IJIRIS: International Journal of Innovative Research in Information Security E-ISSN: 2349-7017
Volume 12, Issue 03, March 2026 P-ISSN: 2349-7009
https://www.ijiris.com/archives
https://doi.org/10.26562/ijiris.2025.v1203.18

Development of Long Range Surveillance Robot with Obstacle Avoidance

M.E.Dhivya
Assistant Professor, Department of Robotics and Automation
Sengunthar Engineering College (Autonomous),Tiruchengode, India
medhivya.ra@scteng.co.in
https://orcid.org/0009-0004-9832-6179
S.Bhuvaneswaran,S.Indiramurugan
Department of Robotics and Automation
Sengunthar Engineering College (Autonomous),Tiruchengode, India
waranbhuvanesh887@gmail.com, indiramurugann@gmail.com

Publication History
Manuscript Reference No: IJIRIS/RS/Vol.12/Issue03/ISMR26.MRIS10097
Research Article Open Access| Double-Blind Peer-Reviewed| Article ID: IJIRIS/RS/Vol.12/Issue03/ISMR26.MRIS10097
Received: 31, January 2026, Revised: 14, February 2026,Accepted: 17, March 2026, Published Online: 25,March 2026.
https://www.ijiris.com/volumes/Vol12/iss-03/18.ISMR26.MRIS10097.pdf **BibTeX Key: Dhiviya@2026Development**
Article Citation:Dhiviya,Bhuvaneswaran,Indiramurugan(2026),Development of Long Range Surveillance Robot with Obstacle Avoidance ,IJIRIS: International Journal of Innovative Research in Information Security,Volume 12, Issue 03 of 2026 pages 170-172 **Doi:>** https://doi.org/10.26562/ijiris.2026.v1203.18
IJIRIS papers should be cited as IJIRIS (International Journal of Innovative Research in Information Security,AM Publications, India 2026, ISSN 2349-7017, https://doi.org/10.26562/ijiris.2026.v1203.18 The journal's official abbreviation is IJIRIS.
Orcid: https://orcid.org/0009-0004-9398-7488

Abstract: In recent years, robotics technology has played a significant role in improving surveillance and monitoring systems. This paper presents the design and implementation of a long-distance surveillance robot with obstacle avoidance capability. The proposed system is developed to monitor remote or hazardous environments where human presence may be risky or difficult. The robot is equipped with an ultrasonic sensor to detect obstacles in its path and automatically avoid collisions while navigating through unknown environments. A wireless or night vision camera is used to capture real-time video and transmit it to the user for monitoring purposes. The entire system is controlled by a microcontroller which processes sensor data and controls the movement of the robot. The proposed robot can be used in various applications such as military surveillance, security monitoring, disaster rescue operations, and industrial safety monitoring. The system aims to reduce human effort and improve safety by enabling remote surveillance with intelligent navigation capability.

I. INTRODUCTION

Robotics has become an important field in modern technology and is widely used in industries, healthcare, defense, and security systems. Surveillance robots are designed to monitor environments where human presence is dangerous, difficult, or not possible. These robots can move through different terrains, capture images or video, and transmit information to the operator in real time. One of the most important challenges in mobile robotics is safe navigation. When a robot moves in an unknown environment, it may encounter obstacles such as walls, objects, or other barriers. If the robot does not detect these obstacles, it may collide with them and cause damage to the system. Therefore, obstacle detection and avoidance are essential features in mobile robots. Obstacle avoidance systems use sensors such as ultrasonic sensors, infrared sensors, or cameras to detect nearby objects. These sensors measure the distance between the robot and the obstacle. When the robot detects an object within a certain distance, the controller processes the sensor data and changes the robot's direction to avoid collision. This process allows the robot to move safely and perform its surveillance task effectively. The proposed long-distance surveillance robot combines obstacle detection technology with wireless monitoring capabilities. The robot is designed to capture live video using a wireless camera while navigating through the environment with the help of obstacle avoidance sensors.

