DESIGN AND DEVELOPMENT OF VOICE CONTROL ROBOT FOR MEDICAL APPLICATION

INTRODUCTION TO ENGINEERING

PROJECT REPORT

Submitted by

SOEC A1 – BATCH 4

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BONAFIDE CERTIFICATE

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SIGNATURE

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EXAMINER 1 **EXAMINER 2**

ABSTRACT

This project was developed in a way that the robot is controlled by voice commands. An Android application with a microcontroller is used for required tasks. The connection between the Android app and the robot is facilitated with Bluetooth technology. The robot is controlled by buttons on the application or by spoken commands of the user. The movement of the robot is facilitated by the two dc servo motors connected to the microcontroller at the receiver side. The commands from the application are converted into digital signals by the Bluetooth RF transmitter for an appropriate range (about 100 meters) to the robot. At the receiver end the data gets decoded by the receiver and is fed to the microcontroller which drives the DC motors for the necessary work. The aim of Voice Controlled Robot is to perform the required task by listening to the commands of the user. A prior preparatory session is needed for the smooth operation of the robot by the user. For the same, a code is used for giving instructions to the controller. "Voice Controlled Robot " has numerous uses both now and in the future. In the future, improvements can be added to the project to make it more effective. The project has a wide range of applications, including military, home security, rescue missions, industry, and medical support. Using the given resources, we were able to create a rudimentary model of a voice-controlled robot. Because this project is simple to implement, this robot is advantageous to human life. The Voice Control Robot is beneficial for monitoring and assisting disabled persons. It is simple to use because it operates with basic voice commands. It is effective in locations where humans are unable to reach. As a result, we can employ this robot to spy on people. It has the potential to be utilized for surveillance.

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LIST OF ABBREVIATIONS

SYMBOLS	ABBREVIATIONS
SCAS	Speech Controlled Automation Systems
VCR	voice-controlled robot
DC	Direct Current
IC	Integrated Circuit
EDR	Enhanced Data Rate
UPS	Uninterrupted Powe supply
GPS	Global Positioning System
CCTV	Closed Circuit Television
DVR	Digital Video Recorder
LED	Light Emitted Diode
AWG	American Wire Gauge
GPS	Global Positioning System
GMS	Global Monitoring System
UART	Universal Asynchronous Receiver-Transmitter
WIFI	Wireless Fidelity

CHAPTER I

INTRODUCTION

Our goal is to create a robot that can be operated by a person's voice command. These systems are sometimes referred to as Speech Controlled Automation Systems (SCAS). The above-mentioned system is a prototype of our design. The concept is to build a robot that will be controlled by voice instructions. A mobile phone is used to control the robot; there are numerous publications that demonstrate the communication between a robot and a smartphone. For remotely automating the robot, a smartphone is an excellent interface. It has a lot of features that can be useful. For the needed work, an Android application with a microcontroller is employed in this design.

Bluetooth technology facilitates the connection between the application and the robot. The commands will be passed via the channel to the module, which will receive them. The goal of a voice-controlled robot (VCR) is to listen to and respond to the user's commands. The system will require accent training after which the gadget will begin to grasp the commands given; the commands have been added via codes.

The primary goal of developing a VCR is to analyse human speech and respond to pre-programmed commands. Backward, forward, right, left, and halt the robot are the most fundamental orders. The robot will be controlled wirelessly using an Android smartphone; our goal is to create a robot using advanced smartphone technology in a simple and cost-effective manner.

CHAPTER II

EXISTING SYSTEM

The Existing system is a speech-recognizing system. Speech recognition is the process of capturing spoken words using a microphone or telephone and converting them into a digitally stored set of words.

The quality of a speech recognition system is assessed according to two factors: its accuracy (error rate in converting spoken words to digital data) and speed (how well the software can keep up with a human speaker).

Speech recognition technology has endless applications. Commonly, such software is used for automatic translations, dictation, hands-free computing, medical transcription, robotics, automated customer service, and much more. If you have ever paid a bill over the phone using an automated system, you have probably benefited from speech recognition software.

CHAPTER III

PROBLEM IDENTIFICATION

The problem identification for a voice-controlled robot can be broken down into several aspects:

1. **Voice recognition accuracy:** One of the most significant challenges of a voice-controlled robot is achieving accurate voice recognition. The robot must be able to differentiate between different voices, accents, and intonations accurately.

2. **Noise interference:** Voice commands are often given in noisy environments. The robot must be able to filter out ambient noise and focus on the user's voice to accurately interpret the command.

3. **Limited Vocabulary:** Voice-controlled robots can only recognize and respond to a limited set of commands, which can be a problem if the user needs to give complex or specific commands.

4. **User Adaptability:** Not all users will be comfortable using voice commands, and some may not be able to use them at all due to disabilities or language barriers. The robot must have alternative input methods to accommodate different users.

5. **Security and Privacy:** Voice-controlled robots may record and store sensitive data, such as personal information or audio recordings of conversations.

CHAPTER IV

PROPOSED SYSTEM

The Android smartphone's microphone is used to recognize human voices. Using the Android operating system and Artificial Intelligence software, this voice is processed and transformed into English words. Speech recognition is a multidisciplinary subfield of computational linguistics that explores approaches and technology that allow computers to recognize and convert spoken language into text.

