SMART PARKING SYSTEM IN IOT

INTRODUCTION

Smart parking system using IoT to identify vacant positions and occupied positions without the need to waste time in finding a suitable position for the cars.

The status of the parking slot detected by the wireless sensor is sent to the database via a gateway and car information is transferred to a database to save and store.The system allows the date and time of entry to the parking area, the date and time of exit from the parking space.

Proper and balanced planning based on automatic and intelligent system to organize parking and provide it with sensor system to detect available, occupied, and reserved parking slots. Streamlined entry and exit of parking, no need to lose time and fuel in order to get parking, smart parking feature and the presence of surveillance cameras.

To ensure the safety of the vehicle and passengers and the presence of fire extinguishers throughout the parking. Smart parking does not cause traffic jams as the time is not wasted to find the available parking space in the parking area and the driver of the vehicle is aware about the location of available parking slot.

PROBLEM DEFINITION:

The project involves deploying IoT sensors to decrease time spent manually searching for the optimal parking slot and accessible to the public through a platform or mobile app. This project includes defining objectives, designing the IoT sensor system and integrating them using IoT technology and Python

PROBLEM STATEMENT:

The number of cars is increasing day by day.The main problem is to find a parking slot, whether in the shopping mall or companies or at the airport or in hospitals. An average, people spent 20 minutes to find a suitable parking for the car.Most of the people park their cars in places not designated for parking, and parking in places not reserved for parking slots. This results in the disruption of the traffic and sometimes in the movement of people. Usually, there are reasons to park people in places not reserved for parking such as the area designated for parking is not enough to cater the needs. This is due to the weak planning and not thinking of solutions to keep pace with the large increase in the number of cars, and most people park the car for long times without thinking. Drives looking for parking space is a major cause of traffic congestion and accounts for 30%.

KEY OBJECTIVES :

Smart Parking involves the use of low cost sensors, real-time data and applications that allow users to monitor available and unavailable parking spots. The goal is to automateand decrease time spent manually searching for the optimal parking floor, spot and even lot. Some solutions will encompass a complete suite of services such as online payments, parking time notifications and even car searching functionalities for very large lots. A parking solution can greatly benefit both the user and the lot owner.

Optimized parking – Users find the best spot available, saving time,resources and effort. The parking lot fills up efficiently and space can be utilized properly by commercial and corporate entities.

Reduced traffic – Traffic flow increases as fewer cars are required to drive around insearch of an open parking space.

