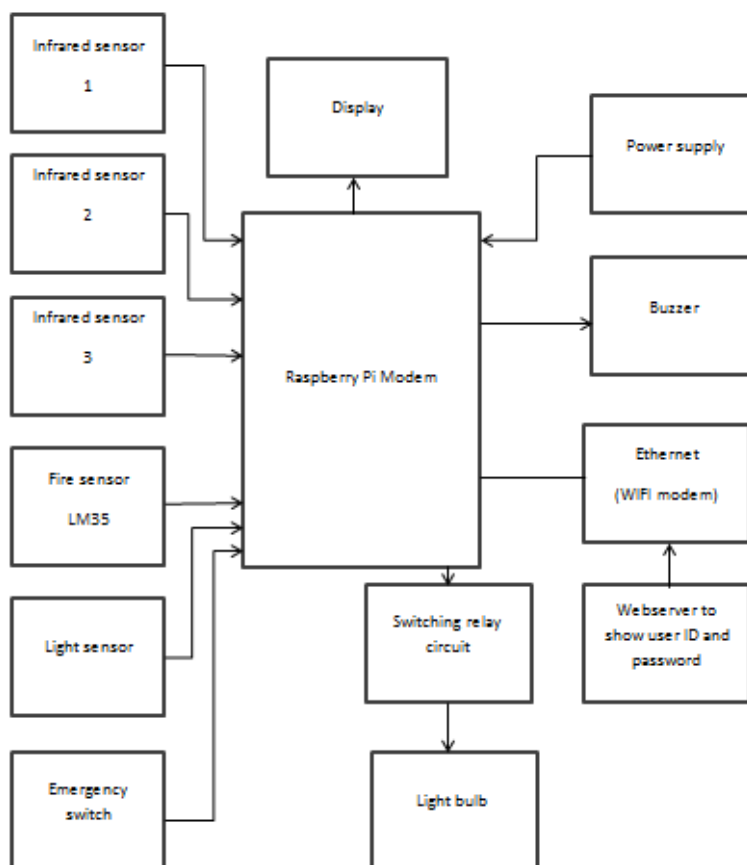

Fig no. 1 Block diagram of system

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Now another option is there for the drivers with no user ID and password. Information also can be displayed on a display board at the entrance of parking area. Additional security purpose of the system is Fire sensor and emergency switch. Fire sensor LM 35 will detect the change in temperature. After increase in temperature above threshold level, it will detect if fire is occur or not. If fire is detected then it will send signal to microcontroller and then alert message will appear on server screen. Also the buzzer will be ON. Emergency switch is the switch for safety of people in parking

area. If any woman or any person in area senses an unusual activity then after pressing the switch it will send signal to microcontroller and buzzer will turn ON. Alert message for help also will be displayed on server.

B. Raspberry Pi ARM 8

The proposed system uses ARM 8 Raspberry pi as a main controller. It operates on +5V input supply and 700mA current. It offers 1.2 GHz speed for the operation. Raspberry pi is basically a tiny credit card size computer with high accuracy and simple to use. It can be connected to our computer or laptop or TV to use for different applications such as web browsing, gaming, programming, and MS office applications etc.
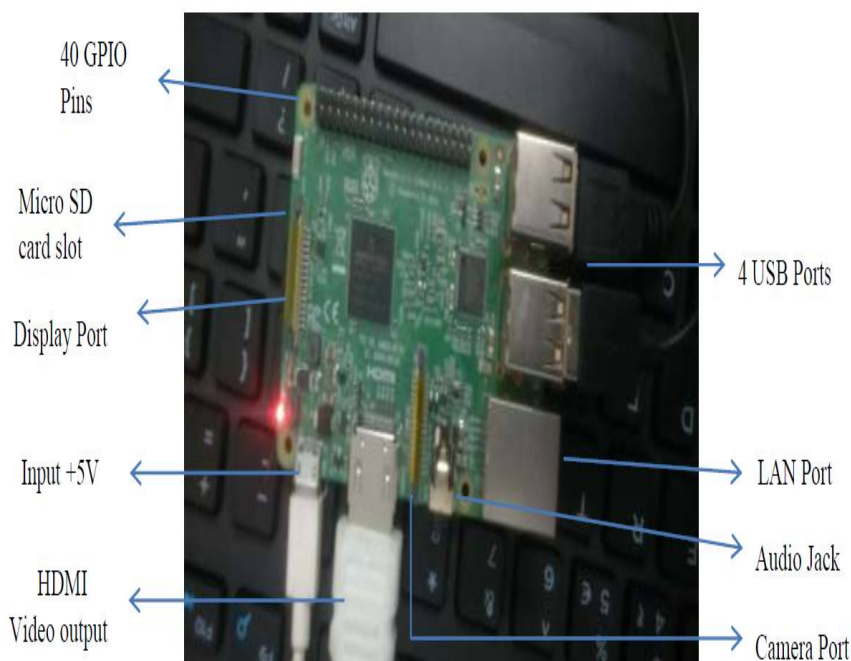

