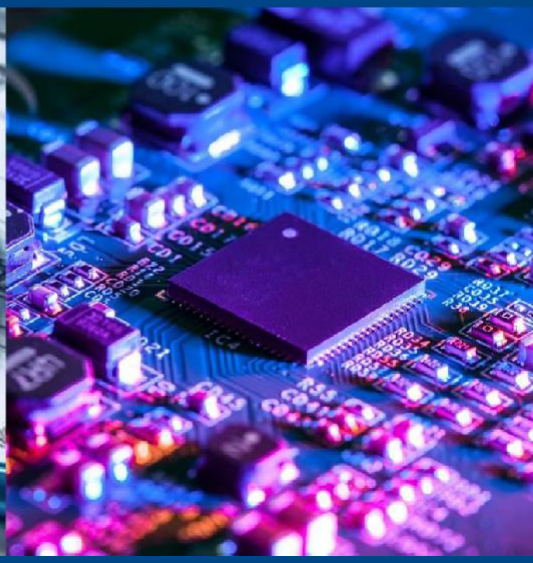
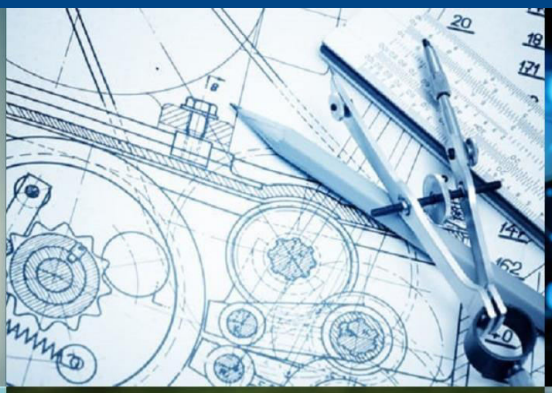
ISSN: 2582-7219

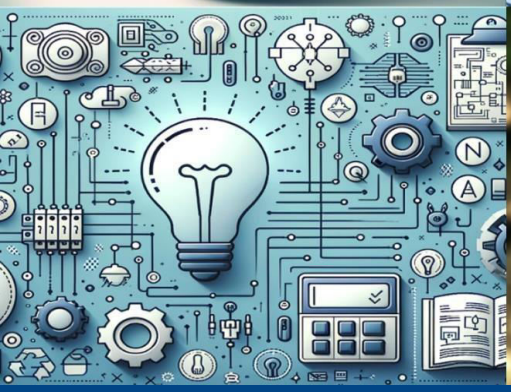




# International Journal of Multidisciplinary Research in Science, Engineering and Technology

*(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)*



**Impact Factor: 8.206**

**Volume 8, Issue 12, December 2025**

© 2025 IJMRSET | Volume 8, Issue 12, December 2025| DOI:10.15680/IJMRSET.2025.0812047

ISSN: 2582-7219 | www.ijmrset.com | Impact Factor: 8.206| ESTD Year: 2018|

International Journal of Multidisciplinary Research in Science, Engineering and Technology (IJMRSET)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

# Development of Robotic Arm Controlling by using Voice Recognition

**Prameshwar. S. Farakate[1], Vyankatesh. M. Waghmode[1], Pruthviraj. A. Patil[1], Aniket.A.Bhathale[1], Milind. Patil[2]**

Student, Department of Mechanical Engineering, Sharad Institute of Technology, Polytechnic, Yadrav, Ichalkaranji, Maharashtra, India[1]

Lecturer, Department of Mechanical Engineering, Sharad Institute of Technology, Polytechnic, Yadrav, Ichalkaranji, Maharashtra, India[2]

**ABSTRACT:** This project presents the design and development of a voice-controlled robotic arm utilizing a 3D-printed 6 Degrees of Freedom (6DOF) structure. The system integrates Arduino Nano as the microcontroller, MG995 and SG90 servo motors for precise actuation, and the AI Thinker VC-02 offline voice recognition module for efficient voice command processing. The robotic arm can recognize and execute pre-defined voice commands, enabling hands-free operation without relying on external internet connectivity. The offline voice recognition capability ensures robust performance in environments with limited or no network access, making the system versatile and reliable. This project demonstrates the potential for voice- controlled robotics in various applications, such as automation, healthcare, manufacturing, and assistive technologies by combining affordability, modularity, and practicality, this project provides a foundation for further exploration of human- robot interaction, paving the way for accessible and intuitive control mechanisms in robotics.