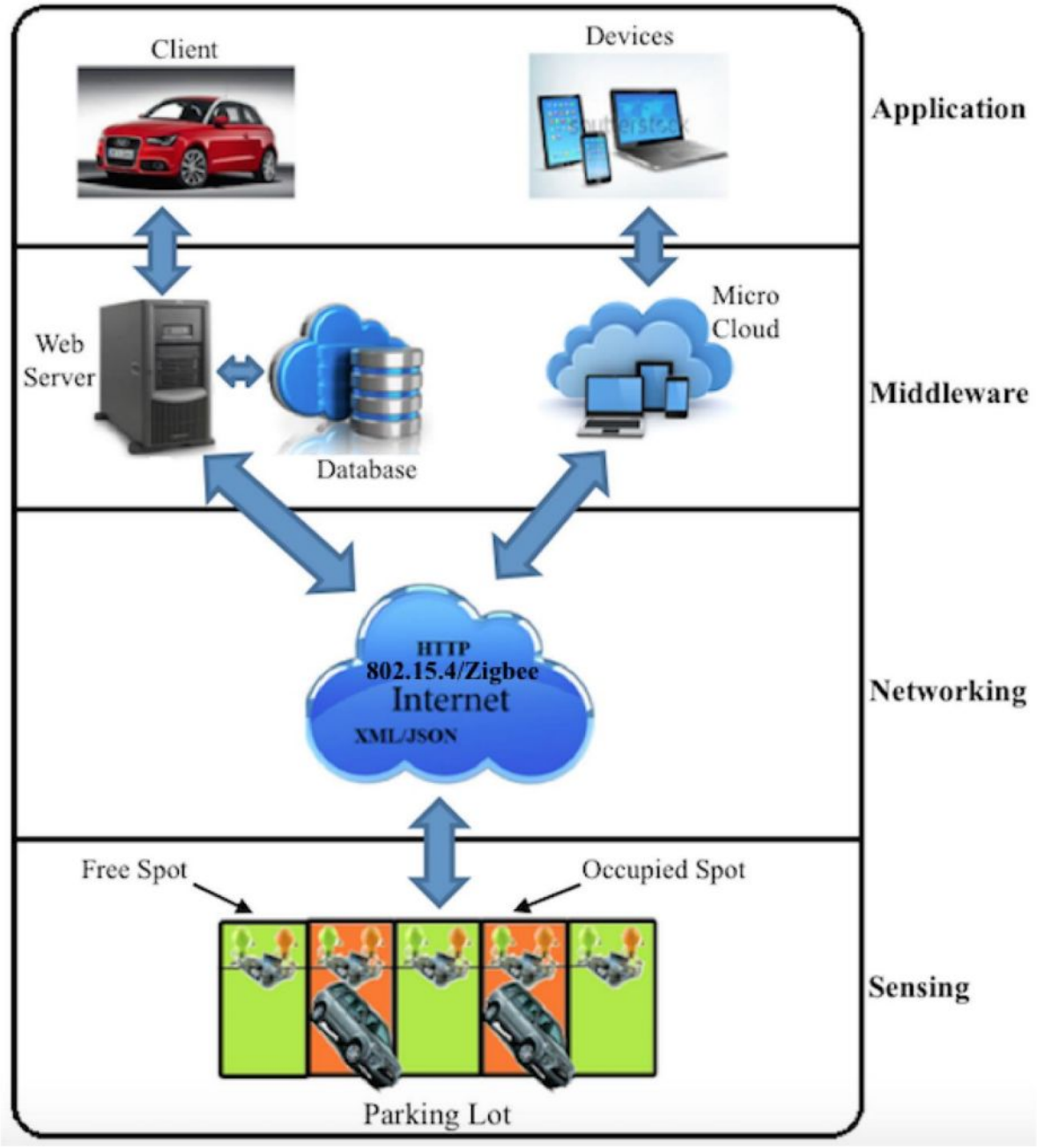
Reduced pollution – Searching for parking burns around one million barrels of oil a day. An optimal parking solution will significantly decrease driving time, thus lowering the amount of daily vehicle emissions and ultimately reducing the global environmental and footprint.

Increased Safety – Parking lot employees and security guards contain real-time lot data that can help prevent parking violations and suspicious activity. License plate recognition cameras can gather pertinent footage. Also, decreased spot-searchingtraffic on the streets can reduce accidents caused by the distraction of searching for parking.

Decreased Management Costs – More automation and less manual activity saves onlabor cost and resource exhaustion.

Enhanced User Experience – A smart parking solution will integrate the entire user experience into a unified action. Driver's payment, spot identification, location search and time notifications all seamlessly become part of the destination arrival process.

DESIGN THINKING :



Database

In smart parking database is necessary to work the parking easily and conveniently. The database acts as an intermediary between the internal network and the external network represented in the application. The database includes the data of each car booked position such as the car number, color and driver name and the last time the parking was reserved and the number of hours reserved. Payment is also done, and this method is done with all cars that have reserved parking, the database must also have a reference copy of the data be a reference in case of damage or loss of data. The database will be available individually in case someone wanted to see his data when entering the parking.

Sensing

Sensors are a critical component of smart parking system. Smart parking is a sustainable and intelligent way of working, by integrating all of its structure. Infrastructure, services and smart devices to monitor and control the parking to ensure sustainability and efficiency. The sensor is located at the heart of smart parking system to monitor and work smartly. Sensors deployed in smart parking to monitor the movement of cars inside and outside the parking. Sensors are interconnected with each other and operate through a network. Sensor sends the signal to the devices deployed in the parking enters or exits, which sends a signal to the database. The display updates the data of the vacant positions and the occupied positions. It is red and green based on the signal that the green light is available and the red color is occupied. Ardino is an electronic piece to connect the sensors with each other and used with Ardino piece called Node mcu This widget helps to connect to Wi-Fi, real time clock connected to the sensors to see the time reservedby the user and the hour of exit from positions and be linked to the application to give an alarm near the end of the specified position reserved, the display screen of reserved positions and available positions and be connected with the Ardino to know the status of positions and work continuously update For positions.

