T.S. SRINIVASAN CENTRE FOR POLYTECHNIC COLLEGE AND ADVANCED TRAINING

No.1 TVS School Road, Vanagaram, Chennai – 95

in partial fulfillment for the award of the

DIPLOMA

IN

MECHATRONICS ENGINEERING

DESIGN AND FABRICATION OF EXPLOSIVE ORDNANCE DISPOSAL ROBOT ARM

A PROJECT REPORT

Submitted by

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BONAFIDE CERTIFICATE

This is to certify that this project report Titled **DESIGN AND FABRICATION OF EXPLOSIVE ORDNANCE DISPOSAL ROBOT ARM** is the Bonafide work of Selvan. _____ who carries out the project work under my guidance. Certified farther, that to the best of my knowledge, the work herein does not form part of any other thesis or dissertation on the basis of which a degree or award was conferred on an earlier occasion on this or any other candidate

HEAD OF THE DEPARTMENT **INTERNAL GUIDE**

Submitted for the Project work Examination held on _____.

Internal Examiner **External Examiner**

ACKNOWLEDGEMENT

Any piece of work that has proved its way remains incomplete if the sense of gratitude and respect is not being deemed to those who have proved to be supportive during its development period. Though these words are not enough, they can at least pave way to help understand the feeling of respect and admire, I have for those who have helped the way through.

First and foremost, we would like to thank Nature & Society for giving us the power to believe in ourselves and pursue our dreams.

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VISION OF CPAT-TVS

To create multi-skilled, technically proficient and highly motivated individuals who continuously strive for excellence and are committed to the betterment of society.

MISSION OF CPAT-TVS

- To provide a solid foundation in Engineering concepts and principles
- To create technically competent diploma engineers through the delivery of specially designed curriculum involving additional courses, industrial training and delivery beyond the framework
- To strengthen critical skills and apt attitudes to meet challenges in all endeavors.

DEPARTMENT OF MECHATRONICS ENGINEERING

VISION

To create proficient and multi-skilled Diploma Mechatronics Engineers who strive for continuous improvement in all endeavors (Automation, Robotics and Maintenance)

MISSION

- To intersperse hands-on training in academic curriculum with additional courses and develop multi-disciplinary technical skills
- To facilitate quality classroom interactions and Industry - linked holistic training
- To instill skills to foster sense of excellence, ethical values, competency and flexibility to adapt to the changing requirements of global industries and entrepreneurship

PROGRAM SPECIFIC OUTCOMES (PSOs)

PSO 1: Ability to solve contemporary issues related to manufacturing, design, and Industrial automation through internship integrated program curriculum that includes knowledge, practice and hands on training.

PSO 2: Ability to thrive by higher studies or become an entrepreneur by adapting discipline, effective communication, business economics, managerial skills for the betterment of society.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

PEO-I: Practice Mechatronics Engineering concepts in the general stems of automation, robotics and allied engineering sectors.

PEO-II: Continue to learn the advances in Mechatronics Engineering that supports career growth.

PEO-III: Reflect and conduct in a responsible, professional and ethical manner.

PEO-IV: Emerge as leaders in their domain that support societal development.

PROGRAM OUTCOMES (POs)

PO.1 Basic and Discipline specific knowledge: Apply knowledge of basic mathematics, science and engineering fundamentals and engineering specialization to solve engineering problems.

PO.2⋯Problem analysis: Identify and analyze well-defined engineering problems using codified standard methods.

PO.3 Design / development of solutions: Design solutions for well-defined technical problems and assist with the design of systems components or processes to meet specified needs.

PO.4 Engineering Tools, Experimentation and Testing: Apply modern engineering tools and appropriate techniques to conduct standard tests and measurements.

PO.5 Engineering practices for society, sustainability and environment: Apply appropriate technology in context of society, sustainability, environment and ethical practices.

PO.6 Project Management: Use engineering management principles individually, as a team member or a leader to manage projects and effectively communicate about well-defined engineering activities.

PO.7 Life-long learning: Ability to analyze individual needs and engage in updating in the context of technological change

MAPPING PROJECT WITH PROGRAM OUTCOMES

POs	Mapping	Justification
PO1	Medium	This project involves fair knowledge in science and mathematics related to physical parameter and design calculation.
PO2	High	This project involves strong knowledge in core engineering related to electronics**.**
PO3	High	This Project provides strong knowledge to perform experiments related to mechanical system and the results can be used to solve engineering problems.
PO4	High	Project work gives exposure to various technologies in automation and tools with an understanding of limitations.
PO5	High	This project helps them to demonstrate their domain knowledge to assess safety issues and give solutions for protection
PO6	High	This project reflects the impact of engineering solutions for society, environmental contexts and demonstrates sustainable development.
PO7	High	Students internalize engineering ethics and design the project. It applies ethical principles relevant to engineering practice to increase protection in society.

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ABSTRACT

Countless number of news flashing dealing with injured trained personnel or military people who loses their lives during defusing bombs in daily world. Bomb defuser robot has been developed by different experts around the world to make an affordable and safe device which will be useful for emergency rescue support. Here a robotic arm is designed to defuse a bomb which is located around the range of 25m with safety and to provide a security for the bomb disposal squad against risks. Inspired by DRDO-DAKSH robot. The whole operation of the robot can be performed wirelessly from a Mobile. The DC Motor is controlled by the PWM signal generated by microcontroller.

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LIST OF FIGURES

CHAPTER 1: INTRODUCTION

1.1 ROBOT BOMB DEFUSER:

- These robots operate as a remote presence for the bomb disposal experts, or “bomb doctors” as they are known within the British Army.
- This allows them to closely examine devices, without putting themselves or others in danger. Once the device has been examined, the robot can (hopefully) then render the bomb inert.
- It is not just bombs that the robots disable, but also any type of device that could detonate.

