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Automated Car Parking System with Empty Slot Detection using Raspberry Pi and IOT

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Abstract:
Variety of occasions turn up when we visit various public places like Shopping malls, 5-star and 7-star hotels, multiplex cinema halls, etc. The difficulty we encounter at these places is finding the availability of parking space. Most of the times we need to travel through multiple parking slots to find a free space for parking. The problem becomes more tedious if the parking is multi-stored. Thus the problem is time-consuming. This situation calls for the need for an automated parking system that not only regulates parking in a given area but also keeps the manual intervention to a minimum. Our proposed system presents an autonomous car parking that regulates the number of cars that can be parked in a given space at any given time based on the parking space availability. This system can be achieved by using raspberry pi and IOT technology.

Keywords: IOT, IR Sensor, LED indicator, MIT App inventor, Raspberry pi.

I. INTRODUCTION

Our system represents a miniature model of automated car parking system. When a car arrives at the entrance, it will be stopped at the main gate and the driver can see the available slots on the gate. Using the Android application on his Android device, the user commands the Parking Control Unit to check the Status of available Parking slots, through an Android Application/web page. The car traces its path to the entrance of the parking area. Here, it waits and the details required for parking of car at the proper slot are communicated to the Car Control Unit. On receiving the information, the car will further trace its path to free parking spot. On successful parking, the data on the LED will be updated automatically. Thus this system proves to be useful for the purpose of the car parking automation and thereby helps reduce the car driver"s time, as the searching of the free parking space is handled by the Parking Control Unit.There is a lot of fuel and time wasted by countless commuters to find for a place for parking. This became our main motivation to develop a system were commuters can get parking information on finger tips, because time saved is time earned. When a car comes in front of the gate of the parking, it will wait on the white marking outside the parking space for the searching of free space.On allocation of free slot, the car will further trace its path to free parking spot. On successful parking, the data on the LED will be updated automatically. The ideal of creating a Smart City is now becoming possible with the emergence of the Internet of Things. One of the key issues that smart cities relate to are car parking facilities and traffic management systems. In present day cities finding an available parking spot is always difficult or drivers, and it tends to become harder with ever increasing number of private car users. This situation can be seen as an opportunity for smart cities to undertake actions in order enhance the efficiency their parking resources thus leading to reduction in searching times, traffic congestion and road accidents. Problems pertaining to parking and traffic congestion can be solved if the drivers can be informed in advance about the availability of parking spaces at and around their intended destination. Recent advances in creating low-cost, low power embedded systems are helping developers to build new applications for Internet of Things. Followed by the developments in sensor technology, many modern cities have opted for deploying various IOT based systems in and around the cities for the purpose of monitoring. A recent survey performed by the International Parking Institute reflects an increase in number of innovative ideas related to parking systems. At present there are certain parking systems that claim to citizens of delivering real time information about available parking spaces. Such systems require efficient sensors to be deployed in the parking areas for monitoring the occupancy as well as quick data processing units in order to gain practical insights from data collected over various sources.

II. EXISTING SYSTEM

We are using Raspberry Pi as our controller. Controller is the main part of the entire system and an IR sensor is interfaced to the Raspberry Pi. Here we are using IR sensors to detect the vehicle in that parking slot. So if it is occupied, that information is available in the web and free slots are also shown so that one can have knowledge -before coming there. This is to avoid waiting. We are using Raspberry pi as our controller and IOT module is interfaced to view the slots using internet.

III. SYSTEM DEVELOPMENT

A. Overview of proposed system:

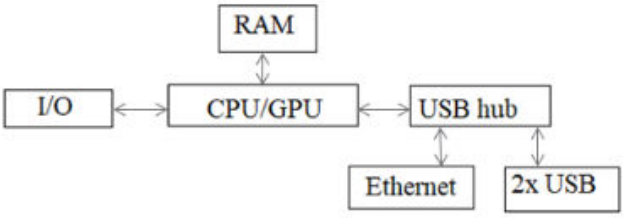

Figure.1. schematic diagram

Now days in many airports and multiplex systems there is a severe problem for car parking systems. There are many slots for car parking, so to park a car one has to look for the all lanes. Additionally there is a great deal of men labor included for this process for which there is whole lot of investment. So the need is to build up a framework which demonstrates specifically which stopping space is empty in any path. The project uses a system including infrared transmitter and receiver in every |side of the road and a LED & LCD display. So the person entering parking area can view using IoT module involved and can decide which slot to enter so as to park the car. Here we are using IR sensors to detect the vehicle in that parking slot. So if it is occupied, that information is available in the web and free slots are also shown so that one can have knowledge before coming there. This is to avoid waiting. We are using Raspberry pi as our controller and IoT module is interfaced to view the slots using internet.

