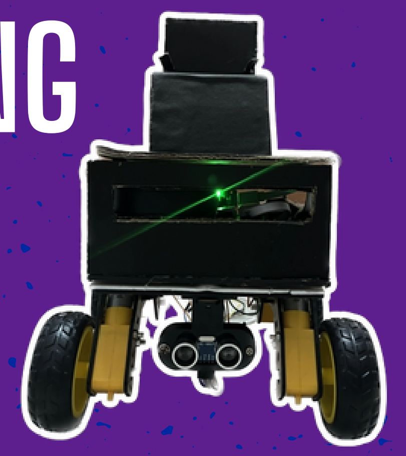
# VOICE CONTROLLED WHEELCHAIR WITH ENVIRONMENT MAPPING




Amrita School of Computing | Amritapuri, Kollam, Kerala, India

Faculty - Dr. Divya Udayan J, Assistant Professor (Sel Gr)

Team Members: Guru Aswini Dath C, Gagan Dwaz Ch, Praneeth V, Venkata Vignesh G


## Introduction

Introducing our revolutionary Voice-Controlled Wheelchair with ROS, Google API, and Advanced Obstacle Avoidance. This cutting-edge assistive technology empowers individuals with limited mobility to navigate effortlessly through natural voice commands. By integrating the Robot Operating System (ROS) and Google's powerful API, users can access a wide range of functionalities for enhanced communication and accessibility. The wheelchair's advanced obstacle avoidance, using ultrasonic sensors, ensures a safe and smooth journey, while the RPLIDAR technology enables real-time environment mapping and analysis. Join us on this transformative journey, where technology breaks barriers and fosters independence for those who need it most.

## Robotic Operating System

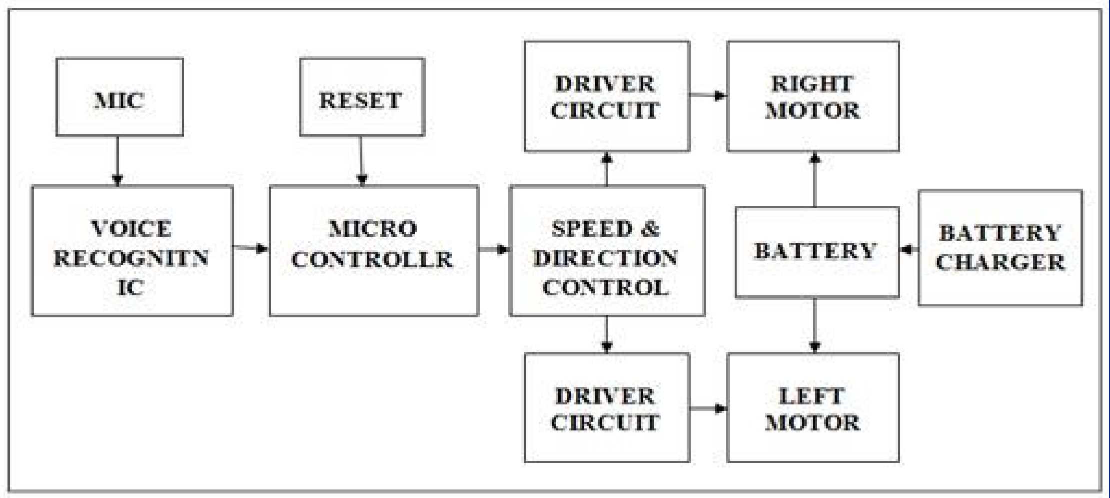
It's a meta-operating system that provides the services you would expect from an operating system. In this modern world, the complexity in the software for developing the advanced robots has been increasing. To control the complexity ROS software is provided with modularization, inter-platform operability, and concurrent resource handling. However, it does not support introspection feature. Reading or writing to resources becomes complex in large multi-threaded systems. But ROS solves the problem by subscribing and publishing the messages rather than reading or writing to the shared resources.

## Prerequisites

- Raspberry Pi
- RPLiDAR sensor
- UR sensor
- Motor driver
- Ubuntu 20.04
- ROS Noetic

## Working

- **Initialization and voice Command Reception:** The wheelchair is initialized, and the voice recognition module is activated. The user issues voice commands, such as "Front", "left", "Right", "stop", "Back".
- **Processing and Execution:** The voice recognition module processes the received voice commands and recognized commands are translated into actionable instructions as forward, backward, left, right by activating the corresponding wheels and motors.
- **Obstacle Detection using Ultrasonic Sensors:** Ultrasonic sensors continuously monitor the area around the wheelchair for nearby obstacles. If an obstacle is detected, the wheelchair adjusts its trajectory to avoid a collision.
- **Graceful Degradation:** In case of any system failures or disruptions, the wheelchair implements graceful degradation, ensuring that it safely stops or continues to operate in a limited capacity to avoid abrupt interruptions.

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## Conclusion

- The voice-controlled interface has proven to be an intuitive and natural way for users to interact with the wheelchair. By processing voice commands, the wheelchair can swiftly execute desired movements, granting users greater control over their navigation and allowing them to focus on their surroundings without the burden of manual controls.
- The success of this project showcases the power of ROS as a versatile and reliable framework for building complex robotic systems.As with any project, there are areas for further improvement. Enhancements in voice recognition algorithms could optimize accuracy and reduce latency, leading to even smoother interactions.
- Our goal is to forge a strong sense of community and support, where cutting-edge technology not only empowers users but also fosters a more inclusive society that values diversity and embraces the limitless possibilities of human potential.

## References


- http://wiki.ros.org/ROS/Tutorials
- R. K. Megalingam, R. S. Reddy, Y. Jahnavi and M. Motheram, "ROS Based Control of Robot Using Voice Recognition," 2019 Third International Conference on Inventive Systems and Control (ICISC), Coimbatore, India, 2019, pp. 501-507, doi: 10.1109/ICISC44355.2019.9036443.
- R. Li, M. A. Oskoei, K. D. McDonald-Maier and H. Hu, "ROS Based Multi-sensor Navigation of Intelligent Wheelchair," 2013 Fourth International Conference on Emerging Security Technologies, Cambridge, UK, 2013, pp. 83-88, doi: 10.1109/EST.2013.35.