

ANDROID CONTROLLED ROBOT WITH VIDEO SURVEILLANCE**Mrs. P. R. Gavhane^{*1}, Mr. Pranav Ramesh Pardhe², Miss. Harshada Ajay Vadak³****Miss. Shravani Pramod Yedke⁴, Miss. Sakshi Bhausaheb Shete⁵**

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ABSTRACT

The rapid improvement of wireless communication & mobile technology has allowed the advancement of intelligent robotic systems that can be remotely operated with high efficiency. This project presents the design & application of an **Android-controlled robot integrated with real-time video surveillance** for remote monitoring & navigation.

The proposed system uses an Android smartphone as a control interface, permitting users to operate the robot through a committed mobile application via Wi-Fi communication. The robot is provided with a microcontroller-based control unit that receives commands from the Android device to control movement in many directions. A mounted camera module provides live video streaming, enabling users to monitor environments in real time from remote locations.

The combination of wireless control & video surveillance enhances the robot's accessibility in various applications such as security monitoring, disaster management, military survey, industrial inspection, & home automation. The system is designed to be cost-effective, user-friendly, & expandable, offering improved mobility, real-time data transmission, & reduced human intervention in hazardous environments.

INTRODUCTION

In recent years, quick development in robotics, wireless communication, & smartphone technology have substantially transformed the way humans interact with machines. The

combination of mobile applications with robotic systems has opened new opportunities for remote monitoring & control.

An **Android-controlled robot with video surveillance** is one such invention that combines mobility, wireless communication, & real-time video streaming into a single intelligent system. Traditional surveillance systems are usually fixed at a particular location, limiting their field of view & functional flexibility. In contrast, a mobile robotic surveillance system can move freely in different directions & access areas that may be hard or unsafe for humans to reach.

By using an Android smartphone as a control interface, the robot can be operated easily through wireless technologies such as Wi-Fi. This eradicates the need for complex control units & makes the system user-friendly & portable.

The robot is provided with a camera module that captures live video & transmits it to the user's Android device. This real-time video feedback allows the operator to monitor environment effectively & make navigation decisions accordingly. The system typically includes a microcontroller to procedure commands, motor drivers to control movement, & communication modules to ensure reliable data transmission between the robot & the smartphone.

Such a system has wide-ranging applications in security surveillance, military operations, disaster management, industrial inspection, & home monitoring. It helps decrease human involvement in hazardous environments while ensuring continuous monitoring & control.

LITERATURE SURVEY

The rapid progress of mobile technology & wireless communication has led to extensive research in the field of remotely controlled robotic systems, specifically those incorporating video surveillance.

Several researchers have used the Android platform to control robotic systems due to its accessibility, widespread acceptance, and built-in communication features such as Bluetooth and Wi-Fi. Patel and Chauhan (2014) executed an Android-controlled robot where motion commands were transmitted via Bluetooth, enabling basic orientational control. Their results demonstrated simplicity in mobile interface design but were restricted by short communication range & basic functionality.

Similarly, Mukherjee et al. (2017) advanced an Android-based robot using Wi-Fi for longer-range operation. The study found that Wi-Fi connectivity improved remote control abilities but required careful handling of network stability & latency.

These studies highlight the appropriateness of Android smartphones as intuitive control interfaces for robotic platforms and supply the foundation for developing advanced surveillance robots.

PROPOSED SYSTEM

The proposed system is an Android Controlled Robot with Video Surveillance developed to provide real-time remote monitoring and mobility through a wireless Android interaction. The system integrates an Android application, a wireless communication module, a microcontroller-based control unit, motor driver circuitry, & a camera module for live video flowing.

A. System Overview

The system permits a user to control the movement of a robot using an Android smartphone while concurrently monitoring the robot's surroundings through live video streaming.

B. Key Components

- **Microcontroller / Processing Unit**

Arduino Uno – Used to acquire control signals and manage motor operations.

- **Wireless Communication Module**

ESP32-CAM – Provides Wi-Fi connection & supports video streaming.

- **Motor Driver**

L298N Motor Driver Module – Used to control the direction & speed of DC motors.

- **DC Motors and Wheels**

Give movement in forward, backward, left, & right directions.

- **Camera Module**

ESP32-CAM Module – Captures & transfers real-time video.

- **Power Supply Unit**

Battery supply used to power the whole robotic system.

C. Working Principle

The Android-controlled surveillance robot operates across wireless communication between the smartphone & the robot. The Android application sends motion commands such as forward, backward, left, and right across a Wi-Fi network.

These commands are acquired by the microcontroller across the Wi-Fi module & are processed to generate appropriate motor control signals. The motor driver then drives the DC motors accordingly to move the robot.

At the same time, the ESP32-CAM captures live video from the robot's environment & streams it to the Android device. This permits the user to observe the environment in real time while controlling the robot remotely.