Using cloud

The cloud provides the processing and storage of data for the parking service. It stores a lot of information about the available and occupied parking, and the time of entry and exit. It also provides the location of the parking, and give the cloud update in the case of entering a new car inthe parking or exit the car from the parking.

Server and database

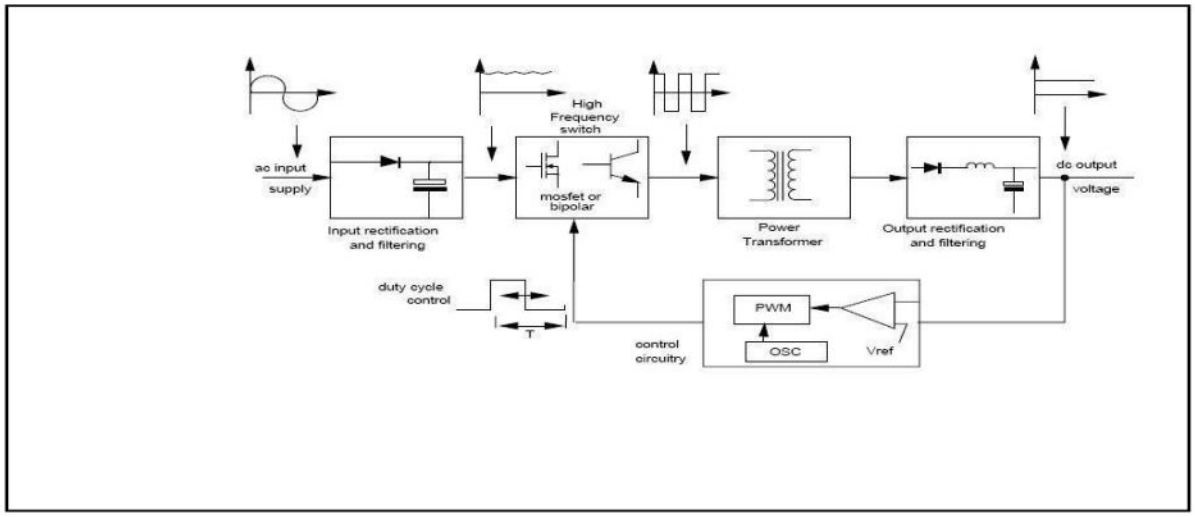
The server works with the database as a bridge between mobile applications and the cloud, where if a person wants to reserve a position in a certain period of time, the server asks the cloud information about the available positions and positions occupied and presented to the consumer to search for a position that suits him. The server sends an update to the cloud that this consumer has chosen a position and set the time of entry and exit, and then sends a signal to the display screen toreserve the position, and the server is connected to a database of all consumers who have booked by mobile phone and entry and exit times.

Application

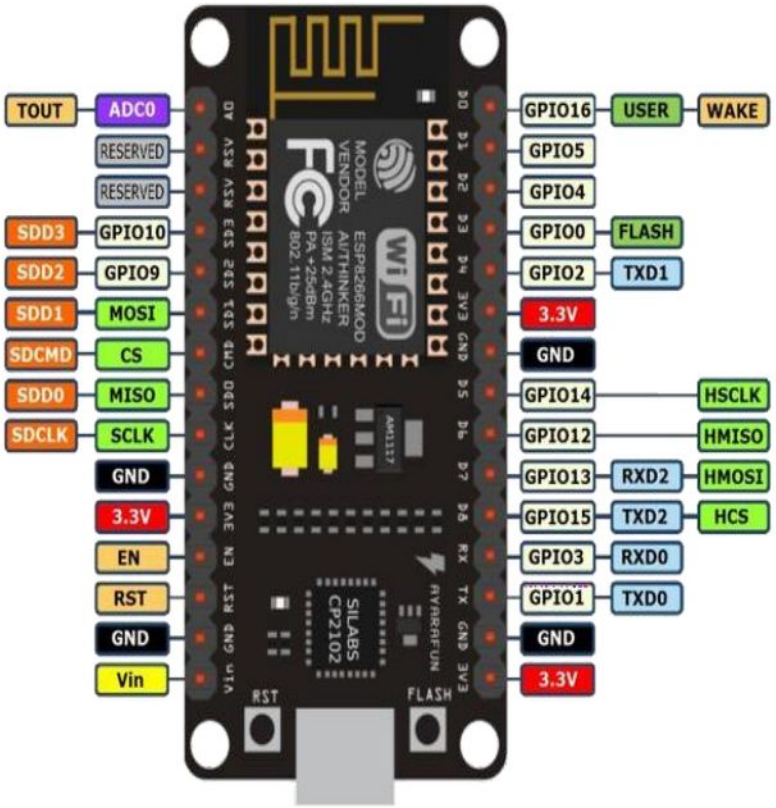
Mobile application can be used to reserve a parking position or search for positions that are close to the intended location of the visit. Most applications require an Internet to work efficiently and explore the best places to stand, the user can book by computer or laptop or mobile phone . The application sends a message to the user about the location of the position, the hours of parking, and billing information.

