LOCOBOT

A report submitted in partial fulfillment of the Academic requirements for the award of the degree of

Bachelor of Technology

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UNDER THE COURSE

SOCIAL INNOVATION IN PRACTICE

CENTRE FOR ENGINEERING EDUCATION RESEARCH

CMR COLLEGE OF ENGINEERING & TECHNOLOGY
(Autonomous)
(NAAC Accredited with ‘A^{+}’ Grade & NBA Accredited)
(Approved by AICTE, Permanently Affiliated to JNTU Hyderabad)
KANDLAKOYA, MEDCHAL ROAD, HYDERABAD-501401
2023-24

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CERTIFICATE

This is to certify that the report entitled **“LOCOBOT”** is a bonafide work done by **P.Venkata Sai Krishna (22H51A0550),Rhea Reddy.T (22H51A0553), S.Koushik Kumar(22H51A0554),Sarmista Rath(22H51A0555),G.Sowmya (22H51A0588)** of II B.Tech, in partial fulfillment of the requirements for the award of the degree of Bachelor of Technology, submitted to Centre for Engineering Education Research, CMR College of Engineering & Technology, Hyderabad during the Academic Year 2023-24.

(Names of the project coordinators)

1. Mr. B. Suresh Ram, HOD-CEER
2. Mr. K. Ravi Kiran, Asst. Professor
3. Mr. K. Ravi Naik, Asst. Professor
4. Mr. G. Ramesh, Asst. Professor

Mr. B.Suresh Ram
(HOD-CEER)

DECLARATION

We, the students of II B.Tech of Centre for Engineering Education Research , CMR COLLEGE OF ENGINEERING & TECHNOLOGY, Kandlakoya, Hyderabad, hereby declare, that under the supervision of our course coordinators, we have independently carried out the project titled **"LocoBot"** and submitted the report in partial fulfillment of the requirement for the award of Bachelor of Technology in by the Jawaharlal Nehru Technological University, Hyderabad (JNTUH) during the academic year 2023-2024.

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We own all our success to our beloved parents, whose vision, love and inspiration has made us reach out for these glories.

ABSTRACT

The development of a smart, multi-functional robot addresses the growing need for advanced personal assistants capable of enhancing daily living through intelligent interaction. Modern lifestyles demand versatile tools that can seamlessly integrate into various aspects of life, providing support through voice recognition and responsive actions. Current robotic solutions often lack the capability to engage meaningfully with users or handle diverse tasks autonomously. This project aims to create a robot that not only understands and executes voice commands but also engages in meaningful conversations, sings songs, and acts as a personal reminder for tasks and important dates.

The robot's ability to interact naturally and intuitively will significantly improve user experience, offering a reliable, interactive, and enjoyable personal assistant solution. By using speech recognition, this robot will enhance daily routines, provide entertainment, and ensure users stay organized, ultimately transforming personal and home environments.

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CHAPTER-1

INTRODUCTION

"LocoBot is an Interactive robot

that anyone can use"

The voice-controlled robot, developed using Arduino technology, represents a significant innovation in the realm of interactive robotics. This robot leverages Bluetooth communication and advanced voice recognition to respond to spoken commands such as "forward," "backward," "left," "right," "nod," "wave," and "hi." The integration of these technologies allows for seamless, hands-free control, making the robot both versatile and user-friendly.

The need for such a robot arises from the growing demand for more intuitive and accessible technology solutions in various fields. In educational settings, this robot can serve as an engaging tool to teach concepts related to robotics, automation, and programming, providing students with hands-on learning experiences. In home automation, it offers a convenient method to control household devices or robots without the need for physical interfaces. Additionally, in personal assistance and entertainment, the robot's ability to perform gestures and respond with audio feedback can create more interactive and responsive environments.

The voice-controlled robot addresses the need for advanced, interactive solutions that enhance user experience through natural, voice-driven commands, paving the way for broader applications and more accessible technology.

CHAPTER-2

LITERATURE REVIEW

2.1. Existing Solutions:

1. Smart Robot For Face Recognition

This advanced robot leverages facial recognition technology to identify and interact with individuals. Equipped with high-resolution cameras and sophisticated algorithms, it can detect faces, analyze facial features, and match them with a database of known individuals. When a recognized face is detected, the robot can greet the person by name and tailor interactions based on past engagements.

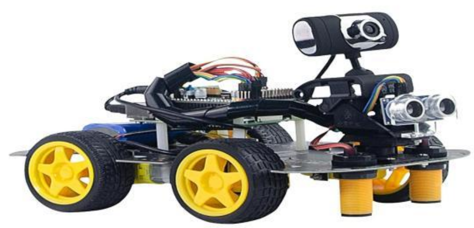


FIG.1:SMART ROBOT FOR FACE RECOGNITION

Disadvantages:

1. **Privacy Concerns:** The continuous monitoring and facial recognition raise significant privacy issues, as it involves constant data collection and storage of facial images.
2. **Accuracy Issues:** The system may struggle with accurately recognizing faces in low-light conditions, or if the person's appearance changes significantly (e.g., due to hairstyle changes or wearing accessories).
3. **High Cost:** Implementing advanced facial recognition technology can be expensive, limiting its accessibility for personal or small-scale use.