Fig. no.2 Interfacing of Raspberry pi

Fig. 2 shows interfacing of raspberry pi microcontroller. It shows the connections require to access use of raspberry pi as a computer server. Interfacing details for raspberry pi is as:

40 GPIO pins- These are general purpose input output pins of raspberry pi. Using these pins we can connect any external hardware circuit to raspberry pi e.g relay circuit, sensor modules, buzzers etc. In this system we are connecting IR sensor module, emergency switch module, buzzer and relay circuit to these pins.

Micro SD card- Micro SD card is external memory card slot for operation of raspberry pi. It requires 8 GB memory card with operating system installed in it. We are using Raspbean OS in this project.

Display port- The port is used to connect a display module in order to display the output.

Input +5V- Input required to operate this controller is +5V so supply of +5V is connected to this slot.

HDMI video output- This slot is used to display output of the system in video format. HDMI cable of computer is connected here to achieve video output.

USB port- Universal serial bus port of raspberry pi enables connection of peripherals such as USB cable, pen drive, mouse, keyboards, webcam etc.

LAN port- Local area network port is used to share internet between two or more computer devices in a particular limited area. We can connect LAN cable to use internet connection on raspberry pi.

Audio jack- Using audio jack we can get output in audio format by using audio earphones or headphones. We can play music on earphone by connecting it to audio jack.

Camera port- By connecting camera to this port we can share image data from camera to the raspberry pi computer.
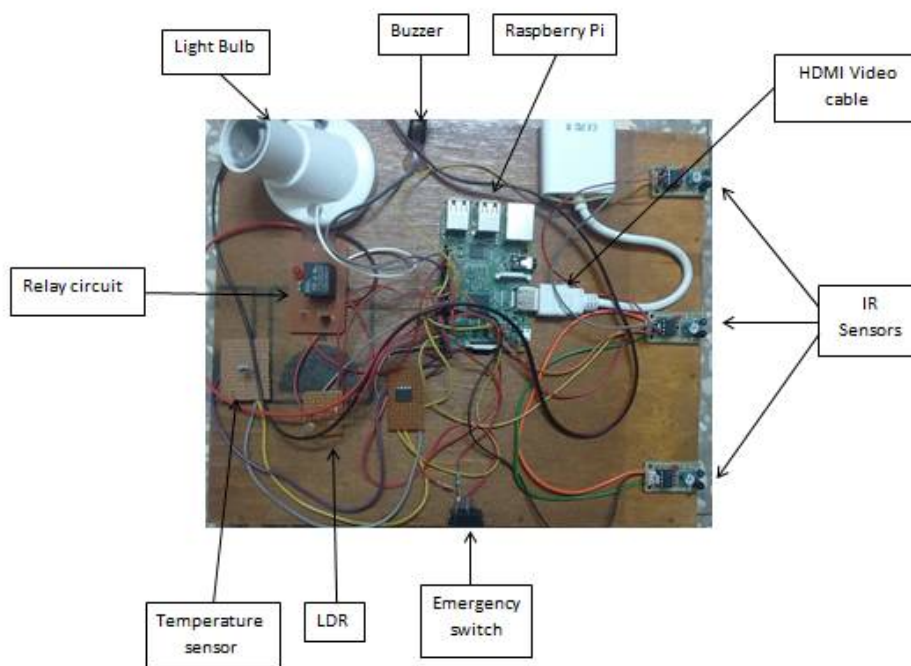
IV. MODEL

