Stand-N-Move Chair

“Empowering Mobility and Independence”

Group Information

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Introduction

The "Stand-N-Move Chair" is an innovative electric wheelchair designed to revolutionize the mobility experience for users with limited mobility. This project aims to empower individuals with mobility challenges, particularly those who wish to stand and control their movement using intuitive head movements.

Objectives

- Develop a Safe and Reliable Standing Mechanism: Design and implement a robust standing mechanism that allows the user to safely transition from a seated to a standing position and vice versa, ensuring stability and minimizing any risk of accidents or falls
- Integrate Joystick-Controlled Directional System: Develop an intuitive and accurate joystick-controlled system that enables the user to maneuver the electric wheelchair in the desired direction by detecting and interpreting joystick movements effectively.
- Automatic Fall Detection System: Develop an accurate fall detection system that will detect fall and notify the nearby hospital and emergency contacts.
- Enhance Safety Features: Implement a comprehensive safety system that includes obstacle detection, collision avoidance, and emergency braking to protect the user from potential hazards and ensure a secure riding experience.

Features

1. Develop a Safe and Reliable Standing Mechanism.
2. Integrate Joystick-Controlled Directional System.
3. Obstacle avoidance.

Hardware Requirements

1. Microcontroller
2. Mechanical Actuators
3. GSM
4. Joystick
5. L298N Motor driver
6. Servo Motor
7. Bread aboard
8. Wheels
9. MPU6050
10. Ultrasonic sensors

Implementation

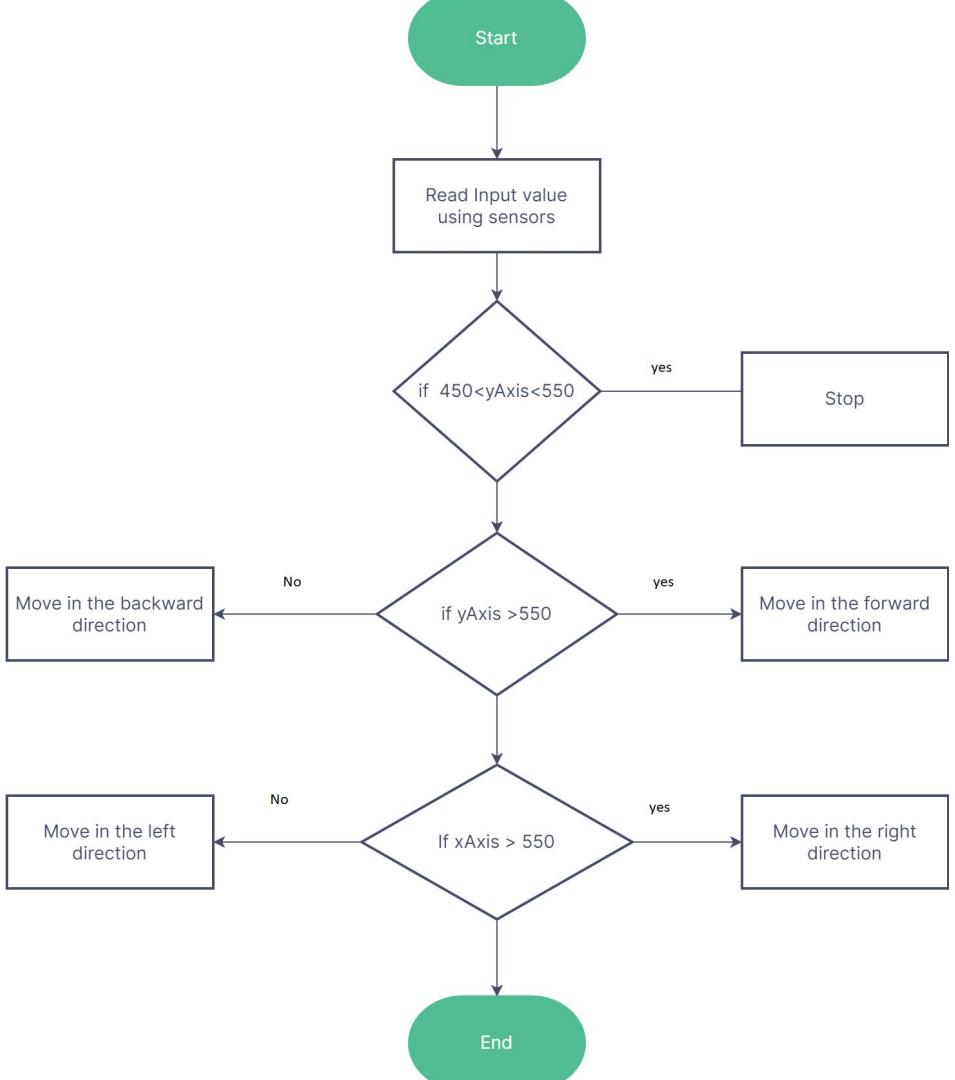
- **Design and Prototyping:**

➔ Developed a Sketch prototype of the project and designed the flowcharts.

