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## SHREE SWAMI ATMANAND SARASWATI INSTITUTE OF TECHNOLOGY, SURAT
### Affiliated with GTU

**UNDER SUBJECT OF**
**PROJECT**
**B.E. IV, SEMESTER-VIII**
**(ELECTONICS AND COMMUNICATION ENGINEERING)**

**Submitted By:**
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**ACADEMIC YEAR**
**(2019-20)**

# CERTIFICATE

This is to certify that research work embodied in this project report entitled **" ARMY ASSISTIVE ROBOT "**was carried out by **Nasit Poonam (160760111029),** studying in **electronics & communication Engineering Department** of **Shree Swami Atmanand Saraswati Institute of Technology, Surat (076)** for partial fulfillment of the subject Design Engineering-1B(2140002) of Bachelor of Engineering degree to be awarded by Gujarat Technological University. This research work has been carried out under my guidance and supervision and it is up to my satisfaction.

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# <u>ACKNOWLEDGMENT</u>

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We wish to express our sincere thanks to our Head of Department Prof. Avani Lakhlani and other faculties for their technical support as well as our team members and classmates which helped us to enhance our project performance.

We feel extremely happy to come out with this project, with support of many individuals who have willingly helped us out with their abilities and we are sincerely thankful to them.

**Yours sincerely,**

Nasit Poonam (160760111029)

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# <u>ABSTRACT</u>

Everyone knows that being a soldier is a dangerous job, but some of the tasks that soldiers are required to do are more dangerous than others. Walking through minefields, deactivating unexploded bombs or clearing out hostile buildings, for example, are some of the most dangerous tasks a person is asked to perform in the line of duty.

What if we could send robots to do these jobs instead of humans? Then, if something went wrong, we'd only lose the money it cost to build the robot instead of losing a human life. And we could always build more robots.

The U.S. military has been developing robotic systems for all sorts of jobs for years now, and some of them are even on the front lines in Iraq . In this article, we'll meet some of the military's latest robot soldiers, find out what sorts of jobs they can do and get a glimpse of what the future holds for military robots.

# CHAPTER 1: INTRODUCTION

The safety of the country is depends on the defense of the country. Attacks are frequently happens near the border. The borders are not safe for the civilians and also for the soldiers that protect the borders. The patrolling the borders 24/7, they always on the alert for any kind of situations. They work in hot summer, cold winters, in rainy day, in storm, in forest, in dessert etc. So, we thought that if they have substitute the soldiers in the difficult situation. So, they can survey the all kind of places that they cannot reach. We are try to replace soldiers in hazardous situations such as handling explosive , bomb disabling etc…where soldiers cannot easily reach. This Army server Robot is used for interfacing warfare Instead of our soldiers returning home in flag-damped caskets to heartbroken families.  The robot can replace the human. Autonomous robot –mobile machine can take decisions, such as a fire of target without human intervention.

On the military border there are many surprising attacks are happen. So those people are living near the military border they suffering every day. So we just try to replace army robot against soldiers and save the soldiers and as well as people. Our goal should be more practical and immediate to design a machine that performs better than humans to do a battlefield particularly with respect to reducing unlawful behavior or war crimes.

Military robots are designed for military tasks such as shooting a gun, flying and going underwater. Military robot use sensors to search and identify things.

## 1.1 PROBLEM IDENTIFICATION:-

On the military border there are many surprising attacks are happen. So those people are living near the military border they suffering every day. Sow just try to replace army robot against soldiers and save the soldiers and as well as people. Our goal should be more practical and immediate to design a machine that perform better than humans to do a battlefield particularly with respect to reducing unlawful behavior or war crimes.

Military robots are designed for military tasks such as shooting a gun, flying and going underwater. Military robot use sensors to search and identify things.

- **What defines a robot?**

 A robot is a mechanical or virtual intelligent agent that can perform tasks automatically or with guidance, typically by remote control. In practice a robot is usually an electro-mechanical machine that is guided by computer and electronic programming. Robots can be autonomous, semi-autonomous, or remotely controlled. Robots range from humanoids such as ASIMO and TOPIO to nano robots, swarm robots, industrial robots, military robots, mobile, and servicing robots. By mimicking a lifelike appearance or automating movements, a robot may convey a sense that it has intent or agency of its own.

- **What is assistive robotics?**

 VDL's definition: An assistive robot performs a physical task for the well-being of a person with a disability. The task is embedded in the context of normal human activities of daily living (ADLs) and would otherwise have to be performed by an attendant. The person with the disability controls the functioning of the robot. (2005) Dave's definition: An assistive robot is a device that can sense, process sensory information, and perform actions that benefit people with disabilities and seniors.

## Purpose of this project:

Purpose of this project is to help out the soldiers to survey the places and the border to identify the strangers. So, they don't have to go and expose them salves to the human-bomb or any other terrorist that info trade the border. We are going to make the robot that survey the field and the any other place that soldiers cannot reach. In this robot we include the night vision camera that can help the soldiers to see in the night. Also there is included the 360 degree rotating gun, speaker, GPS tracker, Bluetooth controller , arduino etc. This robot is remote control so we can control the robot from far away. Also there is battery included. The wheels are chain wheel so they are able to go anywhere like mud, forest, snow, heels, etc. Robot has the strong metal body can withstand the shocks and any other damage. It is also heat and cold resistance.

# CHAPTER 2: LITERATURE REVIEW

## 2.1 Literature Review:-

## Arduino based Battlefield Assistive Robot

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*Abstract*—Sophisticated technology advancing day by day and robotics has become a promising field for research in this race. Military forces now using robots for reducing causalities and to defeat their enemies. The major focus of this project, is on the use of robot in war, peace and as well as their impact on society. Here Radio Frequency modules signals are used in wireless remote control system for transmitting and receiving wireless signals to control the motors and actuators of robot control system. Night vision monitoring system has been added which will capture and transmit the information surrounding the robot to the operator. With this feature the robot can not only transmit real time videos with night vision capabilities but cannot also be identified by the enemies in war zone. A metal detector and GSM module has also been added which will inform us about any bomb underneath the robot vehicle. Another assistive feature here added that, is a robotic arm has been installed to pick or drop some object if needed.

*Keywords— Robot, Radio Frequency module, actuators, Night Vision camera, Metal Detector, GSM Module*

### I. INTRODUCTION

Science has brought out wondering technologies to ease human life. Robotics is one of the branches of it, which has made human life easier and lessened the workload. It has also enabled us to reduce the participation of human in risky works. Nowadays robots are being used for various purpose in industries, labs, Space and also in battlefield. People are sending robots to places where man can hardly go like in space, underwater, bomb surrounded areas. Wireless communication system has become one of the essential features for commercial products and a popular research topic within the last ten years. There are now more mobile phone subscriptions than wired-line subscriptions. Lately, one area of commercial interest has been low-cost, low-power, and short distance wireless communication used for personal wireless networks. Technology advancements are providing smaller and more cost effective devices for integrating computational processing, wireless communication, and a host of other functionalities.

This project's main functionality is to deal with tough situations where human beings cannot handle situations like darkness, entering narrow and small places and detecting hidden bombs etc. Such hostile situation is occurring day by day in different parts of the world through terrorist attack or in natural catastrophes. This system works using an RF signal through which the whole controlling of the system response is done. Using night vision camera attached to robot situations around the system is observed according which the robot is instructed to move or do other functionalities. Besides with the robotic arm anything can be picked and carried within its limit and with the help of metal detector and GPS system and a cell phone a signal will be obtained if there is ant short of bomb or metallic weapons around the robot. The robot along with camera can wirelessly transmit real time video with camera controlling capabilities and using a robotic arm anything can be picked or dropped within its limit. This kind of robot can be very useful for helping purpose in war fields. The project is also designed to search invisible metal stuffs from where people are not capable to reach and it is so designed to work in hostile environment where visible light will not be available.

