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## Survey Paper

# Multifunctional Smart Military Robot with Visual Inspection Robot - “Warrior Robo”

Sushmitha Deb<sup>1\*</sup>, Mandara V.<sup>2</sup>, Shashank P.<sup>3</sup>

<sup>1,2,3</sup>Electrical & Electronics Engg./ Faculty, SJMIT, Chitradurga, Karnataka, India

\*Corresponding Author: sd.eee@sjmit.ac.in

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**Abstract:** This research provides a cutting-edge method for remote and border surveillance utilizing a Using the most latest 3G technology, a multipurpose robot is used in military and defence applications. This autonomous car is capable of providing border area surveillance in place of soldiers. The robotic car uses the internet as a communication channel and may be operated manually or autonomously. This multimodal robot is employed in isolated and combat zones to find people, bombs, dangerous chemicals, and fire. Due to their finite range of frequency and restricted control which is manual, wireless security robots are traditionally obsolete. It is operating on one's own and is managed by infrared and ultrasonic sensors. Cell phones are employed as video cameras by initiating a 3G video calls, and its operation is controlled by DTMF decoders. The robot's path is changed based on real-time information about its surroundings. The experimental findings of the choice of tilt angle and power consumption of solar panels in automated and its manual modes are also illustrated in this study. Under specific conditions, this robotic vehicle is intended for both reconnaissance and surveillance.

**Keywords:** Wireless Sensor Networks (WSN); DTMF; Sensors; PIR; GSM; GPS; Arduino Uno

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## 1. Introduction

The applications also cover the domains of defence, medicine, industrial automation, and home automation. This study describes a multifunctional robot with a metal detector, an IR flame sensor, and a fire detector that communicates with a PC using a terminal app. Distance measurement is done using an ultrasonic sensor, whose outputs (status) are shown on a monitor and LCD display. Since quite a while ago, the usage of robots in many fields has become increasingly popular. Wireless camera that provides continuous monitoring benefit when deployed coupled with laser gun can be utilised for defence purposes. Robots are useful in the military because they can undertake hazardous duties without endangering people's lives. There have been security systems with a variety of applications that use PIC, ARM7, and 89S52 microcontrollers. ArduinoUNO The current technology may be used to communicate between a PC and a robot while also detecting flames, fire detectors, obstacles in the distance, and monitoring the environment with a wireless camera and an ANDROID APP. This technology also includes a laser rifle so that the captor can be eliminated without putting a soldier's life in danger. The main aim of this project is to implement a wireless PC controlled multi-purpose robot using the TERMINAL APP interface for defence. It contains a built-in gas sensor for locating gas leaks and also an IR flame detector for spotting fires. This versatile robot switches on various features in the robot unit depending on the signal it receives from the microcontroller. On a

desktop and LCD screen, the results of various actions can be observed and displayed. A further feature of this robot is its wireless camera, which can be used to locate and neutralize the captor, as well as its laser pointer cannon. The suggested vehicle uses a temperature sensor to automatically identify the presence of fire and put it out. The suggested robot includes a water spray that can spray water at an angle of 180 degrees. You can move the sprinkler in the desired direction. It's possible that as it moves closer to the fire, it will come across some barriers. If this happens, it has the opportunity to dodge them. It recognizes barriers.

## 2. Literature Survey

[1]Tawfiqur Rakia, M. A. Rashid Sarkar Proposed movable robot consists of sensor like LM35 and Arduino Flame Sensors are used to detect the fire and distances on its way towards fire. In this for the mobility of the Robot, two wheels made of Nylon and a caster ball is used. This is mainly a rear wheel drive type of vehicle. The water container has the capacity to contain at least 1L water. It is made of strong cardboard which has water resistant property.

[2]Shiva Agrawal, Nidi Agrawal proposed that the human can control the robot by using the Bluetooth module. The Bluetooth module is work with the android application. In this the Bluetooth model communicate android application by using driving motor, Arduino mega, voltage divider, tyres, Bluetooth, motor driver.

### 3. Feasibility Study

The technological, financial, and operational aspects of the "Warrior Robo," a multifunctional smart military robot with visual inspection skills, would be assessed as part of the feasibility study.

#### 3.1 Technical Feasibility:

Analyzing the proposed robot's capabilities, such as its capacity to carry out a variety of tasks, such as visual inspection, reconnaissance, surveillance, and even battle, is necessary to determine the technical viability of the Warrior Robo. Additionally, it would entail evaluating the robot's robustness, maneuverability, and compatibility with already in use military hardware and systems. It would also be crucial to do a thorough analysis of the requisite technology and its accessibility.

