# SMART PARKING

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| **Date** | **10-10-2023** |
| **Team ID** | **530** |
| **Project Name** | **Smart parking using IOT** |

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## 1. Introduction

Our project idea is to implement a smart parking system in rural areas using Internet of Things (IOT) to overcome the time consumption and frustration. A using sensor, mobile application, cloud-based methodology. In this document, we will outline the problem statement, the steps involved in solving it, and the design thinking approach that will guide our project.

## 2. Problem Statement

Objective: The current state of urban parking is inefficient, causing congestion, pollution, and driver frustration due to the lack of available parking spaces and ineffective management.

Data: We have a dataset containing various features of (e.g., size, location, time consumption and traffic) due to in search of available parking space.

## 3. Design and Innovation Strategies

IOT-enabled smart parking systems address challenges by deploying a network of sensors, cameras, and real-time data analytics to monitor and manage parking spaces.

Real-time Availability: IOT sensors detect whether a parking space is occupied or vacant and relay this information to a central server or a mobile app. Drivers can access up-to-the-minute data on available spots, reducing the time spent hunting for parking.

3.1. MICROCONTROLLER SELECTION:

For a smart parking IOT system, consider microcontrollers like Arduino, Raspberry Pi, or ESP8266/ESP32 for their capabilities, power efficiency, and community support.

ESP8266/ESP32:

ESP8266 and ESP32 are low-cost, power-efficient microcontrollers with built-in Wi-Fi capabilities. They are well-suited for IOT applications, including smart parking, due to their connectivity features.

## 3.2. SENSOR SELECTION:

Ultrasonic sensors for detecting vehicle presence, infrared sensors for counting, and temperature/humidity sensors for environmental monitoring
Ultrasonic Sensors:
Ultrasonic sensors can be used to detect the presence of a vehicle in a parking space. They measure the distance to the nearest object, enabling detection of parked vehicles.

Infrared Sensors:
Infrared sensors can be employed to count the number of vehicles entering and exiting a parking area. They can also help detect the occupancy status of the parking spots.

## 3.3. CONNECTIVITY:

Utilize Wi-Fi or Lora WAN for connectivity, enabling seamless communication between the devices and the central system.

Utilize Wi-Fi connectivity for communication between parking sensors and a central server or cloud. Wi-Fi provides a reliable and high-speed connection, making it suitable for transmitting real-time data on parking space availability and occupancy.

### 3.4. CLOUD PLATFORM:

Opt for cloud platforms like AWS IOT, Google Cloud IOT, or Azure IOT for data storage, processing, and real-time analytics.

Google Cloud IOT offers a robust and flexible cloud platform with services like Google Cloud IOT Core for managing IOT devices, Google Cloud Pub/Sub for event ingestion and processing, and Big Query for data analytics and insights.

### 3.5. PROTOCOL:

Use MQTT (Message Queuing Telemetry Transport) for efficient and reliable communication between devices and the cloud due to its low bandwidth and low power requirements.

Using MQTT allows real-time data transmission from parking sensors to the central server, enabling immediate updates on parking space availability, occupancy, and other relevant information. This facilitates timely and accurate guidance for drivers searching for parking spots, enhancing overall parking management and user experience in the smart parking system.

Camera Deployment:

Install cameras in strategic locations within the parking area to capture the parking spots effectively. Ensure proper mounting and alignment for optimal coverage.

Image Acquisition:

Continuously capture images or video frames using the cameras. Stream these images to a central server or edge device for further processing.

Object Tracking:

Implement object tracking algorithms to track the detected vehicles across consecutive frames. This helps in monitoring the movement and occupancy of parking spaces.

Occupancy Detection:

Analyse the tracked vehicles to determine whether a parking spot is occupied or vacant. Threshold and contour analysis can be used to identify empty parking spaces.

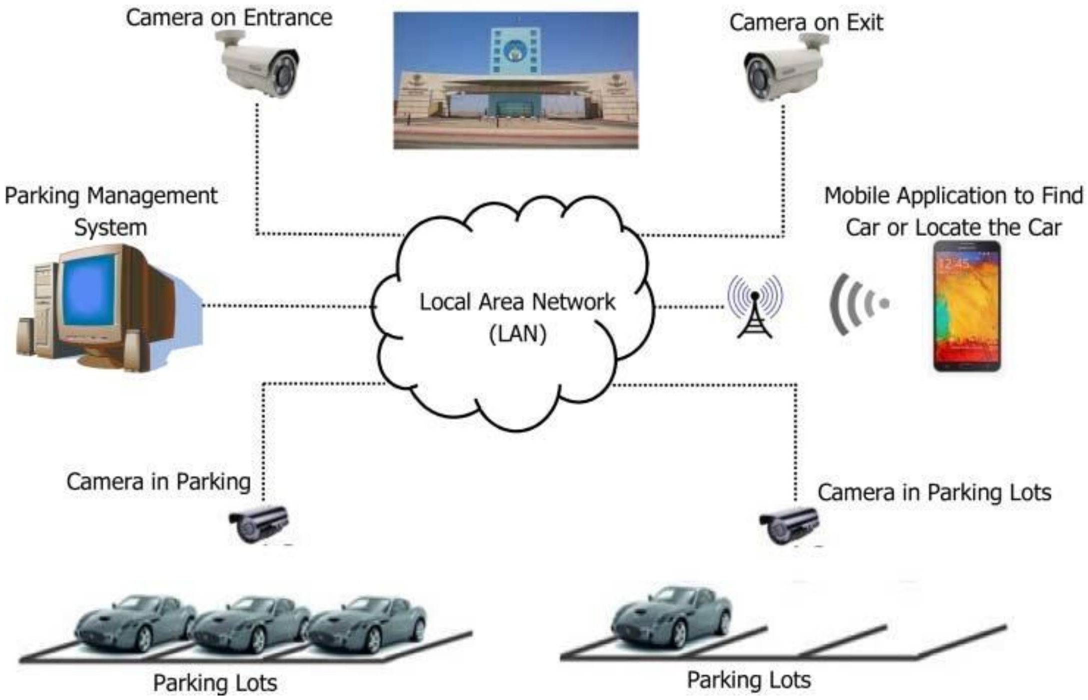
Data Processing and Analysis:

Process the collected data to generate insights, such as the number of available parking spots, parking duration, and trends in parking occupancy. This information is crucial for smart parking management.

## 3.6. PUBLIC PLATFORM:

Integrate a user-friendly mobile app for drivers to find available parking spaces and make reservations, enhancing the overall experience.

After a parking session, users might receive alerts asking for feedback on their experience, helping operators improve the system.




## 4. Conclusion

The implementation of a smart parking solution using IOT technology addresses the challenges in conventional parking systems, improving efficiency, user experience, and urban sustainability. The proposed solution provides a scalable foundation for further enhancements and integration with evolving smart city initiatives, ultimately contributing to a more connected and efficient urban infrastructure.