

SMART PARKING SYSTEM USING IOT

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Abstract-Smart Parking is a parking strategy that combines technology and human innovation in an effort to use as few resources as possible—such as fuel, time and space—to achieve faster, easier and denser parking of vehicles for the majority of time they remain idle. The 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 which enables the user to find the nearest parking area and gives availability of parking slots in that respective parking area. These systems use effective sensors in the parking areas and by tracking information from various sources and also deployed active data processing units. Here our proposed idea is implemented using django web framework and creating a web application so the drivers or end users could get their parking information via Wi-Fi or Internet. It mainly focuses on reducing the time in finding the parking lots and also it avoids the unnecessary travelling through filled parking lots in a parking area. Thus, it reduces the fuel consumption which in turn reduces carbon footprints in an atmosphere.

Key Words: Smart Parking, Internet of things(IOT),Web Framework, Web Application, Django, Wi-Fi, Carbon Footprint

1. INTRODUCTION

IOT technology grows in various fields of smart applications but we have not yet found boundary constraints of this technology. Some smart applications which it has implementing currently such as on smart grids, smart lighting, smart energy, smart city, smart health etc. [4]. Problems such as, traffic congestion, limited car parking facilities and road safety are being addressed by IoT. A smart city is an urban area that uses different types of electronic data collection sensors to supply information which is used to manage

assets and resources efficiently. Here are some reasons why we need smart parking:

- According to a recent research, 30% of the traffic in urban areas is caused by drivers and motorists looking for parking spaces.
- On average, drivers spend 17 hours per year searching for a parking spot.
- The fuel wasted for the search of parking is one of the big sources of fuel wastage resulting in wastage of almost one million barrels of world's oil every day.

1.1 EXISTING SYSTEM

There is no wireless technology available for monitoring parking spaces. As a given population increases, the number of vehicles also increases. Even if a given population were to remain constant in number, the number of vehicles bought by people continues to increase. Thus, it has become necessary to develop techniques and equipment to save time and the environment.

1.2 PROPOSED SYSTEM

Our proposed system presents a smart parking system that regulates a number of vehicles to the nearest parking space at any given time based on the parking space availability. The user requests the Parking Control Unit to check the status of available parking slots. As soon as the user request, all the available free slots are displayed to the user. The parking space is monitored continuously in real time and the status of the space is updated. Using the data, we can optimize parking and reduce fuel consumption.

2. LITERATURE SURVEY

Too many cars, too much traffic and there is no enough parking area. This is the situation which is seen in most of the metropolitan cities today. People keep on roaming on roads searching for a parking space to park their vehicles especially at peak hours of time [3].

More than half of the world's people are living in the cities. So, the cities have reached full of its occupancy. As people uses vehicles for transportation so there is large number of vehicles exists for people convenience. Most of the time people spend their precise time on searching parking lots to park their vehicles. Thus, congestion occurs in the traffic it leads to a hectic job to find the parking space to park their vehicle. The most traffic occurs only because of vehicle congestion in the urban areas thus people are wasting time in searching the parking area abnormally to park their vehicles [4].

Traffic congestion caused by vehicle is an alarming problem at a global scale and it has been growing exponentially. Car parking problem is a major contributor and has been, still a major problem with increasing vehicle size in the luxurious segment and confined parking spaces in urban cities. Searching for a parking space is a routine (and often frustrating) activity for many people in cities around the world. This search burns about one million barrels of the world's oil every day. As the global population continues to urbanize, without a well-planned, convenience-driven retreat from the car these problems will worsen[5].

3. SOFTWARE AND HARDWARE REQUIREMENTS

3.1 SOFTWARE REQUIREMENTS

1. Python

Python is an interpreted high for programming. Python is a multi-paradigm programming language. Object-oriented programming and structured programming are fully supported, and many of its features support functional programming and programming. It is used in Web and Internet Development, Software Development and Business Applications; it has many more applications as it has features like Multiple Programming Paradigms, Compatible with Major Platforms and Systems and Robust Standard Library.

2. HTML

Hypertext Markup Language (HTML) is the underlying markup language of the World Wide Web [6].HTML is a markup language that web browsers use to interpret and compose text, images, and other material into visual or audible web pages. The web app is designed using HTML.Hypertext Markup Language (HTML) is the standard markup language for creating web pages and applications. Web receives HTML documents from a web server or from local storage and render the documents into multimedia web pages. HTML describes the structure of a web page semantically.

3. Django

Django is a source web, written in Python, which follows the model-view-template (MVT) architectural pattern. It consists of an object-relational mapper (ORM) that mediates between data models (defined as Python classes) and a relational database ("Model"), a system for processing HTTP requests with a web templating system ("View"), and a regular-expression-based URL dispatcher ("Controller").Some of its features are a lightweight and standalone web server for development and testing, a form serialization and validation system that can translate between HTML forms and values suitable for storage in the database, and a caching framework that can use any of several cache methods. In this project we have used django version 2.1, which is the latest version released by Django foundation.