II. SYSTEM ARCHITECTURE

The proposed surveillance robot consists of several hardware and software components that work together to perform surveillance and navigation tasks. The central part of the system is a microcontroller which controls the overall operation of the robot. The microcontroller receives input from sensors and sends commands to other components of the system. An ultrasonic sensor is used to detect obstacles in front of the robot. The sensor emits ultrasonic sound waves and measures the time taken for the echo to return after hitting an object. Using this time difference, the system calculates the distance between the robot and the obstacle. If the detected distance is less than the predefined threshold value, the robot automatically changes its direction to avoid collision. The movement of the robot is controlled using DC motors connected through a motor driver module. The motor driver acts as an interface between the microcontroller and the motors, allowing the controller to manage the speed and direction of the robot. The robot is mounted on a chassis which holds all the electronic components and provides mechanical support. For surveillance purposes, a wireless or night vision camera is mounted on the robot.

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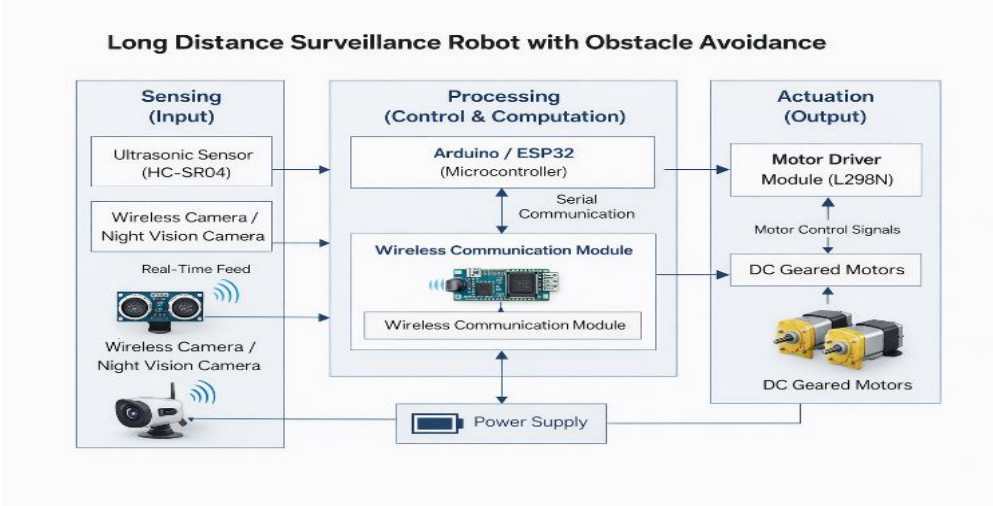
This camera captures real-time video of the surrounding environment and transmits it to a remote monitoring device such as a smartphone or computer. The video transmission allows the operator to observe the environment and control the robot if necessary.

