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Voice controlled Wheelchair using Arduino Nano

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ABSTRACT: Mobility assistance is a critical requirement for individuals with physical disabilities who face difficulty operating conventional wheelchairs. This paper presents the design and implementation of a voice-controlled wheelchair using an Arduino Nano. The system enables wheelchair movement through simple voice commands such as forward, backward, left, right, and stop. Voice commands are recognized using a voice recognition module or smartphone-based application and processed by the Arduino Nano. The controller operates DC motors through a motor driver circuit to achieve the desired motion. The proposed system is cost-effective, easy to use, and suitable for elderly and physically challenged users. Experimental results demonstrate reliable command recognition and smooth wheelchair navigation.

I. INTRODUCTION

Assistive technologies have significantly contributed to improving the independence and quality of life of people with physical disabilities. Conventional wheelchairs often rely on manual control or joystick-based systems, which may not be suitable for users with severe motor impairments. As a result, alternative control techniques such as voice-based systems have gained considerable attention.

Voice-controlled systems provide a hands-free and intuitive method of interaction, allowing users to control wheelchair movement using spoken commands. This paper proposes a voice-controlled wheelchair system based on the Arduino Nano platform. The primary objective is to develop a reliable, low-cost, and user-friendly mobility solution using readily available electronic components. The system is designed to respond accurately to predefined voice commands, making it suitable for users with limited technical expertise.

II. LITERATURE SURVEY

Various research works have been carried out in the field of automated wheelchairs using control techniques such as joystick operation, gesture recognition, eye-blink detection, and brain-computer interfaces. Among these methods, voice-controlled systems have emerged as a preferred solution due to their simplicity and natural mode of interaction. Earlier implementations employed microcontrollers such as Arduino Uno and Raspberry Pi along with smartphone-based or cloud-based speech recognition systems. Although effective, these approaches often increase system complexity, cost, and dependency on internet connectivity. To overcome these limitations, the proposed system utilizes an offline voice recognition approach, enhancing reliability and ensuring continuous operation without network dependency.

III. METHODOLOGY

The system integrates hardware and software components to achieve voice-controlled wheelchair movement. Voice commands are captured using a voice recognition device and transmitted wirelessly. The Arduino Nano processes the received signals and controls the motor driver to drive DC motors accordingly.

1. System Design Methodology

The system is designed by integrating both hardware and software components. Voice commands given by the user are captured using a smartphone or voice recognition device. These commands are converted into control signals and transmitted wirelessly using an **RF transmitter**. The **RF receiver** connected to the Arduino Nano receives the commands. The Arduino processes the received signals and generates control outputs for the motor driver, which drives the DC motors to move the wheelchair in the required direction.

2. Hardware Methodology

1. Arduino Nano is selected as the main controller due to its compact size and low power consumption.
2. RF transmitter is used at the user side to send control commands wirelessly.
3. RF receiver is interfaced with Arduino Nano to receive the transmitted commands.
4. Motor driver (L298N / L293D) is connected to Arduino Nano to control motor direction and speed.
5. DC motors are connected to the motor driver for wheelchair movement.
6. A suitable power supply is provided to Arduino Nano, RF module, motor driver, and motors.

3. Software Methodology

1. Arduino Nano is programmed using Arduino IDE.
2. RF receiver input pins are initialized to read incoming signals.
3. Received RF signals are decoded and compared with predefined commands.
4. Based on the command, Arduino generates appropriate signals for the motor driver.
5. The process runs continuously to ensure real-time response.

4. Working Methodology

- The user speaks a command such as **FORWARD, BACKWARD, LEFT, RIGHT, or STOP**.
- The command is transmitted wirelessly using the **RF transmitter**.
- The RF receiver receives the signal and sends it to the Arduino Nano.
- Arduino Nano processes the command and activates the motor driver accordingly.
- DC motors rotate in the desired direction, resulting in wheelchair movement.
- When the **STOP** command is received, the motors immediately stop.