4. **Security Risks:** Storing facial recognition data can be a target for cyberattacks, potentially leading to unauthorized access and misuse of personal information.

2. Line Follower Robot Using PID Algorithm

This robot is designed to follow a path marked by a line on the floor, using sensors such as infrared (IR) to detect the line. The PID (Proportional-Integral-Derivative) algorithm is employed to adjust the robot's speed and direction, ensuring it stays on track even through curves and intersections.

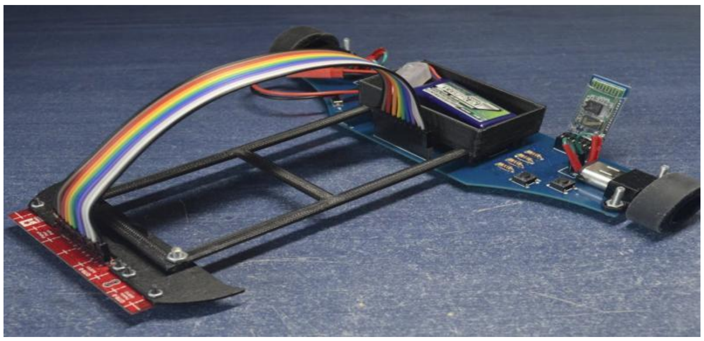


FIG.2:LINE FOLLOWER ROBOT USING PID ALGORITHM

Disadvantages:

1. **Limited Functionality:** These robots are often restricted to following a pre-defined path and cannot adapt to dynamic environments or changes in the path.
2. **Complex Tuning:** Properly tuning the PID algorithm to achieve optimal performance can be complex and time-consuming, requiring specific expertise.
3. **Scalability Issues:** Scaling the technology for more complex applications or larger environments can be challenging and may require significant modifications.

3.Wireless Gesture-Controlled Robotics Projects

This project involves controlling a robot through wireless hand gestures. Sensors like accelerometers and gyroscopes detect the movements of the user's hand, which are then translated into commands that the robot executes in real-time.

Disadvantages:

1. **Gesture Recognition Limitations:** The accuracy of gesture recognition can be affected by the range, lighting conditions, and the user's ability to perform consistent gestures.
2. **Interference:** Wireless signals can be subject to interference from other electronic devices, potentially causing unreliable operation.
3. **Learning Curve:** Users may need time to learn and adapt to the specific gestures required to control the robot effectively.

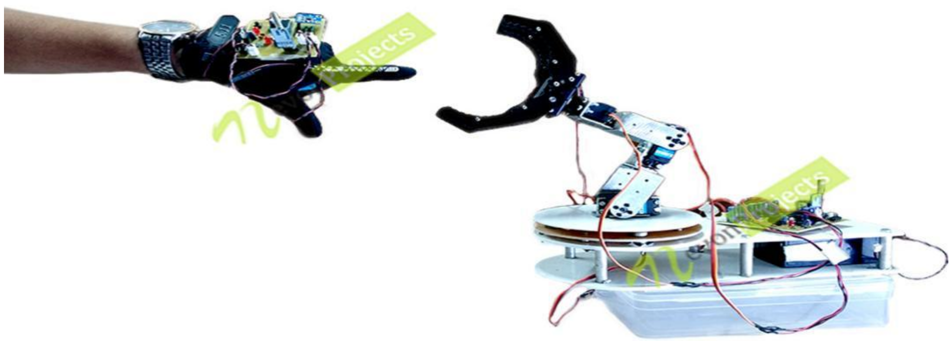


FIG.3:WIRELESS GESTURE-CONTROLLED ROBOTICS PROJECTS

4 .HMI-Based Robotic Arm

Human-Machine Interface (HMI) technology is used to create a robotic arm that mimics the movements of a human hand. This allows for precise control, making it suitable for tasks that require fine motor skills and dexterity, such as assembly, painting, or surgery.

Disadvantages:

1. **High Complexity and Cost:** Developing and maintaining an HMI-based robotic arm can be complex and expensive, often requiring advanced hardware and software.
2. **Precision Limitations:** While HMI-based systems aim for high precision, the accuracy can still be limited by the quality of the sensors and the responsiveness of the system.

3. **Learning and Adaptation:** Users may require significant training to effectively operate the HMI interface and achieve the desired precision in tasks.
4. **Maintenance Challenges:** The sophisticated technology involved can require regular maintenance and updates, adding to the overall operational costs.

