

# Intelligent Rat Robot for Military Surveillance

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**Abstract:** The intention of this paper, is to develop robot for the safety and protecting the lives of our people during the threat time as well as in the war field attacked by the terrorists. The live information is transmitted by the robot via night vision camera used in it. It also consists of Passive infrared sensors which is capable of measuring the heat being emitted by human and biological chemicals to release dangerous gases. Army people of our country face challenging time as they set foot into unexplored area. Therefore, the robot developed as mention tends to be the proper bot in helping the lives of the people. At the time of the war, the robot can be used for various purpose like getting live data of the action and this kind of activity of the robot helps in making the counter attack plan before the terrorist take the next step in the action. Along with activities of the robot mentioned above, it also gives the live location of the terrorists or any illegal armed actions taking place and form plan for the attack at appropriate time.

**Keywords:** Bluetooth, Night vision camera, Ultrasonic sensor, PIR sensor, Sprayer, MIT app, Arduino microcontroller.

## 1. Introduction

To build a high-tech system that supports high-speed technology, advanced robots control functionality and software new control theory methods. The robot is designed in such a way that it uses the advanced controlling techniques as per today's technology. The Record design of our project encourages developing an intelligent RAT robot Wireless camera connected for remote service. The transmitting module consists of the push buttons which send the commands to the receiving module to control the robot movement either to the right, left, forward or downwards.

As a controller module, the robot operating under the Arduino Uno board is considered in the warfare. It also includes Bluetooth module of HC-35 which has L293D motor drivers. Wherein servo motors of four are used often in the locomotion of the robot. The uniqueness of the wireless camera in 360 degrees via motor to extract the live information in the place of illegal armed forces. One of the best historic moments in the field of the automation and robotics is Sydney siege. In which the robot consists of the laser beam light in them and the bomb to be disposed will be already present in the robots which it will be sent into the dark room because of to make sure that it will not cause any harm to the people in the military forces. This is the reason, it has considered to be as New South Wales Police

Department 's one of the best operation resulting in usage of modern technology in case of reducing the loss of mankind.



Fig. 1. The Sidney siege robot

## 2. Problem Statement

Military forces play major role in protecting our country. The people in forces, face life threat in large number. It is because of the sudden attack by our neighboring countries. These attacks can be of getting captive over a building with a greater number of people, entering the border during night time, and illegal entry to our country.

## 3. Proposed Work

The main motive of our project is to make it user friendly. RF signals Are used as signals for the flight. Encoding is achieved by using these signals and signal is sent via the transmitter and to prevent the life danger our military people face.

## 4. Methodologies

The main objectives of the project are listed below:

1. To capture the image and record the activities taking place in war field during night times we use night vision camera.
2. To detect obstacles faced by robot during its motion in the field and to detect the presence of human, we use Ultrasonic Sensors and PIR sensors.
3. To make people go unconscious we use some harmful biochemical in the war field.
4. The rat robot is used in military surveillance because people in the war field will not know the presence of the robot.

*Objective-1:*

In addition to what constitutes a simple camera, it consists of a transmitter device. It captures images and transmits those images in the form of digital signals through the transmitter that are received by the receiver device connected to the TV or computer. The camera may be as far as 30 miles from the receiver. A night vision camera can obtain illumination either by magnifying the visible light using image intensifiers or by using reflected infra - red light from objects close to infra - red light.

The rat robot's handheld night vision camera consists of a handheld transmitter. There is a cluster of IR LEDs that are used to send the image source IR light. The reason IR light is preferred is that it is normally dark at night time, and because every camera requires light for illumination, infrared light is the preferred alternative as all objects emit a spectrum of infra-red light. The camera is operated by a 12 V battery, capturing those images and transmitting them to the receiver device connected to a TV unit. The transmitting unit transforms the images into digital signals and the receiver unit receives the digital signals and translates them back into images, and these images or videos are tracked and analyzed on a television screen.

Feature and details,

- 4.3inch digital TFT LCD
- LED Camera, with night vision
- Auto detect power on/off
- PAL/NTSC Compatible

Features:

- Range of the voltage used: DC-5V
- Minimum current operated: 15Ma
- Optimum frequency 40KHZ
- Longest distance measured: 4m
- Shortest distance measured: 2cm



Fig. 2. Night vision camera

*Objective-2:*

The ultrasonic sensor is useful to detect objects that are a certain distance from the robot. Unlike the touch sensor, though, the ultrasonic sensor is not reliant on physical contact. The distance provides more space to react in. The ultrasonic sensor is usually used for a distance of 10cms or more while the light sensor is used for a shorter distance. For example, the ultrasonic sensor may be used to search the room for nearby objects, as well as for object detection and evasion.