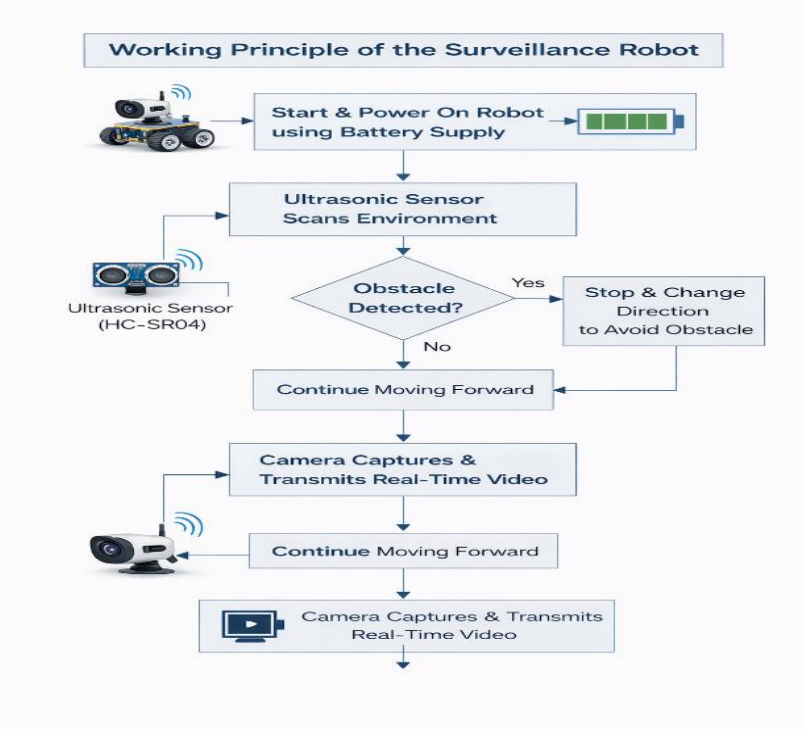


III. WORKING PRINCIPLE

The working principle of the surveillance robot is based on sensor-based navigation and wireless monitoring. When the robot is powered on, the microcontroller initializes all connected sensors and modules. The ultrasonic sensor continuously scans the area in front of the robot to detect any obstacles. As the robot moves forward, the ultrasonic sensor sends ultrasonic waves toward nearby objects. When these waves hit an object, they reflect back to the sensor. The sensor measures the time taken for the echo to return and calculates the distance between the robot and the obstacle. This distance information is sent to the microcontroller for processing. If the detected distance is greater than the predefined safe distance, the robot continues to move forward. However, if an obstacle is detected within the unsafe distance range, the microcontroller stops the robot and changes its direction by controlling the motors through the motor driver. This allows the robot to avoid collision and find a new path.

IV. HARDWARE IMPLEMENTATION

The hardware implementation of the surveillance robot involves integrating various electronic components on a robotic platform. The microcontroller acts as the main processing unit that controls all operations of the system. It is programmed using embedded programming languages such as Arduino programming language. The ultrasonic sensor is installed at the front side of the robot so that it can effectively detect obstacles in the path of movement. The motor driver module is connected between the microcontroller and the DC motors to control their speed and direction.



This allows the robot to move forward, backward, and turn left or right depending on the control signals received from the microcontroller. The wireless camera is mounted on the top section of the robot to provide a clear view of the surrounding area. In some cases, a night vision camera can also be used so that the robot can perform surveillance even in low-light or dark environments. The entire system is powered by a rechargeable battery which supplies power to all components of the robot.

V. APPLICATIONS

The long-distance surveillance robot can be used in many real-world situations where remote monitoring is required. In military applications, the robot can be used for border surveillance and reconnaissance missions. It can move through difficult terrain and transmit live video to military personnel. In disaster situations such as earthquakes or collapsed buildings, the robot can help rescue teams by entering dangerous areas and providing visual information about trapped victims or structural damage. The robot can also be used in industrial environments where hazardous gases or high temperatures make it unsafe for humans to enter. Another important application is in security systems where the robot can patrol buildings, warehouses, or restricted areas and provide continuous monitoring through its camera system.

VI. RESULTS

The proposed long-distance surveillance robot was successfully tested in different environments to evaluate its performance. The ultrasonic sensor accurately detected obstacles and the robot was able to avoid collisions effectively by changing its direction automatically. The wireless camera provided continuous real-time video transmission to the user device, enabling effective remote monitoring. The experimental results demonstrate that the system operates reliably and can be used for surveillance and security applications.

VII. ADVANTAGES

The proposed surveillance robot offers several advantages in terms of safety, efficiency, and cost. Since the robot can operate in dangerous environments, it reduces the risk to human life. The obstacle avoidance capability allows the robot to move safely without collisions. The wireless monitoring system provides real-time video surveillance which improves situational awareness. Additionally, the system can be implemented at a relatively low cost using easily available components such as Arduino, ultrasonic sensors, and DC motors.

VIII. FUTURE ENHANCEMENTS & ARCHITECTURAL MIGRATION

The proposed surveillance robot can be further improved by integrating advanced technologies to enhance its performance and functionality. In the future, artificial intelligence and computer vision techniques can be implemented to enable automatic object detection and tracking. GPS modules can be added to provide accurate location tracking of the robot during long-distance operations. Additionally, integrating advanced sensors and longer-range communication modules can improve navigation and surveillance capabilities in complex environments.

IX. CONCLUSION

This paper presented the design and development of a long-distance surveillance robot with obstacle avoidance capability. The robot uses ultrasonic sensors to detect obstacles and automatically adjust its direction to avoid collisions. A wireless camera is integrated into the system to provide real-time video surveillance to the operator. The proposed system demonstrates how robotics technology can be used to improve safety and monitoring in various environments. The robot can be used in military, industrial, and disaster management applications where remote surveillance is required. In the future, the system can be enhanced by integrating advanced technologies such as artificial intelligence, computer vision, GPS navigation, and autonomous path planning to improve the efficiency and intelligence of the surveillance robot.

REFERENCES

1. A. Kumar et al., "Obstacle Avoiding Robot: A Review," International Journal of Research in Engineering.
2. W. Budiharto, "Intelligent Surveillance Robot with Obstacle Avoidance Capabilities," Computational Intelligence and Neuroscience.
3. "Long Range Spy Robot with Metal and Obstacle Detection," IJERT.