3.2 HARDWARE REQUIREMENTS

1. Raspberry Pi

The Raspberry Pi is a series of small single-board computers developed by the Raspberry Pi Foundation. The first-generation Raspberry Pi 1 Model B was released in February 2012. Raspberry Pi 3 Model B was released in February 2016 with a 1.2 GHz 64-bit quad core processor, on-board Wi-Fi, Bluetooth and USB boot capabilities. Raspbian is a free operating system based on Debian GNU/Linux and optimized for the Raspberry Pi hardware. Here we are using Raspberry Pi 3B+.It has 40 GPIO pins which are available to us.

2. IR sensors

IR sensors are used to detect the presence of a vehicle. The radiations are not visible to naked eye IR sensors detect the heat and motion of an object or person. Thermal radiations are detected by passive IR sensors. The resistances and the output voltages, change in proportion to the magnitude of the IR light received [1]. The IR transmitter sends an infrared signal that, in the presence of a reflecting surface (especially if it is white), "bounces" in various directions, including the one along which the radiation hits the IR receiver, which captures the signal by detecting the object, and signaling it through one of its pins.

3. Jumper Wires

A jump wire is an electrical wire, or group of them in a cable, with a connector or pin at each end, which is normally used to interconnect the components of a breadboard or other prototype or test circuit, internally or with other equipment or components, without soldering. Jumper wires are wires that have connector pins at each end, allowing them to be used to connect two points to each other without soldering. Jumper wires are typically used with breadboards and other prototyping tools in order to make it easy to change a circuit as needed [2].

4. Perforated PCB

Perfboard is a material for prototyping electronic (also called DOT PCB). It is a thin, rigid sheet with holes pre-drilled at standard intervals across a grid, usually a square grid of 0.1 inches (2.54 mm) spacing. These holes are ringed by round or square copper pads, though bare boards are also available. Inexpensive perfboard may have pads on only one side of the board, while better quality perfboard can have pads on both sides (plate-through holes). Since each pad is electrically isolated, the builder makes all connections with either wire wrap or miniature point to point wiring techniques. Discrete components are soldered to the prototype board such as resistors, capacitors, and integrated circuits. The substrate is typically made of paper laminated with phenolic resin (such as FR-2) or a fiberglass-reinforced epoxy laminate (FR-4).

4. SYSTEM DESIGN

4.1. BLOCK DIAGRAM

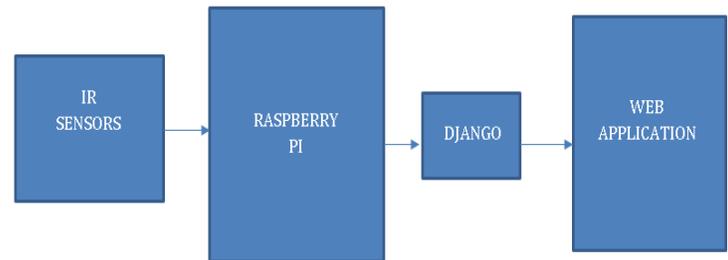


Fig 1: Block Diagram

4.2. FLOW CHART

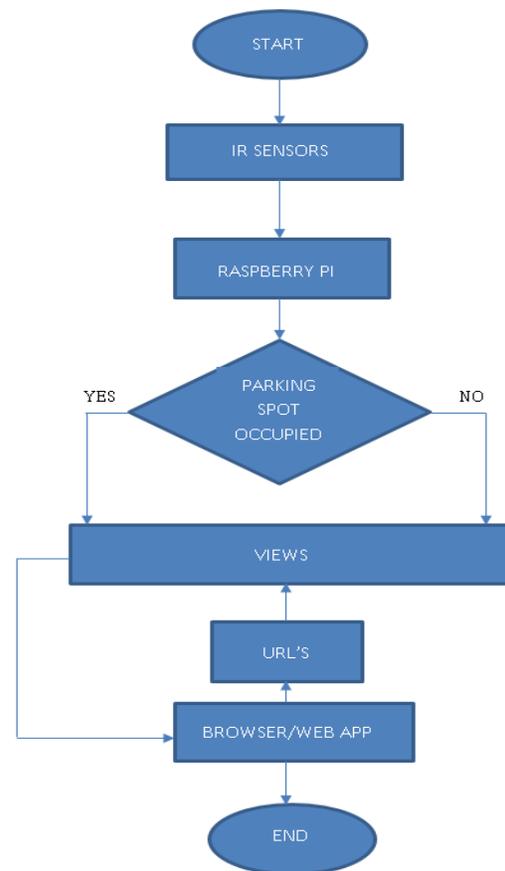


Fig 2:Flow Chart

5. IMPLEMENTATION OF THE SYSTEM

1. A new project is started in django in the Raspberry Pi and a new app is created, then appropriate changes are made in the framework.
2. The code for the main logic is written in Python, and the code for web app is written in HTML and are saved in the project.
3. IR sensors detect whether the parking space is occupied by a vehicle or if the space is empty. The data is sent for further processing to Raspberry Pi.
4. The monitored data is analyzed in real time and the optimum control information is determined and transmitted to django framework.
5. When a user clicks on the URLs, django goes to the URL file and decides which function to fire in views and gives the end result in form of html template response in the browser app that gives the status of the parking spot.