The robotic vehicle preventing obstacles uses ultrasonic sensors for its travel. The 8051 mc is used in achieving desired operation. Robot has an ultrasonic sensor which is mounted in the front and motors are interfaced to the mc. These sensors transmit the ultrasonic waves from the sensor head as robot be in its desired path. As robot detects any obstacles these waves

from the head of the sensor sends the information to the mc.

The short and high frequencies both are emitted by the ultrasonic sensors and it represents the speed of sound in the air. The waves produced by the sensor will be in the form of echo signals as sensor detects the object, it will produce these signals back. Thus, by this action the object is detected.

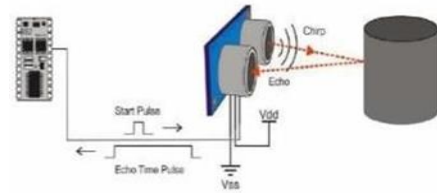


Fig. 3. Schematic of obstacle detection

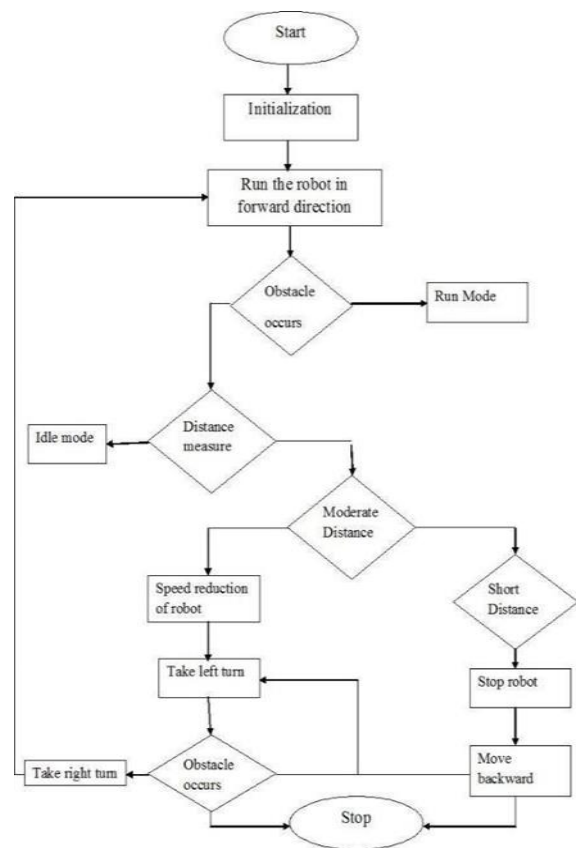


Fig. 4. Flowchart for obstacle detection and avoidance

*PIR sensor:*

This sensor is used for the detection of human or particles which are in motion at the certain specified range. These sensors are referred as PIR sensors used as motion sensors. PIR can detect animal/human activity across a range of specifications, defined by the particular sensor spec. It absorbs the radiation produced by the human or particles body instead of producing the radiation by the sensor like ultrasonic sensors. In the detection area, the detector's lens absorbs the human body's infrared radiation energy through the clothing and focuses on the pyro-electric sensor. In this kind of sensors when a moving

object are detected at the range of the sensing area it enables the sensors to sense the object i.e., it absorbs its radiation and sends the information that it has sensed the moving object as per this project designed soon after receiving the information it tends the sprayer to spray the chemicals into the atmosphere so that these chemicals will be inhaled by the moving objects.

For a moment the pyroelectric system sees the human body moving and then doesn't see it.



Fig. 5. PIR sensor

**Characteristics:**

- Full Motion Detection with PIR.
- Low-noise double part sensor with high sensitivity.
- Voltage supply-5V.
- Adjustable delay time.
- Default TTL performance.

