

A Review Paper on Voice Controlled Pick and Place Robot

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Abstract— A Voice Controlled Pick and Place Robot is an intelligent robotic system designed to perform object handling operations through human voice commands. The system mainly consists of an Arduino Uno microcontroller, Bluetooth module, DC motors, motor driver, robotic arm, battery supply, chassis with wheels, and connecting wires. The voice commands given through an Android mobile application are transmitted wirelessly using Bluetooth communication to the Arduino controller. The controller processes the commands and controls the movement of the robot and robotic arm for pick-and-place operations. Such systems are widely used in industrial automation, medical assistance, military operations, and hazardous environments where human intervention is difficult or unsafe. This paper presents the review of different voice-controlled robotic systems, methodologies, applications, advantages, and comparison with existing systems.

Index Terms— Voice Controlled Robot, Arduino Uno, Bluetooth Module, Pick and Place Robot, DC Motor, Motor Driver, Robotic Arm, Wireless Control, Automation.

I. INTRODUCTION

Robotics and automation technologies are rapidly developing in modern industries. Pick and place robots are extensively used for handling materials and performing repetitive tasks. Traditional robots require manual programming or remote control systems, whereas voice-controlled robots provide an easier and more intelligent method of operation.

A Voice Controlled Pick and Place Robot uses speech recognition technology for controlling robot movements. The robot receives voice commands through a smartphone application connected via Bluetooth. The Arduino Uno acts as the main

controller which processes the commands and drives the DC motors and robotic arm.

The major components used in the proposed system are:

- Arduino Uno Board
- Bluetooth Module (HC-05/HC-06)
- DC Motors
- Motor Driver IC/Shield
- Battery
- Robot Chassis and Wheels
- Connection Wires
- Robotic Arm/Gripper

The system shown in the given block diagram consists of Bluetooth communication between the Android device and Arduino Uno. The Arduino controls the motor driver which operates four DC motors and robotic arm mechanisms.

Working Principle

- User gives voice command through Android mobile.
- Bluetooth module receives the command.
- Arduino Uno processes the command.
- Motor driver activates DC motors.
- Robot moves accordingly and robotic arm performs pick-and-place action.

II. LITERATURE REVIEW

Several researchers have developed voice-controlled robotic systems using Arduino and wireless communication technologies.

1 Bluetooth Control Pick and Place Robot using Arduino:

Researchers developed a Bluetooth-controlled robotic system using Arduino Uno and color sensors for industrial pick-and-place operations. The system reduced human effort and improved operational accuracy.

2 Low Cost Arduino Based Voice Controlled Pick and Drop Service

This work proposed a low-cost robotic arm controlled through voice commands using Arduino and Bluetooth communication. The robot could detect obstacles and perform object handling tasks effectively.

3 Android Voice Controlled Pick and Place Robot

Researchers implemented a robotic vehicle and robotic arm controlled through Android voice commands. Bluetooth communication was used between the mobile application and Arduino Uno.

4 Voice Controlled Robot Vehicle Using Arduino

This research explained voice-controlled movement of robotic vehicles using Bluetooth technology and Android applications. The system improved user interaction and remote operation capabilities.

5 Voice Controlled Pick and Place Robot with Camera Vision

This work integrated voice recognition with camera vision for object monitoring and pick-and-place operations. The robot could perform intelligent object manipulation tasks.

6 Voice Controlled Pick and Place Robot for Rescue Applications

Researchers proposed a voice-controlled rescue robot using ATmega328 controller and motor driver IC for disaster management and hazardous area operations.

III. METHODOLOGIES

1 Hardware Components

Arduino Uno: Arduino Uno acts as the central processing unit of the robot. It receives commands from the Bluetooth module and controls motors accordingly.

Bluetooth Module: The HC-05 Bluetooth module provides wireless communication between the smartphone and Arduino controller.

DC Motors: DC motors are used for robot movement and robotic arm operation.

Motor Driver IC: Motor driver IC controls motor direction and speed since Arduino cannot directly drive high-current motors.

Battery: Battery supplies power to Arduino, motors, and Bluetooth module.

Robot Chassis and Wheels: The chassis provides mechanical support and mobility to the robot.

Connection Wires: Connection wires establish electrical connections among all components.

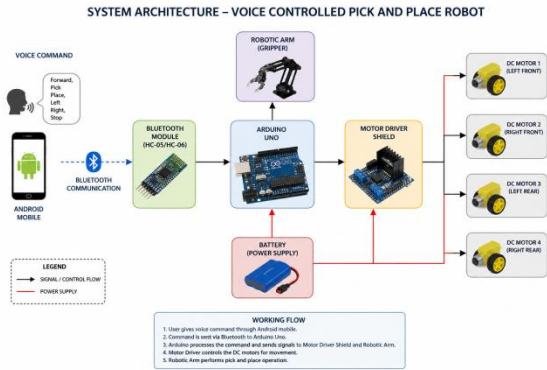
2 Software Methodology

- Arduino IDE is used for programming.
- Android mobile application converts voice to text commands.
- Commands like Forward, Backward, Left, Right, Pick, and Place are transmitted through Bluetooth.
- Arduino processes the received commands and controls the robot.