### II. LITERATURE REVIEW

Literally the word robot comes from the Slavic word ROBOTA which means labor. A robot is generally an electromechanical machine that is able to perform tasks weather automatically or manually or in both moods. It is also defined as the industrial machine that replaces the human being to work in such condition, which is hazardous and unsafe. Battlefield assistive Robot can be defined as a machine that removes the mines in war all on its behalf and can be used spying on the enemies. Nowadays with the improvement of technology, robots are used in military operations, which are not completely automatic. Those were actually control remotely. The robots or unmanned machines as they are termed, can be any moving object or a flying airplane fitted with all necessary equipment like sensors, LIDARS (Laser based Communication RADARS), cameras etc. [1, 7, 8]. Their operations can be from disposing bombs, to surveying enemy territories. Generally, there are three kinds of unmanned machines used in the military operations:

- Unmanned Ground Vehicle (UGV): They are used for ground purposes. They can carry heavy load, move on uneven terrains and have various sensors and cameras fitted on them.

- Unmanned Aerial Vehicle (UAV): They are used to carry aerial weapons and flying machines.

- Unmanned Underwater Vehicle (UUV): They are submarines or machines, which can survey under water [2].

North American Military, "TISON, heavy EOD robot" This unmanned multi mission robot is capable of Heavy-lift 9 degree-of-freedom manipulator with strong gripping

2. A year and a half ago, Russian defense contractor Rosoboronexport unveiled their remote control tank, the Uran-9. The tank has advanced target detection and identification systems allowing it to be operated by just one person. In addition to

full operation under manual control it can function autonomously under limited conditions.

3. South Korea, with its long, heavily defended border with North Korea, has used a simple AI sentry guns for years. They are fixed location piece of equipment that watches for and responds to possible threats. The Samsung SGR-A1 was developed in 2006 and reportedly deployed in 2010 along the demilitarized zone.

A similar system developed by Do Maam Super a Egis II was also unveiled in 2010. It can detect human at 3km during the day and 2.2 km at night. They are normally equipped with a 127mm caliber standard.

# CHAPTER 3: SYSTEM DESCRIPTION

## 3.1 WIRELESS CONTROLLED MILITARY COMBAT ROBOT SYSTEM

This work practically implements the advanced features in the defense field. With the help of this idea, "Wireless Intelligent Army Robot" the army people can know the position of battle field and can detect location of enemy without entering to the battle itself. Presents a modern approach for surveillance at remote and border areas using multifunctional robot based on current 3G technology used in defense and military applications. In an intelligent unmanned army robot is actively being developed for both civilian and military use to mainly perform in dangerous activities. Has robot is controlled from the PC in Zig-bee communication using application software. Depicts the design and implementation of intelligent R-Hex robot using microcontroller. The robot is controlled by wireless communication using Zig-bee module. Forward, right move, left move and backward direction from the Microcontroller will drive the robot in any desired direction. In , the main objective of our system is to get camouflaged including some additional parameters like blue-tooth module for real time data processed by the camera at the video screen and PIR sensor to trace the intruders. Thus the proposed system using blue-tooth reduces errors at defense and keeps the nation secure from the foe. presents the design and development of robot which are specifically used in war field. For that purpose a wireless camera are mounted on the robotic body. This wireless camera is used to monitor the exact position of the enemies and send it on real time base. The robotic motion is control by RF technology. The main aim of is to study development of the mobile operated spy robot. The robot is in form of a vehicle mounted with a web cam, which acquires and sends video to a TV or PC. Gave solutions to solve very hazardous military applications are performed by wireless robots. These applications are performed by processing PC by receiving video of the surveillance area with the help of FM modulation/demodulation process. The present work with robot and is controlled by a RF transmitter and receiver module. The transmitter and receiver are connected with encoder and decoder ICs respectively. The received data will be fed into driver unit. The LD293 is motor driver IC to operate the motors in any direction required dependent on logic applied to logic pins. The transmitter block consists of push buttons, Encoder and RF transmitter. The receiver block consists of RF receiver, Decoder, driver unit, relay unit, sensor unit, buzzer for indication of toxic gas, motor units for

movement of robot and water pump. The block diagram of receiver unit. The controlling of this robot is done with help of RF module. This robot can be used to detect toxic gases and can used as fire fighter with help of sensors. For this a micro wireless camera is fitted on the robot where the video and voice are transmitted to the required place i.e. control room. The tank type robot is constructed with help of chain wheels which is connected to motors for the movement of robot in all directions with geared facility. The RF transmitter and receiver are used both in the control unit as well as in the robotic module. The RF transmitter and receiver operate at the frequency of 433MHz. The RF transmitter module is used to transmit the signals to control the robot. Push button switches are used in transmitter to give the input signal to microcontroller and the output of microcontroller is connected to IC HT12E which encodes and sends the serial bits to the RF transmitter module.

## 3.2 VNC SERVER BASED ROBOT FOR MILITARY APPLICATION

The project has been designed for such that the India is facing the problems against the terrorism activities and not India but throughout the world. Everyday hundreds of trained personnel are either injured or lose their lives while defusing bombs. Typical examples of multi-robot applications include military reconnaissance, surveillance, planetary exploration and many geophysical mapping, service, and entertainment etc. Our robot provides an extra layer of protection to the bomb disposal squad by allowing them to check and analyze a suspicious packet before actually approaching it for disposal. This robot is designed to take high risk and lets the robot operators to focus on what to do to an explosive device when They see the bomb through the camera than what immediate action should be taken for the system to save the life of the human's. The evolution and increasing research in computer interaction has resulted in a large set of input devices for interaction. The keyboard and mouse have been for long the main instruments to provide an input to a computer. Newer technologies have however, allowed for a more natural and intuitive way of information exchange. The research of bomb-disposed robot is a hotspot in robot field currently, involving in knowledge in different fields, including mechanical design, the image processing, kinetic control, sensor technology, mechanics of communication etc. So, developing robot control system is a complicated engineering. This system will include multifunctional tools, two simultaneously

working robot arms with dextrousg rippers, a stereo head, smart sensors for ordnance, for human detection and for the assessment of the environment, autonomous vehicle and advanced information and Communication facilities that will lead to improvement of the emergency risk management. thus the developing technology has now given the relief to Bomb disposal teams to stay as far away from their work site as possible as for their safety, preferably only interacting via remote-controlled, expendable robots, bomb disposal is also an extremely delicate job and most robots lack the finesse to properly disarm a bomb. Even though the driver of the robot was completely oblivious to the incident.

**BLOCK DIAGRAM:**
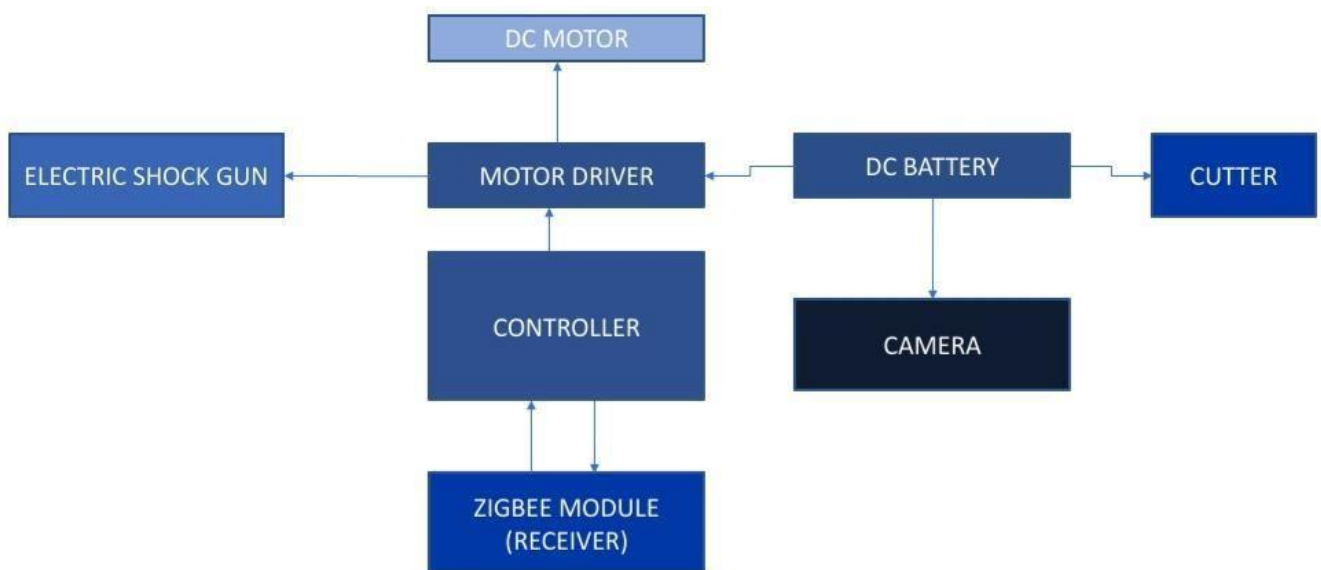


## 3.3 DETAILS OF BLOCK:

1. DC BATTERY:-

   Here we use the 12 volt dc battery. Battery give the dc power supply. And current flow is 1300 KAH.