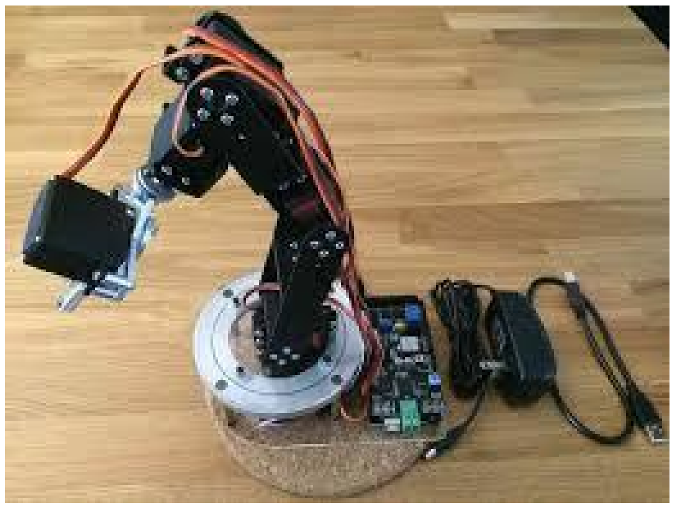


FIG.4:WIRELESS GESTURE-CONTROLLED ROBOTICS PROJECTS

GAPS IN EXISTING SOLUTIONS:

All the existing solutions have many disadvantages. The following are the gaps we found in those existing solutions:

- Existing robots often struggle with navigating complex terrains and environments .
- Many robots lack natural and responsive speech interaction capabilities
- Limited options for user customization and programmability
- High maintenance and repair costs can be a burden for users
- High initial purchase cost
- Susceptibility to interference from other electronic devices

- Requires a stable Wi-Fi connection for optimal functionality

2.2. Proposed Solution:

As we have gone with the need statement, we gone through a literature review so that we can know what exactly our prototype must contain, what kind of updates it should have. While going through this process we came across constraints like :

1. It should be durable
2. Lightweight and low cost.
3. It should navigate different environments easily.
4. User friendly and interactive

CHAPTER-3

PROBLEM DEFINITION

3.1 Problem Statement:

Developing a smart, multi-functional robot capable of recognizing voice commands and responding accordingly through movement, speech and interaction with users. The robot possesses the ability to understand and execute tasks based on voice inputs, engage in meaningful conversations with users, sing songs to enhance user experience and interaction, and additionally acts as a reminder for tasks and important days.

3.2 Objective:

1.To enhance interaction between humans and robots

2.To navigate and move through various environments

3. Effectively communicate with users

4. To engage with people in a social context, providing companionship, assistance

3.3 Requirement Analysis:

1.DC GEARED MOTORS

FIG 5: .DC GEARED MOTORS

A DC geared motor combines a standard DC motor with a gearbox to reduce speed and increase torque, making it ideal for precise and powerful movements. In Arduino projects, it is commonly used for driving wheels in robots, operating mechanical arms, and powering conveyor belts.

The motor's speed and direction can be easily controlled using an Arduino and a motor driver like the L298N. This versatility and ease of control make DC geared motors a popular choice for hobbyists and educators working on robotics, automation, and other mechanical projects.

The ability to control speed and direction programmatically with an Arduino makes it possible to create complex navigation algorithms, enabling the vehicle to follow specific paths, avoid obstacles, or even perform tasks like line following.

2. SPEAKER MODULE

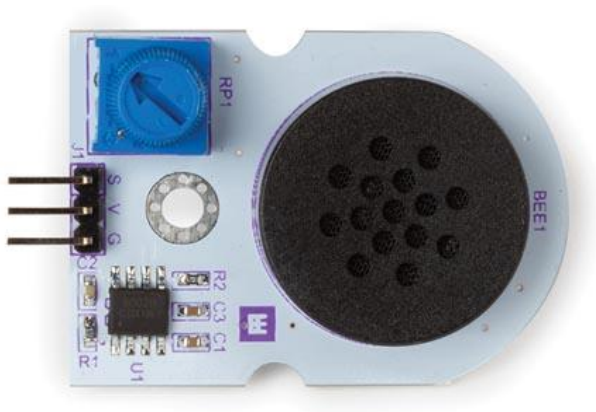
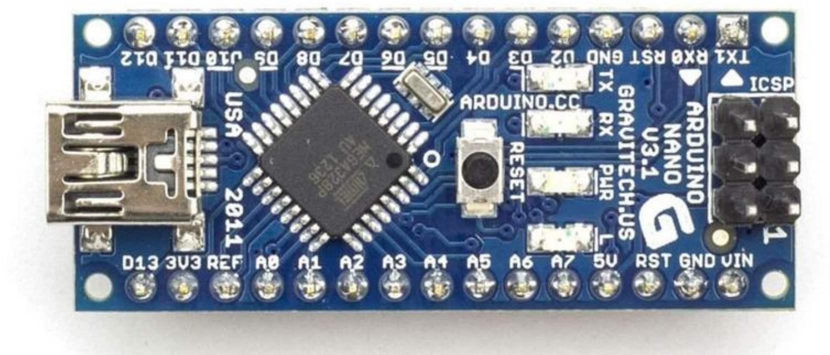


FIG 6: SPEAKER MODULE

A speaker module in Arduino projects is used to generate sound, allowing the creation of audio signals, alarms, or even simple music. This module typically includes a small speaker or piezo buzzer, which can be easily controlled through the Arduino's digital output pins