Block Diagram:

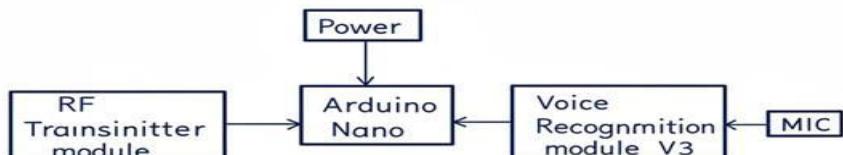


Fig.Transmitter section

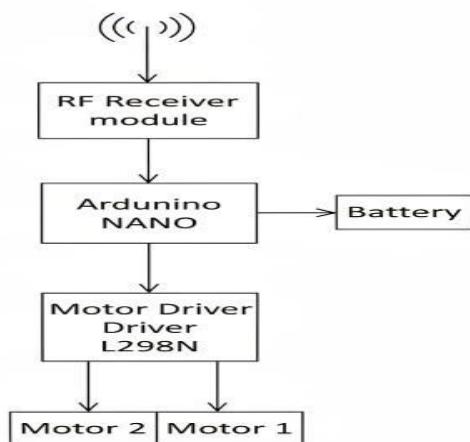
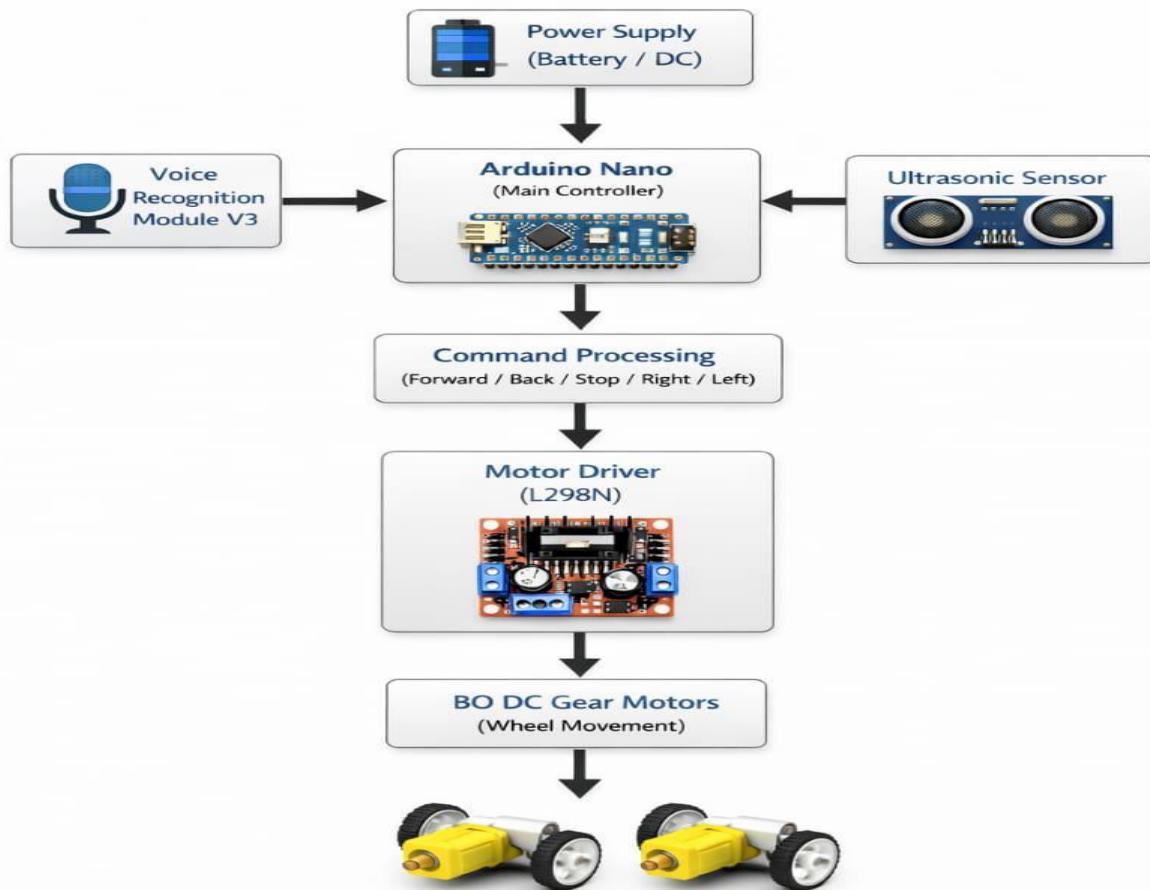