2. MOTOR DRIVER:-

   The motor driver is a module VNH2SP30 used. This is dual bidirectional motor driver is based on the very popular Dual H-bridge motor driver IC. This

module will allow to easily and independently control two motors of up to 30A each in both directions. It is for Robotic application and suited for connection to a microcontroller requiring just a couple of control lines per motor.

Driver is a high current and high voltage IC. Its receives TTL logic signals and operate different loads like motors, solenoid relays etc..

Operating supply voltage up to 46v
Dc current up to 30A
Low saturation voltage
Over temperature protection

| MD1 | | MD2 | | OUTPUT OF MOTOR |
|---|---|---|---|---|
| M1 | M2 | M3 | M4 | |
| 0 | 0 | 0 | 0 | STOP |
| 1 | 0 | 1 | 0 | FORWARD |
| 0 | 1 | 0 | 1 | REVERSE |
| 1 | 0 | 0 | 1 | LEFT |
| 0 | 1 | 1 | 0 | RIGHT |

4. ARDUINO UNO:-

The arduino is open source hardware. In arduino ATmega328P IC use. It has 32 KB. it has 14 digital pins use for input or output. They operate at 5 volt. Each pin can provide or receive a maximum of 40ma and has an internal push up resistor of 20-50 kohms. The arduinonano has 6 analog inputs. Each of provide 10 bits of resolution. Arduino clock speed is 15 MHz and SRAM is 2 KB.

5. ZIGBEE MODULE:-

ZIGBEE module is an easy to use serial port protocol module. Designed for transparent wireless serial connection setup. It can be transmit and receiving the data of arduino.

6.  DC GEAR MOTOR:-

Gear motor is a specially designed DC motor which has gear assembly helps in increasing the torque and reducing the speed. Compared to a normal DC motor, maximum rpm a gear motor can produce is less. DC motor is machine that converts electrical energy into mechanical energy in form of rotation.

7. ELECTRIC SHOCK GUN:-

Here we add the electric shock gun which is attached to the battery. It is use for shock to the attacked person for few minutes.

8. CUTTER:-

Cutter is used for any obstacle come in that path so, it cuts the obstacle and go away. It is connected to 12v DC battery, which is continuous the applied voltage.

# CHAPTER 4: WORK METHODOLOGY

We are making the robot that can operate on the programming. Which is easily movable and controlled. We can see the basic arrangement in the block diagram. There is a motor, arduino, motor drive, battery, Bluetooth, electric shock gun, cutter and camera. The working of robot is based on the autonomous system. Which allows us to operate the robot with remote. Here we upload the program that we made in the arduino software that includes the command of how motor will operate. So, we used mobile application through give command to Bluetooth. Bluetooth HC05 module used. So, command will given to Arduino.

The Arduino send the command signal to the motor drive which is connected with arduino. Arduino used Atmega328 IC. Arduino operating voltage is 5 volt. So, we cannot drive DC motor because arduino current is very small so it is not capable to drive motor. So, we are used motor driver and relay driver. Motor driver has a 4 analog operating pins the two of them connected with the Johnson DC motor. motor driver through Arduino signal will amplified and convert in high power signal and this signal given to motor driver. So, motor will rotate. For this way start 4 motor with motor driver. Here the motor is bidirectional.

Night vision camera is 360 degree rotating and it installed on the top of the robot and connected with arduino and give image to the operator. So the operator can see on time. Camera is controlled by mobile application so, whatever will be seen then give to command and we seen that video. Also there is inbuilt speaker module that give the command and receive the audio from the robot.

We put the electric shock gun for defense purpose. Which is able to faint the attack person for few time. DC battery the power backup to provide to the robot. So 3 to 4 hours continues power also 2 to 3 day standby mode power. Also in future we add the solar panel. So we don't require charge it can charge itself. Also in place of Bluetooth we can use zigbee. So we get long range cover up.