Speech recognition has a long history in terms of technology, with multiple waves of key advancements. Advances in deep learning and big data have recently improved the field. The improvements are proven not only by the increasing number of academic articles published on the subject but also by the widespread industry acceptance of a range of deep learning approaches in the design and deployment of voice recognition systems around the world.

1. Voice-controlled robot helps to control the robot through voice commands received via an Android application.

2. The user gives a voice command to the robot.

3. The robot's microphone captures the sound waves and converts them into electrical signals.

4. The electrical signals are then processed by the robot's microcontroller.

5. The microcontroller analyzes the signals and identifies the command given by the user.

6. The robot then performs the specified operation based on the command given.

CHAPTER V

BLOCK DIAGRAM / DESIGN

BLOCK DIAGRAM :

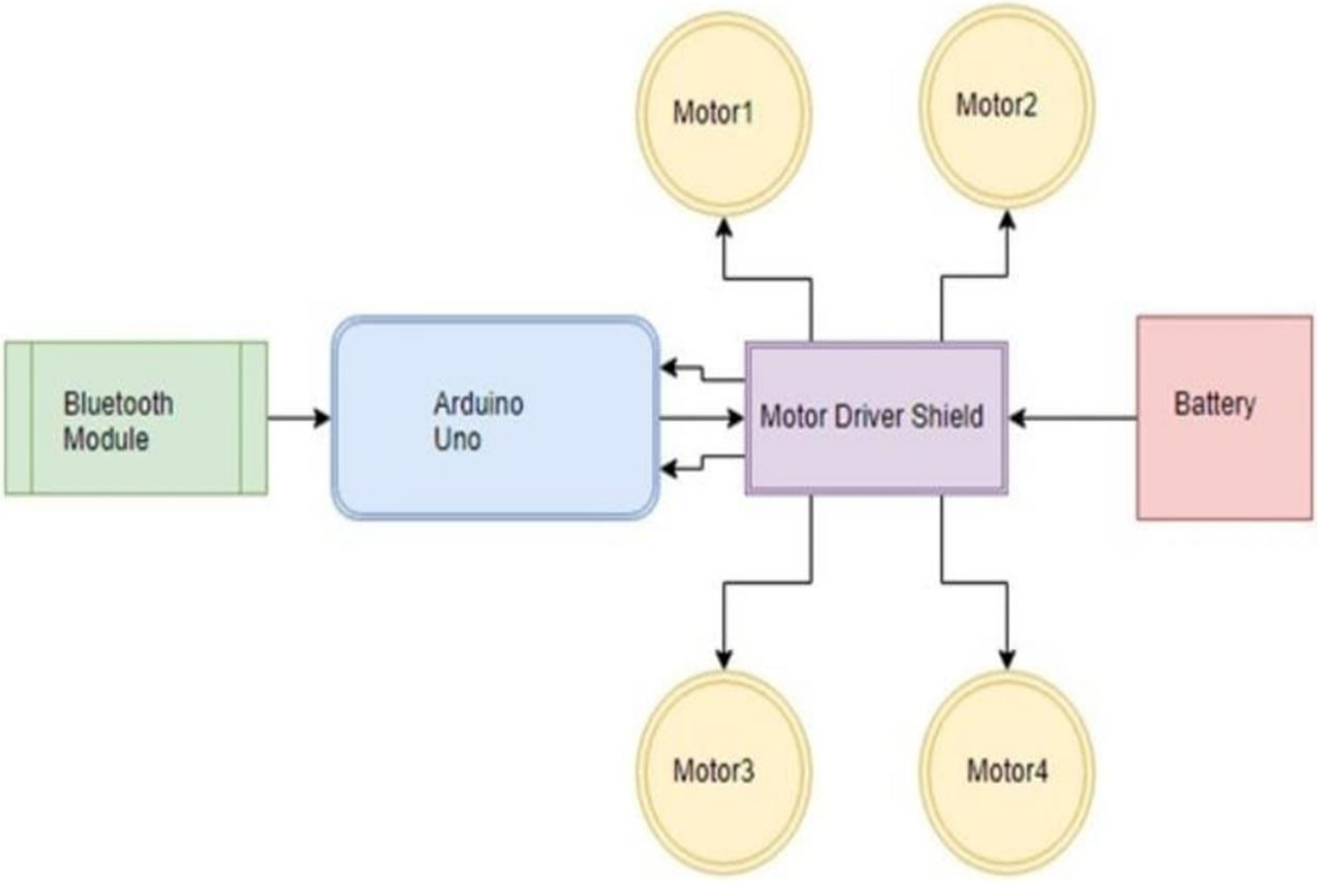

Figure 5.1: Block Diagram

DESIGN :

