Voice Controlled Wheelchair

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Problem Statement/objectives

Traditional wheelchairs can be difficult to operate for people with physical limitations, hindering their independence and mobility. Hence, we need a simple and easy way for them to move around independently.

Project Objectives:

1. To design a voice-controlled wheelchair system that is user-friendly

2. To Integrate the reliable voice recognition module for accurate command interpretation

3. To provide optional joystick control for user convenience in alternative situations

Existing Solutions/Literature Survey

- Smart wheelchairs are powered wheelchairs equipped with sensors and computer systems to assist users with mobility.
- They offer various controls like joysticks, voice commands, gesture control or even tongue movements.
- Advanced models can navigate somewhat on their own, avoiding obstacles and planning paths.
- According to the International journal of engineering technology and science (IJETS) there are wheelchair which uses the Electroencephalography control or the Electrooculography control for the movement of the wheelchair

Existing Solutions/Literature Survey

- Researchers have explored the development of voice-controlled wheelchairs using different technologies such as DSP starter kits, Arduino microcontrollers, and dedicated voice recognition modules like HM2007 and V3.

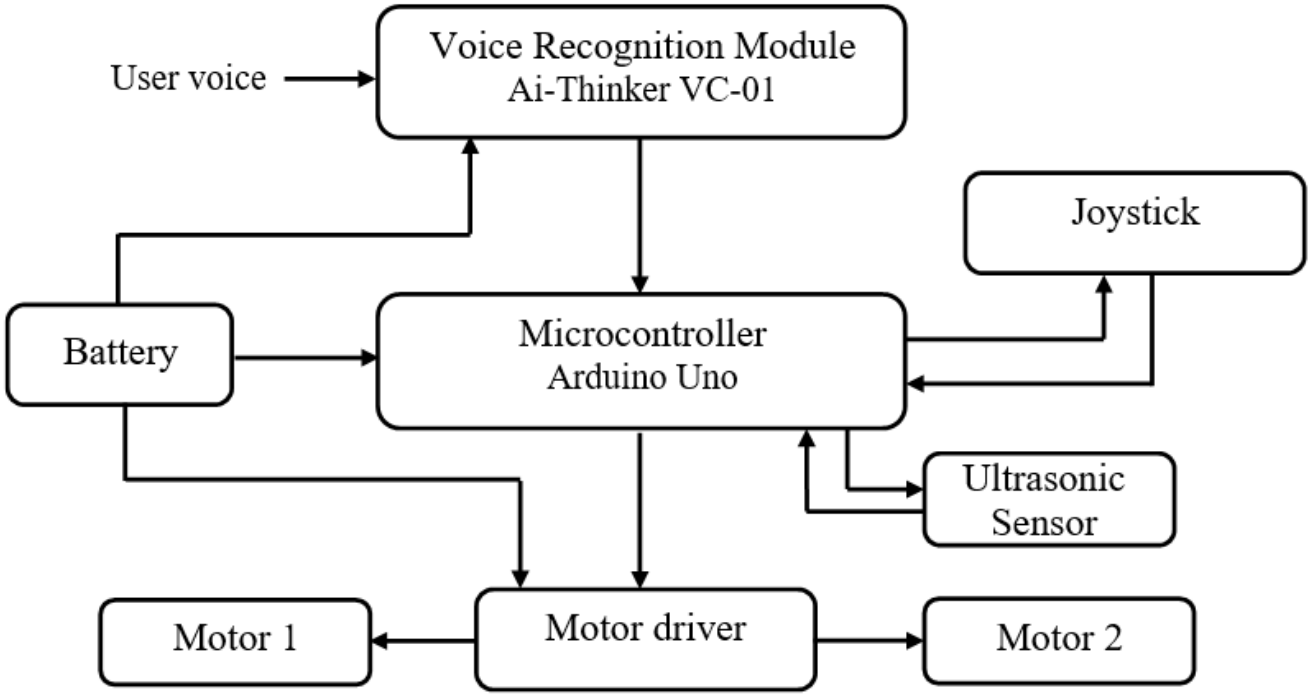
- Features also include voice passwords for secure operation and smartphone integration for enhanced functionality.

