SMART PARKING BASED ON IOT
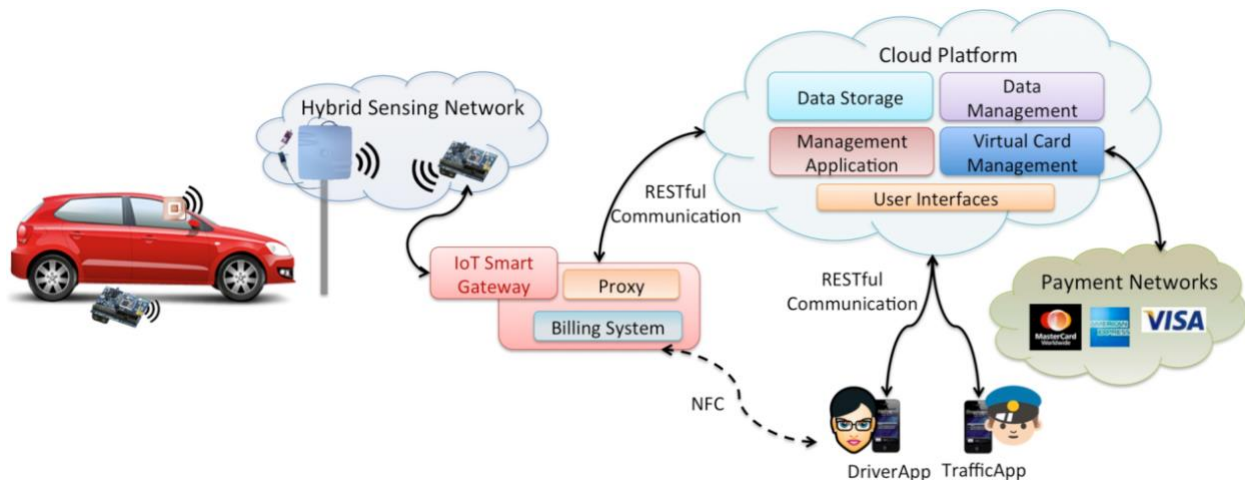
TEAM MEMBER

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Phase- I Document Submission

PROJECT: *Smart Parking Based on Iot*

PROJECT DEFINITION

A Smart Parking IoT (Internet of Things) project refers to a system that leverages connected sensors, devices, and technology to optimize the management and utilization of parking spaces in urban or crowded areas. This concept aims to address the challenges associated with parking, such as congestion, inefficiency, and environmental impact, by employing IoT technology. Here's a more detailed definition:

Smart Parking IoT Project: A smart parking IoT project is a comprehensive solution that utilizes sensors, cameras, data analytics, and communication networks to monitor and manage parking spaces in real-time. The key components of such a project typically include:

1.**Sensors**: IoT sensors are placed in parking spaces to detect the presence or absence of vehicles. These sensors can be in-ground, ultrasonic, or infrared, and they transmit data to a central system.

2.**Data Connectivity**: The collected data from the sensors is transmitted through wireless or wired networks, enabling real-time monitoring and analysis.

3.**Data Processing**: Advanced data analytics and algorithms process the sensor data to determine parking space availability and occupancy status. This information is often made accessible through mobile apps, websites, or electronic signs.

4.**User Interface**: Users, such as drivers or parking operators, can access information about available parking spaces, reserve spots, and make payments via user-friendly interfaces, which are typically available on smartphones or other digital devices.

5.**Payment Systems**: Many smart parking projects integrate secure and convenient payment options, allowing users to pay for their parking electronically.

6.**Traffic Management**: By providing real-time data on parking space availability, smart parking projects can help reduce traffic congestion and direct drivers to available parking areas, thus improving overall traffic management.

7.**Environmental Benefits**: Reducing the time spent searching for parking spaces can result in decreased fuel consumption and lower emissions, contributing to environmental sustainability.

8.**Security**: Surveillance cameras and other security features can be integrated into the system to enhance safety in parking areas.

9.**Efficiency**: Parking operators benefit from better management of their parking facilities, leading to improved revenue and resource utilization.

Smart Parking IoT projects are designed to enhance convenience and efficiency for both drivers and parking operators, promote environmental sustainability, and alleviate parking-related challenges in urban or high-traffic areas.

OBJECTIVE

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 automate and 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 bycommercial and corporate entities.

Reduced traffic – Traffic flow increases as fewer cars are required to drive around in search 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 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-searching traffic on the streets can reduce accidents caused by the distraction of searching for parking.

Decreased Management Costs – More automation and less manual activity saves on labor 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.