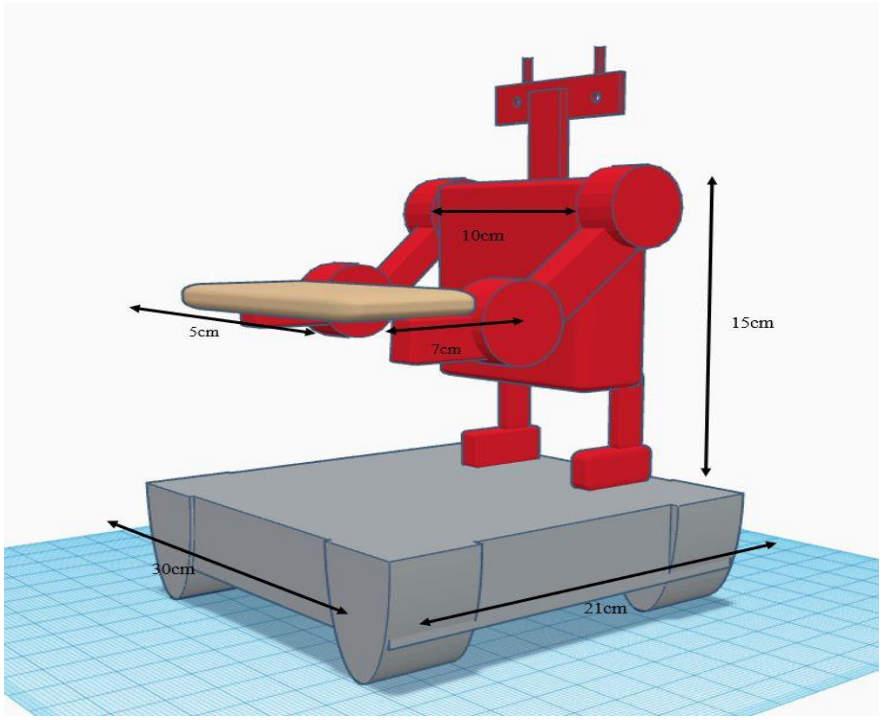

Figure 5.2 : Design

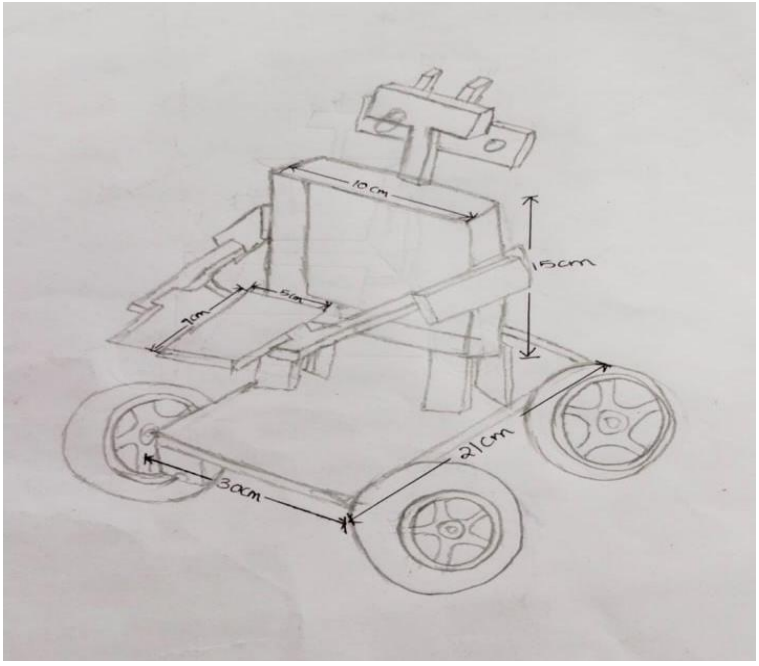

Figure 5.3 : Drawn Design

CHAPTER VI

LIST OF MATERIALS	COST
Arduino Uno	650
Motor Driver L298	200
Bluetooth HC-05	300
12V Battery1.3 AH	450
Motors with Wheels &Clamps	1200
Sun Board Sheet	298
Jumper Wires	197
TOTAL	**3295**

6.1 ARDUINO UNO:

The Arduino Uno is a microcontroller board based on the ATmega328P. It has 14 digital input/output pins, 6 analog inputs, a 16 MHz quartz crystal, A USB connection, a power jack, an ICSP header, and a reset button.

Specifications : Microcontroller: ATmega328

Operating Voltage:5V

Input Voltage (recommended): 7-12V

Input Voltage (limits): 6-20V

DC Current per I/O Pin: 20 mA

DC Current for 3.3V Pin: 50 mA

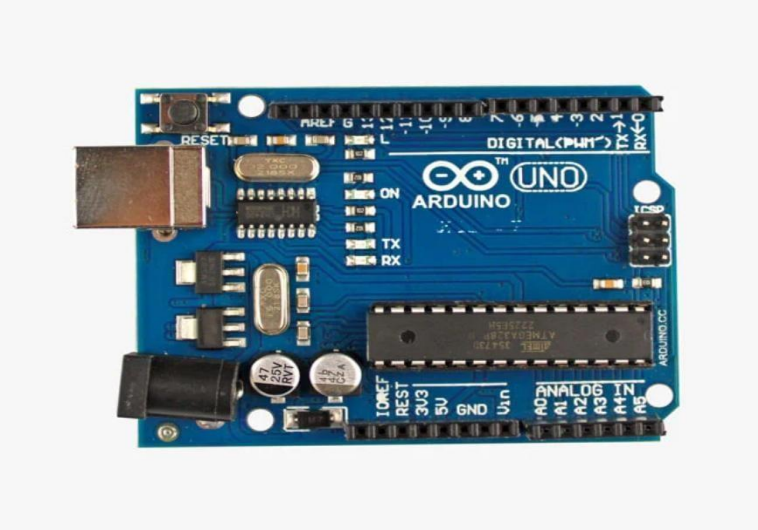

Figure 6.1 : Arduino Uno

6.2 MOTOR DRIVER L298:

The L298N motor driver module is a high-power motor driver module for driving DC and Stepper Motors. It consists of an L298 motor driver IC and a 78M05 5V regulator. The L298N module can control up to 4 DC motors or 2 DC motors with directional and speed control.