# ARMY ASSISTIVE ROBOT

- **Schematic layout:**
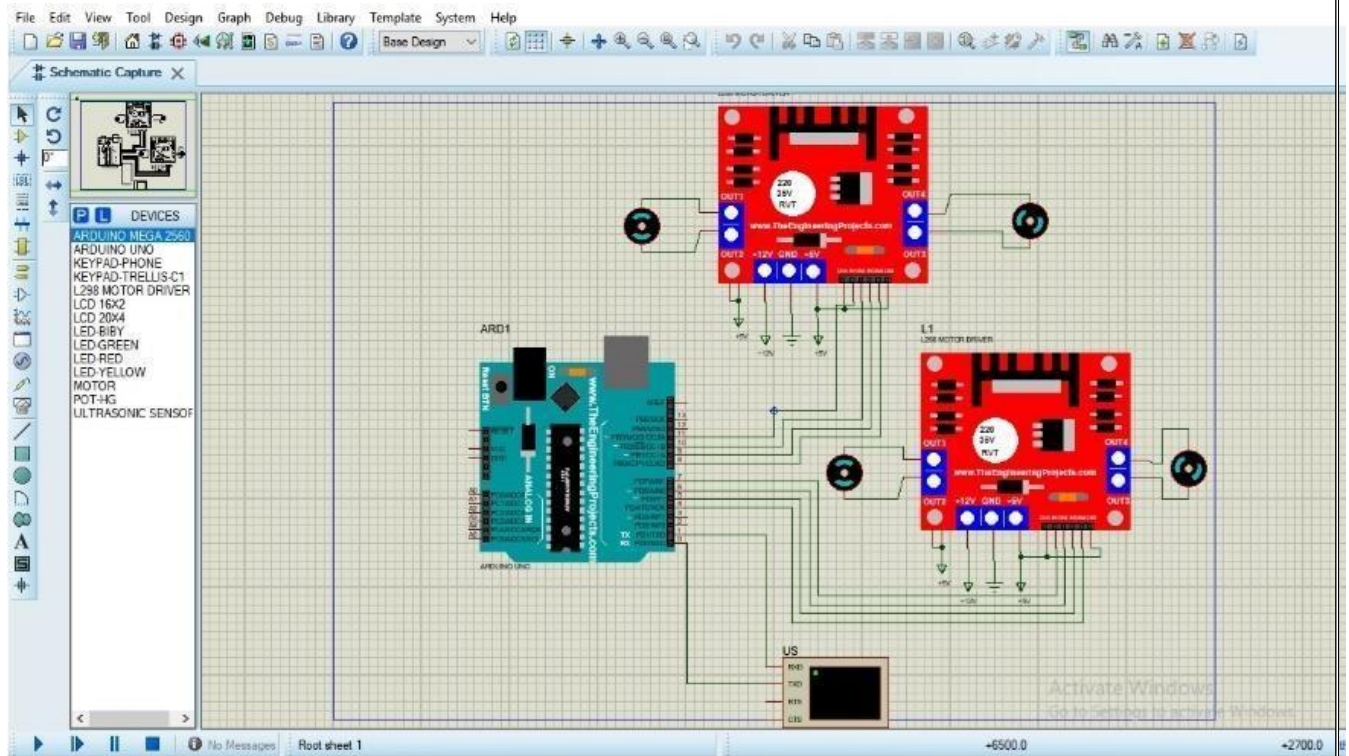


## Fig:4.1 SCHEMATIC DIAGRAM

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# CHAPTER 5: CANVAS REPORT

**The AEIOU stands for,**

A=>   Activities
E=>   Environment
I=>   Interaction
O=>   Objects
U=>   User

## 5.1 AEIOU Canvas:-

The objective of the observation canvas is to adopt systematic approach based on design thinking and articulate the insights derived from empathization process including observation, interaction etc during ISY(industrial shodh yatra)..
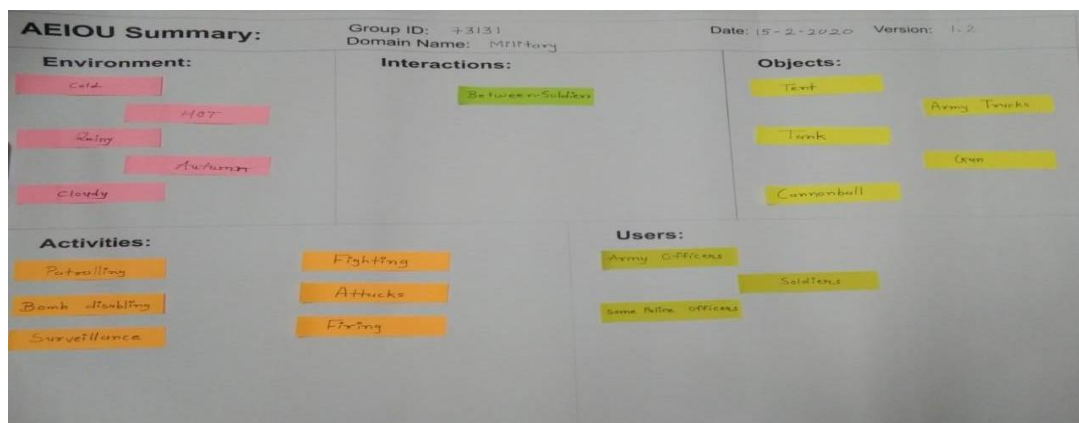


**Fig: 5.1 AEIOU canvas**

## 5.2 Empathy Canvas:-

A user empathy map is used to help in the discussion about the needs a user has using it allows you to focus on what was observed, and what can be inferred about your different groups belief and emotions. Developing a better understanding of the person for whom you are designing your product with the empathy map helps you synthesize observation and draw out unexpected insights.
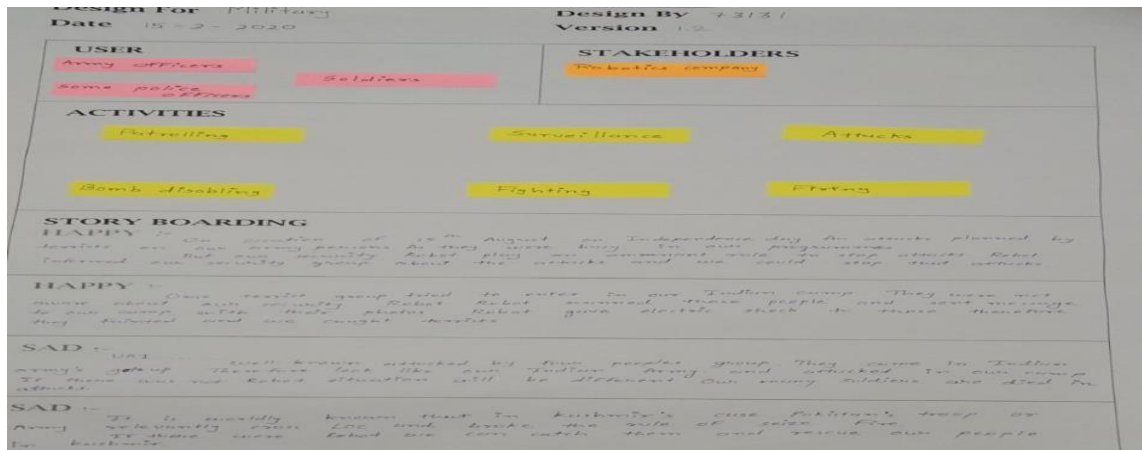
**Fig: 5.2 Empathy canvas**

## 5.3 Ideation Canvas:-

The objective of the ideation canvas is to adopt a systematic design thinking approach to ideate and approach towards solving the defined challenge, finalized in observation canvas. This effort will bring in various heuristics for solving a challenge using multiple ways.
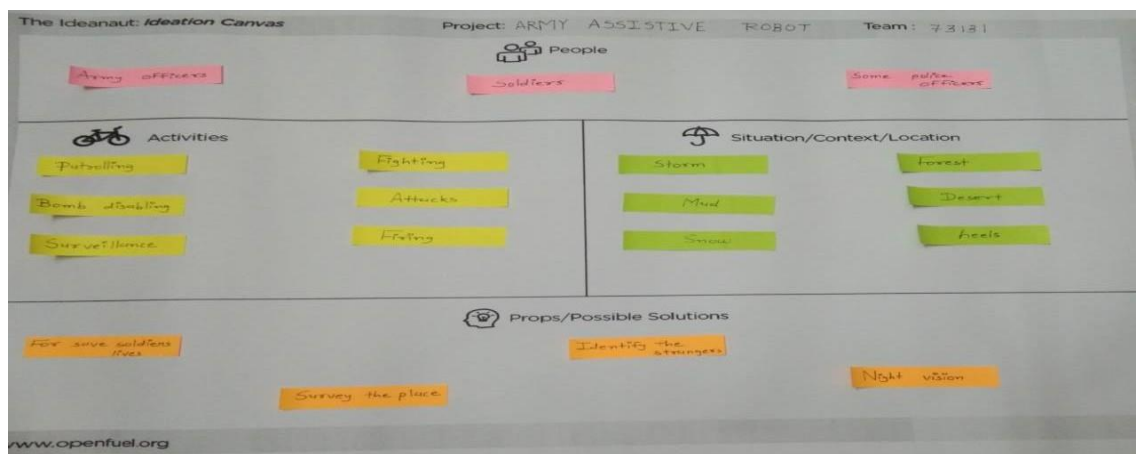


**Fig: 5.3 Ideation canvas**

## 5.4 Product Development Canvas:-

Product development canvas deals with the purpose for the product for the product that will ultimately be the output, the people those are to be benefitted by this and also the possibilities of corrections in the product hardware or software portion.
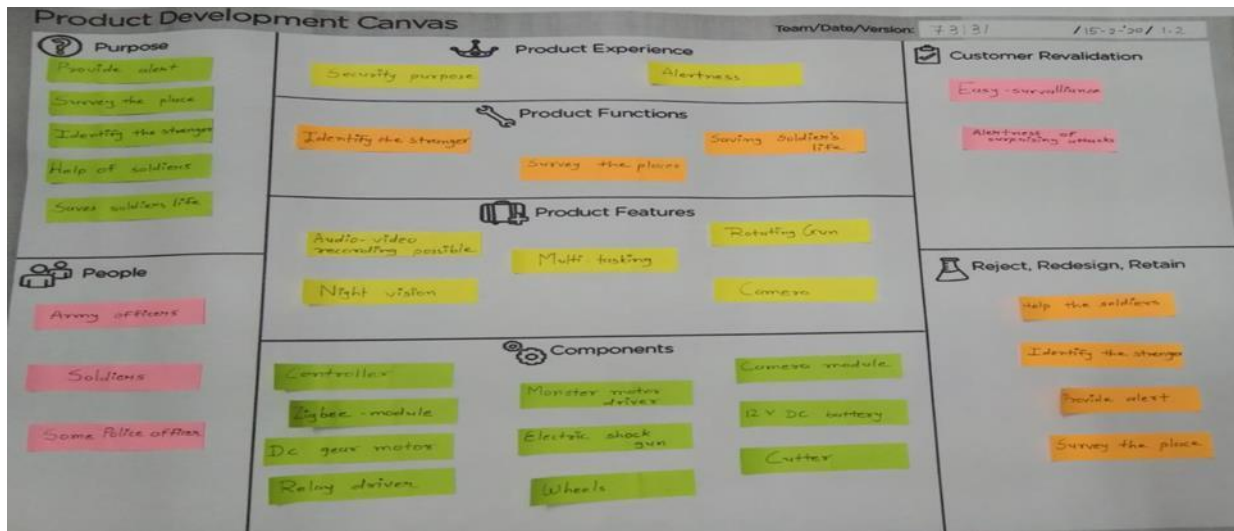
**Fig: 5.4 Product canvas**