3. Speaker or Piezo Buzzer: The primary component that produces sound when driven by an electrical signal.

4. Control Circuitry: Some modules include additional circuitry for amplifying the signal or smoothing out the sound.



5. <u>ARDUINO NANO</u>

FIG 7: ARDUINO NANO

The Arduino Nano is a compact and versatile microcontroller board based on the ATmega328P chip, designed for projects where space is at a premium. Measuring just 18 x 45 mm, it provides the functionality of the Arduino Uno in a smaller form factor, making it ideal for tight spaces and portable applications. Despite its size, the Nano offers a robust set of features, including 22 digital I/O pins, 8 analog inputs, and a USB connection for programming and power. Its small footprint makes it particularly suitable for wearable technology, embedded systems, and small robots. Additionally, its ease of use and compatibility with Arduino libraries make it a popular choice for prototyping and educational projects. The Arduino Nano's blend of compactness and capability allows for flexible and efficient development in various electronic applications.

4. BLUETOOTH

FIG 8: BLUETOOTH

A Bluetooth module in Arduino projects enables wireless communication between the Arduino and other Bluetooth-enabled devices such as smartphones, tablets, or computers. This module is useful for creating wireless data transfer, remote control applications, and IoT (Internet of Things) projects.It is used in controlling robots, home automation systems, or other devices wirelessly via a smartphone or computer.

5. SD CARD MODULE

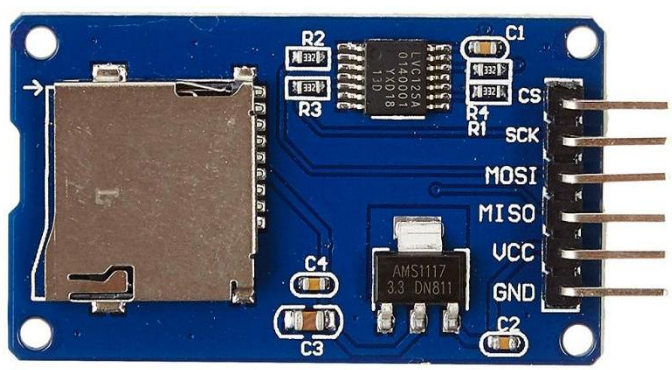


FIG 9:SD CARD MODULE

An SD card module in Arduino projects expands the storage capabilities of the Arduino, allowing it to read from and write data to an SD card. This module is essential for applications requiring data logging, file storage, and retrieval of large datasets or media files.

It communicates with the Arduino using the SPI (Serial Peripheral Interface) protocol and includes features like a voltage regulator and level shifter to ensure compatibility. Common uses of an SD card module include recording sensor data over time, storing configuration settings, and saving various file types, making it a versatile tool for enhancing the functionality of Arduino-based projects.

6. DRIVERS:

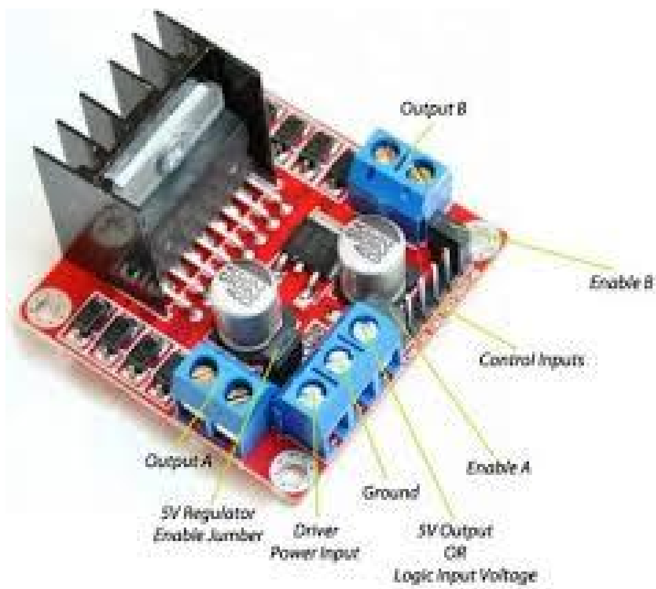


FIG 10:DRIVERS

Motor drivers are critical components in Arduino projects, enabling the control of DC motors, stepper motors, and servo motors. These drivers act as intermediaries between the low-power Arduino microcontroller and the higher-power motors, allowing the Arduino to manage motor speed, direction, and sometimes torque. For instance, the L298N motor driver can control the speed and direction of two DC motors or one stepper motor, using PWM (Pulse Width Modulation) signals from the Arduino. Motor drivers provide necessary voltage and current amplification, protecting the Arduino from potential damage due to high-power demands. They are essential in robotics, automation, and any project requiring precise motor control.

