Augmented Powered Mobility

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Abstract

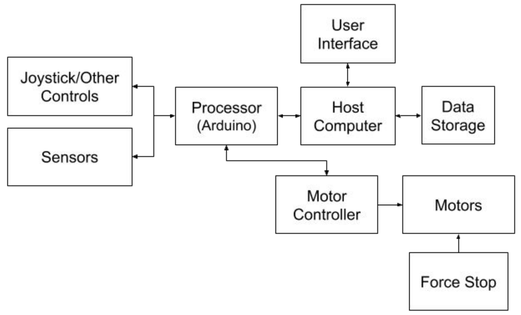
Independent mobility is a privilege that many of us take for granted. Our client, Krista Branch, is a physical therapist in the Flagstaff Unified School District (FUSD), who helps children with severe impairments to improve their quality of life through movement training. This is achieved through augmented powered mobility, or moving with the help of an electric wheelchair. Those that suffer from diseases that affect mobility and motor skills are often only able to move by driving a custom electric powered wheelchair. Unfortunately, these chairs are expensive, and the children who need them have little to no experience with driving one. That is where our team, AmpEd, comes in.

Primary Goal: The basis of our Augmented Mobility Platform Education (AmpEd) is to help children with severe disabilities gain independence. Our goal is to design and develop a platform with electronics and data collection software to meet the needs of our client and her students. Our platform aims to help the disabled children that Branch works with to experience independent mobility. Furthermore, we want to provide data collection for the client, so that she can tailor future therapy sessions with her students to better meet their specific needs. Assistive devices and platforms have been made to address some of these problems, but they are also expensive, and larger in scope than what the client is seeking.

Primary Objectives: Our platform should provide several ways to drive the platform, depending on the level of the student's motor skills. It should also collect data that our client can analyze later to help improve the student's performance. Finally, the platform should be relatively inexpensive, safe to ride and operate, and compatible with a standard laptop.

Design Overview

The main objective of the design is to create a final product that is adaptable for different needs. To accomplish this, we designated various subsystems that we believe to be crucial to the success of the project. Commands are sent from the client's computer to the Arduino to dictate how the platform will be driven. The Arduino then processes the commands, and directs the motors to move according to the driving mode chosen. Data is collected by the sensors attached around the platform, and sent back to the Arduino to be processed. Calculations are done, and at the end of a driving session, data is recorded locally to the client's PC.



A visual representation of how the different subsystems connect within the overall system.

Final Results

The final model we were able to create included the following features:

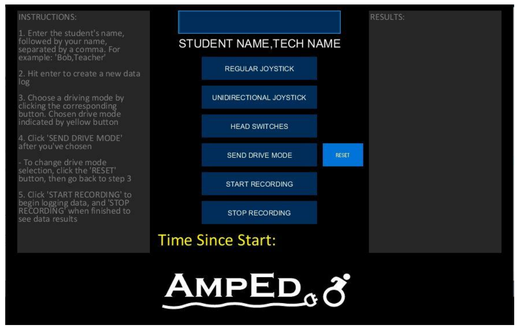
- Self-Sufficient Power System
- Handle User Inputs and Presets
- Display Data and Inputs to PT
- Handle Multiple Sessions of Recording
- Log Data to Text Files
- Data Collection
- Ability to Switch Control Inputs
- Easily Adaptable

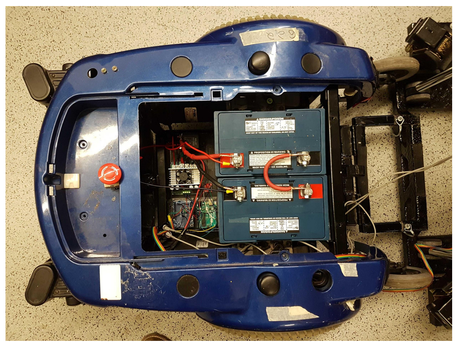
Final Results

The chair is able to be controlled by different kinds of input with only being able to use one type of control at a time. Currently, there are two options which include, a regular joystick as well as a set of switches that can be controlled using different parts of the body for users with disabilities that affect motor skills. If needed, more controls can be easily added to the code and circuitry.

As the chair is operating, the PT is able to record data about how well the student is driving as well as record the data and save each session to a text file.

All components on the chair are powered from the on-board batteries. This makes the chair completely self-sufficient and does not need another to rely on another power source.





The final platform without the head switches mounted.

References

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