**IoT-based Car Parking System Documentation**

**Overview**

The IoT-based Car Parking System is a project that automates and monitors the car parking process using NodeMCU, IR sensor, servo motor, and the Blynk IoT platform. The system detects the presence of a car in a parking spot using an IR sensor, controls the opening and closing of a barrier using a servo motor, and provides real-time monitoring and control through the Blynk mobile app. This documentation provides an overview of the project, including its features, hardware requirements, setup instructions, and usage guidelines.

**Features**

* Automatic detection of car presence using an IR sensor
* Remote monitoring and control of parking spots using the Blynk mobile app
* Real-time updates on parking spot availability
* Barrier control using a servo motor
* Push notifications and alerts for parking spot status changes

**Hardware Requirements**

* NodeMCU (ESP8266-based development board)
* IR sensor module
* Servo motor
* Jumper wires
* Power supply (5V)

**Circuit Diagram**

Include a circuit diagram that illustrates the connections between the NodeMCU, IR sensor, servo motor, and any additional components. Label the pins and components used in the circuit.

**Setup Instructions**

1. Connect the IR sensor to the NodeMCU as follows:
   * VCC to 3.3V or 5V pin
   * GND to GND pin
   * OUT to a digital input pin (e.g., D1)
2. Connect the servo motor to the NodeMCU as follows:
   * VCC to 5V pin
   * GND to GND pin
   * Signal pin to a digital output pin (e.g., D2)
3. Connect the NodeMCU to your computer using a USB cable.
4. Set up the Arduino IDE or preferred development environment with the necessary libraries for programming the NodeMCU.
5. Install the Blynk mobile app on your smartphone (available for Android and iOS).
6. Create a new project in the Blynk app and obtain the authentication token.
7. Open the car parking system project code in the Arduino IDE.
8. Modify the code to configure the Wi-Fi settings (SSID and password) for the NodeMCU to connect to your local network.
9. Insert the Blynk authentication token in the code.
10. Upload the code to the NodeMCU.
11. Power up the circuit using a suitable power supply.
12. Launch the Blynk app on your smartphone and connect to your Blynk account.
13. The Blynk app allows you to monitor and control the car parking system, view real-time updates, and receive notifications.

**Usage Guidelines**

1. Open the Blynk app and navigate to the car parking system project.
2. The app displays the status of each parking spot, indicating whether it is vacant or occupied.
3. As a car approaches a parking spot, the IR sensor detects its presence and updates the status on the Blynk app.
4. To reserve a parking spot, tap on the corresponding spot on the Blynk app.
5. The NodeMCU receives the reservation command and activates the servo motor to open the barrier.
6. Once the car has parked, the IR sensor detects its presence and updates the status on the Blynk app.
7. To release a parking spot, tap on the corresponding spot on the Blynk app.
8. The NodeMCU receives the release command and activates the servo motor to close the barrier.
9. The Blynk app provides real-time updates on parking spot availability, allows for remote monitoring and control, and sends push notifications and alerts for parking spot status changes.

**Conclusion**

The IoT-based Car Parking System offers an automated and efficient solution for managing parking spots using NodeMCU, IR sensor, servo motor, and the Blynk IoT platform. By integrating these components, the system accurately detects car presence, controls the opening and closing of barriers, and provides real-time monitoring and control through the Blynk mobile app. With its features and capabilities, the car parking system improves parking efficiency and convenience while offering seamless remote access and monitoring for users.