#### 3.2 Economic Feasibility:

The manufacture, deployment, and maintenance expenses of the Warrior Robo would need to be examined in order to determine its economic viability. This would entail looking into the price of the parts and materials needed to build the robot, the price of research and development, and the price of training staff to use and maintain the robot.

#### 3.3 Operational Feasibility:

The Warrior Robo's operational viability would entail examining the robot's capacity to meet military demands and its efficiency in practical settings. This would necessitate a thorough examination of the robot's potential use, such as in war situations or for surveillance and reconnaissance. The robot's interoperability with current military infrastructure as well as its simplicity of deployment and use in the field would need to be taken into account in the study.

## 4. Facilities Required For Proposed Work

#### 4.1 Motors

Here we are using a 25inch motor output shaft and a 2mm rear encoder shaft, Motor1 is a 12V DC geared motor. The best motor controllers for this motor are those rated for 12V@2A. DC motors deliver precise and efficient results due to their easy controllability and extensive use in industry for load characteristics and speed control.



Fig.1. Motors

#### 4.2 Ultrasonic Sensor

The 2cm–400cm ultrasonic ranging module HC-SR04 provides a non-contact measuring function and has an accuracy of up to 3mm. In this module we have included ultrasonic transmitters, receivers, and control circuits. The fundamental working principle:

The Module automatically transmits eight pulses at a frequency of 40 kHz using an IO trigger for at least a 10us high level signal, and it then checks to see if a pulse signal has been received back. If the signal is returned at a high level, the period between sending and receiving an ultrasonic signal is the time of high output IO duration.

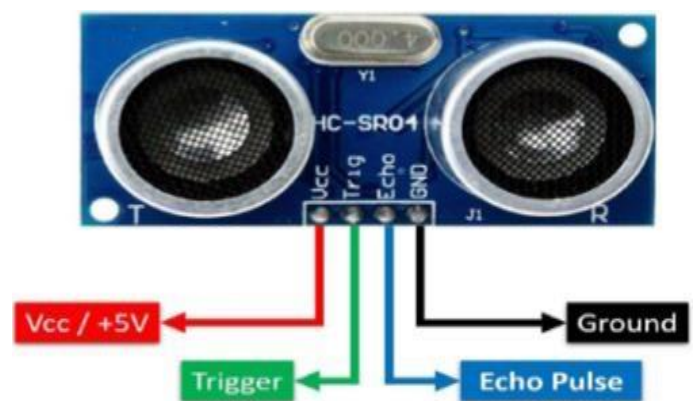


Fig.2.UltrasonicSensor

#### 4.3 HC-05 -Bluetooth

Designed for Simple Bluetooth SPP (Serial Port Protocol) module for transparent wireless serial connection setup. As a serial port Bluetooth module, you may get a fully approved Bluetooth V2.0+EDR (Enhanced Data Rate) 3Mbps modulator with a full 2.4GHz radio transceiver and baseband. 10A or DC30V 10A and has a common interface that a microcontroller may use to operate it directly. For safety reasons, this module is optically segregated from the high voltage side and further avoid ground loop while interacting with a microcontroller.

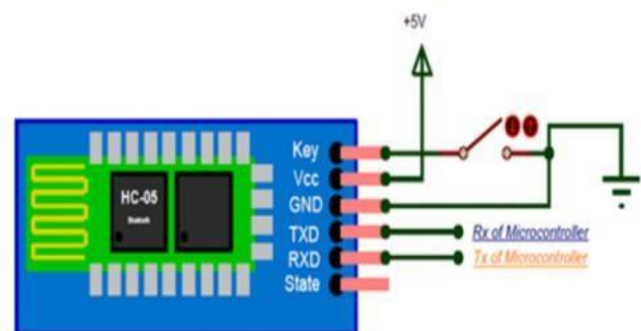


Fig.3. Bluetooth

#### 4.4 Relay Module

Low Level 5V two-channel relay interface board with a need of 15-20mA driver current per channel. They are employed to manage various electrical devices and equipment that draw a lot of electricity. It is designed with high-current relays that work under AC250V