## I. INTRODUCTION

The advent of voice-controlled technology has revolutionized human-machine interaction, enabling devices to respond seamlessly to spoken commands. This project, a Voice-Controlled Robotic Arm, demonstrates the fusion of voice recognition and robotics to create an efficient, user- friendly system. The robotic arm is built with a 6 Degrees of Freedom (6DOF) 3D-printed structure, powered by MG995 and SG90 servo motors for precise and versatile movement. An Arduino Nano serves as the microcontroller, orchestrating the operations and ensuring smooth communication between components. At the heart of the project lies the AI Thinker VC-02 offline voice recognition module, which allows the robotic arm to process and execute pre- defined voice commands without the need for internet connectivity.

This system provides a glimpse into practical applications such as automation, assistive technology, and remote operation, paving the way for enhanced accessibility and innovative problem-solving in various domains. By combining affordability, modularity, and functionality, this project showcases how advanced technologies can be integrated to create impactful solutions.

## II. LITERATURE REVIEW

[1] The user's gestures direct the movement of the robot in this project. This model consists of transmitter unit with PIC Microcontroller for recognition of gestures. The instructions will be followed by the receiver unit with PIC Microcontroller. This system was created at a low cost and with a high level of efficiency.
[2] Thegoal of this project is to operate a robot. To do this, the recorded pictures are processed using a circular Hough transform- based method to determine the appropriate targets. Then, to regulate the robot's motion, control signals are supplied to the receiver unit.
[3] This paper describes how humans can communicate with robots using basic hand gestures. This can be done using a Leap motion sensor. We suppose that the robot is capable of emotional interaction in this scenario. This study helps us to understand how human can interact with a robot using effective hand gestures.
[4] In paper, they show a voice controlled based interface for navigating a robot. Six axis accelerometer records the

ISSN: 2582-7219 | www.ijmrset.com | Impact Factor: 8.206| ESTD Year: 2018|

International Journal of Multidisciplinary Research in Science, Engineering and Technology (IJMRSET)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

user's hand motions. Any form of connection is used to provide data wirelessly to a microcontroller. The received signals are then converted into one of six navigational control commands.

[5] This paper presents a method of controlling an automatic with using voice the Arduino Nano. A motion device attached on the arm is used to control the projected model.

[6] The main purpose of this project is to control the robotic arm's movement using an voice controller. This paper's main contribution is the development of a simple and effective object detection system on the robot's physical model. The experimental results are used to assess the suggested object detection algorithm and voice control.

[8] In this we are used voice to operate a robot. They proposed a new user detection method, as well as detection that relies on the robots to voice recognize the in successive frames.

This paper presents an inflatable robotic arm controlled by a voice to be used for healthcare applications. The arm is constructed almost entirely of plastic elements. Therefore, it is softer and lighter than typical robotic arms that are made of metal and heavy elements. Because the softness and lightness of the inflatable robotic arm is intrinsically safer, it is suitable for healthcare applications. In this paper, a new control method is proposed which allows the inflatable system to be controlled with a voice. To verify the usefulness of the proposed method, we used an inflatable robotic arm with six degrees of freedom (6 DOF) to obtain experimental results for the control performance of the inflatable robotic arm. Moreover, we conducted preliminary tests which simulated patients controlling the robotic arm with a voice in order to assist with eating their meals.

## III. METHODOLOGY

### A. System Design and Planning

- The project began with designing a

6 Degrees of Freedom (6DOF) robotic arm using a CAD software. The design was optimized for 3D printing to ensure affordability and customization.

- The required components, including the Arduino Nano, MG995 servo motors, SG90 servo motors, and the AI Thinker VC-02 offline voice recognition module, were selected based on their compatibility, cost, and performance.

### B. Mechanical Assembly

- The 6DOF robotic arm was fabricated using 3D-printed parts and assembled with the servo motors.
- The MG995 servo motors were used for high-torque joints, while the SG90 servo motors were utilized for lighter and precise movements.
- Joints were aligned and tested for smooth motion and stability.

### C. Circuit Integration

- A circuit was designed to interface the Arduino Nano with the servo motors and the VC-02 module.
- Power distribution was carefully managed to ensure the motors received adequate voltage and current for smooth operation.

### D. Programming

- The Arduino Nano was programmed using the Arduino IDE.
- Servo motors were controlled using PWM (Pulse Width Modulation) signals, with predefined positions mapped to specific tasks.
- The AI Thinker VC-02 module was configured to recognize pre-defined voice commands and send corresponding signals to the Arduino.

