PROJECT ABSTRACT

Voice-Controlled Smart Wheelchair

Millions of people with limited upper-body mobility depend on others to move a manual wheelchair, and conventional joystick chairs still demand fine motor control.

01 Title

Voice-Controlled Smart Wheelchair

02 Introduction / Background

Millions of people with limited upper-body mobility depend on others to move a manual wheelchair, and conventional joystick chairs still demand fine motor control. Voice control restores independence: the user simply speaks, and the chair moves. Combined with automatic obstacle avoidance, a voice-driven wheelchair becomes a genuinely assistive device — and an ideal final-year project spanning embedded control, wireless communication and human-centred safety design.

03 Problem Statement

Existing powered wheelchairs assume the user can operate a joystick reliably, excluding many potential users; add-on voice modules are expensive and rarely include collision safety. This project builds a complete voice-driven wheelchair on a model chassis — speech-to-command over Bluetooth, differential-drive motor control, ultrasonic auto-stop on obstacles, and joystick plus emergency-stop fallbacks — proving the concept end to end.

04 Objectives

- Drive a wheelchair model with spoken commands (forward, back, left, right, stop).
- Bridge phone speech recognition to Arduino motor control over Bluetooth.
- Implement ultrasonic obstacle auto-stop that overrides drive commands.
- Provide joystick fallback and emergency stop for layered safety.
- Achieve smooth, ramped motion suitable for a human rider.
- Document the assistive value and the path to full-size adaptation.

05 Proposed System / Working

An Android app captures voice, converts it to text with the phone's speech engine, matches it to the command set and transmits a short code over an HC-05 Bluetooth serial link. An Arduino UNO parses incoming codes and drives two geared DC motors through an L298N/BTS7960 driver in differential-drive configuration, with PWM ramping for smooth starts and stops. HC-SR04 ultrasonic sensors scan ahead; if an obstacle enters the safety distance while moving forward, the

controller suppresses drive commands and halts the chair, sounding a buzzer. A joystick module provides manual fallback and a latching emergency-stop switch cuts motor power independently of the firmware. Command latency, obstacle stop distance and battery runtime are measured and reported.

The chair responds to spoken commands with sub-second latency, steers smoothly in differential drive, and halts automatically before obstacles at the set safety distance — resuming on the next command once the path clears. The live demo is compelling: speak "forward", watch it move; place a hand in front and it stops itself. Fallback controls and the emergency stop are demonstrated for the safety story examiners want to hear.

06 Technologies / Components Used

wheelchair/robot base model · **DC motors + driver** · **Arduino** · **Bluetooth module** · **ultrasonic sensors** · **voice app** · **battery**

07 Key Features

- Voice command driving via Android app and Bluetooth.
- Differential-drive motor control with smooth PWM ramping.
- Ultrasonic auto-stop that overrides voice commands on collision risk.
- Joystick fallback and independent emergency stop.
- Buzzer alerts and battery-level indication.
- Measured command latency and stop-distance data.

08 Applications / Use Cases

- Assistive mobility for users with limited hand function
- hospital patient transport
- elderly care
- rehabilitation centres
- as a platform for further autonomy research (head-gesture control
- indoor navigation)

10 Conclusion

This smart wheelchair turns voice into mobility: a working assistive device with layered safety — voice primary, obstacle override, joystick and emergency stop — that demonstrates embedded control, wireless interfacing and human-centred design in one viva-ready package.