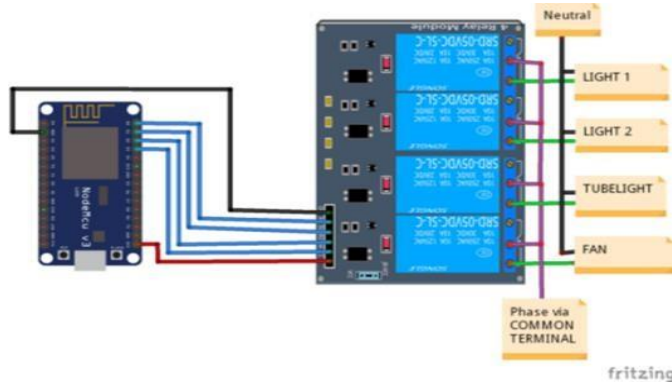


Fig.4. Relay module

**4.5 Power Regulator**

The most recent model of computer microprocessors will function at far lower voltages and greater currents than the current generation in order to reduce power consumption and boost performance. These microprocessors will also require highly exact supply voltage control, a centralised power system is unable to offer. A voltage regulator module (VRM), which is situated on the motherboard close to the load, delivers high-quality power to the CPU in a distributed power system to achieve the required regulatory precision.



Fig.5. Power Regulator

**4.6 Motor Driver**

Motor driver or motor driver integrated circuit (IC), the L293D allow DC motors to drive in either direction. It is possible to control two DC motors simultaneously in any direction using the 16-pin IC L293D. It means that a single L293D IC may operate two DC motors. Motor driver integrated circuit (IC) with dual H-bridges.

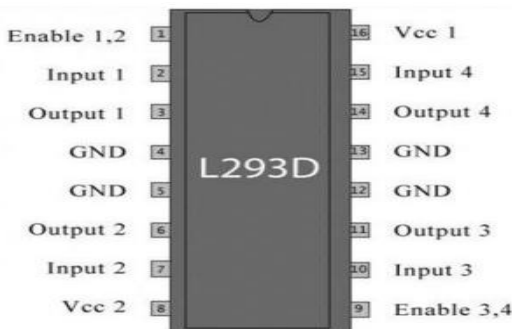


Fig.6. Power Regulator

**4.7 Arduino Uno**

Arduino Uno is a microcontroller board based on the ATmega328 (datasheet). It is having 16 MHz ceramic resonator, 6 analogue inputs, 14 digital input/output pins (of which 6 may be used as PWM outputs), a USB port, a power connector, an ICSP header, and a reset button. Everything required to support the microcontroller is included. To start up, we are attaching it to a computer using a USB cable or a battery.



Fig.7. Arduino UNO

**5. Methodology**

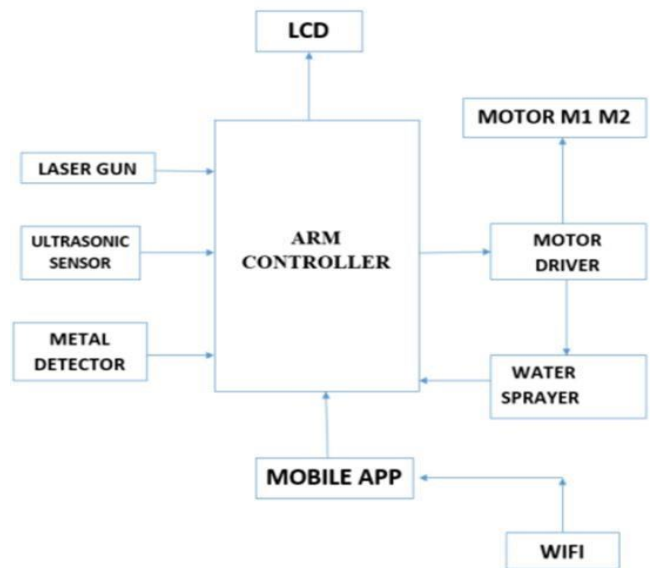


Fig.8. Block Diagram

**Working:**

This project based on a micro-controller and IOT concepts. Where we are using Arduino, Servo motors, car chassis, camera module, sensors and mechanical arm to build this surveillance robot setup. The camera which we used to tram the video over Wi-Fi use The wonderful thing about this is that we can operate the entire system from an Android app and the internet will give us a live stream. So for this we build an android application using android studio, the app has controls like forward, backward, turn left, turn right. And same for the Arm. The Arduino uses C language for coding.



The data capture through camera module, send to the desired device using internet. By using this data, the user gives further commands to the robot. Now we are selecting domain like machine learning with artificial intelligence so we consider on working of this domain which will achieve the aim of this project. Any computer-enabled algorithm that can be used on a data set to detect a pattern in the data is referred to as machine learning. The wider notion of robots performing activities in a way that we would consider intelligent is known as artificial intelligence (AI).

