SMART PARKING

DEVELOPING SMART PARKING SYSTEM USING ARDUINO:

Developing a smart parking system using Arduino is another viable option for creating a cost-effective and customizable solution. Here's a basic guide on how to develop a smart parking system using Arduino:

Components and Materials:

- **Arduino Board**: Choose a suitable Arduino board (e.g., Arduino Uno, Arduino Mega) depending on the number of parking spaces and sensors you plan to use.
- **Proximity Sensors**: Use ultrasonic sensors or IR sensors to detect vehicle presence in parking spaces.
- **LED Displays**: LED displays or status lights to show the availability of parking spots.
- **Wi-Fi/Bluetooth Module**: To connect your Arduino to the internet and enable data transmission and remote monitoring.
- **Mobile App/Web Interface**: Develop a mobile app or web interface for users to check parking availability and make reservations.
- **Database**: Set up a database to store information about parking spaces, reservations, and user data.
- **Server**: Develop a server application that communicates with the Arduino and the database. You can use platforms like Raspberry Pi or a cloud-based server.

Development Steps:

- **Set up Arduino:**
- Load the Arduino IDE and install the necessary libraries.
- Configure the Arduino board and Wi-Fi/Bluetooth module for network connectivity.
- **Sensor Setup:**
- Connect proximity sensors to the Arduino board.
- Write Arduino code to read data from the sensors and detect vehicle presence.
- **Database and Server:**
- Set up a database to store information about parking spaces, reservations, and user data.
- Develop a server application that communicates with the Arduino and the database. You can use platforms like Raspberry Pi or a cloud-based server.
- **User Interface (App or Web):**
- Create a mobile app or web interface that allows users to check parking availability and make reservations.

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- Integrate payment gateways for online payments if needed.
- **Data Processing and Display:**
- Write code on the Arduino to send data about parking space availability to the server.
- Develop code to update LED displays or status lights to indicate the availability of parking spots.
- **Security and Access Control:**
- Implement security measures to protect the system from unauthorized access.
- Create user authentication and authorization processes.
- **Testing and Debugging:**
- Thoroughly test the system to ensure accurate sensor readings, data transmission, and user interface functionality.
- Debug any issues that arise during testing.
- **Deployment:**
- Install the Arduino and sensors in the parking area.
- Ensure a stable power supply.
- **User Training and Support:**
- Educate users on how to use the smart parking system.
- Provide support channels for user inquiries and issues.
- **Monitoring and Maintenance:**
- Continuously monitor the system's performance and resolve any issues that may arise.
- Plan for regular maintenance and updates to the system.

Consider scalability, security, and the specific needs of your parking area when developing a smart parking system using Arduino. Regularly update and maintain the system to ensure its continued functionality and reliability.

ARDINO CODE:

```
#include <Wire.h>
#include <LiquidCrystal_I2C.h>
LiquidCrystal_I2C lcd(0x27, 16, 2);
#include <Servo.h>
Servo myservo1;


int IR1 = 2;
int IR2 = 4;
int SmokeDetectorPin = 6;
int BuzzerPin = 7;
```

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```
int Slot = 4;


bool flag1 = false;
bool flag2 = false;


unsigned long lastLcdUpdate = 0;
unsigned long lcdUpdateInterval = 1000;


void setup() {
  lcd.begin(16, 2);
  lcd.backlight();
  pinMode(IR1, INPUT);
  pinMode(IR2, INPUT);
  pinMode(SmokeDetectorPin, INPUT);
  pinMode(BuzzerPin, OUTPUT);


  myservo1.attach(3);
  myservo1.write(100);


  lcd.setCursor(0, 0);
  lcd.print("     ARDUINO    ");
  lcd.setCursor(0, 1);
  lcd.print(" PARKING SYSTEM ");
  delay(2000);
  lcd.clear();

  Serial.begin(9600);
}


void loop() {
  if (digitalRead(IR1) == LOW && !flag1) {
    if (Slot > 0) {
```

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```
      flag1 = true;
      if (!flag2) {
        myservo1.write(0);
        Slot--;
      }
    } else {
      displayMessage("    SORRY :(    ", "  Parking Full  ");
    }
  }


  if (digitalRead(IR2) == LOW && !flag2) {
    flag2 = true;
    if (!flag1) {
      myservo1.write(0);
      Slot++;
    }
  }


  if (flag1 && flag2) {
    delay(1000);
    myservo1.write(100);
    Serial.println("Servo returned to initial position.");
    flag1 = false;
    flag2 = false;
  }



  if (millis() - lastLcdUpdate >= lcdUpdateInterval) {
    updateLcdDisplay();
    lastLcdUpdate = millis();
  }


}


void updateLcdDisplay() {
```

