Standing Assist Mobility Device

Andrew Dihle, Daija Rogers, Nathaniel Bennett, Rebecca Sanda

Project Description

This device is a powered wheelchair has a seat that lifts the occupant using a strong jack and portable battery power. The wheelchair can also maintain a speed of 3.5 miles per hour and travel up to 10 miles on a single charge. The device is a convenient form of short-distance personal transportation because any of the medically approved portable oxygen tanks can be easily fastened to it instead of being stowed in an unreachable location for the occupant. This device does not sacrifice safety for convenience, however. A mount for a life alert device is attached to ensure the occupant can get assistance when needed. Additionally, while the chair is raising or lowering, there are safety redundancies taken to prevent injury including a 5-point harness seatbelt, brakes that automatically lock during seat operation, and a jack that will not slip even if power is completely disconnected. The durable steel frame provides a long life of the device while the pneumatic wheels deliver a comfortable ride on almost any surface. The control system is tailored to the elderly with an easy-to-use joystick, which manages the driving wheels, and rocker switch to enable the raising and lowering of the seat. The wheelchair also comes standard with a battery charger and maintainer combination that keeps the battery in top shape for the duration of its life.

Design

Figure 1 pictured above is an overall 3D rendering of the device that was designed. The seatbelt is pictured next to the chair which mounts to the top edges of the back of the seat and the middle of the bottom seat edge. Figure 2 is a side view of the device itself displaying how the wheels will be attached along with the placement of the hydraulic jack being used. The emergency button can be seen on one arm rest that will provide locomotion. The emergency button is seen on the other arm rest to place the emergency device. Figure 3 displays an isometric view of the device.

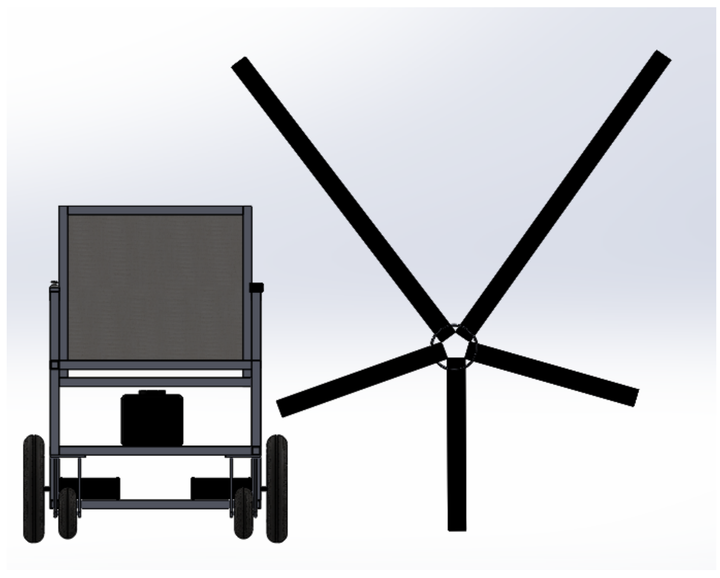

Figure 1: Front view of device with seatbelt pictured on the right

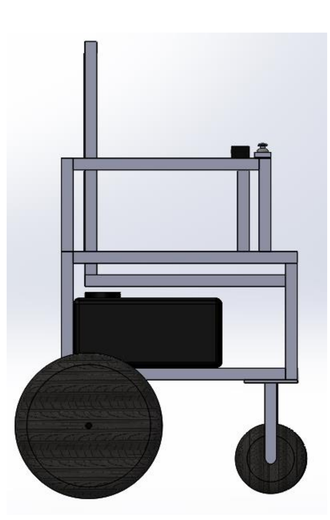

Figure 2: Side view of device

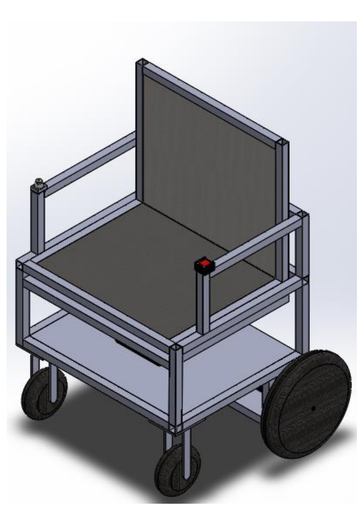

Figure 3: Isometric view of device

Engineering Standards

- ISO 7176-1 to –25
- ANSI/RESNA WC-1&2
- IEEE C2
- UL-2580 & 2272 & 1004

Functional Requirements and Specifications

Requirement	Specifications
Maximum lifting angle	50 degrees
Chair width	28"
Top speed	3.5 mph (miles per hour)
Distance on a single charge	10 miles
Maximum occupant lifting weight	300 lbs.
Maximum oxygen tank mount diameter	7.2"
Harness	5-point
Emergency Button	Has one
Control method	Arduino joystick
Lifting Mechanism control	Rocker switch and jack
Locking breaks	Has them

Project Justification

Many elderly people have the capability of walking around on their own, but have difficulty transitioning from a sitting to standing This unique wheelchair aims to improve the standard of living of these people by giving them their independence back by assisting them in standing.

Verification Test Data

All the verification testing could not be completed due to the semester going online before it could be completed. This is the test data that was performed on the wooden prototype that was created as a proof of concept for the design made. All the verification testing that was done passed.

Requirement	Pass/ Fail
Maximum Lifting Angle at 50 Degrees	Pass
5-Points of Contact	Pass
Ease of Use for Seatbelt	Pass
Control Mechanism	Pass

Build

Figure 4 below is the frame that was built for the wooden prototype. This prototype was to precede the final build that would have been made from steel. Figure 5 shows the circuit that drives the hydraulic jack motor and the drive motors. It is run using an Arduino Uno and Sabertooth motor driver. Figure 6 is a picture of the motors that will be attached at the bottom of the chair shown in figure 1.

Figure 4: Wooden prototype frame

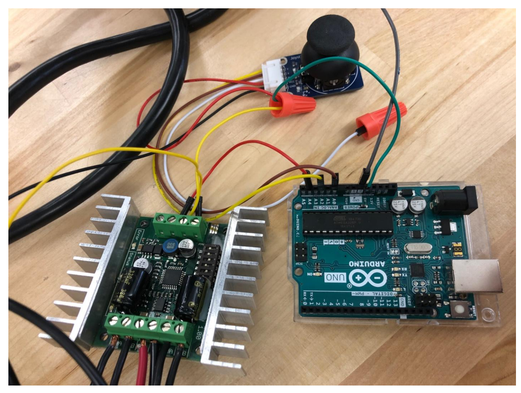

Figure 5: Circuit for drive motors and hydraulic jack

Figure 6: Drive motors with wheels attached