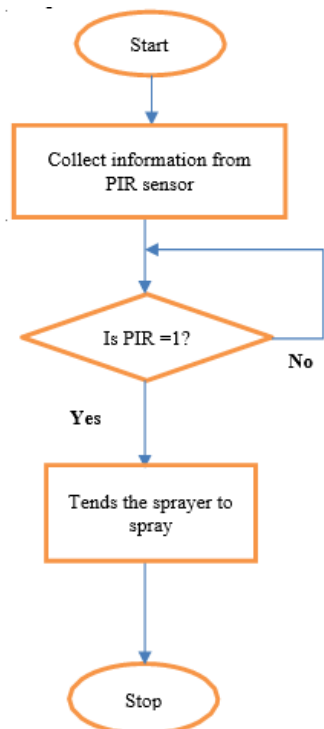


Fig. 6. Flowchart for the PIR sensor

**Objective-3:**

The chemicals using in the robot is not first time, it has carried out in many other various parts of the world. But using

the chemicals for the of making people go unconscious is for the first in our country. The chemicals which can be used in this project are sleeping gases like BZ, Halothane vapor (Fluothane), methyl propyl ether (Neothyl), methoxyflurane (Penthrane), anesthetic gases or liquid like chloroform. The chemicals should be used in the proper form otherwise it will cause the huge destruction to our people as well in the war field. The chemicals will impact the human within three to five minutes of inhale and it will make people be in the unconscious mode for up to 20minutes to two hours it all depends on how much of chemicals used in the project.



Fig. 7. Chloroform

**Features:**

- The amount of 100 ppm of chloroform can cause people go unconscious without more harm.
- It lasts till 20 minutes to two hours.

According to the Wisconsin Department of Health Services, "a person may feel exhausted, dizzy, and headache immediately or shortly after exposure to 100 ppm (100,000 ppbv) of chloroform in the air. The primary application of chloroform is that it will not cause more harm when people are expose to such chemicals at specified amount. Since, it will be used the army forces it not only affects the opponent people but it also affects our own people. So, keeping this in mind we use this chemical in small amount.

**Objective-4:**

The robot locomotion in the project is made to be as realistic as the rat. Here a bioinspired legged robot will be built in order to make it feel like real rat.

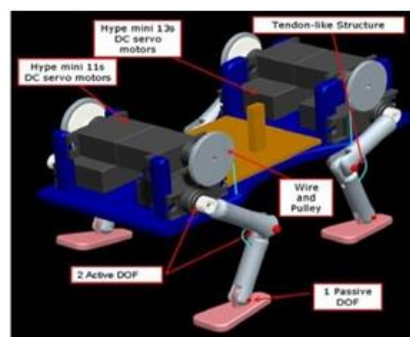


Fig. 8. Internal structure of rat robot CAD design

The servo motors used in designing the legs of the robot with 8 DC engines which are available commercially. The front legs use particular DOFs of 4 Hype mini 11s. The motion range of these motors will be 120 degrees without any mechanical reduction or the gear which will be faster than the range of motion of the real rat.

For the rear legs of the robot for walking and running actions, two Hype mini 13s used to guide proximal links while two Hype mini 11s are used to activate the connection. Transmission ratio average for the distal leg connections from the four-rat robot is 2. The 3D printer is used for producing the first prototype of the legs of rat robot and manufacturing machines for micro-fabrications. The central part of the base is used to hold all the components which are used to mount on it for supporting purpose.

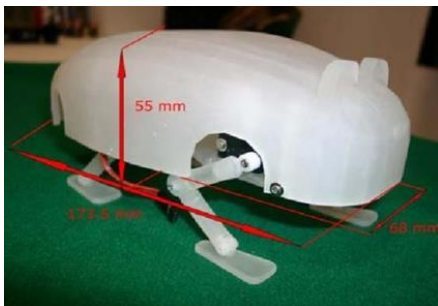


Fig. 9. The external structure of the robot with legs

The above figure represents the entire dimensions of the rat robot along with the legs. This kind of designs are chosen to make sure that the developed robot should look exactly like the real biological rat animal. These prototypes might weigh up to 260 grams wherein the real rats weigh 350 to 550 grams.

### 5. Block Diagram

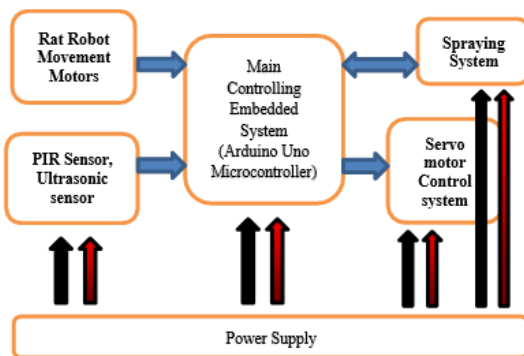


Fig. 10. Robot's block charts

The parts used in the architecture is as shown in figure. The rat robot movement uses the motors for the locomotion purpose to look same as real rats and it is interfaced with the embedded system i.e., Arduino Uno microcontroller. The two servo motors are used in the model, one is for the spraying purpose i.e., when the sensor detect the motion in the field the robot used it tends the sprayer to spray chemicals into the atmosphere and

the other motor is used for the purpose of making sure the robot sprays the chemicals at appropriate height so that it reaches the suspect's smelling sense organ as expected i.e., used in making robot go ups and downs. The sensors used are Ultrasonic and PIR sensors in action of detecting obstacles and motion respectively, overcome the actions as mentioned in the objectives. The power supply used here is the Lithium-Ion battery. It is rechargeable battery and commonly used for portable electronics and electrical vehicles and are growing in popularity for military and aerospace applications.