7. BREAD BOARD

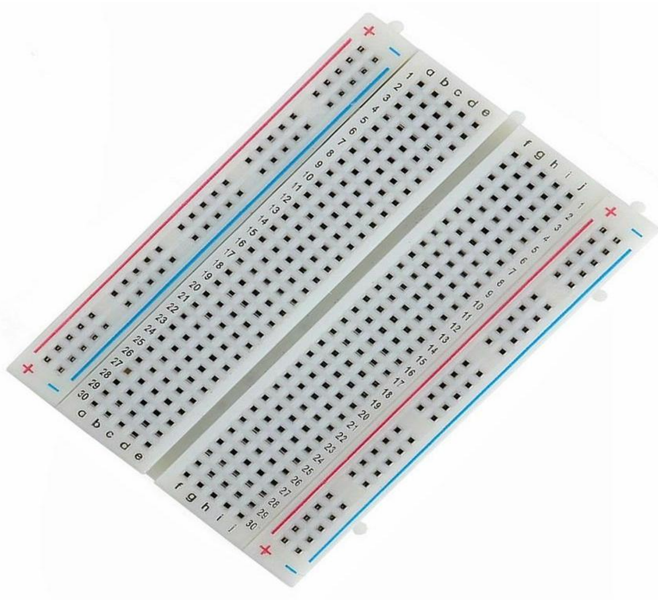


FIG 11:BREADBOARD

A breadboard is an essential tool in electronics and Arduino projects, used for prototyping and testing circuits without the need for soldering. It features a grid of interconnected holes into which components such as resistors, capacitors, ICs, and wires can be inserted to form temporary circuits.The breadboard's layout includes horizontal and vertical rows that facilitate easy connections and reconfigurations of components, making it ideal for experimenting with different circuit designs. Its reusable nature allows hobbyists and engineers to quickly assemble, modify, and troubleshoot circuits, making it a staple in learning environments

8. JUMPER WIRES

FIG12 :JUMPER WIRES

Jumper wires are essential components in electronics and Arduino projects, used to make connections between different points on a breadboard or between a breadboard and other devices like microcontrollers, sensors, and modules. These wires come in various lengths and colors, often with male or female connectors on the ends, making them versatile for creating temporary and flexible circuits. The male connectors can be easily inserted into the holes of a breadboard or the female headers on an Arduino, while female connectors can attach to pin headers or male connectors. Jumper wires enable quick and efficient prototyping, allowing for easy modifications and troubleshooting in circuit design.

9. WHEELS

FIG 13 :WHEELS

Wheels are a fundamental component in robotics and Arduino projects, providing the means for movement and navigation. They are typically attached to motors, such as DC motors or servo motors, which drive the wheels and enable the robot to travel across various surfaces. The choice of wheels, including their size, material, and tread pattern, can significantly affect the robot's performance, traction, and maneuverability. In Arduino-based robotics, wheels are often used in conjunction with sensors to enable functions like obstacle avoidance, line following, and autonomous navigation. Properly selected and mounted wheels ensure stable and efficient mobility, making them crucial for any mobile robot project.

10. PHONE

FIG 14:PHONE

A phone can be a powerful tool in Arduino projects, serving as a user interface, control device, or data source. With the help of Bluetooth or Wi-Fi modules, an Arduino can communicate wirelessly with a smartphone, enabling remote control of projects such as robots, home automation systems, or other interactive devices. Applications developed for smartphones can send commands, receive data, and display information in real-time, providing an intuitive way to interact with Arduino-based systems. Additionally, smartphones can use their sensors, like GPS, accelerometers, or cameras, to gather data and transmit it to the Arduino for further processing, greatly enhancing the functionality and versatility of the project.

CHAPTER-4

METHODOLOGY

Our problem is to create an interactive robot that move and communicate with users when needed. The robot that we designed responds to the commands given by the user. If the user tell to to move forward and responds by moving in a forward direction, similarly it can talk,nod its head and shake hands with the user.

4.1 CONCEPTUAL DESIGN:

Our design includes very simple mechanism. The design of the prototype is as shown below in the figure

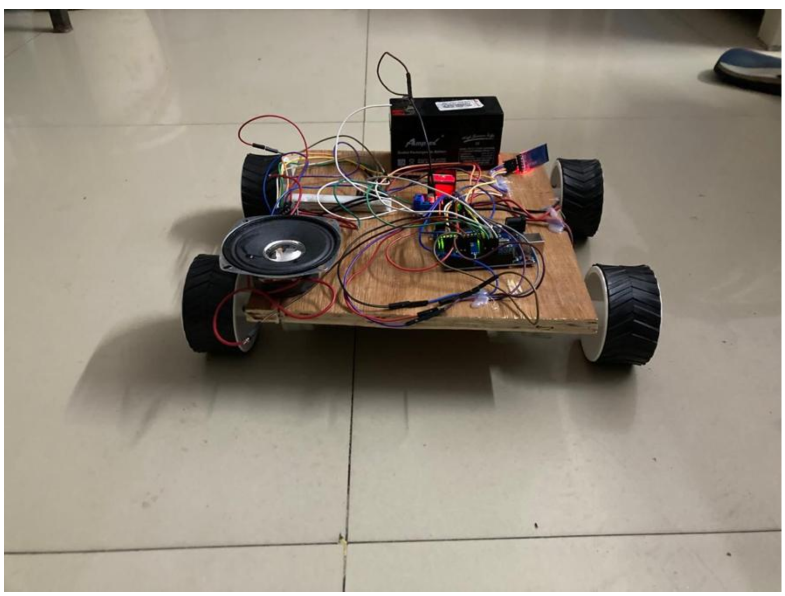


FIG15: PROTOTYPE

Our initial prototype had a simple design, we had a the necessary components on wooden board with wheels attached.Here we would send our voice commands via phone to Arduino.The phone and the Arduino were connected using Bluetooth.The voice command was processed and the servo motors would move wheel in the needed direction or the robot would reply to the command through the speaker module

