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# A MULTIFUNCTIONAL ROBOT FOR REMOTE SURVEILLANCE IN MILITARY APPLICATIONS

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**ABSTRACT -** Surveillance plays an important role in border areas to keep eye on enemies. In such situations it is difficult to allow duty of surveillance to a soldier, which may cause dangerous to the life on one. Rather we can use an robot to keep eye on border areas. So in such cases this kind of robots are very useful they are small in size and provided with many abilities so they can perform the duty of surveillance and spying perfectly. In case if they found by the combatant, they have no identity to whom they belong. Military on border area are facing many problems so this kind of technology help them to aware about the opponent activities, so they can take further decisions.

## INTRODUCTION

As we know the surveillance is a difficult task of international border areas. It is not possible by the border guarding forces to watch the border at each and Every moment. In this case the essential requirement is to have a system Security control unit. Nowadays, to carry out risky jobs the robots are used that cannot be done by the soldiers. In this present work, a Arduino System-based spy robot platform with remote monitoring and control Algorithm through RF has been developed which will save human live, reduces manual error and protect the country from enemies. The main component of the system is Arduino, itis a micro-controller, which perform all the processes of system. We can use this kind of technologies in the border area to keep tracking all the activities of opponent. This robot is provided with abilities like camera, mechanical Arm, IR sensors. Which help in the task of spying as well as a general purpose of military. Spying and surveillance is a crucial task, we cannot put someone life to risk, instead of that we can use this kind of robots which do not need sleep, they don't get hungry, they don't have emotions, they are just stick to their duties and follow the orders. Nothing can be more important than human life. Use of such robots can help to save many lives on border areas. And we can use this manpower in other tasks. The base part of robot consist of wheels, so they can travel on rough & watery surfaces too. The arm is located just above the base which can help in picking up the object, hold it, drop it. The arm can move in 360 degree, providing better ability to the machine. The IR sensor avoid collision of the robot to unwanted obstacles. The camera module stream the live footage of the scene over wi-fi to the receiver screen. So the one who is sitting on the output screen can have all the records of opponent activities. This kind of robots can easily replace the soldiers and perform the duty with better modifications. So in the future the warfare are handled by this kind of smart robots. Which minimize the life threats during wars.

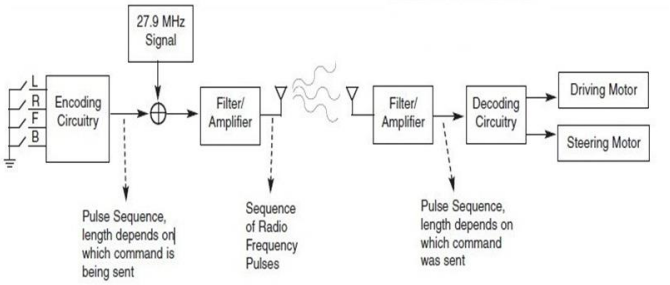
## PROBLEM STATEMENT

To minimize the threat to the life. And save as much as possible Soldier's life, which we can consume somewhere else. In this project we developed an smart robot for military applications which provide us surveillance on border area. We can know the real time condition there and act further according to that.