## 5.5 *Business Model Canvas:-*

**Business Model Canvas** is a strategic management and lean start-up template for developing new or documenting existing **business models**. It is a visual chart with elements describing a firms or product's value proposition, infrastructure, customers, and finances.
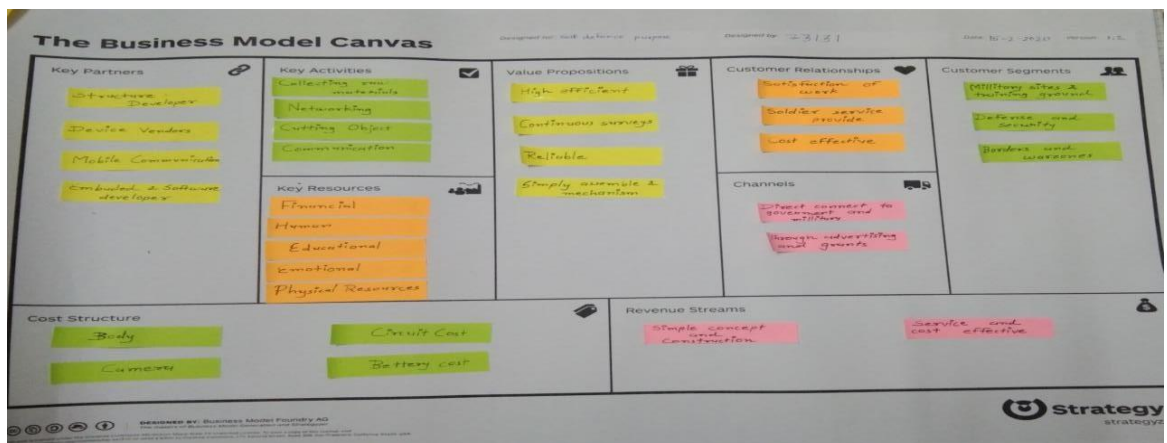


□□□□□□□□□□□□□**Fig: 5.4 BUSINESS MODEL CANVAS**

□□ **Description:-**

Formal descriptions of the business become the building blocks for its activities. Many different business conceptualizations exist; Osterwalder's work and these propose a *single reference model* based on the similarities of a wide range of business model conceptualizations. With his *business model design template*, an enterprise can easily describe their business model.

# CHAPTER 6: HARDWARE DISCRIPTION

## 6.1 INTRODUCTION

### 6.1.1 COMPONENT REQUIRED

- ✓ Arduino UNO
- ✓ Aluminum sheet, wood sheet, rod for shock gun
- ✓ VNH2SP30 Monster  motor driver Module
- ✓ Relay driver
- ✓ Zigbee Moduale
- ✓ DC gear motor
- ✓ Four Johnson DC motor
- ✓ 12V DC Battery
- ✓ Connecting wire
- ✓ Electric shock gun
- ✓ Electrode
- ✓ Camera
- ✓ Cutter
- ✓ Wheels

### SPECIFICATION OF COMPONENT

**1. CAMERA**:-

Camera is used for the on time vision on the display at the camp.



**Fig: 6.1 CAMERA**

## 2. ARDUINO UNO:-

- Microcontroller: MicrochipATmega328IC[7]
- Operating Voltage: 5 Volts
- Input Voltage: 7 to 20 Volts
- Digital I/O Pins: 14 (of which 6 provide PWM output)
- Analog Input Pins: 6
- DC Current per I/O Pin: 20 mA
- DC Current for 3.3V Pin: 50 mA
- Flash Memory: 32 KB of which 0.5 KB used by bootloader
- SRAM: 2 KB UNO
- EEPROM: 1 KB
- Clock Speed: 16 MH

**Fig: 6.2 ARDUINO**

## Pin Description:

| Pin Category | Pin Name | Details |
|---|---|---|
| Power | Vin, 3.3V, 5V, GND | Vin: Input voltage to Arduino when using an external power source.<br><br>5V: Regulated power supply used to power microcontroller and other components on the board.<br><br>3.3V: 3.3V supply generated by on-board voltage regulator. Maximum<br><br>current draw is 50mA.<br><br>GND: ground pins. |
| Reset | Reset | Resets the microcontroller. |
| Analog Pins | A0 – A5 | Used to provide analog input in the range of 0-5V |
| Input/Output Pins | Digital Pins 0 – 13 | Can be used as input or output pins. |

Internal

| | | |
|---|---|---|
| Serial | 0(Rx), 1(Tx) | Used to receive and transmit TTL serial data. |
| External Interrupts | 2, 3 | To trigger an interrupt. |
| PWM | 3, 5, 6, 9, 11 | Provides 8-bit PWM output. |
| SPI | 10 (SS), 11 (MOSI), 12 (MISO) and 13 (SCK) | Used for SPI communication. |
| Inbuilt LED | 13 | To turn on the inbuilt LED. |
| TWI | A4 (SDA), A5 (SCA) | Used for TWI communication. |
| AREF | AREF | To provide reference voltage for input voltage. |

## Arduino Uno Technical Specifications:

| | |
|---|---|
| Microcontroller | ATmega328P – 8 bit AVR family microcontroller |
| Operating Voltage | 5V |
| Recommended Input Voltage | 7-12V |
| Input Voltage Limits | 6-20V |
| Analog Input Pins | 6 (A0 – A5) |

| | |
|---|---|
| Digital I/O Pins | 14 (Out of which 6 provide PWM output) |
| DC Current on I/O Pins | 40 mA |
| DC Current on 3.3V Pin | 50 Ma |
| Flash Memory | 32 KB (0.5 KB is used for Bootloader) |
| SRAM | 2 KB |
| EEPROM | 1 KB |
| Frequency (Clock Speed) | 16 MHz |

## Other Arduino Boards:

Arduino Nano, Arduino Pro Mini, Arduino Mega, Arduino Due, Arduino Leonardo

## Overview:

**Arduino Uno** is a microcontroller board based on 8-bit ATmega328P microcontroller. Along with ATmega328P, it consists other components such as crystal oscillator, serial communication, voltage regulator, etc. to support the microcontroller. Arduino Uno has 14 digital input/output pins (out of which 6 can be used as PWM outputs), 6 analog input pins, a USB connection, A Power barrel jack, an ICSP header and a reset button.

## How to use Arduino Board:

The 14 digital input/output pins can be used as input or output pins by using pinMode(), digitalRead() and digitalWrite() functions in arduino programming. Each pin operate at 5V and can provide or receive a maximum of 40mA current, and has an internal pull-up resistor of 20-50 KOhms which are disconnected by default. Out of these 14 pins, some pins have specific functions as listed below:

- **Serial Pins 0 (Rx) and 1 (Tx):** Rx and Tx pins are used to receive and transmit TTL serial data. They are connected with the corresponding ATmega328P USB to TTL serial chip.

- **External Interrupt Pins 2 and 3:** These pins can be configured to trigger an interrupt on a low value, a rising or falling edge, or a change in value.
- **PWM Pins 3, 5, 6, 9 and 11:** These pins provide an 8-bit PWM output by using analogWrite() function.
- **SPI Pins 10 (SS), 11 (MOSI), 12 (MISO) and 13 (SCK):** These pins are used for SPI communication.
- **In-built LED Pin 13:** This pin is connected with an built-in LED, when pin 13 is HIGH – LED is on and when pin 13 is LOW, its off.

Along with 14 Digital pins, there are 6 analog input pins, each of which provide 10 bits of resolution, i.e. 1024 different values. They measure from 0 to 5 volts but this limit can be increased by using AREF pin with analog Reference() function.

- Analog pin 4 (SDA) and pin 5 (SCA) also used for TWI communication using Wire library.

Arduino Uno has a couple of other pins as explained below:

- **AREF:** Used to provide reference voltage for analog inputs with analogReference() function.
- **Reset Pin:** Making this pin LOW, resets the microcontroller.

## Communication:

Arduino can be used to communicate with a computer, another Arduino board or other microcontrollers. The ATmega328P microcontroller provides UART TTL (5V) serial communication which can be done using digital pin 0 (Rx) and digital pin 1 (Tx). An ATmega16U2 on the board channels this serial communication over USB and appears as a virtual com port to software on the computer. The ATmega16U2 firmware uses the standard USB COM drivers, and no external driver is needed. However, on Windows, a .inf file is required. The Arduino software includes a serial monitor which allows simple textual data to be sent to and from the Arduino board. There are two RX and TX LEDs on the arduino board which will flash when data is being transmitted via the USB-to-serial chip and USB connection to the computer (not for serial communication on pins 0 and 1). A Software Serial library allows for serial communication on any of the Uno's digital pins. The ATmega328P also supports I2C (TWI) and SPI communication. The Arduino software includes a Wire library to simplify use of the I2C bus.