B. Block diagram:

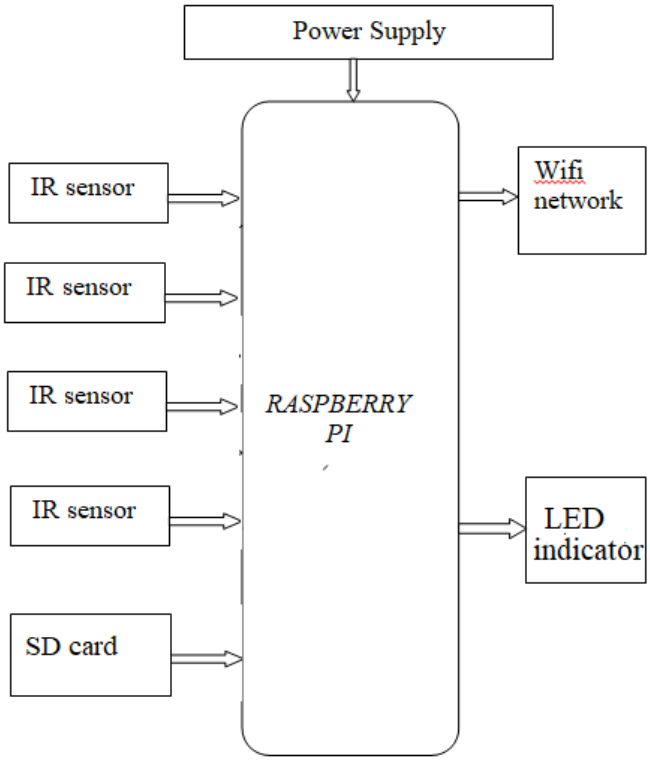

Figure.2. Block diagram of hardware system

Raspberry Pi: This section forms the control unit of whole project. This section basically consists of Raspberry Pi with associated circuitary like IR sensor, LED display, power supply and Wifi module. The Raspberry Pi forms the heart of the project because it controls the devices being interfaced and communicates with the devices according to the program being written.

IR Sensor: IR sensors are light based sensor that are used in various applications like proximity and object detection. There are two types of IR sensors: Transmissive type and Reflective type.In Transmissive type IR sensor the IR transmitter(usually an IR LED) and IR detector(usually a photodiode) are positioned facing with each other so that when an object passes between them the sensor detects the objects. The other type of IR sensor is Reflective type IR sensor. In this the transmitter and the detector are positioned adjacent to each other facing the object. When an object comes in front of the sensor the sensor detect the object.

Wifi module: This module will be installed as an Android app/Web Application in the user's phones. And will display the parking lot status. The system will require a Raspberry Pi with various IR sensors attached to it.

Power Supply: A power supply is an electrical device that supplies electric power to an electrical load. The primary function of a power supply is to convert electric current from a source to the correct voltage, current, and frequency to power the load. The recommended input voltage is 5.1v and recommended input current is 2.5A.

LED Indicator: It is used to indicate information of empty and occupied slots.

C. Details of Raspberry Pi:

- **Pin diagram:**

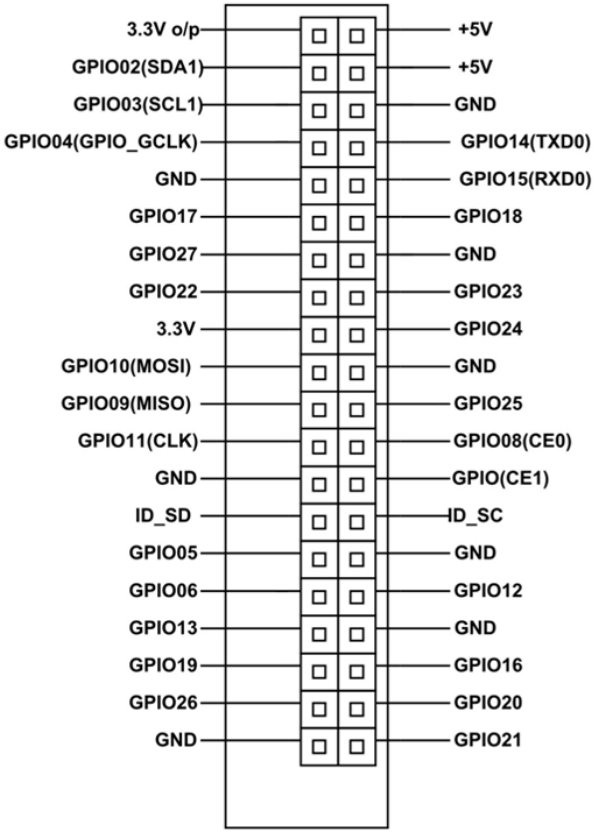

Figure.3. Pin diagram of Raspberry Pi

- **Features of Raspberry Pi :**

1) Broadcom BCM2837 64bit ARMv7 Quad Core Processor powered Single Board Computer running at 1.2GHz 2) 1GB RAM
3) BCM43143 WiFi on board
4) Bluetooth Low Energy (BLE) on board
5) 40pin extended GPIO
6) 4 x USB 2 ports
7) 4 pole Stereo output and Composite video port
8) Full size HDMI
9) CSI camera port for connecting the Raspberry Pi camera
10) DSI display port for connecting the Raspberry Pi touch screen display
11) Micro SD port for loading your operating system and storing data
12) Upgraded switched Micro USB power source (now supports up to 2.4 Amps)
13) Expected to have the same form factor has the Pi 2 Model B, however the LEDs will change position

