**SMART PARKING SYSTEM**

**OBJECTIVES:**

The Smart Parking System aims to optimize urban parking by providing real-time parking availability information to drivers. The key objectives include:

**1. Real-Time Parking Availability:** Utilize IOT- sensors to detect and transmit real-time parking occupancy data.

**2. Mobile App Development**: Create a user-friendly mobile application to display parking availability information.

**3. Raspberry Pi Integration**: Utilize Raspberry Pi as a central hub to collect and process data from IOT sensors.

**4. Efficient Parking Management:** Enable efficient use of parking spaces, reducing congestion, and minimizing search time for drivers.

**5. Environmental Impact**: Reduce emissions caused by vehicles searching for parking spaces.

**IOT Sensor Setup:**

IOT sensors are deployed in each parking space to detect occupancy. These sensors can be infrared, ultrasonic, or magnetic sensors. They are connected to Raspberry Pi devices via a wireless or wired connection.

**Mobile App Development:**

The mobile app is designed for both Android and iOS platforms. It communicates with the central system (Raspberry Pi) to fetch real-time parking availability data and displays it to users. The app includes features like:

- Real-time Parking Availability: Displays the number of available parking spaces.

- Navigation: Provides directions to the nearest available parking space.

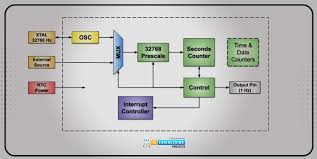
- Reservation: Allows users to reserve a parking space in advance.

- Payment Integration: Enables users to pay for parking within the app.



**Raspberry Pi Integration**:

Raspberry Pi acts as the central processing unit. It receives data from IOT sensors, processes the information, and sends it to the mobile app via APIs. Python scripts handle data processing and communication with the app.



**Code Implementation:**

Python scripts are utilized for Raspberry Pi programming. The scripts handle data processing, sensor communication, and API interactions. Additionally, mobile app development involves languages like Swift for iOS and Java/ KOTLIN for Android.

Code Snippet (Sample Python Code for Data Processing):

python

# Sample Python code for processing sensor data

import RPi.GPIO as GPIO

import time

# Initialize GPIO pins for sensor input

GPIO.setmode(GPIO.BOARD)

TRIG = 11

ECHO = 13

GPIO.setup(TRIG, GPIO.OUT)

GPIO.setup(ECHO, GPIO.IN)

def get\_distance():

# Send ultrasonic pulse

GPIO.output(TRIG, True)

time.sleep(0.00001)

GPIO.output(TRIG, False)

start\_time = time.time()

stop\_time = time.time()

# Measure pulse duration

while GPIO.input(ECHO) == 0:

start\_time = time.time()

while GPIO.input(ECHO) == 1:

stop\_time = time.time()

# Calculate distance

elapsed\_time = stop\_time - start\_time

distance = (elapsed\_time \* 34300) / 2

return distance

# Main loop to continuously monitor parking occupancy

while True:

distance = get\_distance()

# Process distance data and send it to the central system

# Implement logic to update parking availability status

# Send data to the mobile app via APIs

time.sleep(1)

**Benefits of Real-Time Parking Availability System:**

**For Drivers:**

**1. Time Savings**: Drivers can quickly find available parking spaces, reducing search time.

**2. Reduced Stress**: Eliminates the frustration of searching for parking, leading to a more positive driving experience.

**3. Cost Efficiency:** Avoids unnecessary fuel consumption, saving money for drivers.

**4. Convenience**: Allows users to reserve parking spaces in advance, ensuring a spot upon arrival.

**Alleviating Parking Issues:**

**1. Optimized Space Utilization**: Efficient use of parking spaces reduces congestion and maximizes occupancy rates.

**2. Environmental Impact**: Decreases vehicle emissions as cars spend less time searching for parking.

**3. City Planning:** Provides valuable data for urban planners to optimize parking infrastructure based on demand patterns.

**4. Improved Traffic Flow**: Reduces traffic congestion caused by cars circling in search of parking spaces.

By implementing a Smart Parking System, cities can significantly enhance the overall urban mobility experience, benefitting both drivers and the community as a whole.