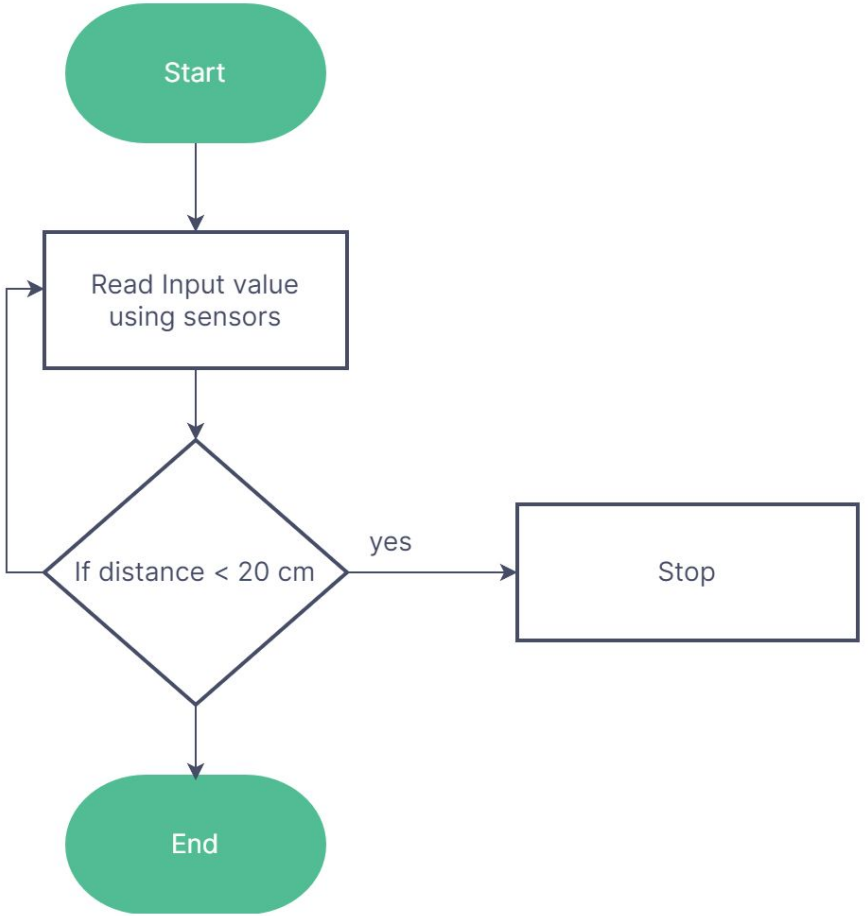
➔ Integrating the necessary components

➔ Testing their functionality with associated code.

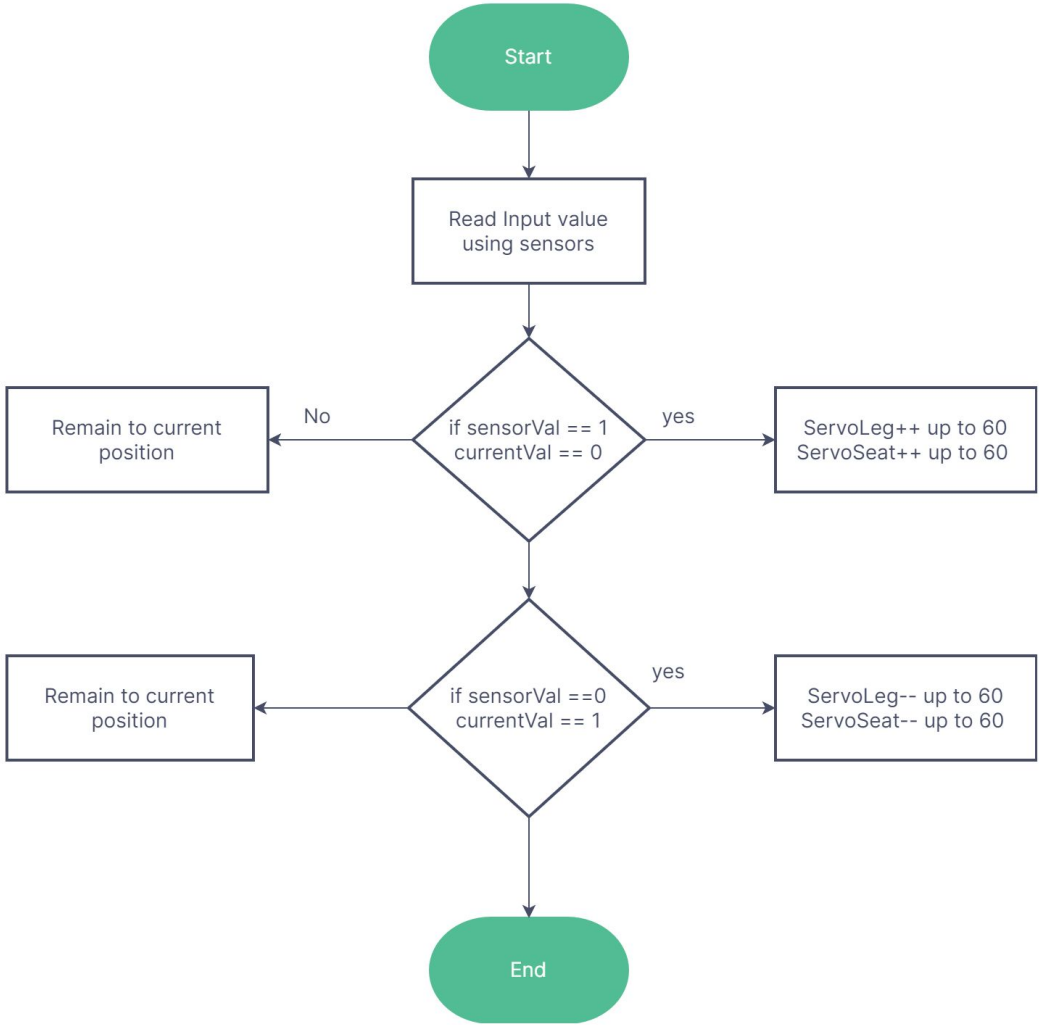
Flowchart - ‘Direction Control’



