

**Sukkur Institute of Business Administration University** Department of Electrical Engineering

**Introduction to Robotics (ITR)**

**Project Report**

**Spring - 2024**

# Project Name

**Gesture & Voice Controlled Robotic Car**

**Students Name:**

**UKASHA ABDUL MAJEED**

**Arslan Aslam**

**Imtiaz Ali**

**Instructor:** Dr. Afaque Manzoor Soomro

Assistant Professor

Department of Electrical Engineering

# Certificate

*It is certified that Mr.* ***Ukasha Abdul Majeed*** *having CMS ID* ***031-21-0006*** *a student of* **BE-VII (EE)** *has carried out the “***Project***” for the subject of* **Introduction to Robotics(ITR)** *as provided by*

*the Instructor of the subject at the department of Electrical Engineering, Sukkur Institute of Business Administration for* **Spring-2024.**

**Date: 19/05/2024** **Instructor’s Signature**

# Certificate

*It is certified that Mr.* ***Arslan Aslam*** *having CMS ID* ***031-21-0002*** *a student of* **BE-VII (EE)** *has carried out the “***Project***” for the subject of* **Introduction to Robotics(ITR)** *as provided by*

*the Instructor of the subject at the department of Electrical Engineering, Sukkur Institute of Business Administration for* **Spring-2024.**

**Date: 19/05/2024** **Instructor’s Signature**

# Certificate

*It is certified that Mr.* ***Imtiaz Ali*** *having CMS ID* ***031-21-0004*** *a student of* **BE-VII (EE)** *has carried out the “***Project***” for the subject of* **Introduction to Robotics(ITR)** *as provided by*

*the Instructor of the subject at the department of Electrical Engineering, Sukkur Institute of Business Administration for* **Spring-2024.**

**Date: 19/05/2024** **Instructor’s Signature**

## Table of Contents

1. **Introduction to Project**
2. **Need**
3. **Working Principle of Project**
4. **Components used**
5. **Model Circuit**
6. **Advantages**
7. **Limitations**
8. **Applications**
9. **Possibilities to extend the project with more advanced features**
10. **Reference**

**Introduction to Project:**

This project involves the creation of a robotic car that can be controlled using both gesture and voice commands. The robotic car is built using an Arduino microcontroller, an HC-05 Bluetooth module, a motor driver IC, and a 4x4 chassis. A smartphone is used to provide control inputs via its gyroscope sensor for gestures and its microphone for voice commands, communicated through a custom mobile application.

**NEED:**

The need for intuitive and user-friendly control mechanisms in robotics is increasing. Traditional control methods, such as remote controls or manual inputs, can be cumbersome and less engaging. By integrating gesture and voice control, this project aims to enhance the user experience and provide a more natural way of interacting with robotic systems. This technology can be particularly useful in assistive devices, remote exploration, and educational tools.

**Working principle of the project:**

The working principle of the project is based on the following steps:

**Gesture Control:** The smartphone’s gyroscope detects tilts and orientations. The mobile app translates these movements into directional commands and sends them via Bluetooth to the HC-05 module on the robotic car. The Arduino interprets these commands and controls the motor driver IC to move the car in the desired direction.

**Voice Control:** The mobile app uses speech recognition to convert voice commands into text. These text commands are then translated into control signals and sent via Bluetooth to the HC-05 module. The Arduino processes these signals and directs the motor driver IC to execute the corresponding movements.

***Components:***

|  |  |  |  |
| --- | --- | --- | --- |
| No. | **Name of Component** | **Specifications** | **Quantity** |
| 1 | Arduino | UNO R3 | 1 |
| 2 | HC-05 | Bluetooth module | 1 |
| 3 | 4x4 Chase | - | 1 |
| 4 | Motor Driver IC | L298N | 2 |
| 5 | 12V Battery | - | 1 |
| 6 | Connecting Wires | - | - |

**MODEL CIRCUIT:**

|  |
| --- |
|  |
|  |
|  |
|  |

**ADVANTAGES**

Advantages of gesture & voice controlled robotic car are as follows:

**Intuitive Control**: Natural and easy-to-use control mechanisms through gestures and voice. Users can operate the car without needing extensive training or knowledge of complex controls.

**Wireless Operation**: Enables remote control without the need for physical connections, providing greater freedom of movement and ease of use.

**Versatile Applications**: Can be adapted for various uses such as assistive technologies for individuals with disabilities, remote exploration in hazardous environments, and as an interactive educational tool for teaching robotics and programming.

**Enhanced User Engagement**: The use of gesture and voice controls can make the experience more engaging and enjoyable, particularly for educational purposes or interactive demonstrations.

**Accessibility:** Voice commands can make the robotic car accessible to people with physical disabilities who may have difficulty using traditional controls.

**Limitations:**

* **Bluetooth Range**: Limited range of Bluetooth communication may restrict the operational distance.
* **Voice Recognition Accuracy**: May be affected by background noise and varying accents.
* **Battery Life**: Continuous operation may drain the battery quickly, requiring frequent recharging.

**APPLICATIONS:**

* **Assistive Devices**: For individuals with mobility impairments, allowing them to control devices using voice or gestures.
* **Remote Exploration**: In hazardous environments where human presence is risky.
* **Educational Tools**: Teaching robotics and programming concepts interactively.

**Possibilities to extend the project with more advanced features:**

**Obstacle Detection**: Integrating sensors to detect and avoid obstacles.

**Enhanced Voice Commands**: Expanding the range and complexity of voice commands.

**Autonomous Navigation**: Implementing algorithms for self-navigation and pathfinding.

**Real-Time Video Streaming**: Adding a camera for live video feedback to the smartphone.

**Multi-Device Control**: Enabling control of multiple robotic cars from a single smartphone. **REFERENCE:**

M. Meghana, C. Usha Kumari, J. Sthuthi Priya et al., Hand gesture recognition and voice controlled robot, Materials Today: Proceedings, https://doi.org/10.1016/j.matpr.2020.06.55