Specifications: Driver Chip: Double H Bridge L298N

Motor Supply Voltage (Maximum): 46V

Motor Supply Current (Maximum): 2A

Logic Voltage: 5V

Logical Current:0-36mA

Maximum Power (W): 25W

Operating Voltage: 3.3V

Figure 6.2: Motor Driver l298

6.3 BLUETOOTH HC-05:

The HC-05 is a Bluetooth module designed for wireless communication. It is based on the Bluetooth 2.0 EDR (Enhanced Data Rate) standard and can act as either of master or slave device.

Specifications: Bluetooth Version: Bluetooth 2.0+EDR

Operating Voltage: 3.3V

Operating current: <40mA

Sleep current: <1mA

Communication distance: 10 meters

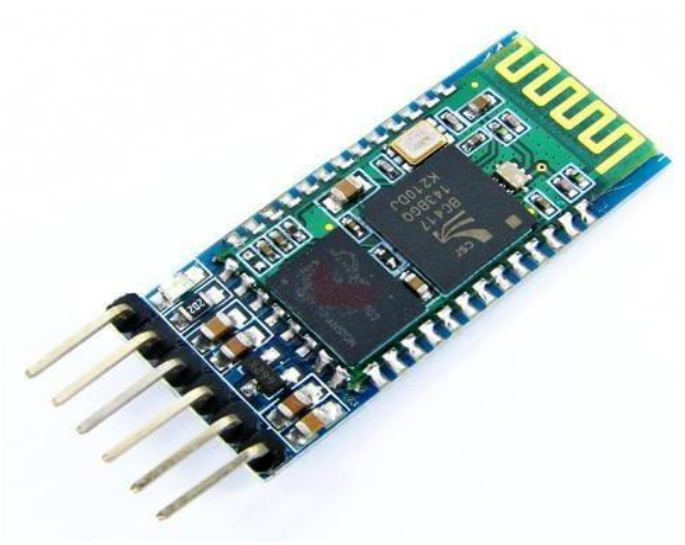

Figure 6.3: Bluetooth HC-05

6.4 12V BATTERY-1.3AH:

A 12V battery with a capacity of 1.3Ah is a type of lead-acid battery that is commonly used in various applications such as electronic weighing scales, medical equipment, electronic test equipment, emergency lights and rechargeable fans, communication equipment, and school and college robotics projects.

Specifications: : Voltage: 12V (12 Volts)

Capacity: 1.3Ah (1300mAh)

Dimensions: Length 3.82 x Width 1.6

Height 2.05 inches

Weight: 1.2 lb

Figure 6.4: 12V Battery-1.3Ah

6.5 12V MOTOR WITH WHEELS & CLAMPS:

12V batteries are used in a variety of applications such as cars, boats, motorcycles, and other vehicles. They are also used in UPS systems, solar panels, and other electronic devices. For example, the Exide 12 Volt/ 7 Ah Power safe Battery is a sealed battery that is used as an original replacement for UPS batteries. The Rechargeable 12V 7AH Sealed Battery is another example of a 12V battery that is used in various applications such as GPS, CCTV cameras, DVR backup, tablet PC, project work, agricultural and industrial.

Specifications: : Operating Voltage: 12V

Rated Speed: 200 RPM

Rated Torque: 1.5 kg-cm

Stall Torque: 5.4 kg-cm

Load Current: 0.3 A

No Load Current: 0.06 A

Figure 6.5: 12V Motor with wheels & clamps

6.6 SUN BOARD SHEET:

Sun Board is a very strong, light, and easily cut sheet material used for the mounting of vinyl prints, as backing in framing, and for painting. It usually has three layers an inner layer of polystyrene foam and a white clay-coated paper on the outside.

Specifications: Thickness: 3mm or 5mm

Color: White

Size: 16" x 12" or A2 (18 Inch X 24 Inch)

Material: Sun Board

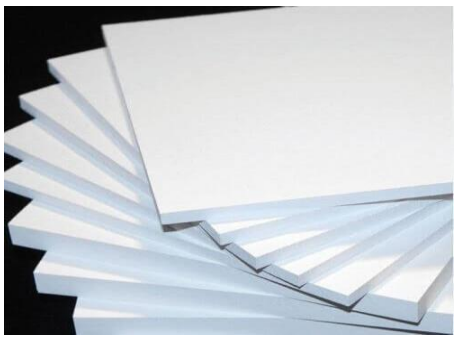

Figure 6.6: Sun Board Sheet

6.7 JUMPER WIRES:

Jumper wires are electrical wires that are used to connect two points on a breadboard or other prototype or test circuit. They typically come in three versions: male-to-male, male-to-female, and female-to-female. You can purchase jumper wires easily and inexpensively or make your own.