### E. Voice Command Integration

- A set of commands such as "Move Up," "Move Down," "Rotate Left,"

"Rotate Right," "Pick," and "Place" were programmed into the VC-02 module.

- The system was tested to ensure accurate recognition and response to each command.

### F. Testing and Optimization

- The robotic arm was tested under different conditions to evaluate its accuracy, response time, and reliability.
- Adjustments were made to the servo calibration, voice command mapping, and power distribution for optimal performance.

### G. Applications and Demonstration

- The final system was demonstrated with real-world applications, such as object picking and placing tasks.
- Potential applications in automation, healthcare, and assistive technology were highlighted.

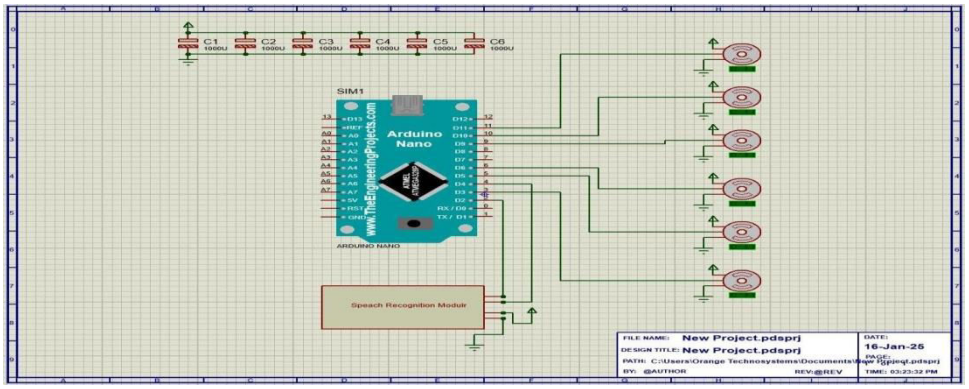
© 2025 IJMRSET | Volume 8, Issue 12, December 2025| DOI:10.15680/IJMRSET.2025.0812047

ISSN: 2582-7219 | www.ijmrset.com | Impact Factor: 8.206| ESTD Year: 2018|

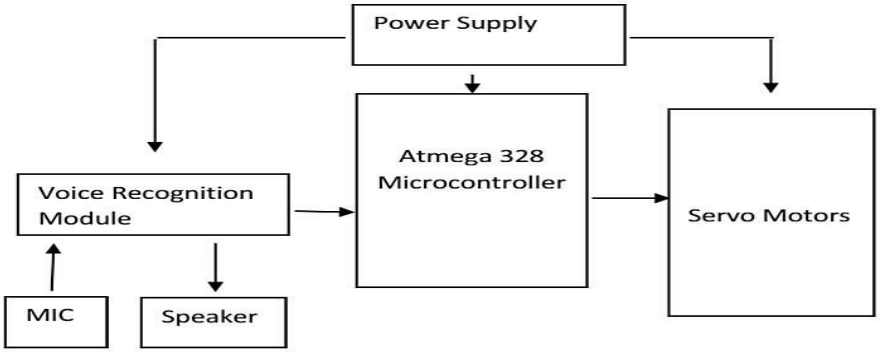
International Journal of Multidisciplinary Research in Science, Engineering and Technology (IJMRSET)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