Fig no. 3 Experimental model

Fig 3 shows experimental model of the whole system. There are different sections shown. As discussed before raspberry pi is the most important factor of the system. After that IR sensor is also one of the necessary factors of the system. . It contains IR trans receiver, voltage comparator IC LM 358 and a variable resistor of 3K. The basic concept of IR (infrared) obstacle detection is to transmit the IR signal radiation in a direction and a signal is received t the IR receiver when the IR radiation bounces back from a surface of the object. Then the reflected signal is received by an IR receiver. This information of detected vehicles in a particular area in parking lot is then sent to microcontroller raspberry pi. It then uploads the information to the website created. Variable resistor is used to adjust the intensity of sensor. The more the intensity is the more area of obstacle will be sensed by IR sensor. Voltage comparator IC LM 358 is used to compare the reference voltage.

V. ADDITIONAL SECURITY MEASURES

Fire detection alarm is one of the additional security measures in this project. For that temperature sensing logic is used. For the temperature sensing purpose IC LM35 is used. Threshold temperature is set at 70 after that if temperature goes up then fire will be detected and fire buzzer will get start and message will be generated.

Emergency switch is another security application which is used in this system. For emergency switch, if someone in parking area is in trouble especially any women then they can press the switch and buzzer will turn ON and 'Emergency detected' will display on the server so that related staff will get to know about it and they will take care of the situation.

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Website: www.ijircce.com

Vol. 5, Issue 6, June 2017

Another feature of IoT also added is auto on off parking lights for reducing power consumption and efficient use of electricity. LDR is used to detect the light intensity of parking lot which sends signal to raspberry for control operation of light switches. Raspberry connected to switch control then operates the lights through relay or driver circuits.

VI. PERFORMANCE TESTING

For getting the result of the system experimental set up is organised. For that IR sensor module should be fitted in the parking slots and raspberry pi should be interfaced on the server as discussed earlier. Result of the system will appear on server as well as on the website. Initially when there are no parking places allotted and no siren ON then it will show result as shown in fig.4

Fig. no.4 Result at initial stage

If all the slots are empty and someone turned the emergency switch ON then it will show result as shown in fig.5

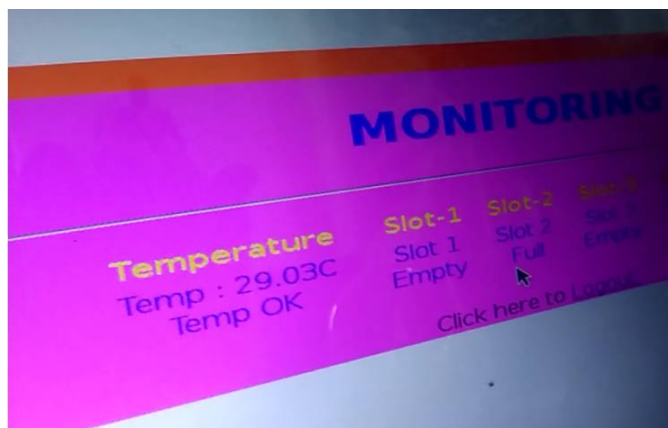Fig no. 5 Result after filling the parking slots

Fig no.6 Result of Temperature sensor

VII. CONCLUSIONS

The vehicle count feature monitors overall count of the parking lot in real time. This system can help the drivers to know the available number as well as taken number of parking spaces before entering the premises. The test results show that the system is accurate enough to use it as an advanced parking system. The proposed parking guidance system is easy to install because of sensor's small size and low cost. Additional features such as women's safety and fire alarm make it a multi-level advanced parking guidance system. Use of raspberry pi enables the service of IoT (Internet of things) so that future work such as automatically turning ON the fans and other things in parking area can be implemented by using the same. We can also work on creating a driver friendly smartphone app as a future work.

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