Specifications: Wire Gauge: 22 AWG to 26 AWG

Wire Material: Stranded copper or tinned copper

Insulation Material: PVC or silicone

Length: Typically 3 to 12 inches, but can be longer or shorter

Figure 6.7: Jumper Wires

CHAPTER VII

WORKING

Voice orders are handled by smartphone, and speech-to-text recognition is done inside the application utilizing Google speech-recognition technology. The message is then shipped off the beneficiary side through Bluetooth. The text got by means of Bluetooth is sent to Arduino utilizing UART serial communication protocol. Arduino code checks the text got. At the point when the text is a matching string, Arduino controls the development of the robot likewise in forward, in reverse, Turning Right, Turning Left, and stopping.

Steps to control the automated robot:

1. Download the application " BT Voice Control for Arduino " from the Google play store and introduce it.
2. After establishment, turn on the Bluetooth of the cell phone and Bluetooth module.
3. Then pair your cell phone Bluetooth with the Bluetooth module and the default secret key for matching is "0000" or "1234".
4. Then the application and robot are prepared to play out the activity.
5. Then click on the "MIC" of the application and provide explicit order to the robot.
6. Robot will play out the provided explicit order.
7. For example, when we express forward through the application to the robot, this order is given to the Bluetooth module of the robot which is associated with the Arduino.

8. As indicated by the programming of the Arduino the robot will play out the assignment or order. Subsequently, the robot will move to advance.
9. According to the given command the robot can perform other operation or command like Backward, Left, Right, Stop, and Rotation of robot.

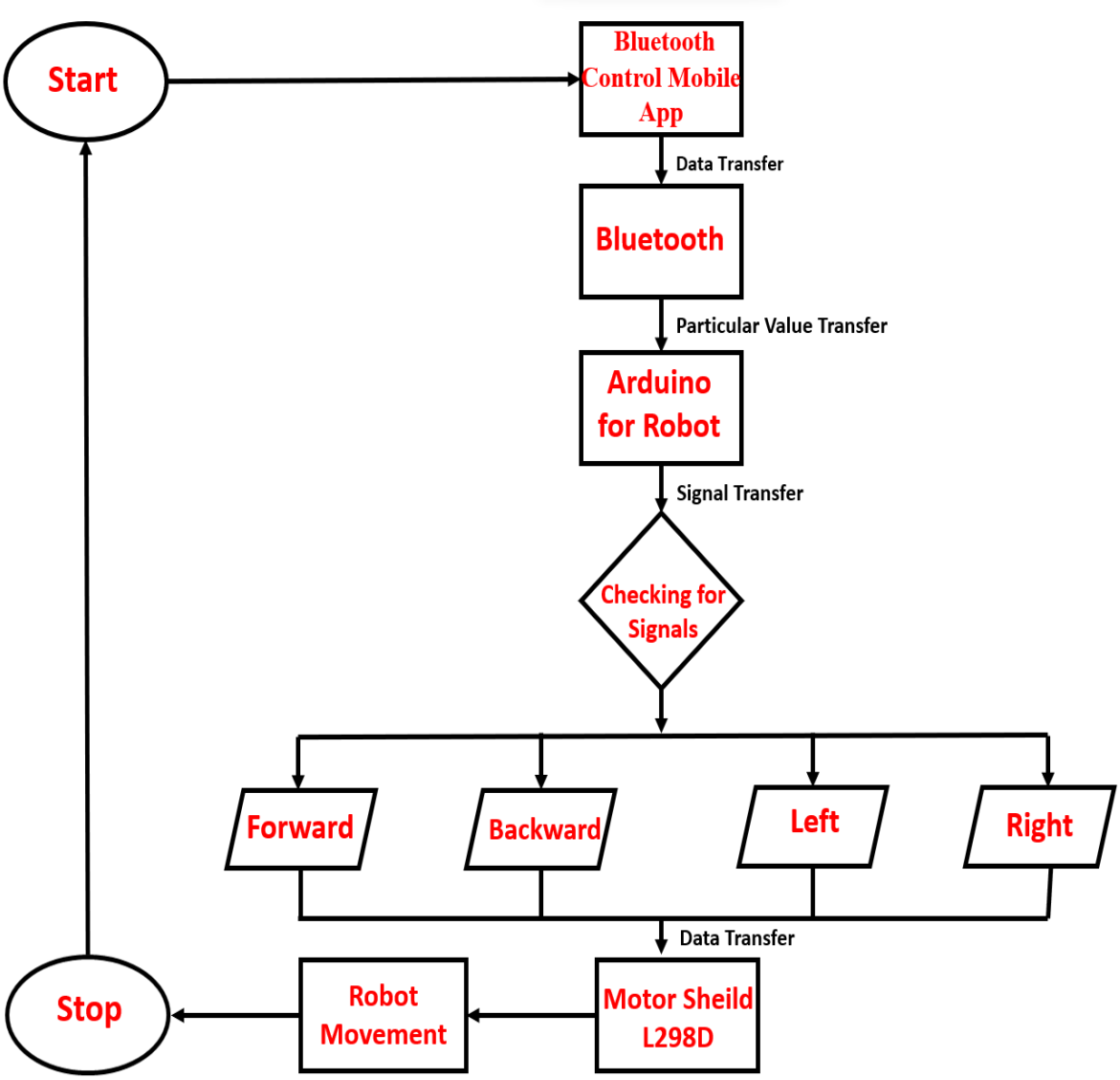

Figure 7.1: Flowchart of Arduino VCR

CHAPTER VIII

SOFTWARE DETAILS

WINDOWS :

Windows is a popular operating system developed by Microsoft Corporation. It is widely used on desktops, laptops, and servers, and is known for its user-friendly interface, powerful features, and wide range of software applications.