1.2 EOD- EXPLOSIVE ORDNANCE DISPOSAL ROBOT:

- EOD is a robot with unprecedented towing and dragging capability coupled with speed, agility, and dexterity.
- Variable speed drive accelerates the robot up to 3km/h. High motor torque allows EOD-3 to climb stairs and slopes up to 45 degrees and drag a fully loaded vehicle for VBIED (Vehicle-Borne Improvised Explosive Device) countermeasures.
- The rubber tracks can maneuver over various types of rugged terrains including snow, mud, and sand.
- The Robot's 6-axis robotic arm can lift 10-30kgs at the distance of 1200-300mm.
- The robot and the manipulator can be operated with precision using variable speed joysticks.

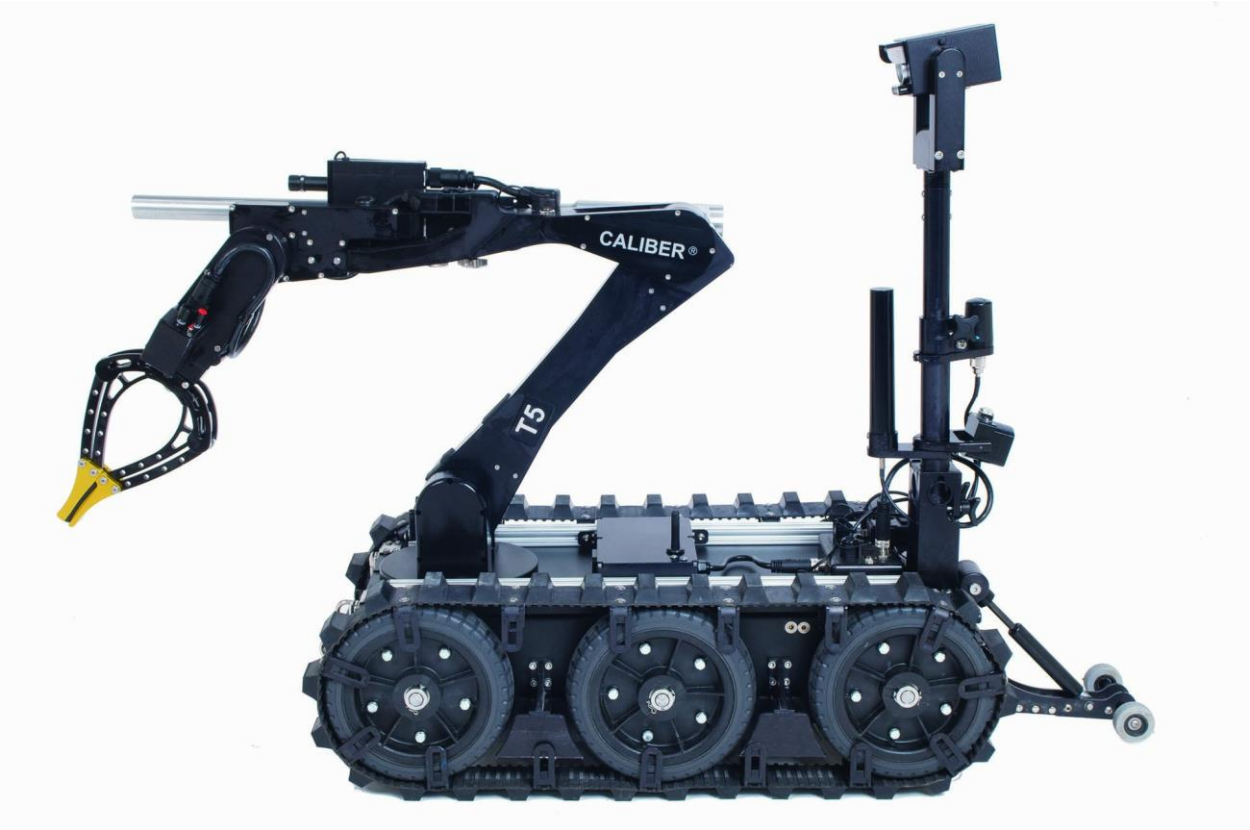


Fig 1.1 EOD- EXPLOSIVE ORDNANCE DISPOSAL ROBOT

1.3 APPLICATION:

- Explosive Ordnance Disposal
- Remote Inspection
- Surveillance / Reconnaissance
- CBRN / HAZMAT Detection

1.4 EOD / SURVEILLANCE AREAS:

- Inside Aircraft & Trains
- Building & Installation
- Urban Transportation Locations
- (Bus Station / Metro Station / Railway Station)
- On Ferries and Ships
- Vehicle interior and exterior

1.5 VEHICLE SPECIFICATION:

- Dimensions (L x W x H): 120cm x 75cm x 90cm
- Weight: 90 kg (110 kg incl. CCU)
- Precision infinite-speed drive system
- Speed: 3 km/h
- Climbing: 45° on rough surface with 10 kg payload
- Turning circle: Zero turning radius
- Payload: 10-30 kgs
- Endurance: 2 hours driving, 4 hours operational
- Battery charging time: 6-12 hours

1.6 MANIPULATOR:

- Payload 10-30kgs at 1200-300mm.
- Precision control using variable speed joystick
- Manipulator Reaches in vertical/horizontal: 135/120cm
- Turret rotation: 360°
- Upper arm incline: + 80° to - 80°
- Lower arm incline angle: 90°
- Lower arm rotation: 360°
- Gripper angle: + 90° to - 90 °
- Gripper rotation: 360°
- Gripper open/close: 120mm
- Gripper force: 300 N
- 2x standard quick release mounts
- Upto 4 days and nights camera
- Distance measuring sensor

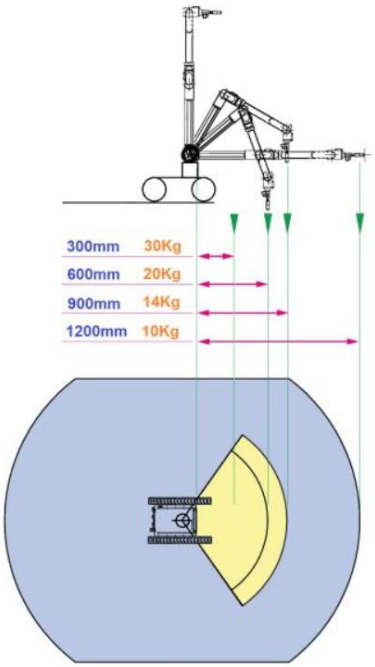


Fig. 1.2 MANIPULATOR

CHAPTER 2: LITERATURE REVIEW

The EOD is versatile equipment for improvised explosive device identification and handling. It can also be utilized to survey and monitor nuclear and chemical contamination levels. The robot has been developed by R&DE – Engineers in collaboration with Tata Motors, Theta Controls, Bharat Electronics and Dynalog

2.1 BEFORE IMPLEMENTATION:

The size of the robot is too big and it is controlled by using gesture of RF controller and it has difficult compatibility, the battery lasts for a certain amount of time.