- Some of the designs also include advanced functionalities like line following, obstacle detection, and temperature sensing.

Proposed solution

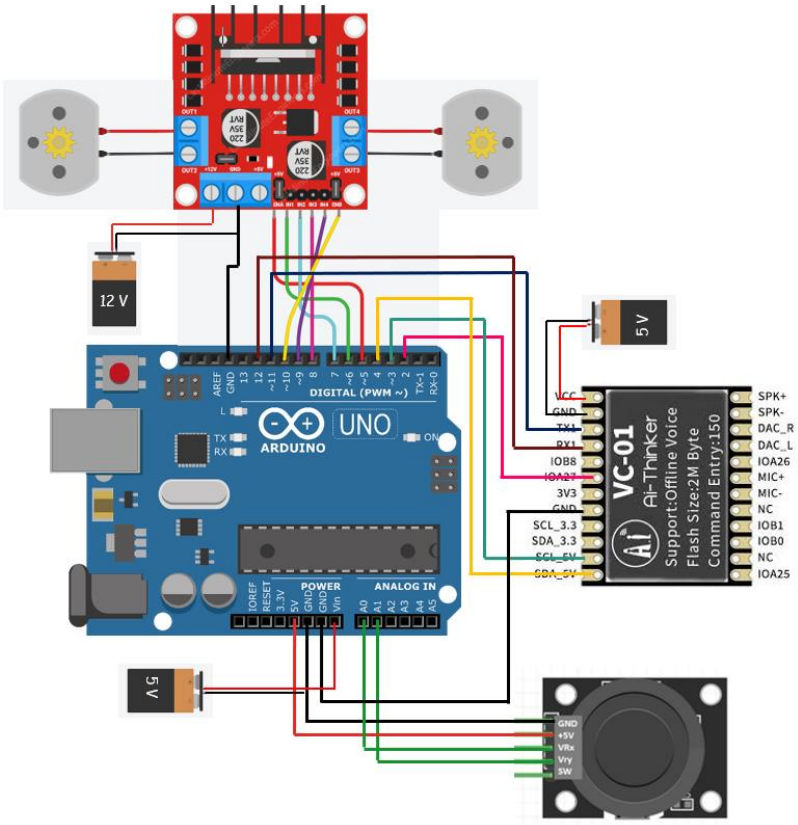
- Voice-controlled system for navigation using simple commands.
- Ai-Thinker VC-01 module for reliable voice recognition and accurate command interpretation.
- Arduino Uno microcontroller for processing and controlling the wheelchair based on the signals received from voice recognition module.
- Optional joystick control for user convenience in situations where voice commands might not be feasible.