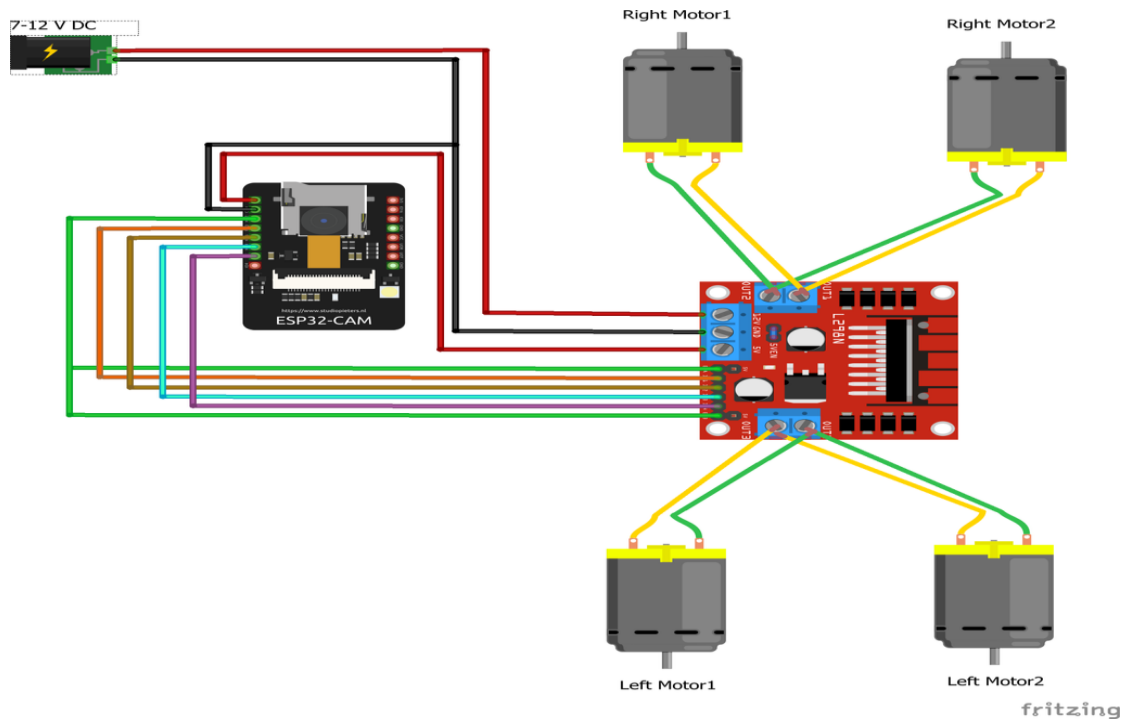
D. Advantages

- Remote Activity
- Real-Time Video Supervision
- User-Friendly Control
- Expandable System
- Energy Efficient
- Low Cost Implementation
- Portability
- Wireless Communication
- Multi-Application Use

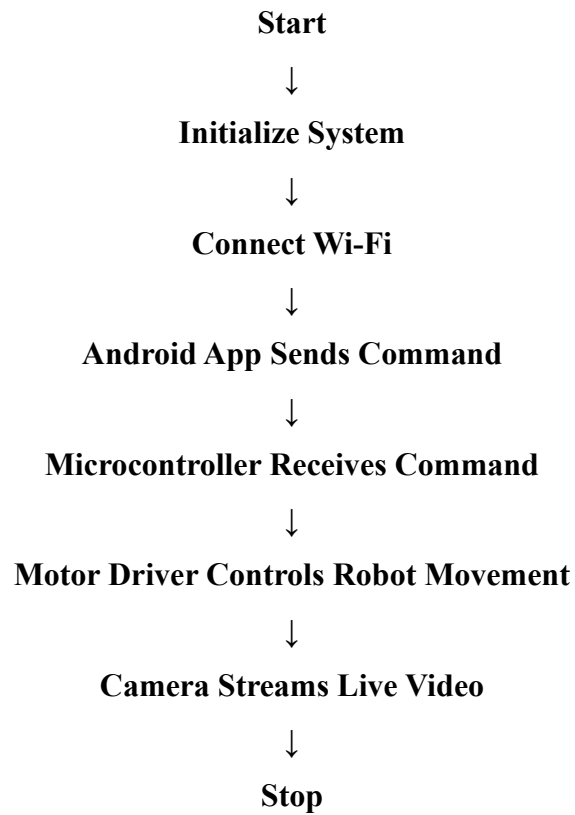
E. Application

- Home Security
- Hospital Monitoring
- Warehouse Surveillance
- Military Surveillance
- Wildlife Observation
- Smart City & IoT Systems
- Industrial Inspection
- Disaster Management
- Investigation and Monitoring
- Educational & Research Projects

Circuit Diagram:



Flow Chart:



MODEL



RESULTS

The Android-controlled surveillance robot efficiently achieves its goal of combining remote movement control with real-time video streaming. During testing, the robot sustained a stable Wi-Fi connection that allowed live video to be streamed to an Android smartphone with small delay.

The integrated camera supplied clear visual feedback, & the Android connection enabled real-time control of the robot's movement. The system answered quickly to user commands with low latency in both motor control & video transmission.

The efficient communication range was suitable for indoor & moderate outdoor environments. Because the system uses inexpensive components & open-source platforms, it remains cost-effective & accessible for educational & practical applications.

CONCLUSION

The **Android Controlled Robot with Video Surveillance** system was efficiently designed & implemented for real-time remote monitoring and control. The system combines wireless communication, embedded control, motor driving, & live video streaming into a single robotic platform.

The Android application sends control commands through Wi-Fi, & the Arduino Uno methods these commands to control the robot via the L298N motor driver. Meanwhile, the ESP32-CAM module streams live video, enabling continuous monitoring of the robot's surroundings.

The advanced system proves that a low-cost and efficient surveillance robot can be created using readily available components. It improves safety by allowing remote monitoring of dangerous or restricted environments.

FUTURE WORK

1. Autonomous Navigation and Obstacle Evasion using sensors.
2. AI-based Object discovery & Tracking.
3. Voice Command Control across the Android application.
4. Ecological Monitoring using temperature, gas, or thermal sensors.
5. Multi-Robot Surveillance Systems.
6. Modular robotic layout for different terrains.

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