Windows provides a graphical user interface that allows users to interact with the operating system and applications using icons, menus, and windows. It also supports a wide range of hardware devices, such as printers, scanners, and cameras, and has built-in drivers for many popular devices.

ARDUINO IDE SOFTWARE :

The Arduino Integrated Development Environment is a software application used to program Arduino microcontroller boards. It is available for Windows, Mac, and Linux operating systems, and is designed to be user-friendly and easy to use, even for beginners.

The Arduino Integrated Development Environment provides a code editor that supports syntax highlighting and auto-completion, making it easy for users to write and debug Arduino code. It also includes a serial monitor that allows users to send and receive data from their Arduino board, as well as a built-in library manager that makes it easy to download and install libraries for common tasks.

ANDROID PHONE :

An Android phone is a type of smartphone that uses the Android operating system developed by Google. Android is one of the most popular mobile operating systems in the world and is used on a wide range of smartphones, tablets, and other mobile devices.

Android phones come in various sizes, shapes, and configurations, with different features and capabilities. Most Android phones have touchscreens, cameras, and support for Wi-Fi and cellular connectivity, as well as GPS and Bluetooth capabilities. They can also run a wide range of apps, from social media and productivity apps to games and entertainment apps.

BLUETOOTH CONTROLLER APP :

A Bluetooth controller app is a software application that allows users to connect and control devices that use Bluetooth technology. These apps are commonly used with gaming controllers, speakers, headphones, and other Bluetooth-enabled devices.

The app typically connects to the device via Bluetooth and provides a user interface for controlling various functions of the device. For example, a Bluetooth controller app for a gaming controller might allow users to customize button mapping, adjust vibration settings, or change other settings related to gameplay. Similarly, a Bluetooth controller app for speakers or headphones might allow users to adjust the volume, equalizer settings, or other audio parameters.

CHAPTER IX

PROGRAM

```
#include <SoftwareSerial.h>
SoftwareSerial BT(0, 1); //TX, RX respectively
String readvoice;
void setup() {
 BT.begin(9600);
 Serial.begin(9600);
  pinMode(4, OUTPUT);
  pinMode(3, OUTPUT);
  pinMode(5, OUTPUT);
  pinMode(6, OUTPUT);
}
void loop() {
  while (BT.available()){  //Check if there is an available byte to read
  delay(10); //Delay added to make thing stable
  char c = BT.read(); //Conduct a serial read
  readvoice += c; //build the string- "forward", "reverse", "left" and "right"
  }
  if (readvoice.length() > 0) {
    Serial.println(readvoice);
  if(readvoice == "* back #")
  {
    digitalWrite(3, HIGH);
    digitalWrite (4, HIGH);
```

```
  digitalWrite(5,LOW);
  digitalWrite(6,LOW);
  delay(100);
 }
 else if(readvoice == "* forward #")
 {
  digitalWrite(3, LOW);
  digitalWrite(4, LOW);
  digitalWrite(5, HIGH);
  digitalWrite(6,HIGH);
  delay(100);
 }
  else if (readvoice == "*left#")
 {
  digitalWrite (3,HIGH);
  digitalWrite (4,LOW);
  digitalWrite (5,LOW);
  digitalWrite (6,LOW);
 delay (800);
    digitalWrite(3, HIGH);
  digitalWrite (4, HIGH);
  digitalWrite(5,LOW);
  digitalWrite(6,LOW);
  delay(100);
 }
  else if ( readvoice == "*right#")
{
```

```
  digitalWrite (3, LOW);
  digitalWrite (4, HIGH);
  digitalWrite (5, LOW);
  digitalWrite (6, LOW);
  delay (800);
     digitalWrite(3, HIGH);
   digitalWrite (4, HIGH);
   digitalWrite(5,LOW);
   digitalWrite(6,LOW);
   delay(100);
}
 else if (readvoice == "*show me Garba#")
{
digitalWrite (3, LOW);
  digitalWrite (4, HIGH);
  digitalWrite (5, LOW);
  digitalWrite (6, LOW);
  delay (400);
     digitalWrite(3, HIGH);
   digitalWrite (4, HIGH);
   digitalWrite(5,LOW);
   digitalWrite(6,LOW);
   delay(600);
   digitalWrite (3, LOW);
  digitalWrite (4, HIGH);
  digitalWrite (5, HIGH);
  digitalWrite (6, LOW);
```

```
    delay (500);
     digitalWrite (3, HIGH);
    digitalWrite (4, LOW);
    digitalWrite (5, LOW);
    digitalWrite (6, HIGH);
    delay (500);
digitalWrite (3, LOW);
    digitalWrite (4, HIGH);
    digitalWrite (5, LOW);
    digitalWrite (6, LOW);
    delay (400);
       digitalWrite(3, HIGH);
     digitalWrite (4, HIGH);
     digitalWrite(5,LOW);
     digitalWrite(6,LOW);
     delay(600);
      digitalWrite (3, LOW);
    digitalWrite (4, HIGH);
    digitalWrite (5, HIGH);
    digitalWrite (6, LOW);
    delay (500);
    digitalWrite (3, HIGH);
    digitalWrite (4, LOW);
    digitalWrite (5, LOW);
    digitalWrite (6, HIGH);
    delay (500);digitalWrite (3, LOW);
    digitalWrite (4, HIGH);
```