Block Diagram

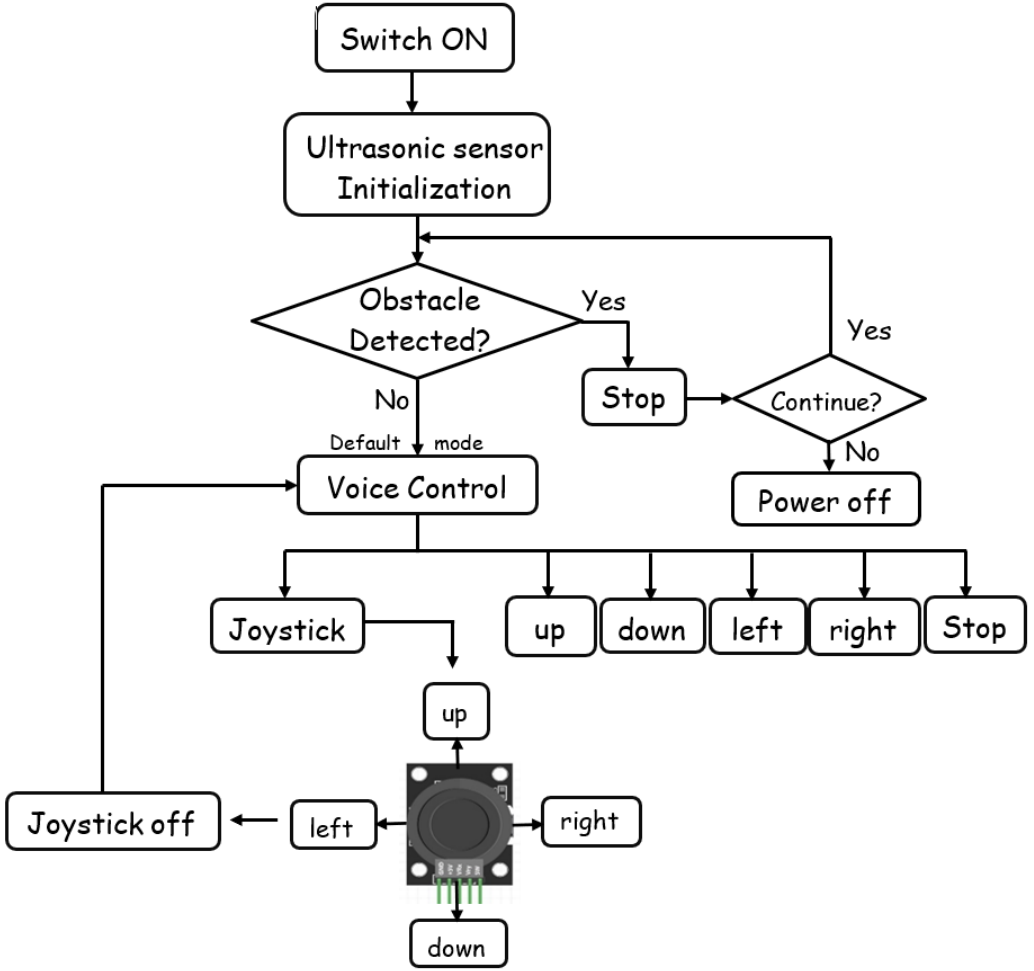


Description of Block Diagram

- Voice Recognition Module (Ai-Thinker VC-01
- Microcontroller (Arduino UNO)
- Joystick
- Motor driver & Motors
- Sensor
- Battery

