

## Spy Robot Wireless Video Surveillance using Arduino

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**ABSTRACT:** We developed a cost-effective Three-wheeled surveillance robot using an Arduino NANO microcontroller and a Smartphone running in Android Operating System. Surveillance robots typically consist of a Internet Protocol(IP) camera, Arduino and Wi-Fi module. We are using Arduino software to interface the Wi-Fi module with Arduino. An Android based application, Wi-Fi module is used to control in this spy robot. This robot can be controlled with the help of Android phone via moving the robot upward, backward, left and right side by using android application through Wi-Fi or Internet. Arduino based microcontroller is used for instruction processing and giving proper instructions. Wi-Fi technology is used to interface between Arduino and Android. An IP camera is used for live video streaming and is used to observe any object & movement of robot. This robot can move to any place and perform smartly through internet and also with in the Wi-Fi network range.

**KEY WORDS:** Android, Robot, Robotic control, Wi-Fi, Surveillance, Arduino

### I. INTRODUCTION:

This project is aimed at developing a surveillance system which can be controlled remotely by using an Android App. It includes a robot with a Wireless Camera attach to it. This robot captures the high resolution video feed and transmits it to the connected Android device which is used to control robot. [1]JOHANN BORENSTEIN AND YORAM KOREN paper is based upon a mobile robot system which has been developed for helping the physically disabled. It uses ultrasonic range finders for obstacle detection and mapping which are mounted on the vehicle. [2]Nils Gageik, Thilo Müller, Sergio Montenegro present a paper on their approach for obstacle detection and collision avoidance of an autonomous flying quad copter using low cost ultrasonic sensors and simple data fusion. [3]Gyula Mester's paper presents motion control in unstructured environments for mobile robots it proposes a fuzzy control of a wheeled mobile robot motion in unstructured environments with obstacles and slopes. [4]Kirti Bhagat, Sayalee Deshmukh's paper tells us that robot is a machine that can perform task automatically. Robotics is a combination of computational intelligence and physical machinery (motors). Computational intelligence involves the programmed instructions.

### II. SCOPE:

As we developing a wireless surveillance system, it can cover more areas by it's movable wheels. It is better than Closed Circuit Television (CCTV), where it covers only the limited distance But in our surveillance system we can stream the live video and capture images when ever and where ever we need with the help of the mobile phone.

### III. REQUIREMENTS:

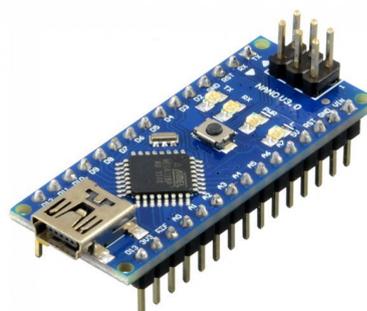


Fig 1 - Arduino NANO

An Arduino is an open-source microcontroller development board. In plain English, you can use the Arduino to read sensors and control things like motors and lights. This allows you to upload programs to this board which can then interact with things in the real world. With this, you can make devices which respond and react to the world at large.



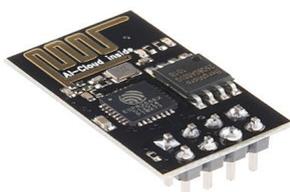
Fig 2 - Ultrasonic sensor HC-SR04

Ultrasonic transmitter emits an ultrasonic wave in one direction, and starts timing when it launches. Ultrasonic spreads waves in the air, and would return immediately when it encounters obstacles on the way. At last, the ultrasonic receiver would stop timing when it receives the reflected wave.



**Fig 3 – IP CAM**

An Internet Protocol (IP) camera, is a type of digital video camera that receives control data and sends image data via the Internet. They are commonly used for surveillance. Most IP cameras are webcams, but the term IP camera usually applies only to those used for surveillance that can be directly accessed over a network connection.



**Fig 4 – Wi-Fi Module ESP 8266**

ESP8266 is a cost-effective WiFi module that supports both TCP/IP and microcontrollers. It runs at 3V with maximum voltage range around 3.6V. More often than not, it also comes under name ESP8266 Wireless Transceiver. This module stays ahead of its predecessor in terms of processing speed and storage capability. It can be interfaced with the sensors and other devices and requires very little modification and development to make it compatible with other devices.



**Fig 5 – Motor Driver Shield L298N**

This motor controller from Tronixlabs Australia is based on the L298N heavy-duty dual H-bridge controller, which can be used to drive two DC motors at up to 2A each, with a voltage between 5 and 35V DC - or one stepper motor with ease. The controller has fast short-circuit protection diodes, and a nice heatsink to keep the L298N happy.



