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Design and Implementation of IoT-Based War Spying Robot with Wireless Night Vision Camera

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ABSTRACT

The goal of this project is to create a robot that uses a wireless night vision camera and an Android app to monitor human activity over Wi-Fi. The user receives real-time visual data transmissions from the robot. It ensures constant surveillance by transmitting live video even in dimly lit areas. The robot can move in the following directions: forward, left, right, backward, and stop when controlled by Wi-Fi. Operation from distant locations is made possible by sending data to a remote IoT cloud database. The system offers a reasonably priced alternative for remote surveillance because it is constructed with a low-cost microprocessor. Since the robot's video can be broadcast to a PC, it can be used for remote surveillance applications like inspections, reconnaissance, and monitoring.

Keywords: *Internet of Things, Integrated Development Environment, Wireless Fidelity, Infrared.*

1. INTRODUCTION

In modern warfare, real-time intelligence and precision are crucial for achieving strategic success while safeguarding human lives. Traditional reconnaissance methods, such as using human scouts, pose significant risks and often result in casualties. Consequently, the defense sector is shifting toward unmanned surveillance systems, especially those integrated with Internet of Things (IoT) technology. These systems offer safer, more efficient alternatives by allowing remote control and monitoring in hostile or low-visibility environments, thereby improving operational security and minimizing direct human involvement. This project focuses on the development of an IoT-based surveillance robot equipped with a wireless night vision camera, gas and fire sensors, and ultrasonic obstacle detection. Designed for challenging terrains, the robot transmits live video feeds and sensor data, enabling real-time decision-making. Controlled via the Blynk IoT app over Wi-Fi or Bluetooth, it features a stable, wheeled base for maneuvering across rough surfaces. Powered by an Arduino microcontroller, it ensures continuous surveillance and intelligence gathering, especially for border security and other high-risk operations. With the ability to operate without fatigue or emotional interference, these robots reduce the need to place soldiers in dangerous conditions. Beyond military use, such robots have significant potential in civilian and emergency applications. In areas affected by fire, chemical spills, or structural collapse, these devices can safely navigate and relay crucial information using their onboard sensors and cameras. Their autonomous navigation, enabled by path-adjustment algorithms, allows them to function effectively in unpredictable and hazardous environments. As IoT and robotics continue to evolve, these integrated systems are set to revolutionize both military strategies and public safety efforts, offering smarter, safer, and more efficient solutions to modern-day challenges.

2. LITERATURE REVIEW

A literature survey reveals both the potential and limitations of RF-based spying robots. Dixit et al. (2024) highlighted a war spying robot with night vision, but its Bluetooth control limits its range, and it works by remotely navigating the warzone using wireless controls. Similarly, Rajeshwaran et al. (2023) focused on an IoT-based robot, but its RF communication faces interference and range restrictions, functioning by using IoT sensors for real-time monitoring. Bandani et al. (2023) demonstrated a spy robot using an Android interface, yet Bluetooth's short range limits its utility, allowing control through a mobile app for surveillance.

Selvaraj et al. (2023) explored a night vision spy bot with multi-sensors but lacked details on mobility and durability, offering surveillance and detection through multiple sensor inputs. Mohite et al. (2023) pointed out that bomb-detecting robots lack fine motor skills needed for precise tasks, using robotic arms for detecting and disarming bombs. Common issues include limited range, security vulnerabilities, and mobility concerns.

3. PROBLEM STATEMENT

Conventional military surveillance methods typically depend on human deployment, which can put personnel at considerable risk, particularly in dangerous or hard-to-reach locations. These systems also struggle with maintaining uninterrupted observation, especially during nighttime or in low-light environments. This highlights the need for a dependable, remotely operated system capable of delivering real-time intelligence while reducing the direct involvement of soldiers in high-risk areas.

4. EXISTING SYSTEM

While human-operated military surveillance systems provide advantages such as adaptability and decision-making capabilities, they also present several limitations. Operators are susceptible to fatigue, human error, and subjective judgment, which can result in overlooked threats or inaccurate evaluations. Their monitoring capacity is constrained by physical and cognitive limits, making it difficult to maintain continuous surveillance over vast or complex areas. Moreover, reliance on human personnel involves significant costs for training, equipment, and upkeep. These systems are also vulnerable to risks such as injury, capture, or psychological strain, which can compromise mission effectiveness.