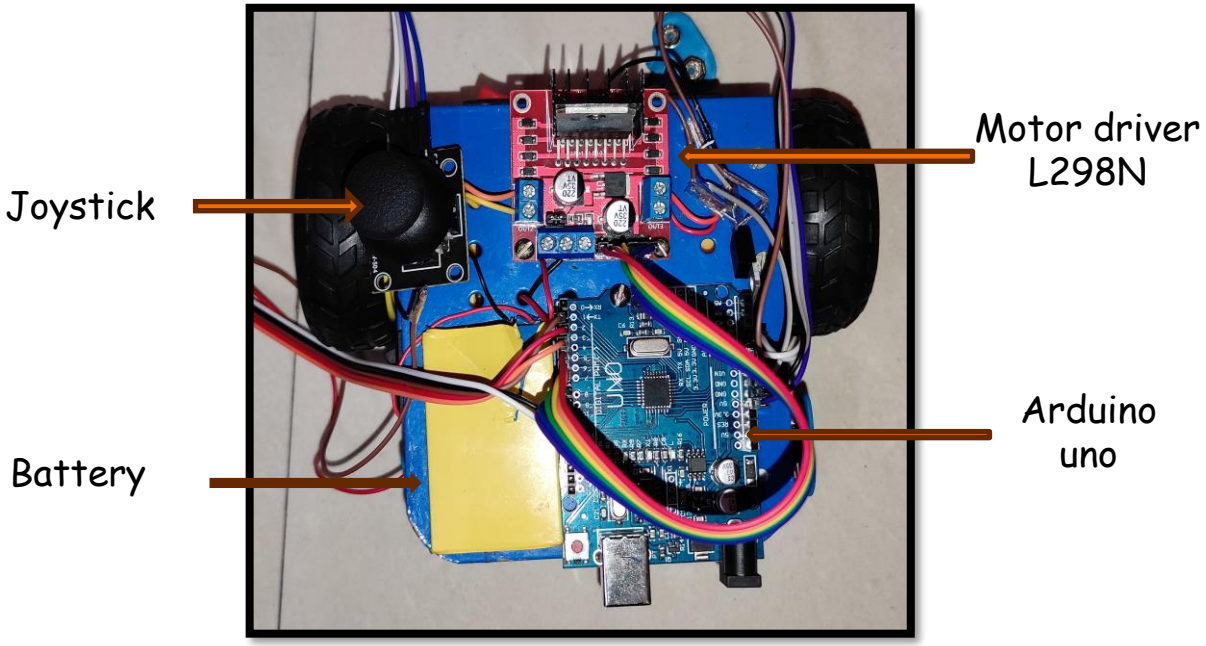


Flowchart


Switch ON
Ultrasonic sensor Initialization
Obstacle Detected?
Yes
No
Stop
Continue?
Yes
No
Power off
Default mode
Voice Control
Joystick
up
down
left
right
Stop
up
Joystick off
left
right
down

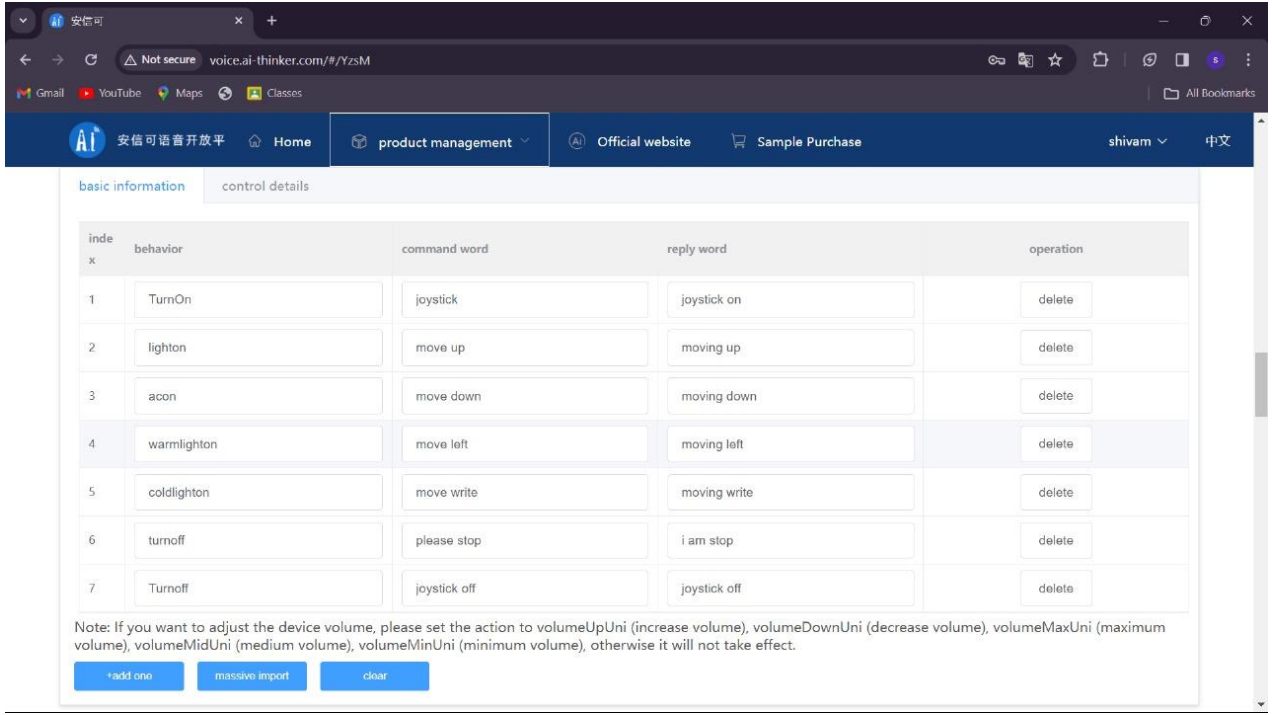
Results (Intermediate results/simulation results)