6. RESULT AND DISCUSSION

This designed automatic smart parking system which is simple, economic and provides effective solution to reduce carbon footprints in the atmosphere. It is well managed to access and map the status of parking slots from any remote location through web app. Thus, it reduces the time of finding the parking slots in any parking area and also it eliminates unnecessary travelling of vehicles across the filled parking slots in a city. So, it reduces time and it is cost effective also.

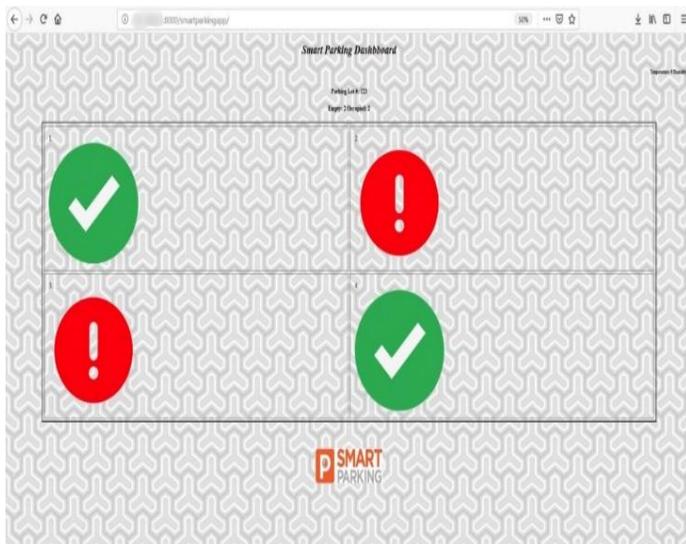


Fig 3: Web Application as seen in browser

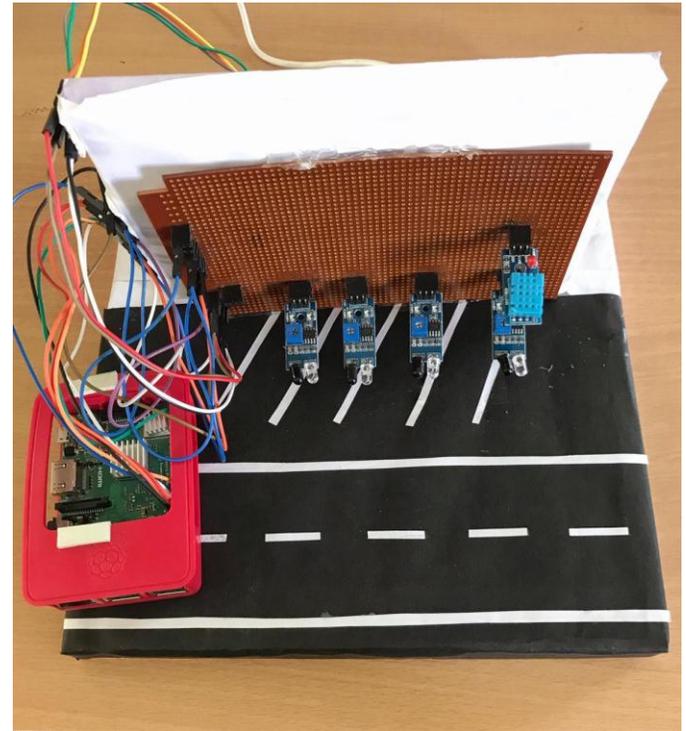


Fig 4: Hardware

7. APPLICATION AND ADVANTAGES

7.1 APPLICATIONS

- It can be used in open spaces as well as in basement parking.
- It can be used in Smart Cities.

7.2 ADVANTAGES

- Optimized parking
- Reduced traffic
- Reduced pollution
- Enhanced User Experience
- Increased Safety
- Real-Time Data and Trend Insight
- Decreased Management Costs

8. CONCLUSION AND FUTURE SCOPE

8.1 CONCLUSION

- Smart parking facilitates the problems of urban livability, transportation mobility and environment sustainability. Smart Parking technology is used for enhancing the productivity levels and the service levels in operations.
- It is well managed to access and map the status of parking slots from any remote location through web browser. It eliminates unnecessary travelling of vehicles across the filled parking slots in a city. So, it reduces time and it is cost effective.

8.2 FUTURE SCOPE

- The automated parking fee system would allow people to travel without cash. It provides drivers with Also, as it would reduce the waiting time, long queues, tension, stress and increase the efficiency of the parking system.
- The smart parking management system can be applied for plane and ship and fleet management.
- For residential and domestic parking system the device can be interfaced with Home Automation system which can control the various home appliances by sensing whether the user is arriving or departing from the parking space.

9. REFERENCES

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