5. PROPOSED SYSTEM

An IoT-enabled war surveillance robot equipped with a wireless night vision camera provides multiple strategic advantages. This integration allows for continuous, remote monitoring of enemy movements, even in low-light environments, delivering crucial intelligence to support military operations. Utilizing robots for surveillance minimizes the risk to human soldiers, helping to safeguard lives during high-risk missions. These IoT-based systems can be operated remotely, reducing manpower requirements and associated costs, while collecting diverse data through onboard sensors and AI functionalities. The real-time information gathered enhances coordination, situational awareness, and decision-making across military units. Additionally, these robots can be reprogrammed and adapted to evolving battlefield scenarios, offering the flexibility needed to respond effectively to emerging threats.

6. PROJECT OBJECTIVES

An IoT-controlled mobile robot was designed to operate in challenging terrains and deliver real-time reconnaissance in hazardous or remote areas. It features a wireless night vision camera that streams high-quality video in real time, enabling effective monitoring even in low-light or dark conditions. Integrated with IoT technology, the system allows remote access and control via cloud platforms or mobile applications, providing users with constant situational awareness. The robot is engineered for power efficiency and durability, ensuring reliable operation in demanding military or surveillance environments. Its rugged design, combined with smart mobility and long-range wireless communication, supports continuous 24/7 monitoring and data transmission.

7. METHODOLOGY

The block diagram illustrates the architecture of an IoT-based surveillance robot system. At the core is the ESP8266 Node MCU microcontroller, which coordinates data processing, communication, and control. Gas and IR sensors are connected to the microcontroller to detect harmful gases and nearby obstacles, enabling safe environmental navigation. The ESP32-CAM module is used for real-time video transmission, feeding live footage to users remotely. Power is supplied via a power supply or solar panel, ensuring continuous operation. A motor driver (L298N) receives control signals from the ESP8266 to operate DC motors for mobility. The Blynk IoT platform is used for wireless control and monitoring through a mobile app. Commands for movement—forward, backward, left, and right—are sent through Blynk and executed via the motor driver. The ESP8266 also handles UART communication with the ESP32-CAM. This setup ensures a robust, remotely operable surveillance robot suitable for defense and monitoring application.

