User controllable interfaces for exoskeletons have consisted of either switch controlled interfaces, for 'on' or 'off', or elastic powered schemes that allow the user's wrist flexion to provide the resistance for their therapy. This project aims to develop a hands-free mode of control for the exoskeleton, that uses more advanced electronic components to achieve a more natural user interface. Our approach to this project is the prototyping of a control system that uses the MyoBand Gesture Control Armband (MyoBand), and a simple Arduino based electronic design. The three modes of operation possible for this design is measuring the electrical signals of the user's arm, or to use the built-in 'pose' sensing which consists of: fist, fingers spread, double tap, wave in, and wave out. The software we are using to communicate with the MyoBand is MyoBridge, and open source library written by Valentine Roland, and it allows for a reliable stream of information from the MyoBand to our Bluetooth Low Energy device. We intend on developing this prototype system and verifying the use of one of these control schemes. The user will be able to use the control scheme to actuate the motors when their fingers are either fully extended, or when they are gripping.

There are multiple integral parts of our prototype system:

- The software connecting the whole system will be the MyoBridge library, which allows for Bluetooth based communications of the readings of the MyoBand.
- The Arduino is a development platform that allows for prototyping of embedded software and we will use it in our prototype.
- The exoskeleton used is intended to assist stroke patients regain the dexterity of their digits by using the motor to pull their fingers back, allowing for use of their hand.

The ‘raw’ readings were less reliable and harder to control than the pose based readings. Using the pose readings we were able to have reliable control over ‘on’ and ‘off’ of the motor. The system is too large to use in its current iteration and will need a dedicated printed circuit board to miniaturize the footprint of the system.

The pose control variation of the control scheme is more reliable than any other current scheme at this point. It also fits well with the intended use of the system and how the user will interact with the device.

Due to the size of the current system, we will need to develop a custom printed circuit board for the control system that enables the same functionality. This would reduce the size, cost, and the amount of time needed to manufacture these devices.

We have two current options for the exoskeleton actuation, either a DC motor based tensioning system, or a linear actuator based tensioning system. Both are awaiting testing on patients.

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