4.2 BLOCK DIAGRAM:

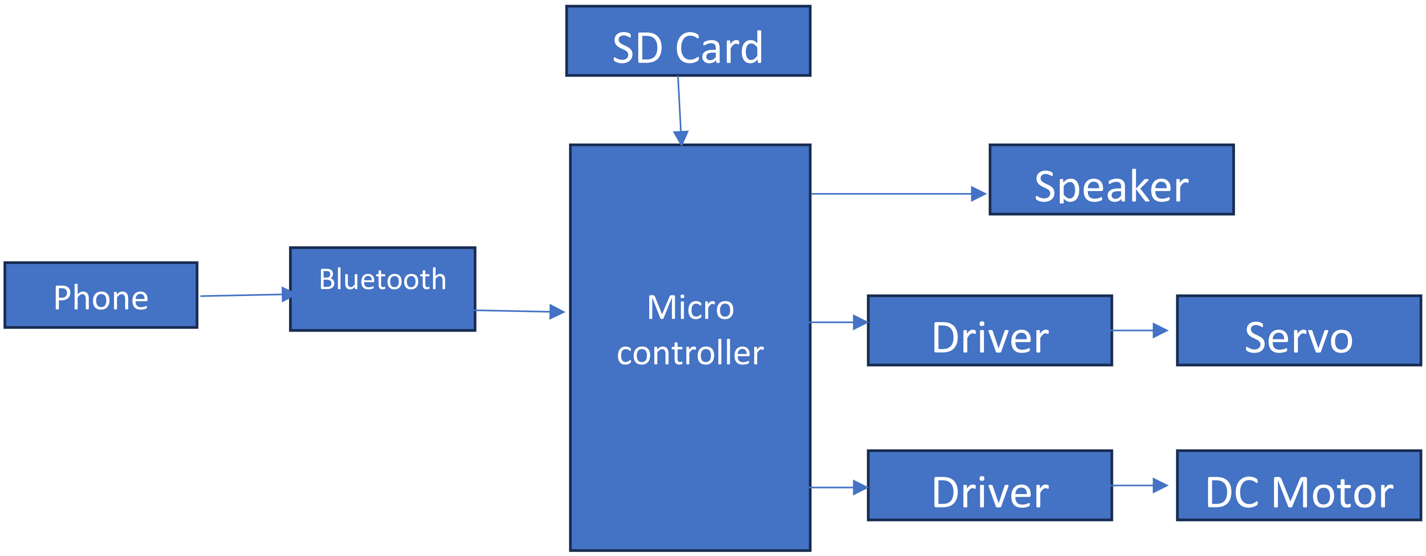


FIG 16: BLOCK DIAGRAM

- Phone is connected to bluetooth and helps transmits data to to the Arduino.This formas our input
- Depending on the command either the drivers that control the servo motors move or the speaker communicates with the user.

4.3 DESIGN DESCRIPTION:

FIG17:LOCOBOT

In this system, a user provides audio commands to an Arduino-based project via a mobile phone. The audio input includes commands such as "forward," "backward," "left," "right," and "hi." To bridge the communication between the mobile phone and the Arduino, Bluetooth technology is employed. The phone, equipped with a voice recognition app or feature, converts the spoken commands into text format. This text data is then transmitted wirelessly to the Arduino through a Bluetooth module, such as the HC-05 or HC-06, which is paired with the phone.

Once the Bluetooth module receives the text data, it sends this information to the Arduino microcontroller. The Arduino is programmed with code designed to process the incoming text commands. This code interprets the text and determines the appropriate action based on the command received. For commands like "forward," "backward," "left," and "right," the Arduino sends specific instructions to a motor driver module. The motor driver, such as the L298N, acts as an interface between the Arduino and the DC motors, enabling precise control over motor movements.

The motor driver processes these instructions and controls the DC motors accordingly, causing the robot or vehicle to move in the specified direction. For instance, a "forward" command results in the motors moving the wheels forward, while a "left" command would cause the motors to turn the wheels left. This setup allows for responsive and intuitive control of the robot or vehicle based on voice commands.

If the command received is "hi," the Arduino's code recognizes this as a special instruction to play a pre-recorded speech or greeting. The Arduino can be connected to a speaker or sound module, which plays a corresponding audio file, such as a friendly "hi" or other pre-set responses. This feature adds an interactive element to the project, enabling not only control of physical movements but also vocal interactions, enhancing the overall user experience.