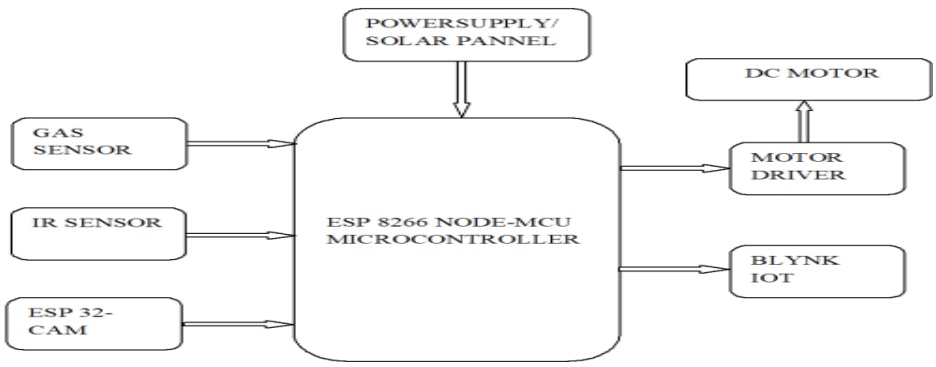

Figure 1: Block Diagram

8. IMPLEMENTATIONS

We created the IoT-based battlefield spying robot by combining several hardware and software components to provide autonomous surveillance and remote controled capabilities. The ESP8266 Node MCU is at the heart of the system, processing sensor data, controlling motor movement via the L298N motor driver, and allowing for wireless communication. The robot detects dangerous chemicals using an MQ-series gas sensor that has been calibrated for accuracy and is attached to the ESP8266's analog port. An infrared sensor is employed for obstacle identification, allowing for safe navigation in unfamiliar terrains, and suitable filtering and noise reduction algorithms were implemented in code to increase sensor dependability. To improve visual monitoring, a real-time video transmission module called ESP32-CAM was created. It sends video data to the Blynk IoT platform over Wi-Fi, allowing users to watch the robot's surroundings and make educated decisions remotely. The ESP32-CAM connects with the ESP8266 via UART, and power-saving measures have been included to increase battery life. The L298N driver uses GPIO pins to operate the motors, with PWM signals regulating speed and direction. Heat dissipation measures, such as heat sinks, were studied to guarantee safe functioning during load. The Blynk control panel allows for directional control by smartphone, with instructions such as forward, reverse, left, and right available through an easy interface. To ensure reliable operation, safety features such as power separation, emergency stop mechanisms, and voltage regulation were added. To ensure ongoing operation, all modules were fueled by either a regular power source or a solar panel. The Blynk app displays real-time fire and gas detection alerts, boosting response. This solution works well for surveillance, and the architecture is scalable for applications such as environmental monitoring, smart automation, and defense.

9. SNAPSHOTS

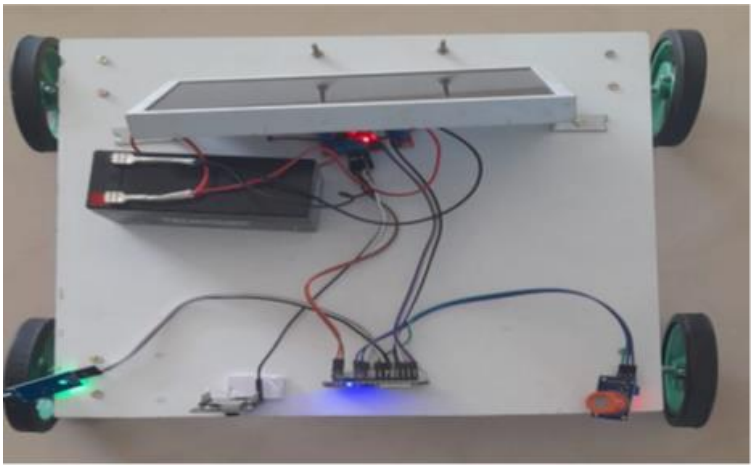

Figure 2: Design and Implementation of IoT based War Spying Robot Using Wireless Night Vision Camera.

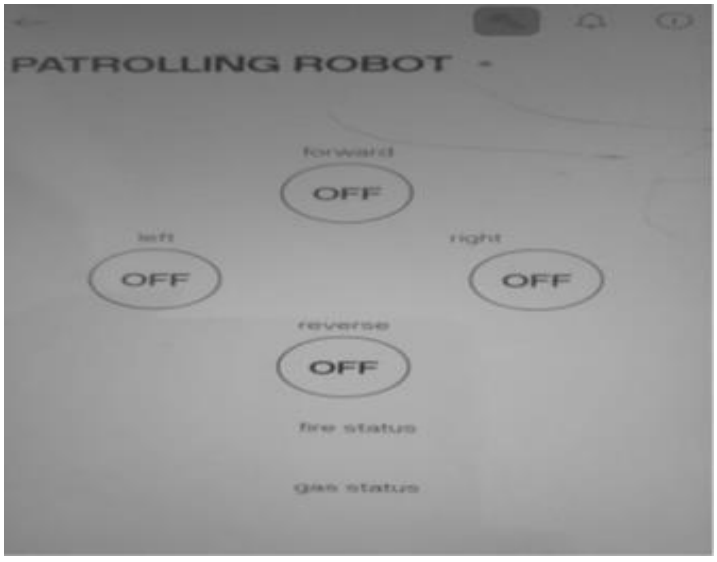

Figure 3: Design of the Control panel.

