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# Health Monitoring and Alerting Smart Wheelchair for Physically Disabled

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**Abstract -** This project focuses on designing and implementing a health monitoring and alerting smart wheelchair to assist elderly and physically disabled individuals. The system allows users to operate the wheelchair using voice commands, facilitating independent mobility for those unable to use their limbs. It incorporates an automatic obstacle detection system using ultrasonic sensors to prevent collisions. Additionally, the wheelchair monitors vital health parameters, including heart rate and blood oxygen levels via a MAX30100 sensor, and body temperature using an LM35 sensor. A flame sensor is integrated to detect fire accidents. Abnormalities in health data or fire detection trigger immediate notifications to caregivers via the Blynk application. Furthermore, the system enables users to control room appliances through voice recognition.

***Key Words*:** LM35 sensor, Flame sensor, Ultrasonic sensor, Voice recognition module, Pulse Oximeter, Heartrate sensors

## INTRODUCTION

Independent mobility is essential for the social and physical development of handicapped individuals. While electric wheelchairs exist, their high cost often makes them inaccessible to many families. This project proposes an affordable, versatile smart wheelchair that combines voice-activated navigation with a comprehensive healthcare monitoring system. By utilizing a voice recognition system, individuals who cannot move their hands or legs can navigate their environment safely.

## HARDWARE DESCRIPTION

The primary components include:

- **Arduino UNO:** Acts as the main microcontroller for wheelchair movement and obstacle avoidance.
- **Node MCU:** Used specifically for IoT functionalities, transmitting health data to the Blynk cloud.
- **Voice Recognition Module (V3):** A speaker-dependent module trained to recognize specific movement and appliance control commands.
- **Ultrasonic Sensor (HC-SR04):** Measures distance to targets to facilitate automatic braking.
- **Health Sensors:** Includes the MAX30100 for pulse oximetry and the LM35 for temperature monitoring.
- **Motor Driver (L298N) & DC Motors:** Manage the speed and direction of the wheelchair wheels.

## METHODOLOGY

The methodology involves four main functionalities: voice-controlled movement, health monitoring, fire detection, and appliance control.

- **Movement Control:** The voice module validates user commands (e.g., "Forward", "Backward") and signals the motor driver
- **Safety Logic:** If the ultrasonic sensor detects an obstacle within a set distance, the wheelchair stops automatically, regardless of user commands.
- **Health Alerting:** Sensors continuously read body parameters. If values exceed predefined thresholds, the Node MCU sends an alert email and app notification to the guardian.

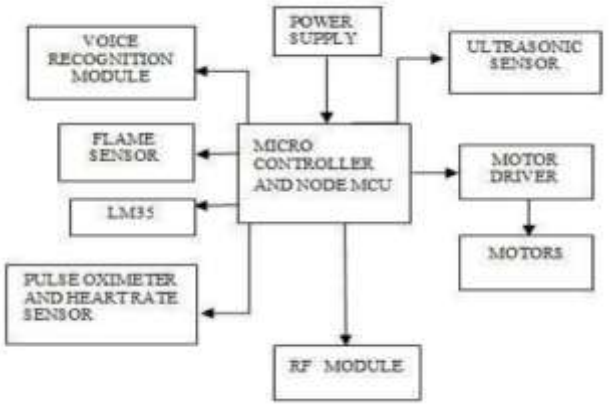


Fig-1: Flowchart

## SOFTWARE DESCRIPTION

**Arduino IDE:** Used for writing, compiling, and uploading the "sketch" to the Arduino and Node MCU boards.
**Blynk App & Web Dashboard:** Provides the interface for real-time monitoring of SpO2, heart rate, and temperature.

## RESULTS

The prototype successfully executed movements based on voice commands, as detailed in the motor logic table.

| COMMAND | LEFT MOTOR | RIGHT MOTOR |
|---|---|---|
| Forward | Clockwise | Clockwise |
| Backward | Anti-clockwise | Anti-clockwise |
| Right | Clockwise | Anti-clockwise |
| Left | Anti-clockwise | Clockwise |
| Stop | No movement | No movement |

Table-1: Motor Logic

Fig-1: Smart Wheelchair Prototype

Experimental testing confirmed that the Blynk application accurately displayed health readings (e.g., 96% SpO2 and 72 bpm heart rate). Fire detection triggered the "fire_alarm" event, sending a notification to the mobile device as intended

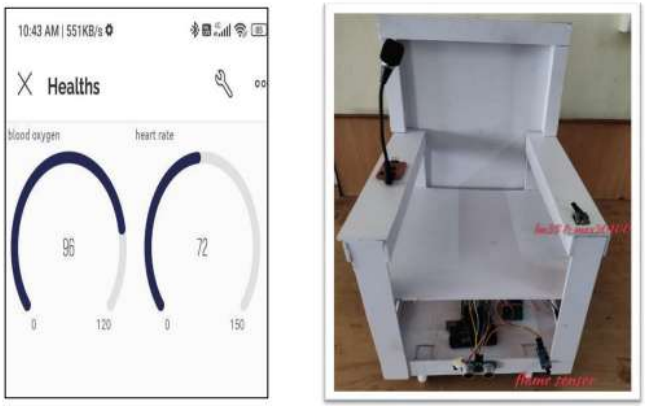


Fig-3: Blynk Application Interface & Wheelchair Prototype

## CONCLUSIONS

This project successfully developed a cost-effective smart wheelchair that enhances the independence of physically challenged individuals. By integrating voice control with

vital sign monitoring and environmental safety features, the system provides a comprehensive support tool for both users and their guardians. Future work may include voice-activated precision turning (e.g., "turn 45 degrees") and a chair-cum-bed modification for increased patient comfort

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