

## Mobile Surveillance Robot for Defense

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**Abstract:** Country borders are required to be protected from enemies or intruders. The soldiers on duty have a heavy risk of their lives. To minimize this risk, a robot can be placed ahead of the army. After some distance the army will be deployed. A distance of 500m is enough to know if the robot is in action or if there is any harm to it. This will reduce the chances of human loss in case of any attack. An Intelligence based unit is designed which can identify human being and take necessary action on them as commanded. The systems can provide a capability increase to forces through expanded surveillance capabilities. The robot will be placed on the borders and as soon as it will detect presence of human it will immediately send an alert to control room. At the control room live video streaming of the area will be visible. An option to communicate with person through cordless microphone and speakers is given if the person is not the attacker. If the robot is hit or anything happens to the robot, an alarm will ring at the control room. This paper presents the examination which is considered important to ensure security and safety. Study of motion detection and other sensor has been conducted in order to make a mobile robot with surveillance capability.

**Keywords:** PIR sensor, Wi-Fi, Robot, Surveillance, Zigbee, control room, speaker, ultrasonic sensor, camera.

### I. Introduction

Now a day's robotics research is focused on creating independent and compliant mobile robots for natural environments rather than for structured industrial environments. These robots are used to do tasks like rescue, security and surveillance etc. This class of robots can be utilized for tasks in the hazardous environments where human is not capable of doing it. Here the focus is on locomotion and choice of particular locomotion mechanism which is best when compared to its substitutes. A robot can be defined as "An independent device that performs tasks and acts that are recognized to humans or a machine in the form human."

Robots are designed to work in dangerous situations and tasks that need high speed and good precision. A danger event normally occurs by the negligence of human. To implement real time surveillance of the border security, Border Safety Robot (BSR) system is developed. Wireless Sensor Network (WSN) is used to monitor conditions such as temperature, gases, humans, metals etc. This system consists of Wi-Fi module, embedded system, microphone, speaker, ultrasonic sensor, PIR sensor, wireless camera, laptop, buzzer and intelligent program on the robot vehicle. There are two main units in our system. One is Control unit and other is Robot unit.

### II. Problem Definition

The brave soldiers serve the armed forces and protect the country. In a very sad situation, a soldier is always ready to sacrifice his for the country. The life of soldier is very important for our nation. To overcome the loss of soldiers life, the idea of the "Border Safety Robot" has come up. The already existing robot can only detect the obstacle. The robot is using ZigBee module for wireless communication which is of low data rate. Also, the existing robots do not have the property to shoot after the victim is detected by the command given through the command room. This all problem are been taken care in this project.

### III. Working

An Intelligence based Unit is designed which will identify human being and shoot them if commanded. Since we are using a machine, it is fast enough to identify humans and shoot them.

It is designed by using wireless battery, ATMEGA89c51 micro controller, laser, gun, speakers, cordless microphone, wireless camera, accelerometer, ultrasonic and PIR sensors. Robot systems can be replaceable to a human in the case of any situational issues.

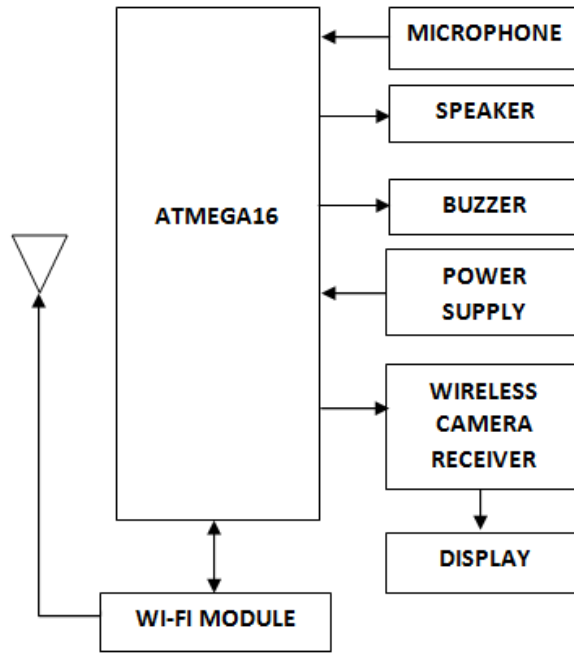


Fig 1: Control Unit

1. **Controller unit:** Its Function is to receive inputs from the sensors and transmit the required data to the master controller. It receives the control signals from master controller and moves the robot. Also the video signals from the camera are received by CU. It later encodes the video and transmits it to display section at control site. It also generates PWM control signals for the motion of robotics control signals Wi-Fi unit. It receives the encoded data from the controller and transmits through Wi-Fi module.
2. **Wi-Fi module:** It used as transmitter and receiver to transfer control data from control unit to robot unit and vice versa through internet.
3. **Display unit:** It is used to display the received video information which is used for robot navigation.
4. **Robot driving motors:** 4 high torque DC motors are used for driving the robot. L293D Motor driver is interfaced with microcontroller to control the robot.
5. **Wireless camera unit:** It consists of an IP camera with Wi- Fi hotspot connectivity. It may consist of a camera with Wi- Fi router whose IP address is known. Also it can be an android smart phone running Wi-Fi live stream software.