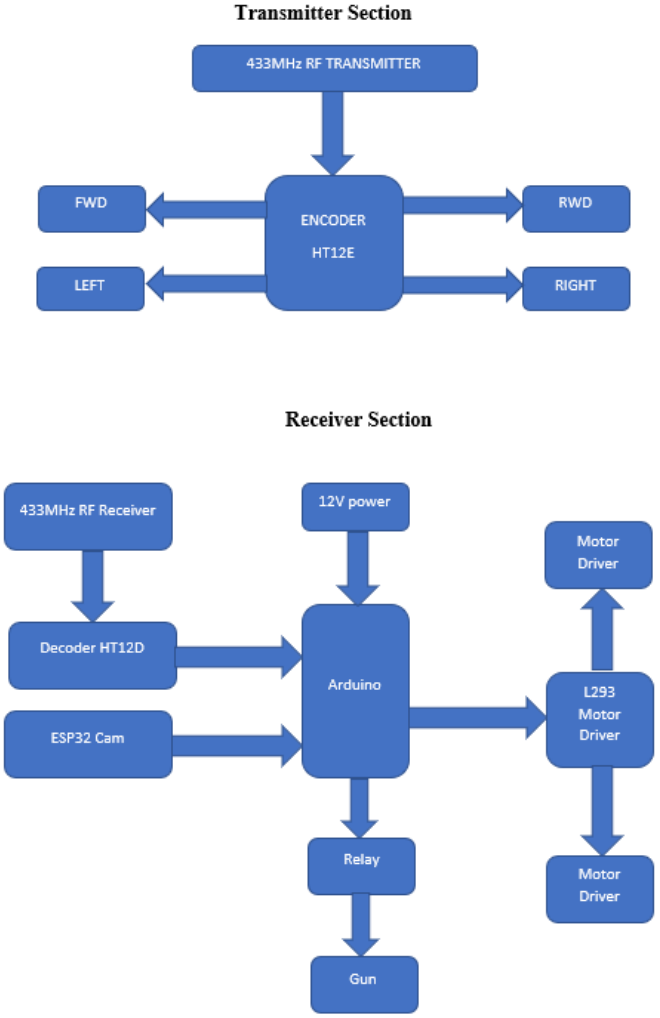
## LITERATURE SURVEY

In this project, proposed the defence environment types of military robots for attack operations and surveillance, the robots are been controlled by using standard short distance RF waves which limits the capability, reduce the reliability and operation functionalities of the robots in terms of long-distance remote controlling. To overcome this problem, the author proposed a self-neural schema-based framework used for autonomous control and decision making and a reporting system, embedded in the robot vehicle. There project consist of a Multi–angled rotatable Camera for increased view of military base or other places. Ultrasonic sensor is used for direction control and object detection for motor control. In this project proposed surveillance robot system used for the real time surveillance in intrude area. This system was designed for video monitoring, capturing the images and storing video frames in memory cards for further verification. This system is controlled by a mobile GUI based application connected over Wi-Fi wireless medium to the surveillance robot. In paper [8], the

author has proposed a robot unit using Zigbee technology to control that unit. The camera unit is used for surveillance in an area which transmits live feed to portable television. With the help of technology like Zigbee it is possible to controlled long range- based robots within 100m from remote locations.



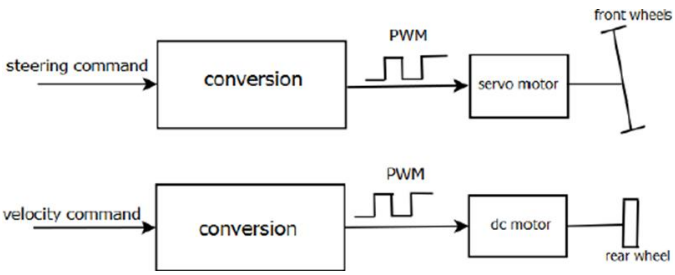

## BlOCK DIAGRAM




## METHODOLOGY

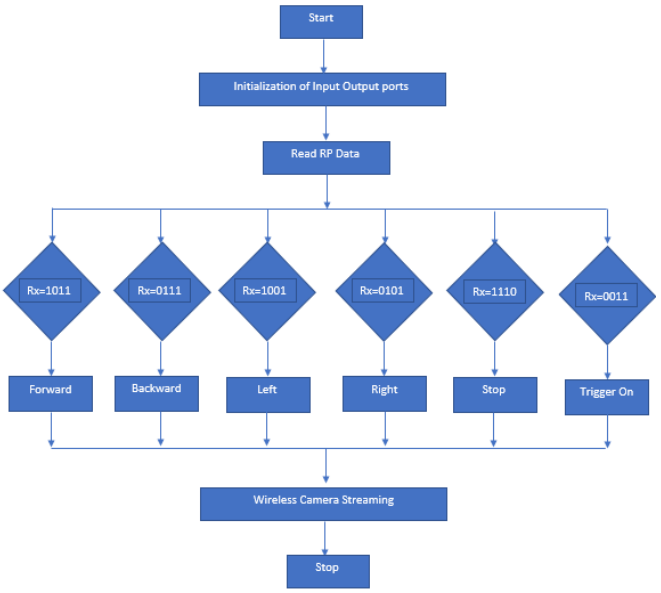
The robot design and construction basically depend upon the weight and the dimensions of the explosive being used. The purpose of this robot will be to reduce the human effort during tense situation.The movement of the robot can be explained as follows. Robot uses servomotor to achieve steering action and DC motor for drive. Steering command from guidance algorithm is converted to PWM signal with appropriate pulse width.