2.2 AFTER IMPLEMENTATION:

The size of the robot is reduced, and it can be controlled using Bluetooth / mobile phone /laptop. this robot is easy to access. Mainly this robot can diffuse/ disposal the wired bomb in shot range. In the future, this robot can help do different tasks. for example, this robot can help elders reach objects in difficult areas.

CHAPTER 3: PROJECT DESCRIPTION

3.1 WORKING PRINICPLE:

In our project robot is controlled using Arduino Bluetooth application, with interface of robotic arm. An end effector is used to hold the bomb, cutter is individually placed to cut the wires. Four-wheel drive BOT is controlled using the Bluetooth application. Partial wire stripper is placed to cut the wires, different types of cutting tools can be used for different applications. Ground based wired bombs can be defused using our project for further future uses this project can be easily modified.

BLOCK DIAGRAM:

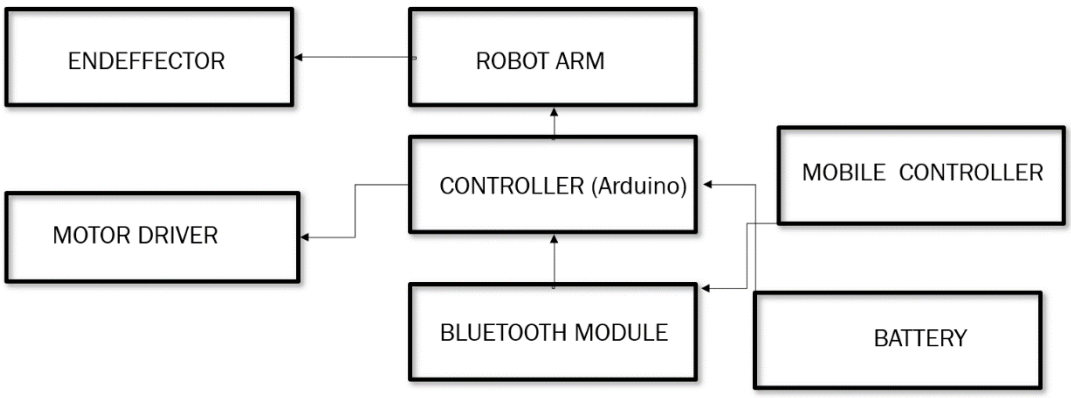


Fig 3.1 BLOCK DIAGRAM

3.2 CIRCUIT DIAGRAM:

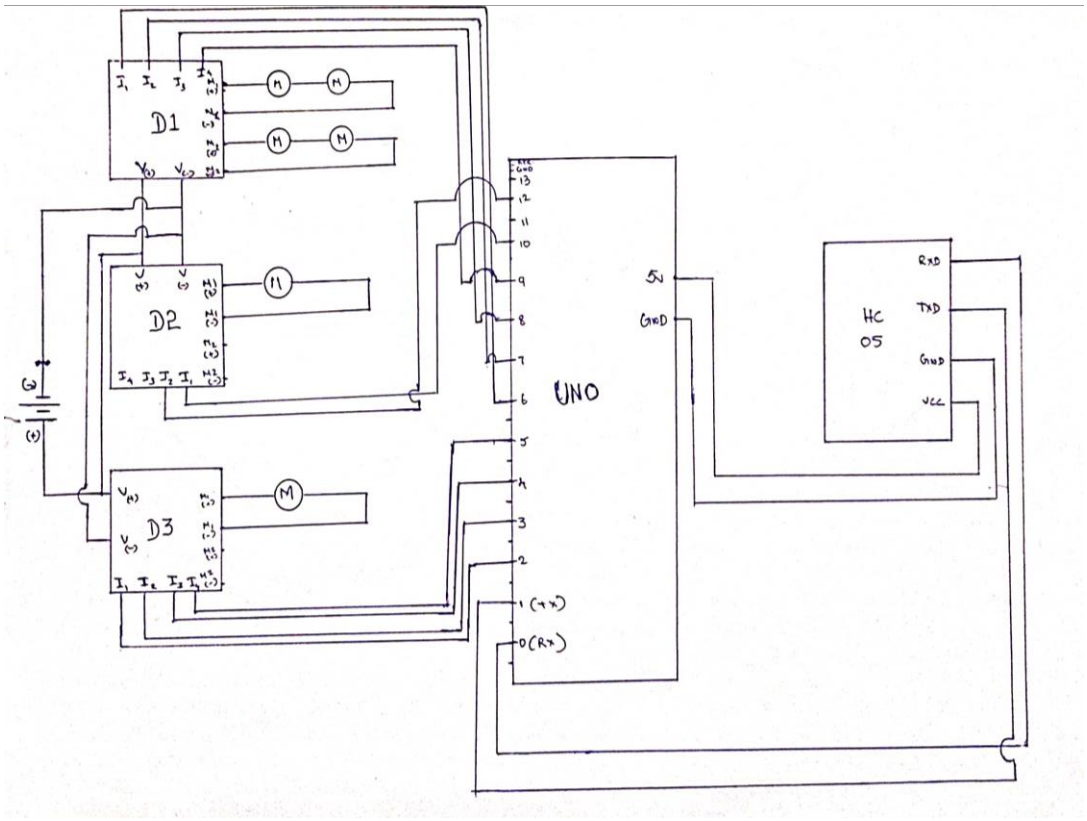


Fig.3.2 CIRCUIT DIAGRAM

DETAILS:

- D1-Motor driver 1
- D2- Motor driver 2
- D3- Motor driver 3
- UNO-Arduino UNO
- HC05-Bluetooth module.
- M - Motor

3.3 ARDUINO UNO:

- The Arduino Uno is an open-source microcontroller board based on the Microchip ATmega328P microcontroller and developed by Arduino
- Arduino UNO is a low-cost, flexible, and easy-to-use programmable open-source microcontroller board that can be integrated into a variety of electronic projects.
- This board can be interfaced with other Arduino boards, Arduino shields, Raspberry Pi boards and can control relays, LEDs, servos, and motors as an output

Fig. 3.3 ARDUINO UNO

SPECIFICATION OF ARDUINO UNO:

- Microcontroller: Microchip ATmega328
- Operating Voltage: 5 Volts
- Input Voltage: 7 to 20 Volts
- Digital I/O Pins: 14
- PWM Pins: 6 (Pin # 3, 5, 6, 9, 10 and 11)
- UART: 1
- I2C: 1
- SPI: 1
- 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
- RAM: 2 kb
- EEPROM: 1 kb
- Clock Speed: 16 MHz
- Length: 68.6 mm
- Width: 53.4 mm
- Weight: 25 g
- ICSP Header: Yes
- Power Sources: DC Power Jack, USB Port and the VIN pin (+5 volt only)

PIN DIAGRAM:

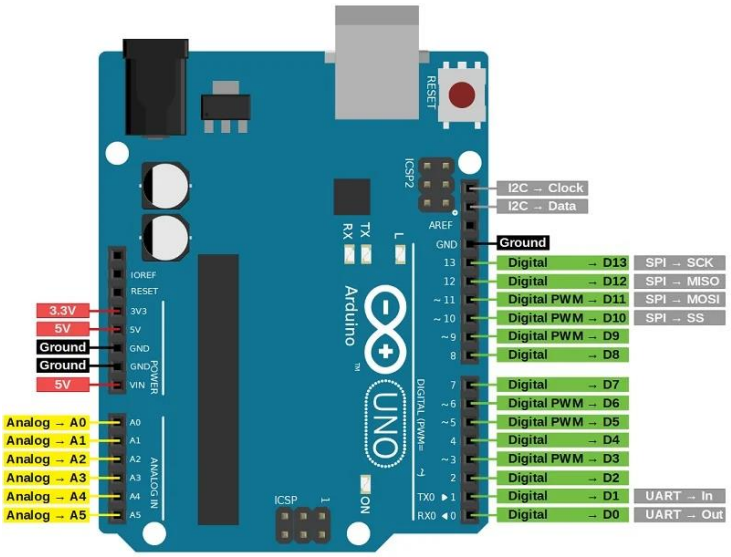


Fig. 3.4 ARDUINO UNO PIN DIAGRAM

FEATURES:

- The operating voltage is 5V.
- The recommended input voltage will range from 7v to 12V.
- The input voltage ranges from 6v to 20V.
- Digital input/output pins are 14.
- Analog i/p pins are 6.
- DC Current for each input/output pin is 40 mA.
- DC Current for 3.3V Pin is 50 mA.
- Flash Memory is 32 KB.

3.4 L293D MOTOR DRIVER:

- The L293 and L293D devices are quadruple high-current half-H drivers. The L293 is designed to provide bidirectional drive currents of up to 1 A at voltages from 4.5 V to 36 V.
- The L293D is designed to provide bidirectional drive currents of up to 600-mA at voltages from 4.5 V to 36 V.
- Both devices are designed to drive inductive loads such as relays, solenoids, DC, and bipolar stepping motors, as well as other high-current/high-voltage loads in positive-supply applications.
- Each output is a complete totem-pole drive circuit, with a Darlington transistor sink and a pseudo- Darlington source.
- Drivers are enabled in pairs, with drivers 1 and 2 enabled by 1,2EN and drivers 3 and 4 enabled by 3,4EN.
- The L293 and L293D are characterized for operation from 0°C to 70°C.

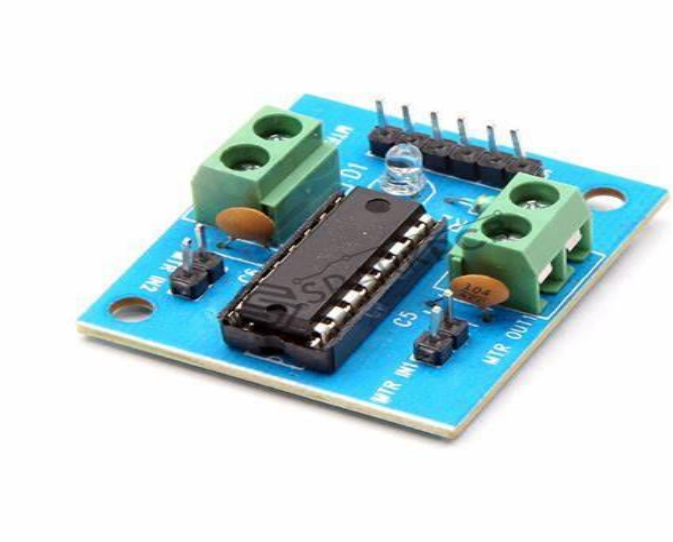


Fig. 3.5 L293D MOTOR DRIVER:

PIN DIAGRAM:

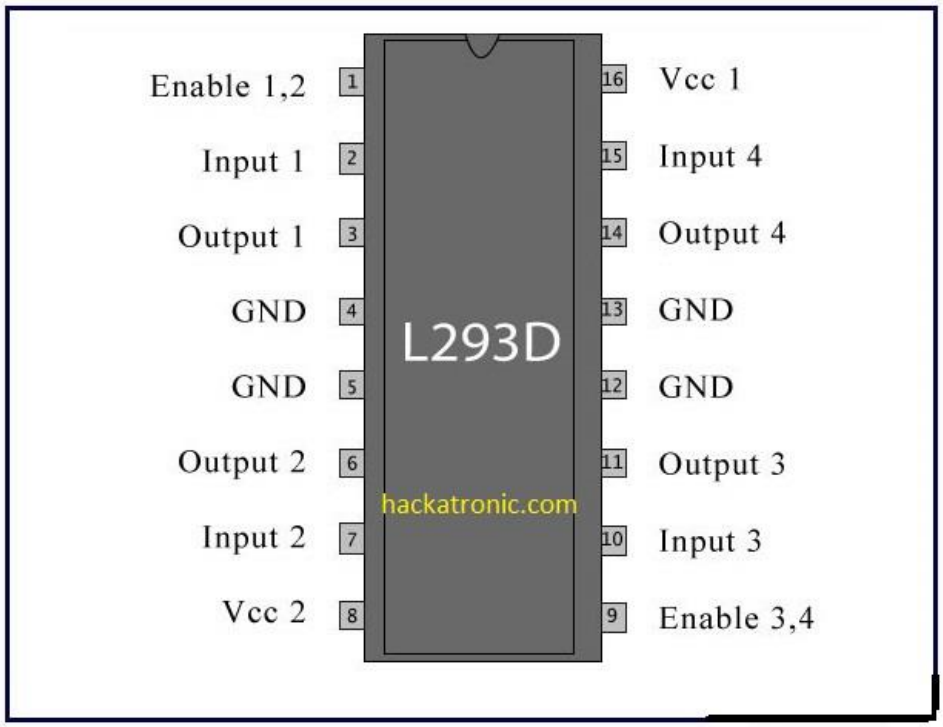


Fig 3.6 L293D MOTOR DRIVER PIN DIAGRAM

FEATURES:

- L293D push-pull four channel drivers with diodes 600ma output current capability per channel 1.

- 2A peak output current (non-repetitive) per channel enable facility overtemperature protect ion logical “0” input voltage up to 1.

- 5 V (HIGH NOISE IMMUNITY) internal clamp diodes description The Device is a Mon eolithic integrated high voltage, high current four channel driver designed to accept standard DTL or TTL logic levels and drive inductive loads and switching power transistors.

- To simplify use as two bridges each pair of channels is equal.

3.5 12 V 1.3AH BATTERY:

- There will be no loss in power output over the battery life. Low self-discharge of about 2-3% per month compared with 20-30% for more common battery systems.
- Quality construction with no compromise on materials to ensure long service life.
- Low internal resistance means a high discharge rate. Wide operating temperature range operating between -15° C to +50 ° C when fully charged.
- 12 V 1.3AH Sealed Lead Acid Batteries are maintenance free
- Zero loss in power output over the battery life.
- Valve regulated, and leakproof ideally suited to all ‘standby applications.
- Low self-discharge of about 2-3% per month compared with 20-30% for more common battery systems.
- Wide operating temperature range between -15° C to +50 ° C when fully charged.

Fig.3.7 12V 1.3AH BATTERY

3.6 BLUETOOTH MODULE HC 05:

- HC-05 is a Bluetooth module which is designed for wireless communication.
- This module can be used in a master or slave configuration.
- Bluetooth serial modules allow all serial enabled devices to communicate with each other using Bluetooth.
- It has 6 pins,
- Data mode**:** Exchange of data between devices.
- Command mode**:** It uses AT commands which are used to change setting of HC-05. To send these commands to module serial (USART) port is used.
- VCC**:** Connect 5 V or 3.3 V to this Pin.
- GND**:** Ground Pin module.
- TXD**:** Transmit Serial data (wirelessly received data by Bluetooth module transmitted out serially on TXD pin)
- RXD**:** Receive data serially (received data will be transmitted wirelessly by Bluetooth module).
- State**:** It tells whether module is connected or not.

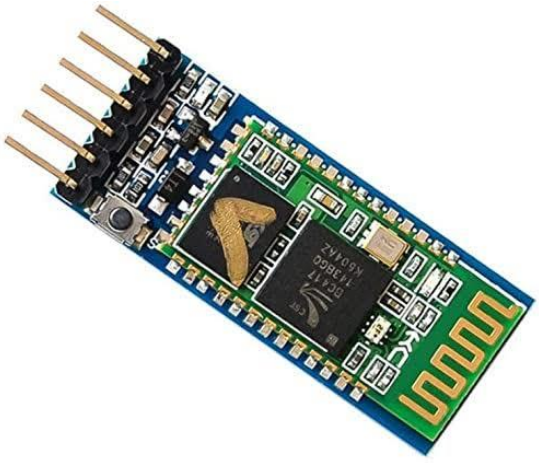


Fig.3.8 BLUETOOTH MODULE HC 05

SPECIFICATION:

- Serial Bluetooth module for Arduino and other microcontrollers
- Operating Voltage: 4 V to 6 V (Typically +5V)
- Operating Current: 30 mA
- Range: 100 m
- Works with Serial communication (USART) and TTL compatible
- Follows IEEE 802.15.1 standardized protocol
- Uses Frequency-Hopping Spread spectrum (FHSS)
- Can operate in Master, Slave or Master/Slave mode
- Can be easily interfaced with Laptop or Mobile phones with Bluetooth
- Supported baud rate: 9600,19200,38400,57600,115200,230400,460800.