When the Arduino receives a "nod" command, it sends instructions to a servo motor or a mechanism capable of tilting the head or moving up and down. This action simulates a nodding gesture, which could be used to signify acknowledgment or agreement.

Similarly, a "wave" command directs the Arduino to control a servo motor or mechanism that can move the hand back and forth in a waving motion. This gesture can be used for interactive or greeting purposes, adding a dynamic element to the project.

CHAPTER-5

IMPLEMENTATION

5.1 RESULTS AND DISSCUSSION:

1.**Remote Control and Automation:**

The robot can be controlled remotely via a mobile phone, making it suitable for applications requiring hands-free operation.This wireless control method eliminates the need for physical connections, allowing for greater flexibility and ease of use. It enables users to operate the robot from a distance, which is particularly useful in environments where direct interaction is challenging.

2.Personal Assistance:

The robot can serve as a personal assistant, performing tasks based on voice commands, such as moving objects or greeting users.It can simplify daily tasks and provide a user-friendly interface for interacting with technology. Voice commands offer an intuitive way to control devices, making technology more accessible and easier to use

3.Enhanced Communication:

The ability to play pre-recorded messages or greetings allows for personalized interactions in customer service or hospitality settings.The robot can provide immediate, contextually relevant responses, improving communication efficiency and enhancing user experience. It can also deliver consistent and professional greetings or information without human intervention.

4.Increased Flexibility:

The modular nature of the system allows for easy upgrades and customization, adapting to different needs and environments.The robot's design can be modified to incorporate new features or respond to different types of commands, offering versatility and adaptability. This flexibility ensures that the system can evolve with changing requirements and technological advancements.

5.2 CONCLUSION:

The integration of voice commands with an Arduino-based robot has successfully demonstrated a significant advancement in interactive technology. Using Bluetooth and voice recognition, the robot executes commands like "forward," "backward," "left," "right," and performs gestures such as "nod" and "wave," along with playing pre-recorded audio for commands like "hi." This system offers intuitive, hands-free control, enhancing user interaction and versatility. It effectively combines motor control, servos, and speech playback, making it ideal for applications in education, home automation, and personal assistance. Future improvements could enhance voice recognition and expand capabilities, further advancing interactive robotics.

6.1. APPENDIX:

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https://whadda.com/product/digital-speaker-module-wpm457/

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https://www.researchgate.net/