D. Flow chart:

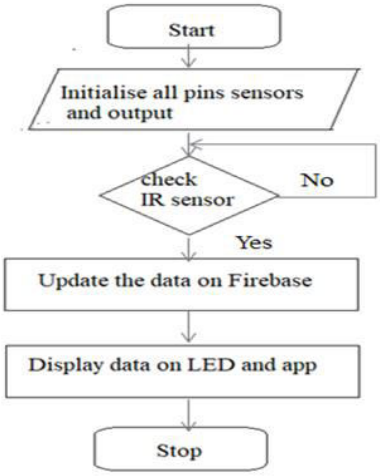

Figure.4. Flow chart algorithm

E. Result:

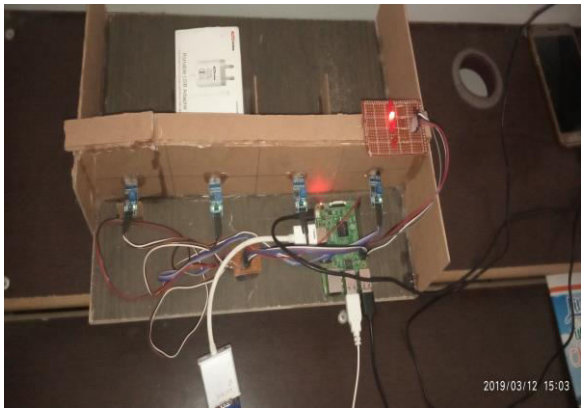

Figure. 5. Model of proposed system

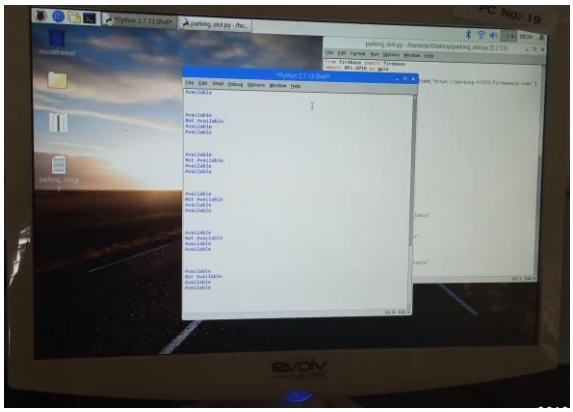

Figure. 6. Output window

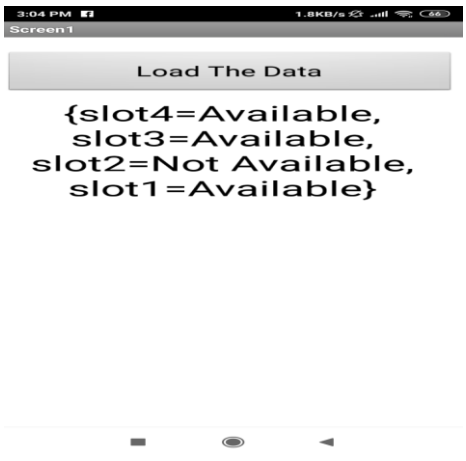

Figure.7. Developed application overview

In this way we have detected which slot is empty or which is full by using MIT app inventor and we have shown the display status on our PC. Thus we implemented IOT and Raspberry Pi technology in our system. our developed system useful for the user which is at the gate of parking area and which is away from the parking area. Both can receive information about parking slots with the help of LED indicator and parking app on their cellphones.

IV. CONCLUSION

An efficient underground-automated multi-storied car parking system prototype design and development was implemented. This system is very much effective as it reduces the fuel usage for car parking and reduces the time wasted by the user to find a car parking slot and the time to park the car. This system is highly accurate and secure against unauthorized access. Though this system has many advantages, there are a few realistic constrains that must not be overlooked. First, the initial cost of building an underground parking system is very high.

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We are feeling happy for forwarding this project as an image of sincere efforts. The successful execution of project work, effort of our guide in giving us good information. We would like to express our heartiest thanks to our project guide Prof. P.B Tathe for his undying support which makes us possible to make this project knowledgeable. He not only provided us the literature and guidance to study but also the platform which required for us to prepare best for this project. We are also thankful Prof. D.M. Raut, Head of Department of Electronics and Telecommunication Engineering and respected Principal Dr. Mahatme Aniruddha for supporting and providing all facilities to complete the work.

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