



Switch Access Methods For an Individual with Athetoid Cerebral Palsy

Overview

For individuals with little to no communication ability, an assistive switch that allows the user to scan through and select options using two simple muscle movements is often used. Unfortunately, current switch technology requires specific movements that cannot be performed by all individuals with these specific communication needs. The PSU RERC on AAC team is focused on developing a switch for a 12-year-old male with athetoid cerebral palsy who experiences very limited and very specific controlled movements, in addition to involuntary movements, due to his disability.



Objectives

When first tasked with this project, the team needed to create a device for an individual who had little to no forms of communication. The customer's needs gave a good outline for the team to decide on a design for the prototype. In concluding this project, the team has created a working prototype that meets the customer needs. The final prototype is able to measure muscle movements and process these signals so that the user is able to interface with a computer (scroll and select). In addition to meeting customer needs, the team was able to meet the target specifications in providing a portable, durable, and user friendly device.

Approach

- The sponsor described the complex needs of our patient including a need for a product that was flexible with gain/loss of reliable muscle function.
- Current products did not accommodate for the patient's sporadic movements.
- Used an EMG device compatible with an Arduino micro-controller to read muscle signals.
- Used current switch interface supplied by the physical therapist sponsor.
- Switch interface was compatible with a standard button/switch where pressing the button completed the circuit.
- A circuit was built using a Zener diode to stop current under a certain voltage to simulate the button/switch.
- The current product will not work when two auxiliary cables are plugged into the switch interface.

Outcomes

After 12 weeks, the following lists the outcomes and accomplishments from our completed device:

- The device captures intentional muscles movements and converts the signals so that the user can scroll through and select options on the computer. This is done with 97% accuracy.
- The device is user-friendly, with the ability to change a set threshold value that controls the sensitivity of capturing intentional signal, based on the specific user.
- Our team created a small, light, and affordable EMG system.