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digitalWrite (5, LOW);
digitalWrite (6, LOW);
delay (400);
  digitalWrite(3, HIGH);
 digitalWrite (4, HIGH);
 digitalWrite(5,LOW);
 digitalWrite(6,LOW);
 delay(600);
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digitalWrite (4, HIGH);
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delay (500);
digitalWrite (3, HIGH);
digitalWrite (4, LOW);
digitalWrite (5, LOW);
digitalWrite (6, HIGH);
delay (500);digitalWrite (3, LOW);
digitalWrite (4, HIGH);
digitalWrite (5, LOW);
digitalWrite (6, LOW);
delay (400);
  digitalWrite(3, HIGH);
 digitalWrite (4, HIGH);
 digitalWrite(5,LOW);
 digitalWrite(6,LOW);
 delay(600);
```

```
 digitalWrite (3, LOW);
digitalWrite (4, HIGH);
digitalWrite (5, HIGH);
digitalWrite (6, LOW);
delay (500);
digitalWrite (3, HIGH);
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digitalWrite (5, LOW);
digitalWrite (6, HIGH);
delay (500);digitalWrite (3, LOW);
digitalWrite (4, HIGH);
digitalWrite (5, LOW);
digitalWrite (6, LOW);
delay (400);
   digitalWrite(3, HIGH);
 digitalWrite (4, HIGH);
 digitalWrite(5,LOW);
 digitalWrite(6,LOW);
 delay(600);
 digitalWrite (3, LOW);
digitalWrite (4, HIGH);
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delay (500);
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digitalWrite (5, LOW);
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```
digitalWrite (6, HIGH);
delay (500);digitalWrite (3, LOW);
digitalWrite (4, HIGH);
digitalWrite (5, LOW);
digitalWrite (6, LOW);
delay (400);
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 digitalWrite(5,LOW);
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delay (500);digitalWrite (3, LOW);
digitalWrite (4, HIGH);
digitalWrite (5, LOW);
digitalWrite (6, LOW);
delay (400);
   digitalWrite(3, HIGH);
 digitalWrite (4, HIGH);
```

```
 digitalWrite(5,LOW);
 digitalWrite(6,LOW);
 delay(600);
 digitalWrite (3, LOW);
digitalWrite (4, HIGH);
digitalWrite (5, HIGH);
digitalWrite (6, LOW);
delay (500);
digitalWrite (3, HIGH);
digitalWrite (4, LOW);
digitalWrite (5, LOW);
digitalWrite (6, HIGH);
delay (500);digitalWrite (3, LOW);
digitalWrite (4, HIGH);
digitalWrite (5, LOW);
digitalWrite (6, LOW);
delay (400);
   digitalWrite(3, HIGH);
 digitalWrite (4, HIGH);
 digitalWrite(5,LOW);
 digitalWrite(6,LOW);
 delay(600);
 digitalWrite (3, LOW);
digitalWrite (4, HIGH);
digitalWrite (5, HIGH);
digitalWrite (6, LOW);
delay (500);
```