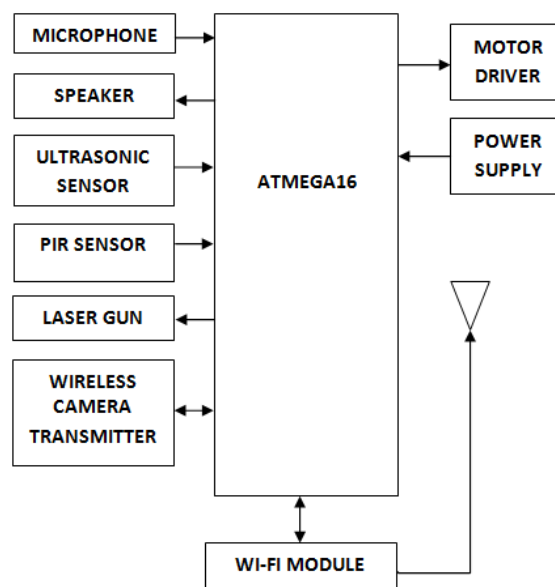


Fig 2: Robot Unit

In this system we a new technique is implemented to overcome the human loss. The military fully will not be a Robo army, but in the borders Robots will be placed. Camera, DC motor, laser, Wi-Fi module, PIR sensor, Ultrasonic Sensor, PC, and Robot body are used. The camera will be placed in all the border lines and also along with the robots. The camera will be monitoring all the places. If the person is victim then the Wi- Fi which is connected to the controller will send the information to another side of the Wi-Fi then the DC motor is initialized and make the Robot to move towards the person and attack them using the LASER. If the person is victim the microcontroller sends information to Wi-Fi, the Wi-Fi sends information to the other side microcontroller then Robot is initiated and the Robot will get the command from the commander and act according to the command. The remote control station and the robot play very important role in the future military operations.

#### IV. Component Description

There are various types of methodologies by which the Robot can be carried on. They are listed below:

1. Hardware Technology
  - i. ESP 8266 WI-FI module
  - ii. Wireless CCTV
  - iii. USB TV tuner
  - iv. PIR sensor
  - v. Ultra sonic sensor (SRHC 04)
  - vi. Servo motor
  - vii. DC motor
  - viii. AVR atmega 16
  - ix. Motor Driver
2. Software Technology
  - x. AVR Studio 7
  - xi. Flash magic
  - xii. Proteus Design Suite

#### V. Dataflow

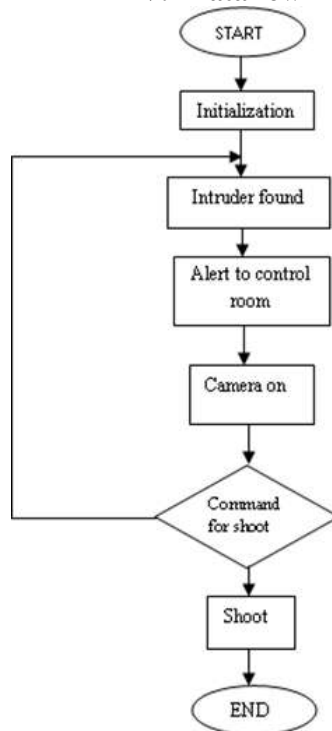


Fig 3: FLOWCHART

## VI. Features

- PIR detecting sensor detects motions from up to 600cms.
- Ultrasonic sensor detects the obstacle from 400cms.
- Robot can be controlled from 200ft through remote with the help of a 434 MHz RF Tx/Rx module.
- Wireless camera will send real time audio and video signals at remote location and its range is 150feets.

## VII. Outcome

As soon as there is some intrusion or movement in front of the camera, it captures the image; the image is forwarded to the microcontroller board. The camera is being able to cover the area around 180°. Also the servo motor has the angle of rotation around 180°. The robot is be controlled wirelessly by Wi-Fi module.



Fig 4: Model of Robot

The ESP8266 is a self contained SOC Wi-Fi module with integrated TCP/IP protocol stack that gives any controller access to the connected Wi- Fi network. With the range/distance of 400 meters the robot can be controlled. PIR SENSOR allows the motion sensing, it is always used to detect whether a human has moved in or out of the range of sensor. The range of the PIR SENSOR is up to 20 feet i.e. 6 meters.

Figure 4 shows the model designed which has ultrasonic sensor near eyes, 360° moveable camera on head, gun in hand.

## VIII. Applications

- As fighting robot.
- As suicide attack bomb.
- To minimize the casualties in terrorist attack.
- Security Purpose.

## IX. Conclusion And Future Scope

In order to strengthen the security and defense of our country we desperately require robotic system which will forearm our defense system. In the recent past our world has witnessed plethora of terrorist activities and in them we had encountered tragic loss of life and property. Such humongous loss would have been avoided if we would have strong life saving robotic system in place. Hence in order to make this world a beautiful place to live we desperately require robot which will assist us in our endeavor. Using this proposed technology the security forces will get a helping hand in detecting the intruders. This system can also be used in high altitude areas where it is difficult for humans to survive.

Using 12V dc supply DC motor rotates 180 degree on 3.5 rpm. Ultrasonic sensor detects obstacle in range of 2meter, PIR sensor range is 2 meter and there both sensor sent data wirelessly using Wi-Fi module. This Wi-Fi module range is 10 meter and sends data at rate of 9600 baud rate at speed of 13 mbps.

In future we can interface GSM module for control through mobile device. So there is no need of control room and laptops, which will save cost of the system. Bomb diffusion application can be implemented in

this system. Even metal detection can be done through this system. 1. IR Sensors: IR sensors can be used to automatically detect & avoid obstacles if the robot goes beyond line of sight. This avoids damage to the system.

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