**Fig 6 –12V DC Motor**

A DC motor is any of a class of rotary electrical machines that converts direct current electrical energy into mechanical energy. The most common types rely on the forces produced by magnetic fields. Nearly all types of DC motors have some internal mechanism, either electromechanical or electronic, to periodically change the direction of current flow in part of the motor.



**Fig 7 – Servo motor**

Servo implies an error sensing feedback control which is utilized to correct the performance of a system. It also requires a generally sophisticated controller, often a dedicated module designed particularly for use with servomotors. Servo motors are DC motors that allow for precise control of angular position. They are actually DC motors whose speed is slowly lowered by the gears. The servo motors usually have a revolution cutoff from 90° to 180°.



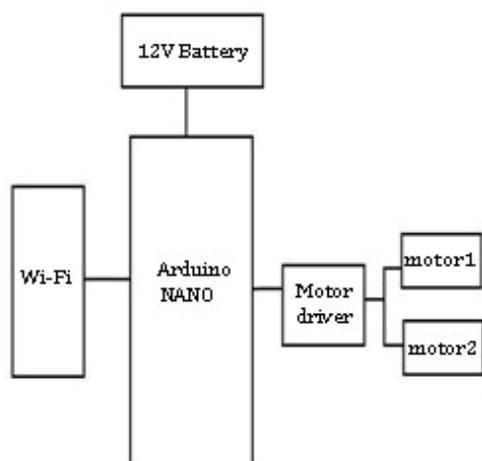
**Fig 8 –MIT APP Inventor**

Open Source Tools to catch performance, usability, version compatibility and other problems Template based wizards. To create a common Android Designs and components Support for building Android Wear Apps Built in support for Google Cloud Platform. To democratize software development by empowering all people, especially young people, to move from technology consumption to technology creation.

6. Motor Driver Shield L298N
7. DC Motors

#### IV. IMPLEMENTATION:

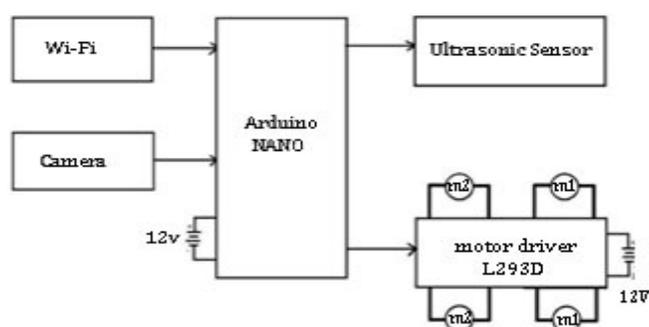
The block diagram of Wireless Surveillance Robot.



Block Diagram of WSR

In that figure we can see that Wi-Fi will send commands to Arduino NANO by decoding it first, then Mega will perform operations on the basis of commands provided by the user & will give the output to Motor Driver Shield which will drive the respective DC motors.

The Architecture of Wireless Surveillance Robot



Architecture of WSR

The major components which are required -

1. Arduino Nano
2. IP CAM
3. Ultrasonic Sensors
4. Servo motor
5. Wi-Fi Module ESP8266

To make more useful & efficient surveillance system, we are using Wi-Fi transmission modules. We are using Wi-Fi Module to communicate with the system by using commands with the help of an Android Application. As we know to transmit data such as pictures and videos through live field requires more bandwidth, for that only reason we are using Wi-Fi module, because it provides more bandwidth for transmission than Bluetooth.

The system is divided into two major parts, User Interface and Wireless Surveillance Robot. In this, User Interface is responsible for getting access & commands from the user which will be connected to the robot through Wi-Fi module to perform actions & get the desired output of surveillance. Performance Parameters are:

- Speed
- Image Resolution
- Noise
- Connectivity Range
- Ultrasonic Sensor Range
- Compact Design
- Camera Angle
- Response Time
- Terrain

#### V. CONCLUSION:

We are concluding that wireless surveillance robot can certainly be a future market for many defense and security purposes like military reconnaissance mission, wireless security and surveillance in hot spots, search and rescue operations or maneuvering in hazardous environment. This can save valuable human lives as well as time and resources need for such operations. We can use both Bluetooth and Wi-Fi for manual control and transmission of video footage depending on the purpose of the surveillance. Further enhancements can be added to improve functionality and features, which will further reduce human efforts and resources.

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