## Applications:

- Prototyping of Electronics Products and Systems

- Multiple DIY Projects.
- Easy to use for beginner level DIYers and makers.
- Projects requiring Multiple I/O interfaces and communications.

### 3. DC GEAR MOTOR:-

- 12V dc gear motors widely use for robotics application
- RPM=500
- Operating voltage=12v
- No load current=60mA (max)
- Load current=300mA(max)
- Torque=1Kg/cm
- Shaft diameter=6mm



**Fig: 6.3 DC GEAR MOTOR**

- DC motor is used to operate the rotating gun and wheels to operate.
- It is connected to the motor drive.

500 RPM 12V DC Geared Motor is high quality low cost DC geared motor. It has steel gears and pinions to ensure longer life and better wear and tear properties. The gears are fixed on hardened steel spindles polished to a mirror finish. The output shaft rotates in a plastic bushing. The whole assembly is covered with a plastic ring. Gearbox is sealed and lubricated with lithium grease and require no maintenance. The motor is screwed to the gear box from inside. Although motor gives 500 RPM at 12V but motor runs smoothly from 4V to 12V and gives wide range of RPM, and torque.

500RPM 12V DC geared motors for robotics applications. Very easy to use and available in standard size. Nut and threads on shaft to easily connect and internal threaded shaft for easily connecting it to wheel.

## Specifications:

DC supply: 4 to 12V
RPM: 500 at 12V
No Load Curent: 50mA at 12V
Load Current = 300mA(max) at 12V
Torque: 5kg-cm at 12V
Total length: 46mm

Motor diameter: 36mm
Motor length:  25mm
Brush type: Precious metal
Gear head diameter: 37mm
Gear head length: 21mm
Output shaft:  Centred
Shaft diameter: 6mm
Shaft length: 22mm
Gear assembly: Spur
Motor weight: 100gms

## 4. JONSHON DC MOTOR:-

It is simple DC motor with gear box attached to the shaft of the motor which is mechanically commutated electric motor. Powered from direct current. 100 RPM 12 V DC geared motors for robotics application. It gives a massive torque of 10Kgcm.
The motor comes with metal gear box and of centered shaft. Shaft has a metal bushing for wear resistance.

> ➢ FEATURES OF JOHNSON MOTOR:-

- 100 RPM 12V DC motors with Metal Gearbox
- 18000 RPM base motor
- Gearbox diameter 37 mm.
- 6mm shaft diameter
- Shaft length 15mm
- Motor Diameter 28.5 mm
- Length 63 mm without shaft
- 300gm weight
- Torque= 20Kgcm
- No load current= 800mA
- Stall current up to 9.5 A



**Fig: 6.4 JOHNSON MOTOR**

## 5. MONSTER MOTOR DRIVER:-

Here we use VNH2SP30 monster module used. It is full bridge motor driver for wide range of automotive application. It has dual monolithic high side driver and two low side switches. It has 30 pin. It control 4 motor. We use VCC pin for

5volt, digital 1, 6,9,4,5,8,7, GND is connected with Arduino for 5v,6, A3,5, A4, A5 pin respectively.

> ➤ FEATURES OF MONSTER MOTOR DRIVER:

- Voltage range: 5.5v to 16 v
- Maximum current rating: 30A
- Practical continuous current: 14A
- MOSFET on resistance: 19mΩ
- Maximum PWM frequency: 20KHz
- Thermal shutdown
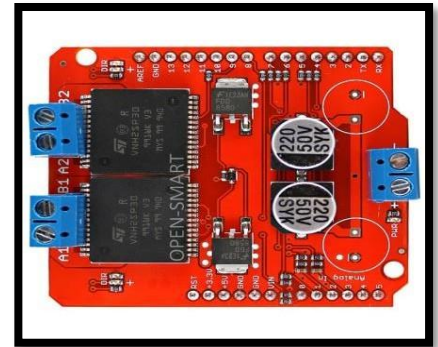- Undervoltage and overvoltage shutdown



**Fig: 6.5  MONSTER  MOTOR DRIVER**

**DESCRIPTION:**

VNH2SP30 is a full bridge motor driver intended for a wide range of automotive applications. The device incorporates a dual monolithic high side driver and two low side switches. The high side driver switch is designed using the STMicroelectronic's well known and proven proprietary VIPower M0 technology which permits efficient integration on the same die of a true Power MOSFET with an intelligent signal/protection circuitary. The VIN and motor out are pitched for 5mm screw terminals, making it easy to connect larger gauge wires. INA and INB control the direction of each motor, and the PWM pins turns the motors on or off. For the VNH2SP30, the current sense (CS) pins will output approximately 0.13 volts per amp of output current.

Step 2: Pinout Details



Connect to Motor 1 and Motor 2

Connect to Power Supply
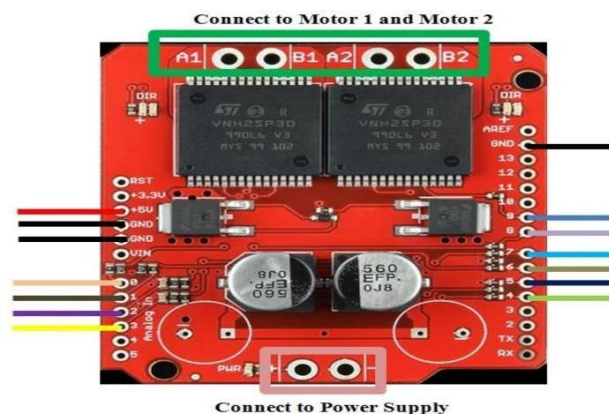
| No. | Colour | Description |
|-----|--------|-------------|
| VCC | | Power Supply |
| GND | | Ground |
| A0 | | Enable for motor 1 |
| A1 | | Enable for motor 2 |
| A2 | | Current sensor for motor 1 |
| A3 | | Current sensor for motor 2 |
| D7 | | Clockwise for motor 1 |
| D8 | | Counterclockwise for motor 1 |
| D4 | | Clockwise for motor 2 |
| D9 | | Counterclockwise for motor 2 |
| D5 | | PWM for motor 1 |
| D6 | | PWM for motor 2 |

**Fig:6.6 MONSTER MOTOR PIN OUT DETAIL**

Hardware Pinout:

A0 : Enable pin for motor 1
A1 : Enable pin for motor 2
A2 : Current sensor for motor 1
A3 : Current sensor for motor 2
D7 : Clockwise (CW) for motor 1
D8 : Counterclockwise (CCW) for motor 1
D4 : Clockwise (CW) for motor 2
D9 : Counterclockwise (CCW) for motor 2
D5 : PWM for motor 1
D6 : PWM for motor 2

Truth table to make motor to rotate :

Motor 0
STOP : D7 0, D8 0 & D7 1, D7 1
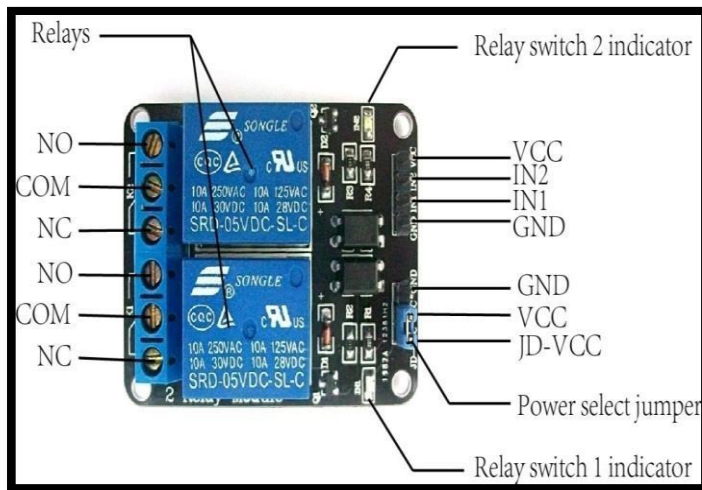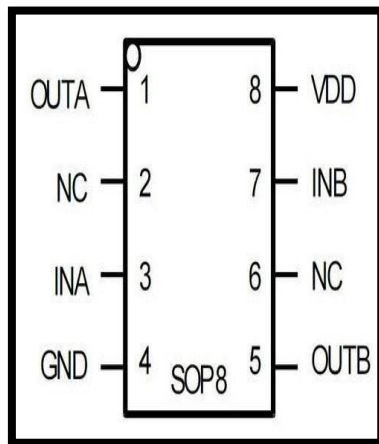CCW : D7 0, D8 1
CW : D7 1, D8 0
Motor 1
STOP : D4 0, D9 0 & D4 1, D9 1
CCW : D4 0, D9 1
CW : D4 1, D9 0

## 6. RELAY DRIVER:-

Relay driver use for controlling the voltage. Relay driver is control the two dc motor. It can be convert low voltage to high voltage generate. And supply the dc motor so it will be run easily.