PIN DIAGRAM:

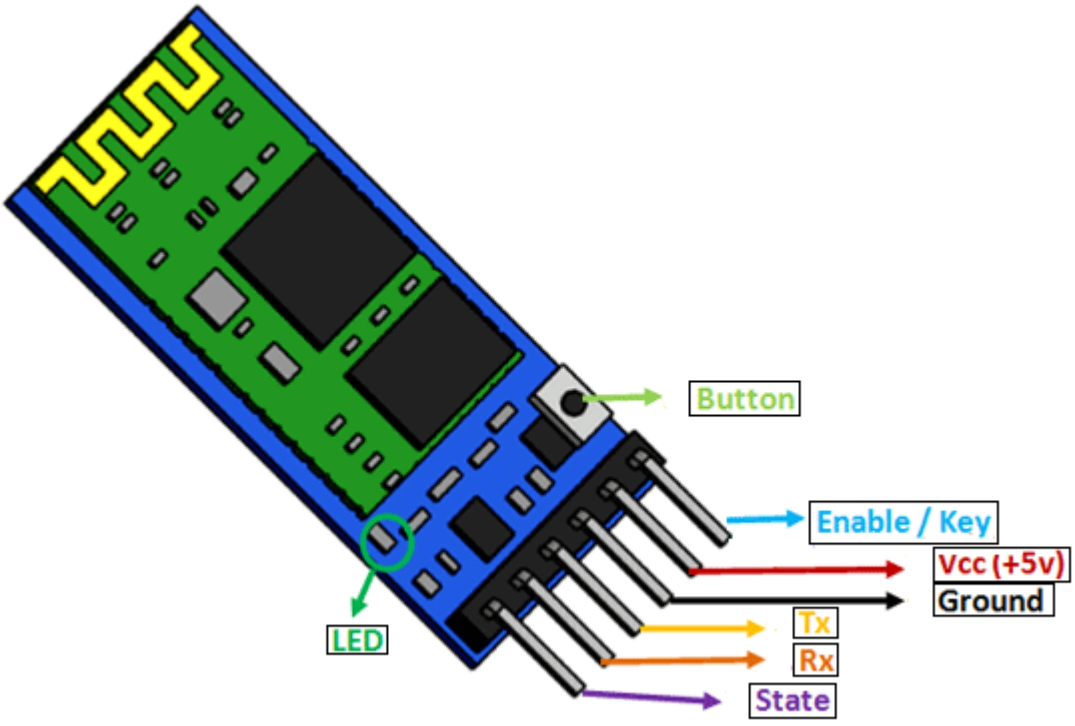


Fig. 3.9 BLUETOOTH MODULE HC 05 PIN DIAGRAM

3.7 9V BO MOTOR:

- Mechanical Bo motor (Battery Operated) lightweight DC geared motor which gives good torque and rpm at lower voltage.

- Here you can get bo motor with varying rated speed. This motor can run at approximately 200 rpm when driven by a single Li-Ion cell.

SPECIFICATIONS:

- Brand BO
- Power Source DC
- Speed 2000 RPM
- Model Name/No. BO Motor
- Voltage 9/12V DC
- Type DC
- Material Plastic
- Mounting Straight
- Motor Type I Shape
- Usage/Application Robotics
- Features BO Motor

Fig. 3.10 9V BO MOTOR

3.8 12V DC MOTOR:

- The 12V DC Motor that we construct is rated from fractional horsepower to 2 HP, running at speeds up to 5,000 RPM.
- These 12V DC Motors can also be designed for applications that require different voltage.
- Such as 24 Volts, 36 Volts, and others up to 180 Volts.
- While smaller DC motors are commonly used in the making of appliances, tools, toys, and automobile mechanisms.
- Electric car seats and larger DC motors are used in hoists, elevators, and electric vehicles.
- A 12V DC motor is small and inexpensive, yet powerful enough to be used for many applications.

Fig. 3.11 12V DC MOTOR

3.9 WIRE STRIPPER:

- A wire stripper is a portable handheld tool used by workers, especially electricians.
- It is also capable of stripping and cutting the wires.