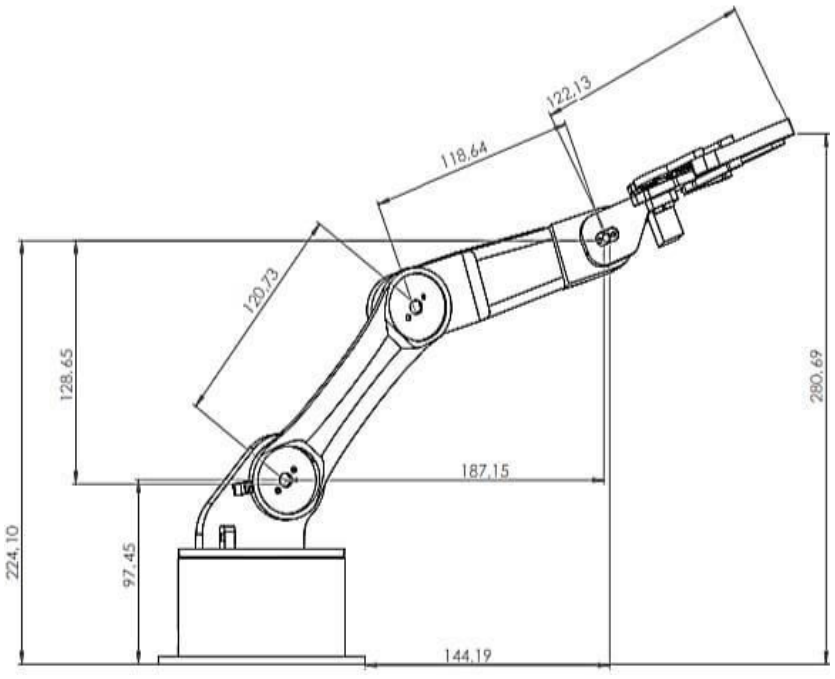
**Circuit diagram**




**Block diagram**




**CADdiagram**



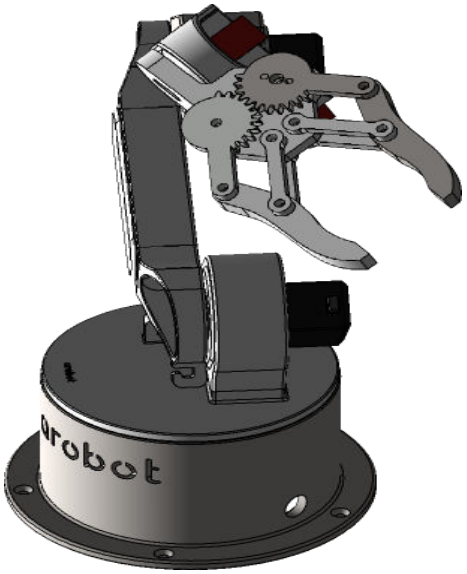
© 2025 IJMRSET | Volume 8, Issue 12, December 2025| DOI:10.15680/IJMRSET.2025.0812047

ISSN: 2582-7219 | www.ijmrset.com | Impact Factor: 8.206| ESTD Year: 2018|

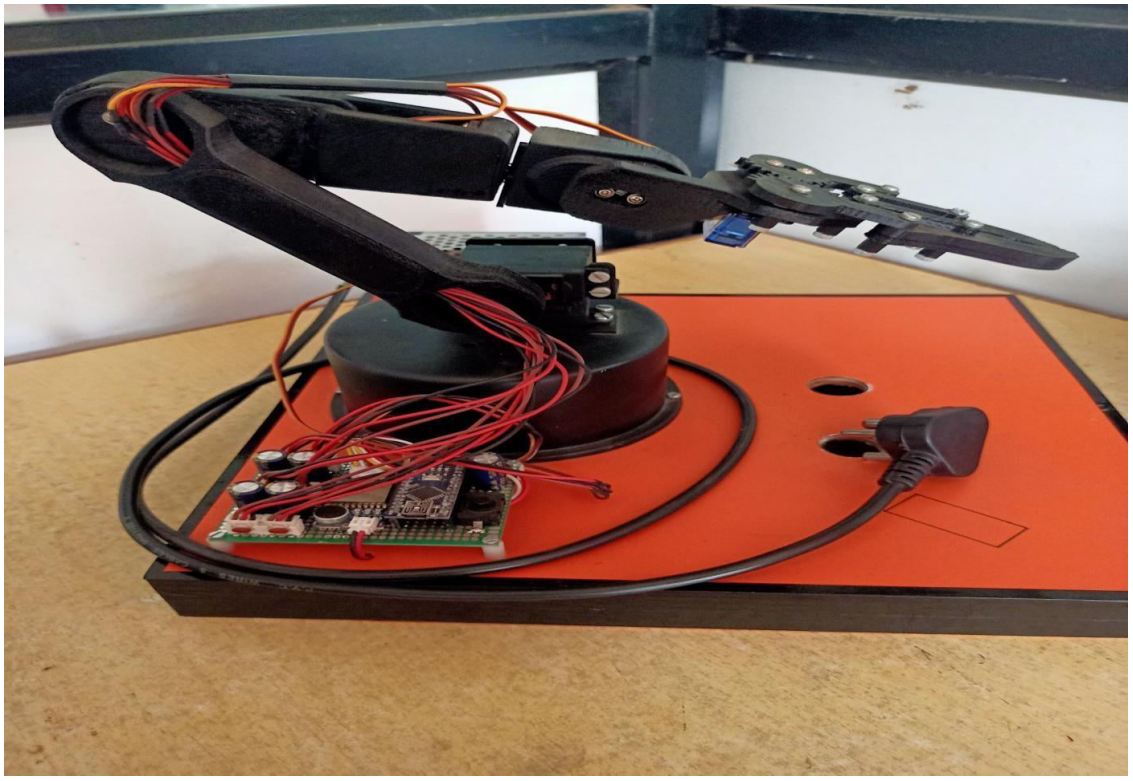
International Journal of Multidisciplinary Research in Science, Engineering and Technology (IJMRSET)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