Flowchart - ‘Obstacle Avoidance’



Flowchart - ‘Standing Mechanism’



Implementation (Cont.)

Electronics and Hardware Integration:

- ➔ Integrated all hardware components assembled together to ensure seamless functionality.
- ➔ Explored alternative hardware configurations (e.g. gyro sensors as a control mechanism, failed to integrate stand-up feature with one servo thus adapted to two servo to design).

Implementation (Cont.)

Obstacle Avoidance Algorithm:

➔ Integrated a sonar sensor which is capable of detecting the presence of objects within a specified range(20 cm).

If the sensor detects an obstacle within 20 cm range, the wheelchair halts its forward movement, regardless of any forward commands issued. However, it retains the ability to move in other directions.

Implementation (Cont.)

Standing Mechanism Implementation:

➔ Integrated two servos into the chair's design.

One is attached to the chair's legs, the other one is connected to the seatback, enabling it to tilt 60-degree angle from its initial position. Controlled by toggle switch.

When the switch is in the "on", the chair transitions into the standing position, with both servos adjusting the seat and backrest accordingly. Conversely, when the switch is turned "off," the chair returns to its initial seating position.

Implementation (Cont.)

Wheel control using joystick:

➔ Integrated a joystick, offering users a convenient steering.

We've linked the enable pins of the wheel motor controllers to the PWM (Pulse Width Modulation) pins of the Arduino. The PWM signals to the motor controllers change in real-time dynamically, resulting in the corresponding acceleration or deceleration of the wheelchair's wheels.

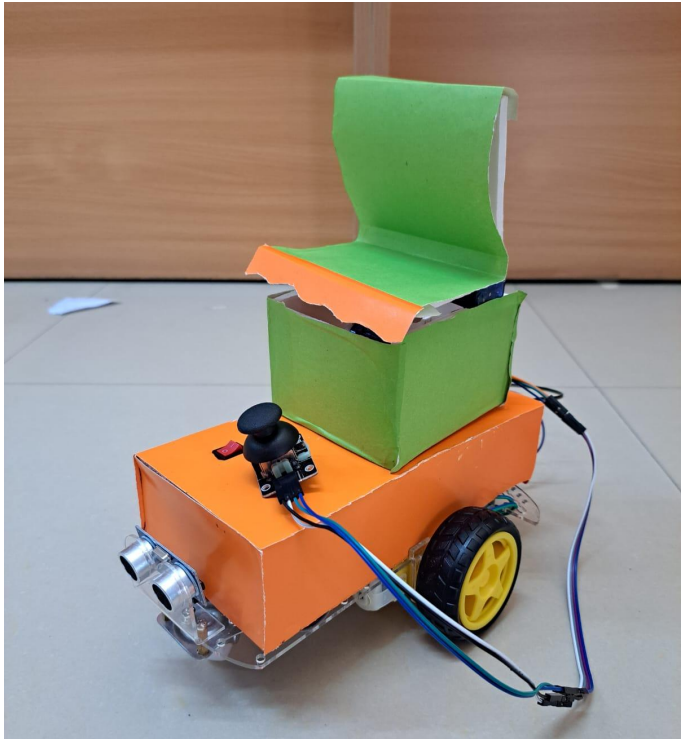
Final Prototype

Functionality

- ➔ Standing Mechanism
- ➔ Direction Control using Joystick
- ➔ Obstacle Avoidance

GitHub link :

https://github.com/Anam-jafar/StandingWheelChairWithObstacleAvoidance.git



Conclusion

- ➔ Empowers users with enhanced mobility and independence.
- ➔ Integrating a safe standing mechanism and intuitive joystick-controlled directional system.
- ➔ Offering a comfortable and accessible solution.
- ➔ Focused on user feedback and safety,
- ➔ Aims to create a transformative experience.