Fig. 3.12 WIRE STRIPPER

3.10 PROGRAM:

```
int IN1 = 2; // GPIO12 D6
int IN2 = 3;
int IN3 = 4; //
int IN4 = 5;

const int arm1=7;
const int arm2=6;
const int dip1=9;
const int dip2=8;

const int cut1=10;
```

```
const int cut2=11;

const int angle1=12;
const int angle2=13;

//const int VCC = 8;
//-------------------------Call A Function-----------------------------//
void front(){
    Serial.println("MOVING FORWARD");
    digitalWrite(IN1, HIGH);
    digitalWrite(IN2,LOW);
    digitalWrite(IN3, LOW);
    digitalWrite(IN4,HIGH);
   delay(3000);
   digitalWrite(IN1, LOW);
   digitalWrite(IN4, LOW);
   delay(200);
}
void back(){
    Serial.println("MOVING BACKWARD");
    digitalWrite(IN1, LOW);
    digitalWrite(IN2,HIGH);
    digitalWrite(IN3,HIGH);
    digitalWrite(IN4,LOW);
    delay(3000);
   digitalWrite(IN2, LOW);
   digitalWrite(IN3, LOW);
   delay(200);
}
void left(){
    Serial.println("TURNING LEFT");
    digitalWrite(IN1, HIGH);
```

```
    digitalWrite(IN2,LOW);
    digitalWrite(IN3, HIGH);
    digitalWrite(IN4,LOW);
    delay(500);
   digitalWrite(IN1, LOW);
   digitalWrite(IN3, LOW);
   delay(200);
}
void right(){
    Serial.println("TURNING ROGHT");
    digitalWrite(IN1, LOW);
    digitalWrite(IN2,HIGH);
    digitalWrite(IN3, LOW);
    digitalWrite(IN4,HIGH);
    delay(500);
   digitalWrite(IN2, LOW);
   digitalWrite(IN4, LOW);
   delay(200);
}
void stop(){
    Serial.println("STOP");
    digitalWrite(IN1, LOW);
    digitalWrite(IN2,LOW);
    digitalWrite(IN3, LOW);
    digitalWrite(IN4,LOW);
}
void armup(){
  Serial.println("ARM UP");
  digitalWrite(arm1,HIGH);
  digitalWrite(arm2,LOW);
  delay(100);
  digitalWrite(arm1,LOW);
  delay(100);
}
```

```
void armdown(){
  Serial.println("ARM DOWN");
  digitalWrite(arm2,HIGH);
  digitalWrite(arm1,LOW);
  delay(100);
  digitalWrite(arm2,LOW);
  delay(100);
}
void armclose(){
  Serial.println("ARM CLOSE");
  digitalWrite(dip1,HIGH);
  digitalWrite(dip2,LOW);
  delay(1000);
  digitalWrite(dip1,LOW);
  delay(500);
}

void armopen(){
  Serial.println("ARM OPEN");
  digitalWrite(dip2,HIGH);
  digitalWrite(dip1,LOW);
  delay(1000);
  digitalWrite(dip2,LOW);
  delay(500);
}


void cutoff(){
  Serial.println("CUTTER STOPPED");
  digitalWrite(cut1,LOW);
  digitalWrite(cut2,LOW);
  delay(2000);
  digitalWrite(cut1,LOW);
```

```
  delay(1000);
}


void cuton(){
  Serial.println("CUTTER STARTED");
  digitalWrite(cut2,HIGH);
  digitalWrite(cut1,LOW);
  delay(2000);
  digitalWrite(cut1,LOW);
  delay(1000);
}

void angleascend(){
  Serial.println("angle up");
  digitalWrite(angle1,HIGH);
  digitalWrite(angle2,LOW);
  delay(500);
  digitalWrite(angle1,LOW);
  delay(100);
}

void angledescend(){
  Serial.println("angle down");
  digitalWrite(angle1,LOW);
  digitalWrite(angle2,HIGH);
  delay(500);
  digitalWrite(angle2,LOW);
  delay(100);
}
```

```
//--------------------------------------------------------------------//
void setup() {
  pinMode(IN1, OUTPUT);
  pinMode(IN2, OUTPUT);
  pinMode(IN3, OUTPUT);
  pinMode(IN4, OUTPUT);
  digitalWrite(IN1, LOW);
  digitalWrite(IN2, LOW);
  digitalWrite(IN3, LOW);
  digitalWrite(IN4, LOW);
Serial.begin(9600);
Serial.print("ROBOTICS");
  pinMode(arm1,OUTPUT);
  pinMode(arm2,OUTPUT);
  pinMode(dip1,OUTPUT);
  pinMode(dip2,OUTPUT);
  pinMode(cut1,OUTPUT);
  pinMode(cut2,OUTPUT);
  pinMode(angle1,OUTPUT);
  pinMode(angle2,OUTPUT);
}
void loop() {
if(Serial.available()>0){
  String rcv = Serial.readString();
  Serial.println(rcv);
      if( rcv.indexOf("front") != -1) {
        front();
        }

  else if (rcv.indexOf("back") != -1) {
     back();
  }
```

```
 else if (rcv.indexOf("left") != -1) {
    left();
 }
else if(rcv.indexOf("right") != -1) {
    right();
 }
 else if(rcv.indexOf("stop") != -1) {
    stop();
 }
 else if(rcv.indexOf("up") != -1) {
    armup();
 }
 else if(rcv.indexOf("down") != -1) {
    armdown();
 }
  else if(rcv.indexOf("open") != -1) {
    armopen();
 }
 else if(rcv.indexOf("close") != -1) {
    armclose();
 }
  else if(rcv.indexOf("cut on") != -1) {
    cuton();
 }
 else if(rcv.indexOf("cut off") != -1) {
    cutoff();

 }
 else if(rcv.indexOf("ascend") != -1) {
    angleascend();

 }
 else if(rcv.indexOf("descend") != -1) {
    angledescend();
```

CHAPTER 4: MATERIALS AND METHODS

4.1 ELECTRICAL AND ELECTRONIC COMPONENTS

The electrical components used are:

- Helical gear motor
- 9V DC motor

The electronics components used are:

- Arduino UNO
- Bluetooth module (HC05)
- Motor driver (L293D)

4.2 MECHANICAL ACCESSORIES

- Gears
- Nuts
- Bolts
- Tyres
- Chassis
- Robot arm

4.2.1 GEARS:

- Gears are mechanical parts with cut teeth designed to mesh with teeth on another part to transmit or receive force and motion. The cut teeth are also sometimes called cogs. Others like chainsaws and motors can be tweaked. In Robotics Gears are used to transfer rotational forces between axles
- Types of GEARS**:**

Spur Gear.

Helical Gear.

Double Helical Gear.

Herringbone Gear.

Bevel Gear.

Worm Gear.

Hypoid Gear.

Fig. 4.1 GEARS

4.2.2 FASTENERES

A fastener is a hardware device that mechanically joins or affixes two or more objects together. In general, fasteners are used to create non-permanent joints; that is, joints that can be removed or dismantled without damaging the joining components.

Fig. 4.2 FASTENERES

4.2.3 TYRES:

- A geared motor is a component whose mechanism adjusts the speed of the motor, leading them to operate at a certain speed. geared motors have the ability to deliver high torque at low speeds, as the gearhead functions as a torque multiplier and can allow small motors to generate higher speeds.
- Used in four-wheel drive.

Fig. 4.3 TYRES

4.2.4 CHASSIES / ROBOT ARM:

- Chaises are made of acrylic plastic material.
- Acrylic is a transparent plastic material with outstanding strength, stiffness and optical clarity. Acrylic sheets are easy to fabricate, bond well with adhesives and solvents, and are easy to thermoform.
- It has superior weathering properties compared to many other transparent plastics.