**Fig: 6.7 RELAY IC & RELAY DRIVER**

A Relay driver IC is an electro-magnetic switch that will be used whenever we want to use a low voltage circuit to switch a light bulb ON and OFF which is connected to 220V mains supply. The required current to run the relay coil is more than can be supplied by various integrated circuits like Op-Amp, etc. Relays have unique properties and are replaced with solid state switches that are strong than solid-state devices. High current capacities, capability to stand ESD and drive circuit isolation are the unique properties of Relays. There are various ways to drive relays. Some of the Relay Driver ICs are as below.

- High side toggle switch driver
- Low side toggle switch driver
- Bipolar NPN transistor driver
- N-Channel MOSFET driver and
- Darlington transistor driver
- ULN2003 driver

**Relay Driver IC Circuit:** Relays are components that permit a low-power circuit to control signals or to switch high current ON and OFF which should be electrically isolated from controlling circuit.

The Required Components

- Zener Diode
- 6-9V Relay
- 9V Battery or DC Power Supply
- 2N2222 Transistor
- 1K Ohm Resistor
- Second Input Voltage Source
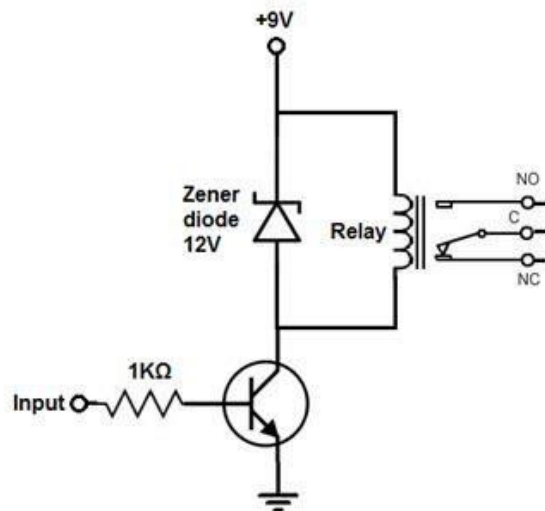


**Fig:6.8 RELAY DRIVER IC CIRCUIT**

In order to drive the relay, we use transistor and only less power can be possibly used to get the relay driven. Since, transistor is an amplifier so the base lead receives sufficient current to make more current flow from Emitter of Transistor to Collector. If the base once gets power that is sufficient, then the transistor conduct from Emitter to Collector and power the relay.

The Transistor's emitter-to-collector channel will be opened even though no input current or voltage is applied to Base lead of Transistor. Therefore, blocking current flows through relay coil.

The emitter-to-collector channel will be opened and allows current to flow through relay's coil if enough current or voltage is applied as input to the base lead. AC or DC Current can be used to power the relay and circuit. Relays are electromagnetic devices which allow low-power circuit to switch a high current

ON and OFF switching devices with the help of an armature that is moved by an electromagnet.

Driver Circuit is used to boost or amplify signals from micro-controllers to control power switches in semi-conductor devices. Driver circuits take functions that include isolating the control circuit and the power circuit, detecting malfunctions, storing and reporting failures to the control system, serving as a precaution against failure, analyzing sensor signals and creating auxiliary voltages.

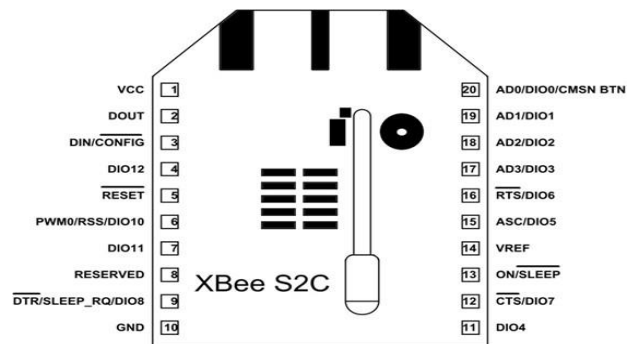## 7. Zigbee Module:-



Fig: 6.9 XBEE S2C – RF MODULE          Fig: 6.10  XBEE S2C – RF MODULE

### XBee S2C Pin Configuration:-

XBee S2C is a 20 pin module as given in XBee S2C pinout diagram and the description for each pin is given below.

| Pin | Name | Description |
|-----|------|-------------|
| 1 | VCC | Power supply |
| 2 | DOUT/DIO13 | UART data out pin (TXD)/GPIO |
| 3 | DIN/CONFIG / DIO14 | UART data in pin (RXD)/ GPIO |
| 4 | DIO12/SPI_MISO | GPIO/ Master Input-Slave Output pin of SPI interface |

| 5 | RESET | Module Reset pin |
|---|---|---|
| 6 | RSS PWM /DIO10 | RX Signal Strength Indicator pin / GPIO |
| 7 | PWM1/DIO11 | Pulse Width Modulator/GPIO |
| 8 | RESERVED | Do not connect |
| 9 | DTR/SLEEP_RQ/ DIO8 | Pin Sleep Control line /GPIO |
| 10 | GND | Ground |
| 11 | DIO4/ SPI_MOSI | GPIO/Master Output-Slave Input pin of SPI interface |
| 12 | CTS/DIO7 | Clear-to-send flow control/GPIO |
| 13 | ON_SLEEP/DIO9 | Device status indicator/GPIO |
| 14 | VREF | Voltage Reference for ADC |
| 15 | ASC/DIO5 | Associate Indicator/GPIO |
| 16 | RTS/DIO6 | Request to send flow control/ GPIO |
| 17 | AD3/DIO3/SPI_SSEL | Analog input/GPIO/SPI slave select |
| 18 | AD2 /DIO2/SPI_CLK | Analog input/GPIO/SPI clock |
| 19 | AD1/DIO1/SPI_ATTN | Analog input/GPIO/SPI attention |
| 20 | AD0/DIO0/C | Analog input/GPIO/ Commissioning Button |

## Features and Electrical Characteristics:-

- Transmission Frequency: 2.4GHz to 2.5GHz
- Number of Channels: 16 Direct Sequence Channels
- Featured with UART (250 Kb/s maximum) and SPI (5 Mb/s maximum) interface
- Featured with software adjustable transmitting power
- Indoor/Urban Range: 200ft
- Outdoor RF line-of-sight Range: up to 4000ft
- Transmit Power Output: 6.3mW (8dBm) in Boost mode,2mW (3dBm) in Normal mode
- RF Data Rate: 250,000 bps
- Receiver Sensitivity: -102dBm in Boost mode, -100dBm in Normal mode
- Supply Voltage Range: +2.1V to +3.6V
- Operating Current: 33mA (at3.3V, for Normal mode) , 45mA (at 3.3V,for Boost mode)
- Idle Current: 9mA
- Maximum output current on all pins together: 40mA
- Power-down Current: <1uA @25C
- ESD protection: 3000V
- Operating Temperature: -40°C to 85° C

## Applications:-

- Home automation
- Commercial building automation
- Industrial application control
- Smart energy
- Medium range wireless communication