Velocity command is also converted PWM signal with appropriate duty cycle. Steering operation forms closed loop as servo motor loop is closed in the module itself. The dropping of the explosive is done by placing the explosive below the body of the robot and then a section of the robot is moved so as to drop the explosive. The surveillance of the robot is done by mounting a camera equipped with night vision thus proving flexibility during the day as well as night. The dropping of the bomb will be done by a motor operated door which will open as per requirement and the terrain. The robot will also include proximity sensors which can detect any movement if the robot does not respond to the remote control, thus providing more flexibility of detonating the bomb. Wireless camera will send real time video and audio signals which could be seen on a remote monitor and action can be taken accordingly.




Being small in size, it is not possible to track it on their radar. It can silently enter into enemy canopy or tent and send us all the information through its' tiny camera eyes. It can also be used for suicide attack, if required. Based on the input codes master will give command to slave microcontroller and robot will behave accordingly, it moves in the forward n reverse directions. Also it speed it controlled in both the directions. It can even turn left or right while moving forward or in reverse directions. Also it can move instantly in reverse or forward direction without slipping. In case of bumps, it moves in reverse direction and turns left or right and waits for the next instruction. The use of the door mechanism at the lower level of the robot will help us to drop the robot at the required position. The detonation of the explosive will be done when the conditions are as required using the cellular network.

## FLOWCHART

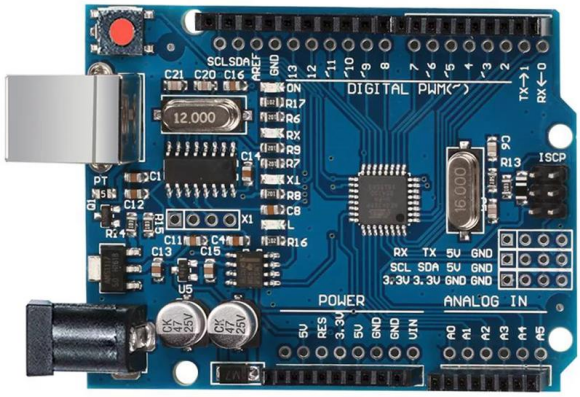



## HARDWARE SPECIFICATIONS

We are using the Arduino-Uno, ESP32cam, Relay, Motor Driver, Encoder HT12E, Decoder HT12D, 433MHz RF Transmitter, 433MHz RF Receiver these components

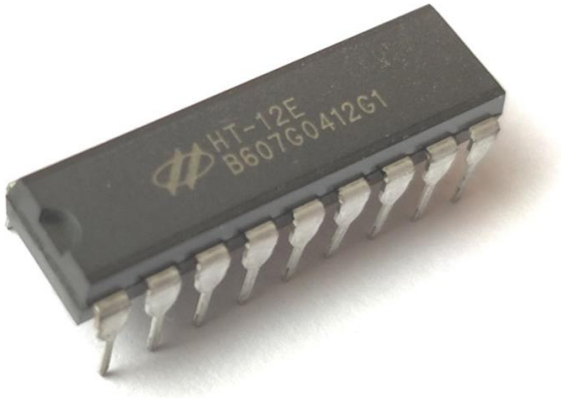
### Arduino-Uno

The Arduino UNO R3 is the perfect board to get familiar with electronics and coding. This versatile microcontroller is equipped with the well-known ATmega328P and the ATMega 16U2 Processor. This board will give you a great first experience within the world of Arduino.