3 System Architecture

The system architecture based on the provided block diagram includes:

- Bluetooth Module connected to Arduino Uno
- Arduino connected to Motor Driver Shield
- Motor Driver connected to DC Motors
- Battery supplies power to the system
- Robotic arm controlled through Arduino outputs



IV. APPLICATIONS

Voice Controlled Pick and Place Robots are used in various applications such as:

1. Industrial Automation
2. Material Handling Systems
3. Medical Assistance Robots
4. Military and Defense Applications
5. Hazardous Environment Operations
6. Warehouse Automation
7. Home Automation Systems
8. Educational Robotics Projects

V. ADVANTAGES

- Easy wireless operation
- Reduced human effort
- Low-cost implementation
- Improved accuracy and efficiency
- User-friendly voice control interface
- Portable and flexible system
- Suitable for hazardous environments
- Real-time control and monitoring

VI. FUTURE SCOPE

- Integration of Artificial Intelligence (AI) for smart decision-making and object recognition.
- Addition of camera and image processing for automatic object detection.
- IoT-based remote monitoring and control through the internet.
- Development of mobile applications with advanced user interface.

- Combination of voice and gesture control systems.
- Autonomous navigation using sensors for obstacle avoidance.
- Industrial automation applications such as conveyor and packaging systems.
- Use of advanced wireless technologies like Wi-Fi and 5G.
- Solar-powered operation for energy efficiency.
- Applications in healthcare, rescue, and hazardous environments.
- Improved robotic arm precision using servo motors.
- Advanced multilingual voice recognition systems.

The future development of the Voice Controlled Pick and Place Robot can make it more intelligent, accurate, and suitable for modern automation industries.

VII. COMPARISON WITH EXISTING SYSTEM

Parameter	Existing Manual System	Voice Controlled Pick and Place Robot
Control Method	Manual Operation	Voice Commands
Human Effort	High	Low
Automation Level	Low	High
Response Time	Slow	Fast
Accuracy	Moderate	High
Wireless Communication	Not Available	Bluetooth Based
Safety	Low	High

The proposed voice-controlled system provides better automation, flexibility, and efficiency compared to conventional manual systems.

VIII. CONCLUSION

The Voice Controlled Pick and Place Robot is an efficient and economical robotic system designed for automation applications. The integration of Arduino Uno, Bluetooth module, DC motors, and robotic arm enables wireless voice-based control of robot operations. The system reduces manual effort and improves operational accuracy. From the literature survey, it is observed that voice-controlled robotic systems have significant applications in industries, healthcare, military, and smart automation systems.

Future improvements may include artificial intelligence, image processing, IoT connectivity, and autonomous navigation for enhanced performance.

REFERENCES

- [1] Manjunatha S. C., Sanjay Kumar K., Sudha T., Raghu S., and Vennela D. N., “Bluetooth Control Pick and Place Robot using Arduino,” *International Journal of Engineering Research & Technology (IJERT)*, vol. 10, no. 11, pp. 1–5, 2022.
- [2] S. K. Mostaque and B. Karmakar, “Low Cost Arduino Based Voice Controlled Pick and Drop Service with Movable Robotic Arm,” *European Journal of Engineering and Technology Research*, vol. 1, no. 5, pp. 1–6, 2018.
- [3] Anil Kumar C. S., Pooja B. M., Manjesh P., Karan Gowda P., and Chiranjana N. R., “Android Voice Controlled Spying, Pick and Place Robot,” *International Journal of Advanced Science and Technology*, vol. 29, no. 10s, pp. 3870–3878, 2020.
- [4] K. Sampath Kumar, P. Santhosh Reddy, and M. Rajiv Vikram Revanth, “Voice Controlled Robot Vehicle Using Arduino,” *International Journal for Research in Applied Science and Engineering Technology*, vol. 10, no. 6, pp. 1–5, 2022.
- [5] G. Shravan Kumar, Ch. Srinu, and Chandana, “Voice Controlled Pick and Place Robot with Camera Vision,” *International Journal for Research Trends and Innovation*, vol. 1, no. 3, pp. 83–87, 2016.
- [6] S. Karthik Teja, B. Aparna, P. Sanju Vara Prasad, P. Prem, and B. Ravi Chandra, “Voice Controlled Pick and Place Robot,” *International Journal of Novel Research and Development*, vol. 8, no. 4, pp. b370–b374, 2023.
- [7] Hakim Ahmed Mirghani, “Control Pick and Place Robotic Arm by using Voice Recognition,” *Master’s Thesis, Sudan University of Science and Technology*, 2018.
- [8] B. Sarada, M. Harika, L. Durga Prasanna, G. Rama Devi, and K. Gnanesh, “Voice Controlled Robot using Bluetooth,” *International Journal of Engineering Research & Technology*, vol. 12, no. 5, pp. 1–4, 2023.