CHAPTER-6

SOURCE CODE

```
#include <SD.h>
#include <TMRpcm.h>
#include <SPI.h>
#include <Servo.h>

// Motor driver pins
const int in1 = 3;
const int in2 = 4;
const int in3 = 5;
const int in4 = 6;

// SD card and speaker setup
const int chipSelect = 10;
TMRpcm music;

// Servo pins
const int headServoPin = 2;
const int shoulderServoPin = 7;
const int wristServoPin = 8;

Servo headServo;
Servo shoulderServo;
```

```
Servo wristServo;

// Initial positions for servos
const int initialShoulderPos = 0;
const int initialWristPos = 90;

// LED pins (using analog pins as digital pins)
const int ledPin1 = A0;
const int ledPin2 = A1;

void setup() {
  Serial.begin(9600); // Start hardware serial at 9600 baud rate for Bluetooth module

  // Motor pins setup
  pinMode(in1, OUTPUT);
  pinMode(in2, OUTPUT);
  pinMode(in3, OUTPUT);
  pinMode(in4, OUTPUT);
  stopMotors();

  // SD card setup
  if (!SD.begin(chipSelect)) {
    Serial.println("SD card initialization failed!");
    return;
  }
```

```
  music.speakerPin = 9; // Speaker connected to pin 9

  // Servo setup
  headServo.attach(headServoPin);
  shoulderServo.attach(shoulderServoPin);
  wristServo.attach(wristServoPin);

  // Move servos to initial positions
  shoulderServo.write(initialShoulderPos);
  wristServo.write(initialWristPos);

  // LED setup
  pinMode(ledPin1, OUTPUT);
  pinMode(ledPin2, OUTPUT);

  Serial.println("Setup complete.");
}

void loop() {
  if (Serial.available()) {
    String command = Serial.readStringUntil('\n');
    command.trim(); // Remove any leading/trailing whitespace
    Serial.println("Command received: " + command);
    blinkLEDs(); // Blink LEDs when command is received
    handleCommand(command);
```

```
  }
}

void handleCommand(String command) {
  if (command == "hi") {
    music.play("hi.wav"); // Play hi response
  } else if (command == "what is your name") {
    music.play("name.wav"); // Play name response
  } else if (command == "forward") {
    forward();
  } else if (command == "backward") {
    backward();
  } else if (command == "left") {
    left();
  } else if (command == "right") {
    right();
  } else if (command == "stop") {
    stopMotors();
  } else if (command == "nod") {
    nodHead();
  } else if (command == "wave") {
    waveHands();
  }
}
```

```
void forward() {
  digitalWrite(in1, HIGH);
  digitalWrite(in2, LOW);
  digitalWrite(in3, HIGH);
  digitalWrite(in4, LOW);
}

void backward() {
  digitalWrite(in1, LOW);
  digitalWrite(in2, HIGH);
  digitalWrite(in3, LOW);
  digitalWrite(in4, HIGH);
}

void right() {
  digitalWrite(in1, LOW);
  digitalWrite(in2, HIGH);
  digitalWrite(in3, HIGH);
  digitalWrite(in4, LOW);
  delay(2000); // Delay for 90-degree turn
  stopMotors();
}

void left() {
  digitalWrite(in1, HIGH);
```

```
  digitalWrite(in2, LOW);
  digitalWrite(in3, LOW);
  digitalWrite(in4, HIGH);
  delay(2000); // Delay for 90-degree turn
  stopMotors();
}

void stopMotors() {
  digitalWrite(in1, LOW);
  digitalWrite(in2, LOW);
  digitalWrite(in3, LOW);
  digitalWrite(in4, LOW);
}

void nodHead() {
  moveServo(headServo, 0, 90, 15); // Nod head from 0 to 90 degrees
  moveServo(headServo, 90, 0, 15); // Nod head from 90 to 0 degrees


}

void moveServo(Servo& servo, int start, int end, int delayTime) {
  if (start < end) {
    for (int pos = start; pos <= end; pos++) {
      servo.write(pos);
      delay(delayTime);
```

```
    }
  } else {
    for (int pos = start; pos >= end; pos--) {
      servo.write(pos);
      delay(delayTime);
    }
  }
}

void waveHands() {
  // Move shoulder servo 90 degrees
  waveShoulderServo(70, 0, 15);
  delay(500); // Pause for 0.5 seconds

  // Move wrist servo 90 degrees twice
  waveWristServo(0, 90, 15);
  waveWristServo(90, 0, 15);
  waveWristServo(0, 90, 15);
  waveWristServo(90, 0, 15);

  // Return shoulder servo to initial position
  waveShoulderServo(0, 70, 15);
}

void waveShoulderServo(int start, int end, int delayTime) {
```

```
  if (start < end) {
    for (int pos = start; pos <= end; pos++) {
      shoulderServo.write(pos);
      delay(delayTime);
    }
  } else {
    for (int pos = start; pos >= end; pos--) {
      shoulderServo.write(pos);
      delay(delayTime);
    }
  }
}

void waveWristServo(int start, int end, int delayTime) {
  if (start < end) {
    for (int pos = start; pos <= end; pos++) {
      wristServo.write(pos);
      delay(delayTime);
    }
  } else {
    for (int pos = start; pos >= end; pos--) {
      wristServo.write(pos);
      delay(delayTime);
    }
  }
```

```
}


void blinkLEDs() {
  digitalWrite(ledPin1, HIGH);
  digitalWrite(ledPin2, HIGH);
  delay(200);
  digitalWrite(ledPin1, LOW);
  digitalWrite(ledPin2, LOW);
  delay(200);
}
```

TEAM DETAILS

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Social Innovation in Practice

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LOCOBOT

ABSTRACT:

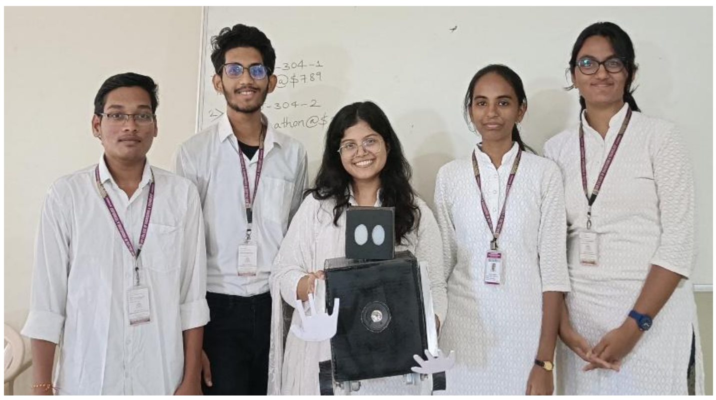
In this project, we developed an interactive robot capable of moving forward, backward, left, and right, and responding to verbal commands. Utilizing Arduino for control, the robot features robust speech recognition for seamless human-robot interaction. This versatile robotic assistant can follow instructions, and engage in simple conversations. It is designed for adaptability, it can be expanded for more complex applications.

DESCRIPTION:

An interactive robot capable of moving in four directions: forward, backward, left, and right using dc motors and servo motors for movement. Controlled by an Arduino, the robot features speech recognition, allowing it to respond to verbal commands and engage in simple conversations. This robotic assistant is designed to perform basic tasks and follow user instructions, enhancing daily life through practical and innovative technology.

CONCLUSION:

We successfully developed a versatile and interactive robotic assistant that can navigate in multiple directions and respond to verbal commands. By integrating Arduino with speech recognition, the robot demonstrates significant potential to enhance daily life through practical applications. Its expandable design allows for future advancements and more complex functionalities.



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