## 6. Result and Discussion

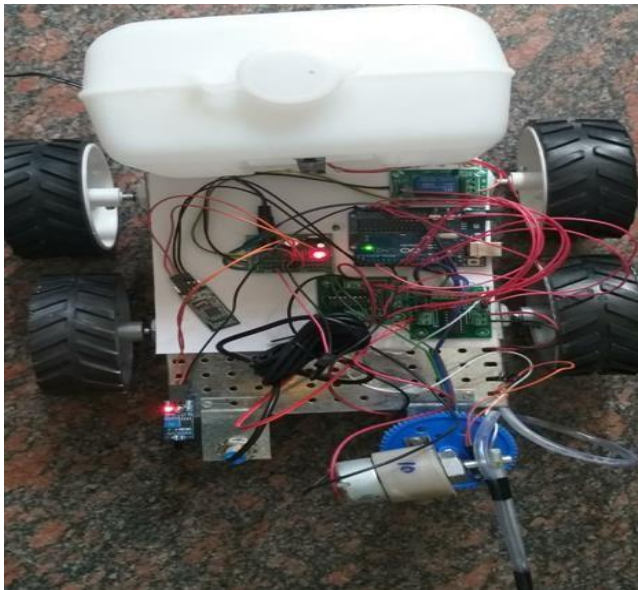


Fig.9. Experimental Model

### 6.1 Path Planning Algorithm

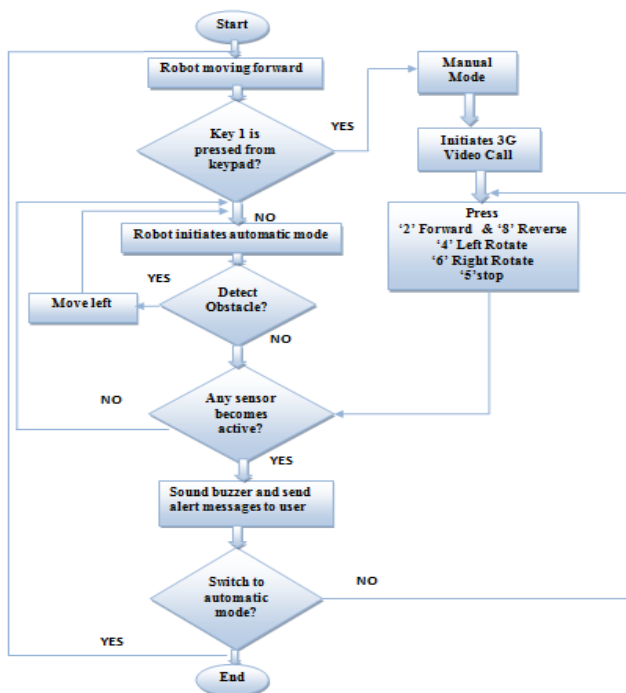


Fig.10. Flow chart of the entire design

### 6.2 Software Analysis and Control Algorithm

#### Software Analysis

- We implement the security robot by programming it in *mikroC PRO* which is a complete featured ANSI C compiler for PIC components.
- It provides various features such as instinctive IDE, prevailing compiler with complex optimizations, plenty of hardware and software libraries, and extra tools that provide help to the user.

#### Control Algorithm

The following steps to taken to control the movement and functionality of robot:

- The military robot initiates in automatic mode by default.
- Key '1' uses to switch from automatic to manual mode.
- During autonomous operation if ultrasonic sensor and infrared sensor detects any obstacle, it rotates left or right according to algorithm.
- The alert messages send to user via WI-FI Module after the activation of any sensor.
- In manual mode to change the path of robot, user initiates 3G video call to cell phone equipped on the robot.
- The 3G video call provides the live view of surrounding in order to change the path an direction of robot.