**3D model**




**Project photograph**



| Fig. No. | Name of Component |
|---|---|
| 1 | 10 k resistor |
| 2 | MPU-6050 |
| 3 | Connecting wire |

ISSN: 2582-7219 | www.ijmrset.com | Impact Factor: 8.206| ESTD Year: 2018|

International Journal of Multidisciplinary Research in Science, Engineering and Technology (IJMRSET)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

| | |
|---|---|
| 4 | Breadboard |
| 5 | RF transmitter |

## IV. RESULT

The development of the voice-controlled robotic arm demonstrates the successful integration of voice recognition technology with robotics to create an accessible, efficient, and user-friendly system. By leveraging components such as the AI Thinker VC-02 offline voice recognition module, Arduino Nano, and servo motors, the project showcases how advanced, yet cost-effective solutions can be implemented to perform complex tasks.

This system highlights the potential of voice-controlled automation in various fields, including industrial automation, assistive technology, and education. Its offline functionality ensures reliability and usability even in environments with limited or no internet connectivity. Moreover, the modular and customizable design makes the robotic arm adaptable to a range of applications, enhancing its versatility.

Through this project, we not only address the need for hands-free and intuitive control systems but also pave the way for future innovations in human-machine interaction. The voice-controlled robotic arm serves as a steppingstone toward more advanced and accessible automation technologies.

## V. CONCLUSION

The development of the voice-controlled robotic arm demonstrates the successful integration of voice recognition technology with robotics to create an accessible, efficient, and user-friendly system. By leveraging components such as the AI Thinker VC-02 offline voice recognition module, Arduino Nano, and servo motors, the project showcases how advanced, yet cost-effective solutions can be implemented to perform complex tasks.

This system highlights the potential of voice-controlled automation in various fields, including industrial automation, assistive technology, and education. Its offline functionality ensures reliability and usability even in environments with limited or no internet connectivity. Moreover, the modular and customizable design makes the robotic arm adaptable to a range of applications, enhancing its versatility.

Through this project, we not only address the need for hands-free and intuitive control systems but also pave the way for future innovations in human-machine interaction. The voice-controlled robotic arm serves as a steppingstone toward more advanced and accessible automation technologies.

## REFERENCES

[1] Zaatari, A., and Ousalah, M., “Integration and design of multi-modal interfaces for supervisory control systems”, Journal of information fusion, vol.4, pp. 135–150, 2003.
[2] Abiri, A., Heise, G., Zhao,X., Jiang, Y., and Abiri, F., “Brain Computer Interface for Gesture Control of a Social Robot: An Offline Study”, in Proc. 25th Iranian Conference on Electrical Engineering (ICEE), Tehran, Iran, May 2-4, 2017, pp. 113–117.
[3] Mitra, S., and Acharya, T., “Gesture Recognition: A Survey”, IEEE Transactions on Systems, Man, and Cybernetics, Part C (Applications and Reviews), vol. 37, no. 3, pp-311- 324, May 2007.
[4] Sigalas, M, Baltzakis, H., and Trahanias, P., “Gesture recognition based on arm tracking for human-robot interaction”, in Proceedings IEEE/RSJ International Conference on Intelligent Robots and Systems, October 2010, pp. 5424∟5429.
[5] Mathe, E., Mylonas, P., Spyrou, E., and Mylonas, P., “Arm Gesture Recognition using a Convolutional Neural Network”, in Proc. 13th International Workshop on Semantic and Social Media Adaptation and Personalization (SMAP), 2018, pp. 37∟42.
[6] Luo, J., Liu, Y., and Ju. Z., “An Interactive Astronaut-Robot System with Gesture Control”, Compute. Intel. Neurosis. vol.2016 (1), pp. 1-11, 2016.

INTERNATIONAL STANDARD SERIAL NUMBER INDIA

# INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY RESEARCH

## IN SCIENCE, ENGINEERING AND TECHNOLOGY

| Mobile No: +91-6381907438 | Whatsapp: +91-6381907438 | ijmrset@gmail.com |

www.ijmrset.com