

<b>RoboScout: A Wireless Rover with Camera Feed and Robotic Arm</b>
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<p><b>Synopsis of the Project:</b></p> <p>RoboScout is an innovative project that presents a versatile wireless rover equipped with a camera feed and a robotic arm, aimed at various applications such as surveying ruins, emergency response, or industrial automation. The project is comprised of two modules: a rover module and a controller module, both featuring ESP8266 boards and communication via Bluetooth Low Energy (BLE) in a server-client model.</p> <p>In Stage 1, the rover module is controlled via an analogue joystick, allowing movement in four directions. Commands are transmitted from the controller (server) to the rover (client) as strings, which are interpreted by the ESP8266 on the rover side to drive the L298N motor driver, enabling motion. Additionally, ultrasonic sensors on the rover detect obstacles within 10 cm, triggering a buzzer to alert the operator.</p> <p>Stage 2 introduces real-time camera feed functionality using an ESP32 CAM module, operated via SG90 servo motors for two-axis movement. The camera feed is accessible within a private network via an IP address. Similar to rover movement, camera positioning is controlled by another analogue joystick on the controller, with commands relayed to the rover's ESP8266. The PCA9685 servo motor driver adjusts the camera's position accordingly.</p> <p>In Stage 3, the project expands its capabilities with the implementation of two robotic arms. One arm, affixed to the rover, is controlled by servo motors, while the other, a miniature replica operated by potentiometers, is on the controller. Movement of the miniature arm alters the resistance values in the potentiometers, which are transmitted to the rover's ESP8266 as a string. These values are parsed and used to drive the arm motors via the servo motor driver, enabling synchronized movement between the controller's miniature arm and the rover's arm.</p> <p>Continuous communication between the modules ensures seamless operation, with OLED displays on both modules providing visual feedback. The project's versatility makes it applicable across various scenarios, including reconnaissance missions, disaster response efforts, or industrial automation tasks. With its wireless capabilities, camera feed, and robotic arm functionality, RoboScout represents a significant advancement in remote exploration and intervention technologies.</p>