## 8. ELECTRIC SHOCK GUN:-

Electric shock gun use for defense purpose. Which is able to some person is attack on the robot so it can be unconscious to the person for 3 to 4 minutes by applying shock. It has generate 3 voltage
.
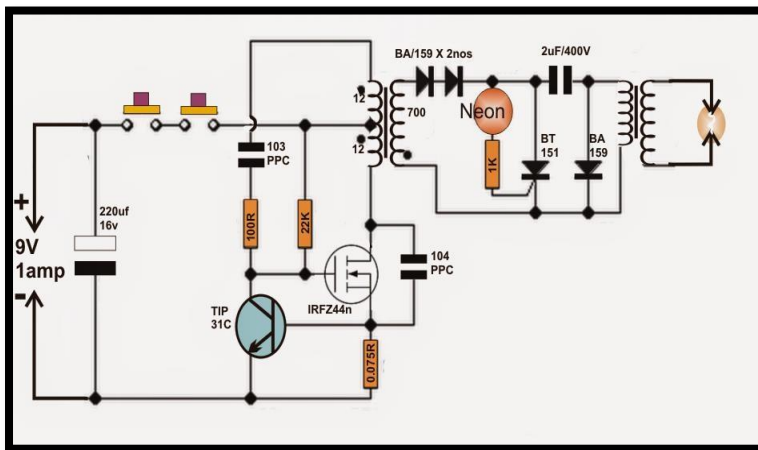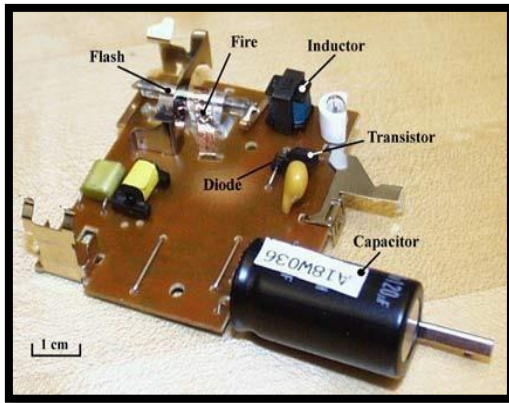
**Fig: 6.11 ELECTRIC SHOCK GUN CIRCUIT**

**Fig: 6.12 ELECTRIC SHOCK GUN**

## 9. WHEELS:-

- Wheels are made up of chains. So it can over come any obstacle.
- Like slippery surface, snow, rocks, sand, etc…
- Wheel diameter:-12cm



**Fig: 6.13 WHEEL**

## 10. CAMERA:-

Camera is used for controlling and viewing currently videos of border and dangerous places. It is controlled by the mobile application.

- RECORDING:

   Keep Recordings Safe On FTP Server Even If Camera Is Stolen / Broken.

- 360 DEGREE MOBILE CONTROL :

   Rotate Camera Horizontally Or Vertically From Anywhere In The World Using Mobile Application

- IR NIGHT VISION**:**
   **CAMERA**

**Fig6.14 NIGHT VISION**

- HD Night Vision With Inbuilt IR Lens. MOTION DETECTION: Will Send Alerts Whenever Any Motion Is Detected.

- 2 WAY AUDIO & SD CARD SLOT:

   Video Chat With Inbuilt Microphone & Speaker. No Need Of Computer. SD Card Slot To Record Images & Videos. No Need Of Separate DVR. 1 Year Warranty And Dedicated Customer Support 24x7.

## Highlights:

• Warranty: 1 Year Warranty
• Brand: Anspo
• Model: V380 WiFi IP Camera
• Camera Type: Robotic 360 Degree Camera ( you can rotate the camera from your mobile/pc)
• Camera Lens: 2 Megapixel
• Recording Resolution: 720P
• Online View ( you can watch the IP Camera from anywhere)
• Two Way Audio ( you can talk and listen using this IP Camera)
• Night Vision
• 2.4 GHz WiFi Connectivity With WiFi Hotspot option.
• Supports Micro SD Memory Card
• Continuous Recording- The camera auto deletes the oldest recordings when the memory card is full.
• Supports power backup from power bank.

# ARMY ASSISTIVE ROBOT

| | |
|---|---|
| Brand | Anspo |
| Model | V380 |
| Warranty | **1 Year Warranty** |
| Camera Type | Robotic 360-degree camera ( you can rotate the IP camera from anywhere in the world) |
| Lens | 2 Megapixel Multicoated HD 3.6 mm Lens |
| Image Sensor | 1/4 inch CMOS |
| Recording Resolution | 720P |
| Video Compression | H.264 |
| Video Framerate | Max 25 fps |
| Rotation | It has a built-in motor and it supports 355 degrees pan and 90 degrees tilt. You can rotate the IP camera from your pc/mobile. |
| Supported Devices | Smartphone or PC. |
| Night Vision | It has 6 IR Infrared LED's for night vision. You can watch everything even in complete darkness. |
| Two Way Audio | This camera has a microphone and speaker. So you can talk and listen using the IP Camera. <ul><li>Microphone: 45 DB</li><li>Speaker: 8 Ohm 2 Watts</li></ul> |

| | |
|---|---|
| Remote/Online View | If you connect the IP Camera to the internet, then you can watch and control the IP Camera from anywhere in the world |
| Motion Detection | It has motion detection recording option and also motion detection alarm. If you turn on motion detection recording, then the IP camera will only record when it detects any motion. Thus saving your memory consumption. If you turn on the motion detection Alarm, then it will ring the alarm and also send a notification to the mobile when it detects any motion. |
| Network | It has 2.4 GHz Wifi and so you can connect it to any wifi router. It also has own WiFi hotspot with a radius of 100 feet. |
| Storage | It supports micro sd memory card upto 64GB. |
| Power Input | 5V 2A |
| Dimensions | 115x 90x 90mm (L x W x D) |
| Weight | 150 grams |

## 11. 12 V BATTERY:-

- Here we use 12 v dc battery for operating robot.
- Its capacity is 13KAh.



**Fig: 6.15 12V BATTERY**

### Product Specification:

| | |
|---|---|
| Capacity (Ah) | 1.3 |
| Nominal Voltage | 12 Volt |

| | |
|---|---|
| Battery Type | Dry Charged Battery |
| Warranty | 12 months |
| Brand | Amptek |
| Minimum Order Quantity | 10 Piece |

**Product Description:**

| | |
|---|---|
| model no: | at12-1. 3 (12v1. 3ah) |
| weight: | 0. 57 kg |
| dimensions: | 97 x 43 x 52 mm |

**application:**

electronic weighing scales, security systems, emergency lights, toys, telecommunication eqpt. , elevators

## 12. CUTTER:-

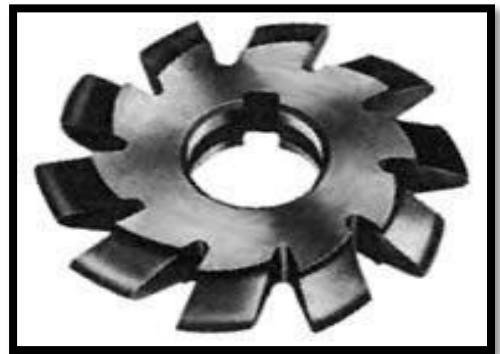- Cutter is used for the cutting the object that come in the way of robot.



**Fig: 6.16 CUTTER**

## 6.1.2 HARDWARE IMPLEMENTATION

In robot we use the aluminum sheet for base, wheel made up of plastic, cutter is made up of metal, and upper part which is controlled the electric shock gun and camera. Upper portion is made up of pvc sheet. So, it can withstand the weight and defense against terrorism.

In Robot structure length is 52.77cm width is 11.51cm and height of the robot is 36cm. wheel diameter is 12 cm used.

## MOBILE APPLICATION

- Here we use mobile application "Arduino Bluetooth RC car"

# ARMY ASSISTIVE ROBOT

- The application allows you to control an Arduino based RC car over Bluetooth enabled android phone.
- Here we control the robot using this mobile application.

Here we also use v380 app for controlling the camera. In this app we connect to the wifi of the camera and in our phone we can see the on time vision. In v380 app also included recording, 360 degree rotation, night vision. And here we also connect the phone by barcode sticker so, no one can attached and hacked the phone and cannot to see on time vision of the border.

# CHEPTER 7 : ADVANTAGES AND DISADVANTAGES

## 7.1 ADVANTAGES

- High Mechanical Strength

- High Temp Resistance

- Easy To Excess

- Night Vision

- Multi –Tasking

-  Rotating Gun and camera

## 7.2. DISADVANTAGES

- Heavy weight
- High cost

# CHEPTER 8: APPLICATION

1) For security, safety of our army force at border.
2) Defensive purpose
3) Military application
4) Robots go to war
5) Autonomy or control
6) Obstacle course
7) Securing security robots
8) Autonomous mobile application

## 8.1 CONCLUSION:

Hear after we conclude that military robots are certainly essential to save the mankind from the humanoid assault activities.

# ARMY ASSISTIVE ROBOT

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