Fig .Receiver section

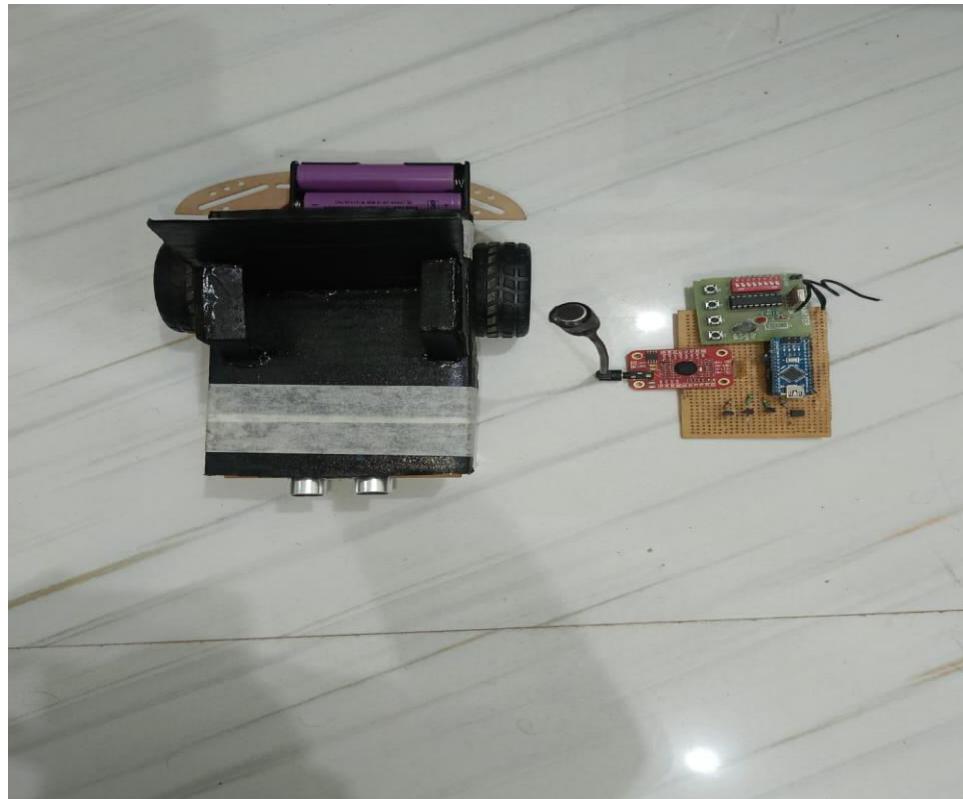
Flowchart:

Voice Controlled Wheelchair - Working Flow



IV. EXPERIMENTAL RESULTS

The developed voice-controlled wheelchair prototype was tested under various operating conditions. The system successfully recognized and executed basic voice commands with satisfactory accuracy. Response time was observed to be minimal, and the wheelchair movement was smooth and stable. Performance was optimal in low-noise environments. Overall, the experimental results confirm the reliability and effectiveness of the proposed system for assisting physically challenged users.



V. CONCLUSION

This paper presented the design and implementation of a voice-controlled wheelchair using Arduino Nano to assist physically challenged individuals. The proposed system is economical, efficient, and easy to operate. Experimental validation confirms that the wheelchair responds accurately to voice commands, offering a dependable mobility solution. With further enhancements such as obstacle detection and advanced speech processing, the system can be effectively deployed in real-world applications.

REFERENCES

1. **M. S. Arsha et al., "Voice Controlled Wheelchair"** — International Journal of Research in Engineering, Science and Management (2020).
<https://journal.ijresm.com/index.php/ijresm/article/view/298> IJRESM
2. **Ramnika A. Jha et al., "Voice Controlled Smart Wheelchair For Physically Disabled Person"** — IARJSET.<https://iarjset.com/papers/voice-controlled-smart-wheelchair-for-physically-disabled-person/> IARJSET
3. **Tan Kian Hou et al., "Voice-Actuated Wheelchair using Arduino"** — New Visions in Science and Technology, DOI:10.9734/bpi/nvst/v1/12369D.<https://stm.bookpi.org/NVST-V1/article/view/3212> stm.bookpi.org
4. **Sandip Shinde et al., "Smart Voice Controlled Wheelchair for Physically Disabled People"** — IJRASET (2023), DOI:10.22214/ijraset.2023.56476.<https://www.ijraset.com/research-paper/smart-voice-controlled-wheelchair-for-physically-disabled-people> IJRASET
5. **Mokhles M. Abdulghani et al., "Wheelchair Neuro Fuzzy Control and Tracking System Based on Voice Recognition"** — Sensors (2020), DOI:10.3390/s20102872.<https://www.mdpi.com/1424-8220/20/10/2872> MDPI
6. **Ayisha S et al., "Arduino Based Voice Controlled Wheel Chair for Physically Challenged Persons"** — IJERT (2023).
<https://www.ijert.org/arduino-based-voice-controlled-wheel-chair-for-physically-challenged-persons> IJERT
7. **"Arduino Based Voice Operated Wheelchair with Obstacle Detection — A Survey"** — IJERT (2018).
<https://www.ijert.org/arduino-based-voice-operated-wheelchair-with-obstacle-detection-a-survey> IJERT



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