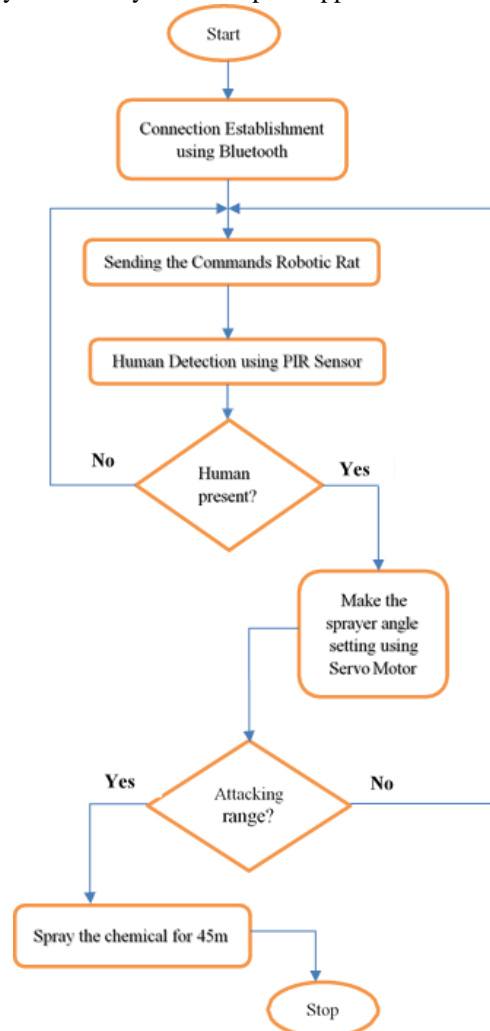


Fig. 11. Flowchart of the entire working of Robot

The above flowchart represents the entire working of the robot in this project. As we have seen all the objectives and the methodology, their respective functions and working, here it has put all together and picturized in this above flow chart.

### 6. Application and Advantages

In this project, as mentioned about the biochemicals usage where in it is the main part of our robot. Since, no one has come across using chemicals in military surveillance project it brings up most advantageous objective. It can be also used to kill



people at the extreme cases like when terrorists hide themselves in some places with lot of security and safety circumstances, where our people can kill themselves in the view of attacking terrorist. During such time this will help in huge way by killing those people or you can use it in a way to make them go unconscious and can attack them with all armed forces without harming anyone at the spot.

- It is used for safety purpose as people near borders face threat problems by the terrorists.
- It can be used in various part of the armed forces.
- The usage of this makes our military people to work smarter than our enemies.
- The outlook of this robot will be same as the biological rat where anyone present at the spot fails to identify it as robot.
- It helps in saving many lives of our people.
- The other advantage is the shape of the robot i.e., in the place where terrorists attack is involved, they don't be able to differentiate the robot with the real rat.

### 7. Future Scope

As we all know that, every inventions or project or technology has its own demerits. Even in this project we have some of them. Since, we weren't able to overcome with such demerits so we present this into the hands of the future generation i.e.,

- 1) The robot can be used in much reduced size and look exactly like the real animal in appearance wise by using the advance technologies that are evolving.
- 2) This can be not only rat but it can be any form as the size reduces the application increases.
- 3) Using long range motion sensors, long battery life can help in more effective way.
- 4) It can be used as weapon.
- 5) Controlling of the robot can be done in unmanned operations like voice command etc.

### 8. Conclusion

The overarching need for our project would be precision. We were able to interpret the issues actually happening in the local area accurately. Our design has caused no disruptions of any kind. The robot will move by remote section unit depending on the direction of the motor, based on the input we offer through the order. It shows the current operation as an example of left robot, near to target, straight up. Using the camera, we can view the things that happen in the surrounding area where the robot is hidden. Most users will be able to use this easily by keeping the circuit simple and easy. So we should be in a position to manipulate its path to build the robot safely, if possible. Using biochemicals in robot helps kill our enemies by unintentionally making them go.

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