- Designing of the basic structure of wheelchair with joystick control



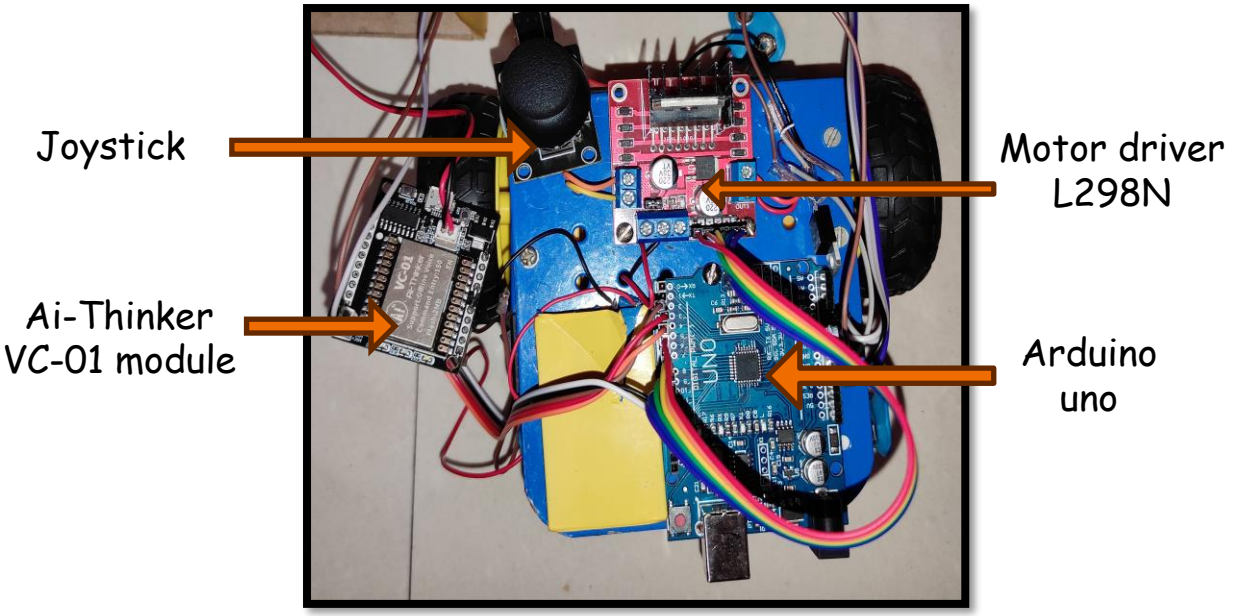
Results (Intermediate results/simulation results)

- Training of VC-01 module for the commands by creating SDK file on the official website of voice.ai.thinker.com



Results (Intermediate results/simulation results)

