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Surveillance Military Dog Robot Equipped with Wireless Camera and Weapon

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Abstract: *Border surveillance presents significant challenges due to vast terrains, harsh environmental conditions, and the constant risk to human patrol units. Traditional monitoring methods are limited by human fatigue, restricted visibility, and exposure to danger, which can compromise national security. To address these limitations, this work proposes the design and implementation of a mobile surveillance robot, modeled as a robotic dog, equipped with an ESP32 microcontroller, wireless camera, and IoT-based control interface. The system integrates DC gear motors for mobility, a servo-driven pan–tilt mechanism for flexible video coverage, and motion detection sensors for intrusion alerting. A real-time video streaming module enables continuous monitoring through Wi-Fi, while teleoperation commands are relayed via a lightweight IoT dashboard. Performance evaluation of the prototype demonstrates reliable video transmission within a communication range of up to X meters, average latency of Y ms, and obstacle detection accuracy exceeding Z%. The robot achieves an operational runtime of approximately N hours under continuous surveillance mode. The proposed system offers a cost-effective, portable, and scalable solution to augment border security by reducing human exposure to hazardous environments. Although the current design is limited by Wi-Fi range and basic obstacle avoidance, it provides a promising foundation for future integration of AI-based detection, GPS-enabled navigation, and non-lethal deterrence mechanisms.*

Keywords: ESP32, Surveillance robot, IoT, Wireless camera, Mobile robot, Border security, Non-lethal deterrence.

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