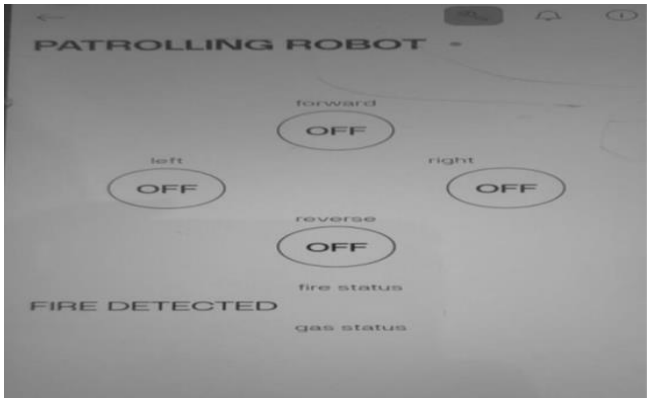

Figure 4: When fire detected

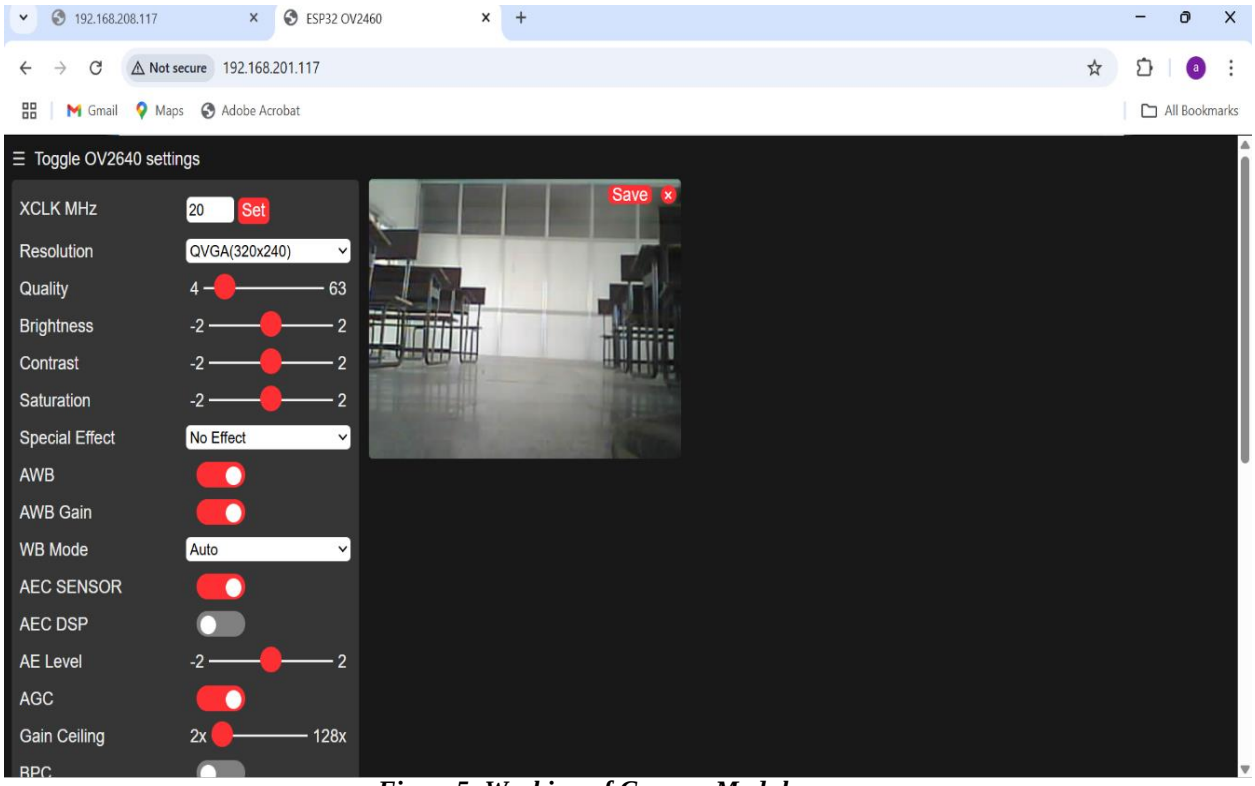

Figure 5: Working of Camera Module

10. RESULTS AND DISCUSSIONS

The developed IoT-based war spying robot successfully demonstrated its ability to monitor hazardous environments remotely through integrated sensing and wireless video capabilities. The gas and flame sensors accurately detected environmental threats, triggering instant alerts on the Blynk IoT platform. Obstacle detection using IR sensors allowed the robot to navigate safely, while the ESP32-CAM module provided real-time visual feedback for improved situational awareness. Directional control via the Blynk app was precise, with smooth motor response to user inputs. The ESP8266 Node MCU microcontroller effectively processed sensor data and managed system functions. Power flexibility, through conventional supply or solar energy, ensured uninterrupted operation. The system responded promptly to fire and gas hazards, confirming its reliability. Communication between the robot and the user was stable, supporting seamless remote operation. The robot's design supports easy customization and expansion for future applications. Overall, the system proved to be a reliable, efficient, and adaptable solution for surveillance in high-risk area.

11. CONCLUSION

The design and implementation of an IoT-based war spying robot with a wireless night vision camera enhances battlefield surveillance and intelligence gathering. Powered by the ESP8266 Node-MCU, the robot integrates a gas sensor for safety, an IR sensor for threat detection, and an ESP32-CAM module for night vision surveillance. A solar panel ensures continuous operation, while a DC motor with a motor driver enables autonomous navigation. The robot transmits real-time data via the ESP8266, allowing seamless communication with command centers.

The Blynk IoT platform offers a user-friendly interface for remote monitoring, control, and decision-making. This robot combines advanced sensing, autonomous navigation, and secure communication, making it a valuable tool for military intelligence and reconnaissance. Future enhancements could include AI for object detection and improved obstacle avoidance.