```
  digitalWrite (3, HIGH);
  digitalWrite (4, LOW);
  digitalWrite (5, LOW);
  digitalWrite (6, HIGH);
  delay (500);
}
readvoice="";}} //Reset the variable
```

CHAPTER X

HARDWARE DISCUSSION

CHAPTER XI

ADVANTAGES / DISADVANTAGES

ADVANTAGES:

1. Voice commands are a far more efficient tool than typing messages.
2. Time-saving.
3. It is hands-free, which means that you can control it without having to use your hands.
4. The proposed robot is capable of understanding the meaning of natural language commands.
5. Voice control eliminates the need for users to manually operate the robot or use remote control, making it easier and more convenient to perform tasks.
6. Voice control can help reduce the risk of accidents or injuries, as users can control the robot from a safe distance without the need for physical interaction.
7. Voice control can enable multiple robots to be controlled simultaneously, allowing for scalability in applications where multiple robots are required.

DISADVANTAGES:

1. They can be less accurate than other types of robots.
2. voice-recognition software is not perfect and can sometimes misinterpret what you say.
3. Background noise interference.

CHAPTER XII

CONCLUSION

The proposed structure of our work shows how a robot can be controlled using Bluetooth. The voice is sent through the Bluetooth innovation and the ideal working actually occurs. This assignment reduces human undertakings at spots or conditions where human interventions are inconvenient. Such systems can be brought into usage at spots, for model, business organizations, home automation, military and gatekeeper, investigation purposes, etc.

Future scope:

1. Here we have used a Bluetooth module that has a limitation of range. In the future, we can add a WIFI module to it for preventing the range limitation.
2. Internet of Things – This will permit the client to control the vehicle from any place in the world.
3. Artificial Intelligence – This will permit the vehicle to be prepared or to advance without anyone else so it turns out to be genuinely independent and can work without human intercession of any sort.
4. We can also use Global Positioning System (GPS) & Global Monitoring System (GMS) so that we can track our automated device from home.

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CHAPTER XIII

LIST OF MODELS

1. **Carpentry :**
    a. Wooden window
    b. Sliding door
    c. Wheelchair
    d. Crank and slotted link
2. **Electronics :**
    a. Power supply board
    b. Emergency light
    c. Relay Board
3. **Machine Shop :**
    a. Machine Vice
    b. Bolt and nut assembly
    c. Simple and compound Gear train
    d. Sheet metal tray

MODEL 1

CARPENTRY: WOODEN WINDOW

AIM: To make a wooden cupboard.

APPARATUS: 1. Scale, 2. Marker, 3. Cutter, 4. Glue, 5. Drilling Machine.

PROCEDURE:

1. Make the required shape of the wooden cupboard.
2. Mark the wood that is to be cut and join the frames with some clamps of the cupboard first.
3. Then make doors to the required shape of the frame.
4. Fix the doors with clamps and screws.
5. Make the handles for the doors to open.

DIAGRAM:

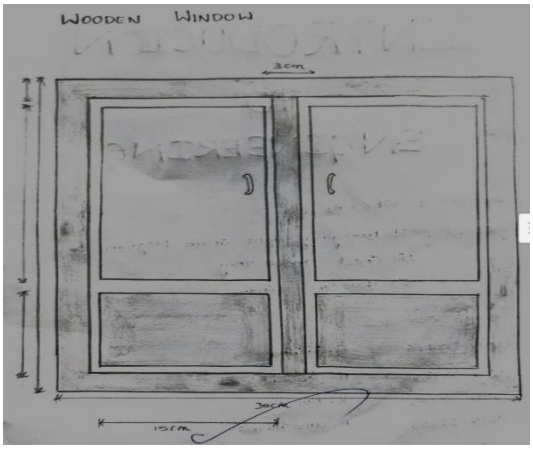


Figure:8.11 design

Figure:8.12 completed design

RESULT: Successfully completed making of wooden cupboard.

MODEL 2

ELECTRONICS: EMERGENCY LIGHT

AIM: To make an Emergency Light.

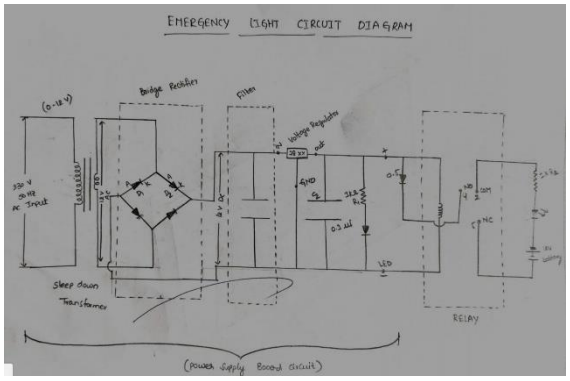
APPARATUS: 1. Battery, 2. connecting wires, 3. light, 4. battery clip, 5. Plaster, 6. Single-side copper clad, 7. Digital multiplier, 8. Drilling machine, 9. Soldering.

PROCEDURE :

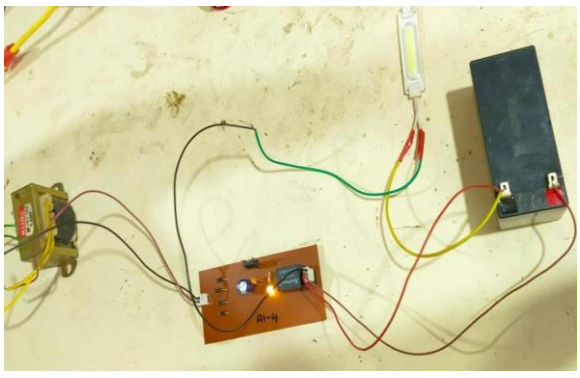
1. First take the copper clad and place the circuit diagram on that clad with the help of ironing and then after 10mins remove the circuit diagram.
2. Now give the connections using soldering.
3. Take the wires from the circuit diagram and connect them to the battery, LED, and power supply.
4. Finally, the light glows.

DIAGRAM :

Design:



Completed Image:



RESULT : Successfully completed making of Emergency Light.

MODEL 3

MACHINE SHOP: SHEET METAL TRAY

AIM: To make a metal sheet tray.

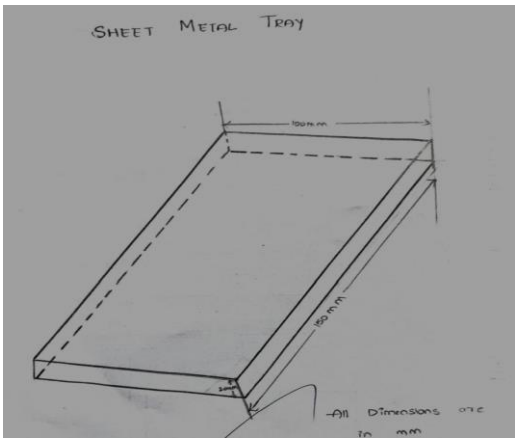
APPARATUS: 1. Steel rule, 2.Tri square, 3.Divider, 4. Sniper, 5.Mallet, 6.Scriber, 7.Pencil, 8. Hammer, 9. Power drill, 10.Ruler

PROCEDURE :

1. Take a rectangular metal sheet.
2. Take the measurements with the help of a scale and pencil/marker.
3. Length=260mm Breadth=170mm Thickness=1mm.
4. Cut the sheet through the marked measurements with the help of scissors.
5. Bend the rest parts of the sheet.

DIAGRAM :

Design:



Completed Images:

RESULT : Successfully completed making of sheet metal tray.