METHODOLOGY

In this project we are using NodeMCU, IR sensors, and servo motors. One IR sensor is used at entry and exit gate to detect the car while two IR sensors are used to detect the parking slot availability. Servo motors are used to open and close the gates according to the sensor value. NodeMCU is an open source IoT platform .It includes firmware which runs on the ESP8266 Wi-Fi SoC from Espressif Systems, and hardware, which is based on the ESP-12 module. The term "NodeMCU" by default refers to the firmware rather than the dev kits. The firmware uses the Lua scripting language. The ESP8266 is a low-cost Wi-Fi enabled microchip with full TCP/IP stack and microcontroller capability. NodeMCU includes CPU core, faster Wi-Fi, more GPIOs, and supports Bluetooth 4.2, and low power Bluetooth. The ESP8266 is a low-cost WiFi enabled microchip with full TCP/IP stack and microcontroller capability. NodeMCU includes CPU core, faster Wi-Fi, more GPIOs, and supports Bluetooth 4.2, and low power Bluetooth. As soon as the IR sensors get the presence of a car in front of the entrance, it will send signal to the NodeMCU to check if there is an empty slot inside the parking lot. When NodeMCU acknowledges that there is an empty slot or more then it will send a signal to the dc servo motor which will open the main entrance. On the other hand if an NodeMCU encounters no empty slots at the time of a car trying to make an entrance, the gate will just not open. In addition, there will be a website linked with the NodeMCU board to show the number of parking. The idea behind our methodology is very simple , usually users spend most of their time in looking for an empty slot where they can park their vehicle which increases fuel consumption and time wastage. We came-up with a new method where we provide the user an empty slot number where he can park his vehicle without wasting his time for finding one . Similarly we try to display the start time and end time so that the user can know for what amount of time he has parked his vehicle.

BLOCK DIAGRAM OF SMART PARKING
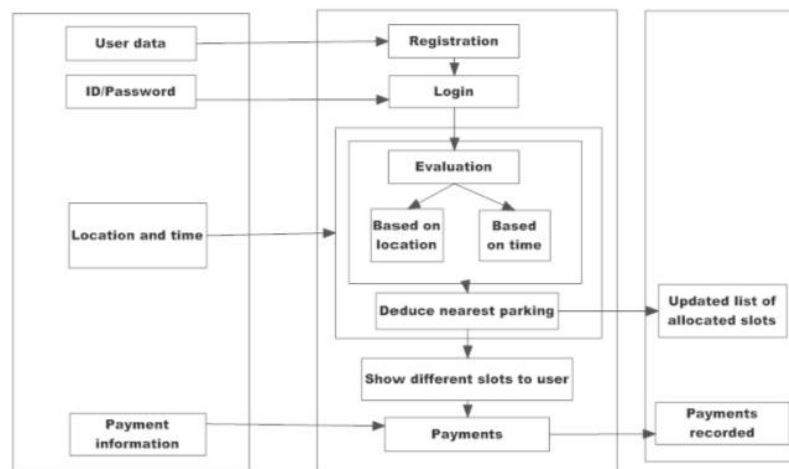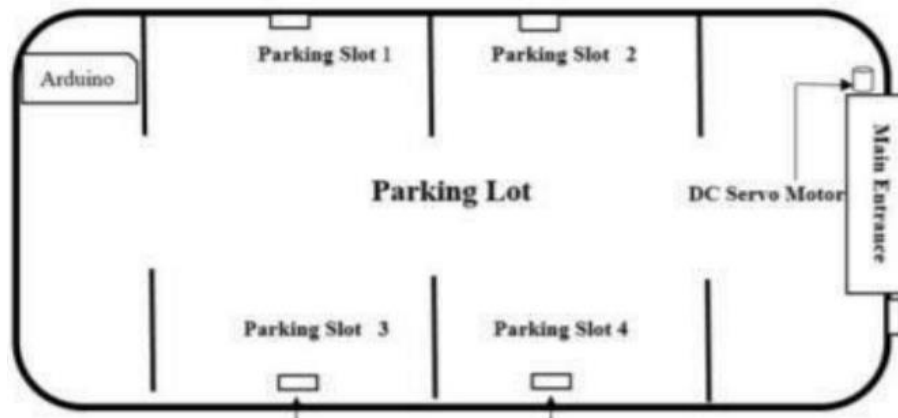
PROBLEM STATEMENT

In metropolitan cities the parking management problem can be viewed from various angles such as high vehicle density on roads. This results in annoying issues for the drivers to park their vehicles as it is very difficult to find a parking slot.

The drivers usually waste time and effort in finding parking space and end up parking their vehicles finding a space on the street which further leads to space congestion. In worst case, people fail to find any parking space especially during peak hours and festive season.

COMPONENTS

Hardware Specifications

• DC MOTOR 3.4

• ENODE MCU (ESP8266)

• JUMPER WIRES

• INFRARED SENSORS

• 16*2 LED DISPLAY

Software Specification

• ARDUINO IDE

FUTURE SCOPE

● The future of smart parking systems is expected to be significantly influenced by the arrival of automated vehicles(AVs).

● Several cities around the world are already beginning to trial self -parking vehicles ,specialized AV parking lots and robotics parking valets.

● This project can be enhanced for tracking vehicle speed on the roads.

● Developing a smart parking solution within a city solves pollution problem .

● Addition of Machine learning to store various other information of the vehicle like its color, design and number which would further add security.

CONCLUSION

The concept of Smart Cities has always been a dream for humanity. Since the past couple of years ago large advancements have been made in making smart cities a reality. The growth of Internet of Things and Cloud technologies have given rise to

new possibilities in terms of smart cities. Smart parking facilities and traffic management systems have always been at the core of constructing smart cities. In this project, we address the issue of parking and present an IoT based Cloud integrated smart parking system. The system that we propose provides real time information regarding availability of parking slots in a parking area. Users from remote locations could book a parking slot for them by the use of our mobile application. The efforts made in this project are intended to improve the parking facilities of a city and thereby aiming to enhance the quality of life of its people.