Web-based Remote Control System for a Car using Python and MQTT

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Objectives:

The objective of this project is to create a web-based remote control system for a car using Python for the server-side code, MQTT for message communication, and HTML/CSS/JavaScript for the client-side interface. The system will allow users to control the car's movement (forward, backward, left, right) using a virtual joystick on a webpage.

Implementation:

Server Setup: Use Python's `http.server` module to create a simple HTTP server that serves the webpage and handles MQTT message sending.

Client-Side Interface: Create a webpage using HTML, CSS, and JavaScript to display the virtual joystick and send joystick position data to the server via MQTT.

MQTT Communication: Use the `paho.mqtt.client` library to establish a connection to an MQTT broker and publish joystick position data to a specific topic.

Arduino Integration: On the Arduino side, subscribe to the MQTT topic and interpret the received joystick position data to control the car's movement using appropriate motor control mechanisms.

Testing and Debugging: Implement a rubric to test the success of the implementation, including ensuring the webpage loads correctly, the joystick moves smoothly, and the car responds appropriately to joystick inputs.

Rubrics for Testing Success:

The webpage should load correctly and display the virtual joystick.

The joystick should move smoothly in all directions.

Joystick movements should be accurately reflected in the displayed joystick value.

MQTT messages should be successfully sent to the broker when the joystick is moved.

The Arduino should receive and interpret MQTT messages correctly to control the car's movement.

Future Enhancements:

Implementing additional features such as speed control, camera feed integration, or obstacle detection.

Improving the user interface for better usability and responsiveness.

Adding security measures to protect the MQTT communication and the web interface from unauthorized access.