REFERENCES

[1] Dixit, Monika, Sneha Kumari, Danish Ahmad, and Sazia Shafak. "Design and Implementation of RF Based War Spying Robot with Wireless Night Vision Camera." In 2024 11th International Conference on Reliability, Infocom Technologies and Optimization (Trends and Future Directions)(ICRITO), pp. 1-5. IEEE, 2024.

[2] Sharma, Divya, and Usha Chauhan. "War spying robot with wireless night vision camera." In 2020 2nd international conference on advances in computing, communication control and networking (ICACCCN), pp. 550-555. IEEE, 2020.

[3] Rajeshwaran, K., M. Rishma, V. Ovia Pavai, and D. Nandhini. "Sensor Assisted War Field Spying Robot using Internet of Things (IoT)." In 2023 4th International Conference on Electronics and Sustainable Communication Systems (ICESC), pp. 5-10. IEEE, 2023.

[4] Patoliya, Jignesh, Haard Mehta, and Hitesh Patel. "Arduino controlled war field spy robot using night vision wireless camera and Android application." In 2022 5th Nirma University International Conference on Engineering (NUiCONE), pp. 1-5. IEEE, 2022.

[5] Bandani, Anil Kumar, Anupama Bollampally, Sri Sahithi, Revanth Naik, and Naveen Kumar. "Design of Spy Robot with Wireless Night Vision Camera Using Android." In 2023 International Conference for Advancement in Technology (ICONAT), pp. 1-5. IEEE, 2023.

[6] Ravi, B., Damera Ganesh, and Bollam Madhu Bhanu Chandra. "Design and Development of Two Wheel Drive Track Spy Robot with Night Vision Camera." Journal of Science & Technology (JST) 8, no. 5 (2023): 104-116.

[7] Selvaraj, D., M. Abithaa, A. Evangeline, M. Arthi, and K. Hashini. "The Night Vision Spy Bot." In 6th International Conference on Intelligent Computing (ICIC-6 2023), pp. 150-158. Atlantis Press, 2023.

[8] Keerthana, S., A. R. Vellaiyan, and M. Rajamohan. "Bomb detection and disposal robot: Aid for risky Military Fields." International Journal of Engineering and Advanced Technology (IJEAT) 8, no. 6 (2019).

[9] Dhule, Abhijeet, Neha Sangle, Supriya Nagarkar, and Asmita Namjoshi. "Military Surveillance Robot." International Research Journal of Engineering and Technology (IRJET) 7, no. 07 (2020): 2395-0056.