### Encoder HT12E :

The **IC HT12E** can be used only with its pair HT12D. These two ICs together form an **Encoder and Decoder pair**. They are 12-bit Encoders/Decoders, meaning they can transmit 12-bit a data among them. But your encoder IC should not communicate with someone else decoder IC, so an Encoder and Decoder IC pair will share a common Address which is an 8-bit data. So out of the 12-bits 8-bits will be used to set address and the remaining 4-bit will be used to transmit data. With 4-bit data we can create 16 types (2^4 =16) of combinations. These IC's are commonly used with RF pairs or IR pairs. So if you are working on a project which has to transmit a 4-bit data from one end to other either by wire or wireless then this IC pair will be best suited for you.




### Esp32 Camera

The ESP32-CAM is a small size, low power consumption camera module based on ESP32. It comes with an OV2640 camera and provides an onboard TF card slot.The ESP32-CAM can be widely used in intelligent IoT applications such as wireless video monitoring, Wi-Fi image upload, QR identification, and so on.


Specifications:

- WIFI module: ESP-32S
- Processor: ESP32-D0WD
- Built-in Flash: 32Mbit
- RAM: Internal 512KB + External 4M PSRAM
- Antenna: Onboard PCB antenna
- WiFi protocol: IEEE 802.11 b/g/n/e/i
- Bluetooth: Bluetooth 4.2 BR/EDR and BLE
- WIFI mode: Station / SoftAP / SoftAP+Station
- Security: WPA/WPA2/WPA2-Enterprise/WPS
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### 433 Mhz RF Tx and Rx

Remote control switch, receiver module, motorcycles, automobile anti-theft products, home security products, electric doors, shutter doors, windows, remote control socket, remote control LED, remote audio remote control electric doors, garage door remote control, remote control retractable doors, remote volume gate, pan doors, remote control door opener, door closing device control system, remote control curtains, alarm host, alarm, remote control motorcycle remote control electric cars, remote control MP3

Specification:

Receiver module

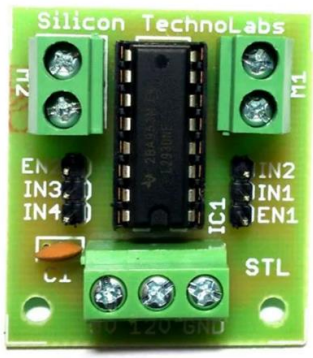
- Product Model: XD-RF-5V
- Operating voltage: DC5V
- Quiescent Current: 4MA
- Receiving frequency: 433.92MHZ
- Receiver sensitivity: -105DB
- Size:30x14x7mm

Transmitter Module

- Product Model: XD-FST
- Launch distance:20-200 meters (different voltage, different results)
- Transmitting power: 10mW
- Transmitting frequency: 433M
- Pinout from left → right: (DATA; VCC; GND)
- Operating mode: AM
- Transfer rate: 4kb/s

### L293D Motor Driver

L293D Motor Driver Module is a medium power motor driver perfect for driving DC Motors and Stepper Motors. It uses the popular L293 motor driver IC. It can drive 4 DC motors on and off, or drive 2 DC motors with directional and speed control.
The driver greatly simplifies and increases the ease with which you may control motors, relays, etc from micro-controllers. It can drive motors up to 12V with a total DC current of up to 600mA.




L293D Motor Driver Module

### Features :

1.Wide supply voltage: 4.5 V to 12 V.

2.Max supply current: 600 mA per motor.

3.The driver two holes of 3 mm dia.

4.Male burg-stick connectors for supply, ground and input connection.

5.Screw terminal connectors for easy motor connection.

6.High noise immunity inputs

### ADVANTAGES

- 1. No need to stop at the border in continuous snow in snowy region.
- 2. Can operate from remote
- 3. Can do live surveillance through camera
- 4. Firing can operate from control room

### FUTURE SCOPE

- In this project we are operating the system manually by using RF remote. In future,it can be operate automatically through Artificial Intelligence.
- This robot surveillance on the ground . In future it can be drone surveillance robot operated manually or automatically by using Artificial Intelligence.

## CONCLUSION

In the proposed system the interfacing of sensors, camera module, Motor control and GPS is done with Arduino for better processing control which provides better surveillance implementation. In this system we obtain information about the area within 5m-10m by use of remote control, sensors and camera feed through wireless medium. In future we can implement fully automated and computer vision based surveillance system to obtain more accurate results.

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