### 6.3 Expected Outcomes

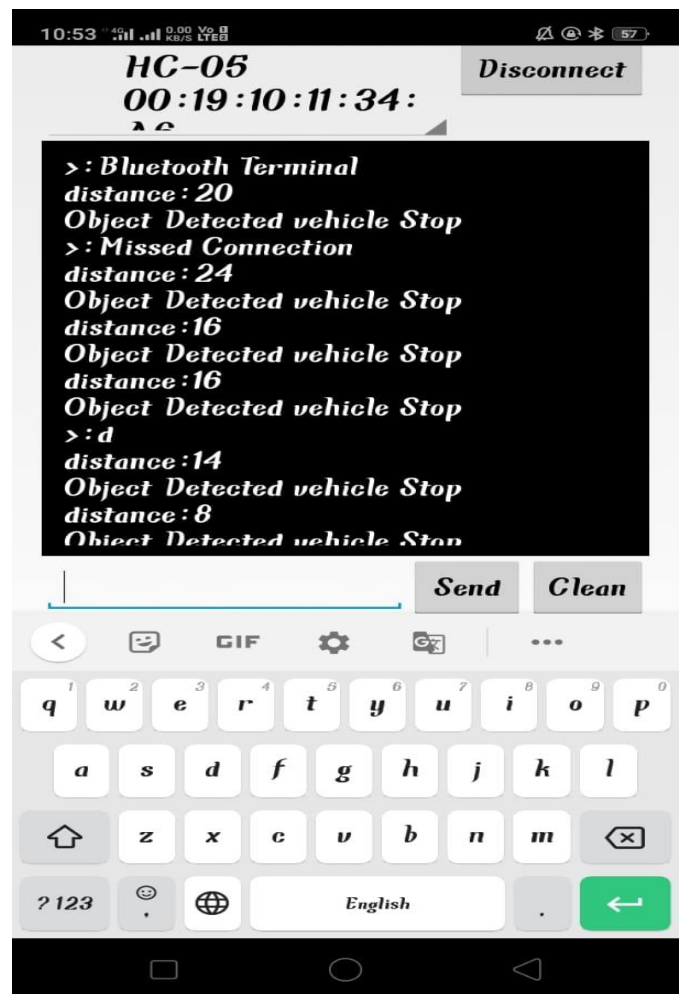


Fig.11.1 Software programming for running the Robo



Fig.11.2 Software programming for running the Robo

## ADVANTAGES

- Several performances
- Its reliable.
- 24/7 working mode.
- Improved version.
- It can relocate from one place to another.
- Robotic employees never grow weary.
- May be persuaded to carry out even the riskiest duties without fear.

## DISADVANTAGES

- The adversary may hack army robots and use them against us.
- Robots might rule the planet and replace us in our occupations.
- Robotic skills are restricted. Although autonomous robots are capable of object detection and navigation they are unable to respond to unexpected situations.

## APPLICATIONS

- It may be used to keep an eye on any suspicious object where a person's presence could be hazardous.
- Due to the existence of a gas detector and a fire detector, it may be utilized in mining.
- It is employed in the gas industry to find potentially dangerous leaks.

- It can be employed in the military; the robot can do risky duties without having to worry about human lives being lost

## 7. Conclusion and Future Scope

- The communication technique has enhanced the use of live camera due to which we can operate the vehicle from any part.
- Use of renewable source of energy (solar) makes it cost effective.
- Its multifunctionality can be updated and can be used as surveillance where the human can not footpace and will be alert before any destruction.
- The majority of the upcoming generation of robots that will be used everywhere will be "recent one and improved" variations of current platforms. For instance, Robot's initial Pack bot was simply a mobile pair of binoculars because it only present a digital camera that relayed back images which the robot was viewing. Now, with the addition of very basic effect or arms and grippers, the majority of Pack bots execute EOD missions.
- Reaper, an Air Force drone that sounds even more terrifying and is around four times larger and nine times more powerful than the Predator, is the Predator's successor. One of its upgrades is a software package for Microsoft Windows that has "automatic man-made object detection" and "coherent change detection." The plane can almost fly itself, and its sensors can identify and classify people and artificial things produced by humans. It is even capable of understanding the changes it observes, such as being able to decipher and follow footsteps or even lawnmower tracks.

## FUNDING SOURCES

Our project has been selected by VTU (Visvesvaraya Technological University, Belagavi ) and given a fund of Five Thousand Rupees (5000/) as per the Ref. No: (VTU/BGM/2021-22/545 ) and rest of the amount has been spend by the staff and students.

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**AUTHORS PROFILE**

**Mrs. Sushmita Deb**, Presently working as Assistant professor, SJMIT, Chitradurga, Karnataka. She is a PhD scholar also. She is having working experience of 17 years in this Academic field. In this tenure she has published many papers in National and International conferences.



Mandara V, Final year student, SJMIT, Chitradurga, Karnataka.



Shashank P, Final year student, SJMIT, Chitradurga, Karnataka.