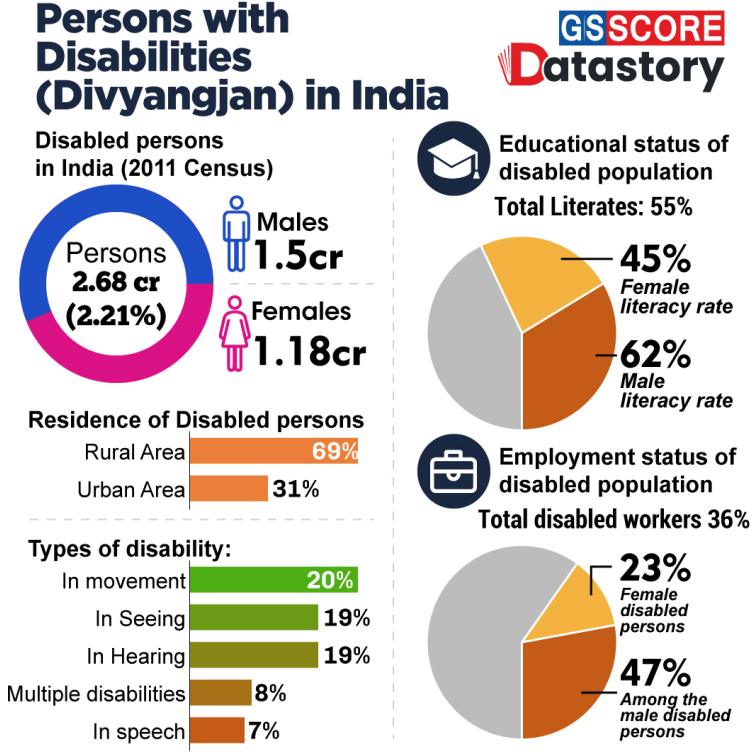
- Programming of Arduino to integrate voice control and joystick control using Arduino IDE
- Testing & troubleshooting



Feasibility Analysis

- Technical feasibility: The project can be used in two ways – first using joystick and second the main voice controlled. It is user-friendly to operate as per the requirement.

- Market feasibility: There is a significant opportunity for a voice-controlled wheelchair for physically disabled persons. The identified target market has a substantial demand for improved mobility solutions, and there are opportunities to address unmet needs and differentiate from existing competitors.



- Cost: The prototype cost is approximately INR 1300. It has a huge market and application.

- Market Trends and Growth Potential :

Industry Trends: Identify trends in mobility aids and assistive technologies for physically disabled individuals.

Growth Potential: Assess the growth potential of the market based on demographic trends, technological advancements, and changing consumer preferences.

MarkWide Research
Inspiring Growth

Smart Wheelchairs Market Key Players

1. Permobil AB
2. Invacare Corporation
3. Ottobock SE & Co. KGaA
4. Sunrise Medical LLC
5. Pride Mobility Products Corp.
6. LEVO AG
7. Karman Healthcare Inc.
8. Quantum Rehab
9. WHILL, Inc.
10. Karma Mobility

Innovation or Uniqueness of the solution

- Personalized voice recognition system (Ai-thinker VC-01) enables intuitive wheelchair operation tailored to individual user commands, enhancing usability.
- Dynamic adjustment of wheelchair movements based on real-time environmental inputs.
- Modular architecture enables effortless customization and upgrades, with compatibility for diverse sensors and accessories to enhance functionality.
- Tailored for users, the interface offers simplicity with intuitive voice commands and customizable controls to accommodate diverse preferences and abilities.

Impact or Usefulness of the solution

Impact:

- Enhanced Independence: Empowering users with physical limitations to move around independently.
- Improved Accessibility: Providing a user-friendly mobility solution for individuals with diverse needs.
- Enhanced Quality of Life: Promoting greater autonomy and freedom of movement for wheelchair users.

Usefulness:

- Simplified Mobility: Easy-to-use voice control reduces the complexity of operating a wheelchair.
- Accurate Navigation: Reliable voice recognition ensures precise wheelchair movements.
- Flexibility: Optional joystick control offers versatility to accommodate different user preferences and scenarios.

Summary

- Developed a user-friendly voice-controlled wheelchair system integrating reliable voice recognition and optional joystick control.
- Explored existing solutions in literature, including advanced functionalities like obstacle detection and smartphone integration.
- Implemented a robust solution using Ai-Thinker VC-01 module for accurate command interpretation and Arduino Uno for control.
- Successfully tested and validated the system, ensuring enhanced mobility and independence for users with physical limitations.

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