COMPONENTS REQUIRED :

A. SMPS – SMPS (switch mode power supply) is the power source of the whole iot device. SMPS convert the 220V AC power to 5V DC. Because our whole system run on 5V DC we need the SMPS to supply the required power.

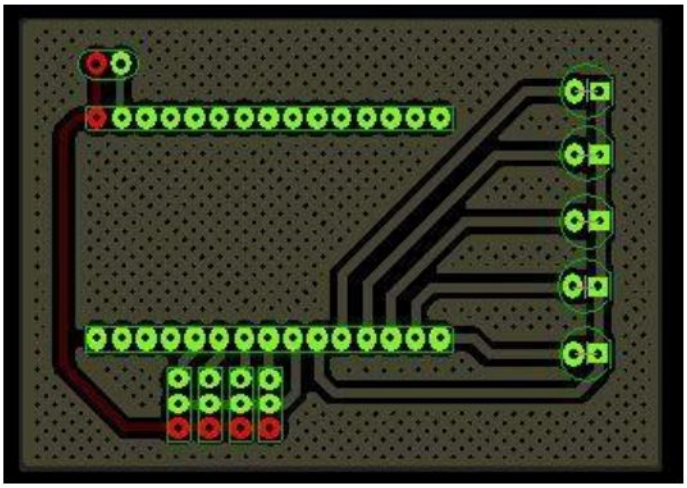


B.Wi-Fi Module: - in this project we have used Node MCU (Micro Controller Unit). The Node MCU contains Wi-Fi as well as a Node microcontroller. Node Microcontroller has 3Mb of ROM which can be used to upload a program



This module has a powerful enough on-board processing and storage capabilities that allows it to be integrated with the sensors and other application specific devices through its GPIOs with minimal development up-front and minimal loading during runtime. Its high degree of on-chip integration allows for minimal external circuitry, including the front-end module, is designed to occupy minimal PCB area.

PCB LAYOUT :



IR Sensor: Infrared Obstacle Sensor Module has two part IR transmitter and IR receiver that sends out IR energy and looks for reflected IR energy to detect presence of any obstacle in front of the sensor module. The module has on board potentiometer that lets user adjust detection range. The sensor has very good and stable response even in ambient light or in complete darkness.

An IR sensor consists of an IR LED and an IR Photodiode; together they are called as Photo–Coupler or Opt–Coupler. As said before, the Infrared Obstacle Sensor has built-in IR transmitter and IR receiver. **Infrared Transmitter** is a light emitting diode (LED) which emits infrared radiations. Hence, they are called IR LED's. Even though an IR LED looks like a normal LED, the radiation emitted by it is invisible to the human eye. **Infrared receivers** are also called as infrared sensors as they detect the radiation from an IR transmitter. IR receivers come in the form of photodiodes and phototransistors. Infrared Photodiodes are different from normal photo diodes as they detect only infrared radiation. When the IR transmitter emits radiation, it reaches the object and some of the radiation reflects back to the IR receiver. Based on the intensity of the reception by the IR receiver, the output of the sensor is defined.