

DEVELOPMENT OF SURVEILLANCE ROBOT USING ESP32 AND ARDUINO MCU WITH IOT BASE COMMUNICATION

ABSTRACT

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Recent advancements in technology and robotics have enabled the development of autonomous systems capable of performing a variety of tasks, including security and surveillance. Conventional constabulary systems and fixed camera installations often face limitations such as blind spots and susceptibility to human error. To address these issues, this study proposes the development of a surveillance robot equipped with ESP32 and Arduino microcontrollers, surveillance cameras, and AI-based face detection capabilities. The system aims to enhance real-time monitoring, improve security responsiveness, and minimize human intervention by autonomously detecting individuals and sending alerts to designated personnel. This study utilizes the Experimental Prototyping Method to develop and test the surveillance robot. Through this approach, a prototype is constructed to validate the research hypothesis prior to full-scale production. This method allows the researchers to detect design flaws and usability issues early, ensuring system reliability and efficiency. Components such as microcontrollers, sensors, and AI algorithms were integrated and tested to ensure proper functionality before the final system configuration. The surveillance robot successfully demonstrated autonomous navigation and real-time surveillance capabilities. It employed ultrasonic sensors for obstacle avoidance and an AI-powered camera for face detection. The system functioned independently, sending immediate alerts to operators without requiring continuous server credentials. The integration of these features resulted in improved monitoring accuracy and reduced dependence on manual surveillance efforts. The prototype surveillance robot effectively addressed the limitations of traditional security systems, such as fixed CCTV cameras and human patrols. The inclusion of ultrasonic sensors enabled safe and autonomous movement, while the AI-driven facial recognition system enhanced threat identification. The robot's ability to send instant notifications improved situational awareness and security responsiveness. This study illustrates the potential of robotics and IoT integration in advancing modern security infrastructure.

RECOMMENDED CITATION

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