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```
  if (digitalRead(SmokeDetectorPin) == HIGH) {
    displayMessage("   WARNING!   ", " Smoke Detected ");
    digitalWrite(BuzzerPin, HIGH);
  } else {
    displayMessage("    WELCOME!    ", "Slot Left: " + String(Slot));
    digitalWrite(BuzzerPin, LOW);
  }
}


void displayMessage(const char *line1, const String &line2) {
  lcd.clear();
  lcd.setCursor(0, 0);
  lcd.print(line1);
  lcd.setCursor(0, 1);
  lcd.print(line2);
}
```

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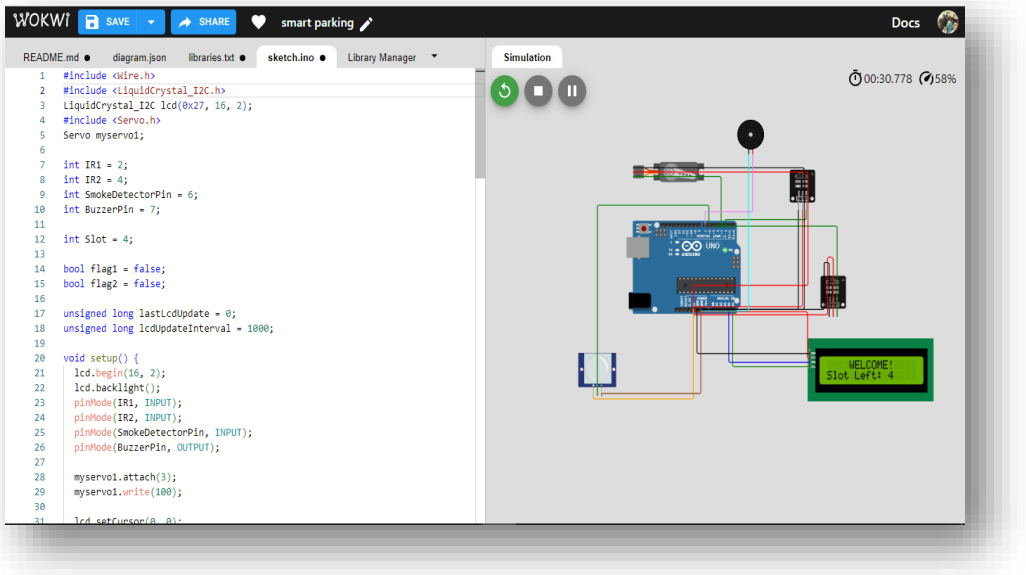
CIRCUIT:



To collect data from sensors connected to a Raspberry Pi and send that data to a cloud server or a mobile app server, you'll need to write Python scripts that use suitable libraries and APIs for data transmission. Below is a basic example of Python scripts for collecting data from sensors (assuming ultrasonic distance sensors) and sending it to a cloud server.

First, make sure you have the necessary libraries installed. You might need to install **requests** for making HTTP requests and **RPi.GPIO** for working with GPIO pins. You can do this using pip:

Python script that collects data from an ultrasonic sensor and sends it to a cloud server:

```
import RPi.GPIO as GPIO
import time
import requests

TRIG_PIN = 23
ECHO_PIN = 24

GPIO.setmode(GPIO.BCM)
GPIO.setup(TRIG_PIN, GPIO.OUT)
GPIO.setup(ECHO_PIN, GPIO.IN)

def get_distance():
    # Send a short pulse to trigger the ultrasonic sensor
    GPIO.output(TRIG_PIN, True)
```

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```
    time.sleep(0.00001)
    GPIO.output(TRIG_PIN, False)

     while GPIO.input(ECHO_PIN) == 0:
       pulse_start = time.time()
    while GPIO.input(ECHO_PIN) == 1:
       pulse_end = time.time()


    pulse_duration = pulse_end - pulse_start
    distance = pulse_duration * 17150  # Speed of sound in cm/s
    distance = round(distance, 2)

    return distance

try:
    while True:
       distance = get_distance()
       print(f"Distance: {distance} cm")


       server_url = " "//URL
       payload = {"distance": distance}
       headers = {"Content-Type": "application/json"}
       response = requests.post(server_url, json=payload, headers=headers)

       if response.status_code == 200:
          print("Data sent successfully")
       else:
          print("Failed to send data")

       time.sleep(5)

except KeyboardInterrupt:
    GPIO.cleanup()
```

This script continuously reads distance data from the ultrasonic sensor, sends it to a cloud server (or mobile app server) via an HTTP POST request, and waits for 5 seconds before taking the next measurement.

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Make sure to replace with the actual URL of your cloud server's API endpoint. Additionally, handle any authentication and security requirements according to your server's specifications.

This is a basic example. Depending on your project's complexity, you may need to implement more advanced error handling, security measures, and scalability for data collection and transmission.