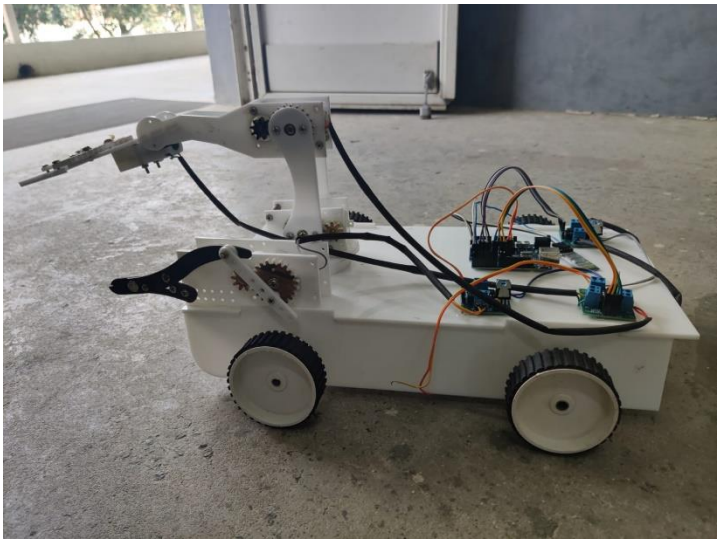


Fig. 4.4 CHASSIES / ROBOT ARM

4.3 PROJECT PROTOTYPE:

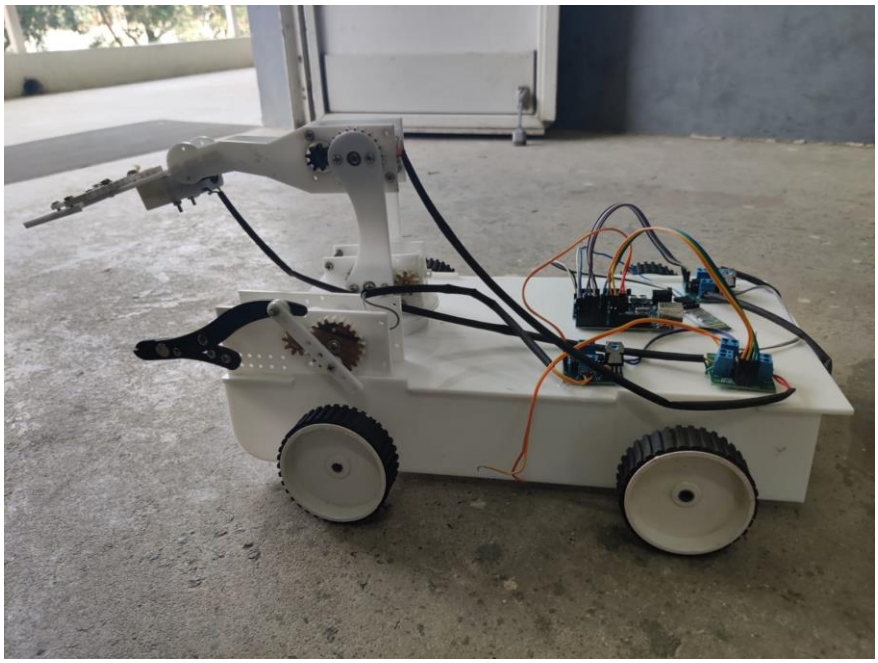
+ 

Fig. 4.5 PROJECT PROTOTYPE

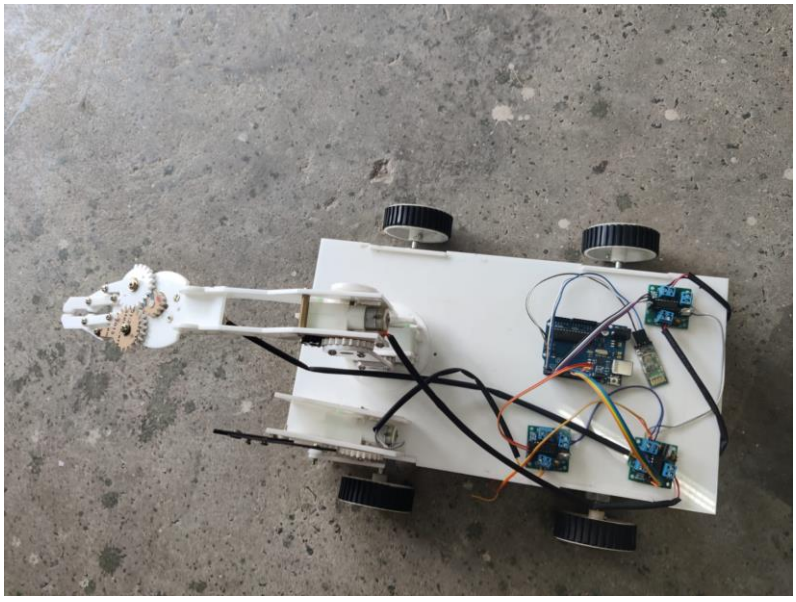


Fig. 4.5 PROJECT PROTOTYPE

5. FUTURE SCOPE

- It can also be utilized to It can and monitor nuclear and chemical contamination levels.
- In future we can add some more technology like control with A.I and radio frequency shield to jam remote signals for triggering a blast.
- By using our device, we can avoid damage or death.
- In future the robot can modified as a combat support application for multiple activities such as fire support, battle damage management, aerial refueling, laying mines, electronic warfare, and many more.

Fig. 5.1 FUTURE SCOPE

6. CONCLUSION

In this project, we learned about how to use Arduino UNO for control and, we learned about how to program the Arduino and learnt how to use a motor driver and we also learned to operate robot arm and bot.

We also learned about how to create a logic system and we got some practical experience about how to do the project in a proper way like identification of components, assembling, and testing.

7. REFERENCES

1. This Project is referred and inspired by Daksh Robot –
   As the Daksh Robot is used for
   Daksh is an electrically powered and remotely controlled robot used for locating
   Handling and destroying hazardous objects safely.

2. The technology has been transferred for production to three firms,

   - Dynalog,
   - Theta Controls, and
   - Bharat Electronics Ltd.

3.The first batch of five units was handed over to General Combat Engineers,

on 19 December 2011

We also referred some books like

* Introduction for robots

* Fundamentals of robotics

The website we referred are,

https://www.defencexp.com/daksh-remotely-operated-vehicle/

https://en.m.wikipedia.org/wiki/DRDO_Daksh