

## Tone of Voice in Augmentative and Alternative Communication Research

### Overview

HOPE Devices is developed by a team that consist of students from Penn State, America, and Belgium Campus, South Africa. The Amyotrophic Lateral Sclerosis (ALS) community, our targeted customer, requires new technology to help in expressing emotion with Speech Generating Devices (SGDs). The project requires the creation of an access method that is easier to input emotions to a SGD. The SGD will receive the emotion selection from an Arduino sensor and speak in the selected emotion, in order to provide expressive control over the tone produced.

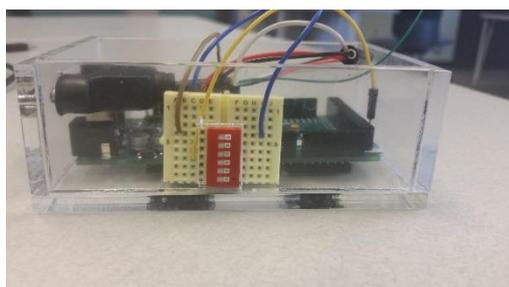


### Objectives

HOPE Devices objective is to develop a user friendly, easy-to-use emotion selection and input device, in order to help people who suffers from ALS select emotions in different manors. The device is used to input an emotion by the use of interchangeable Arduino sensors, after which a speech generating program speaks in the selected emotion's rate, range, pitch, speed and frequency.

### Approach

To construct the requirements for this project we published a survey online amongst the ALS community and met with our Advisor Godfrey Nazareth. Godfrey was diagnosed with the ALS. Group meeting were held to brainstorm ideas and concepts. Based upon a certain set of criteria we then chose three top concepts. We did low-level detailed research in regards with the three topics where we gathered relevant patents and existing products. An Analytical Hierarchal needs chart (AHP) and Quality Function Deployment (QFD) table were used to measure the importance of design requirements compared to customer needs. A CAD model was drawn to display the packaging of our final products. We created two prototype emotion sensors, a SoftPot Potentiometer strip and a sleeve to house an off-the-shelf MyoWare Muscle Sensor. Our emotion sensor communicated to the computer via an Arduino Mega. Our Alpha prototype was validated with several testing phases. Our results were purely based on our interaction and what the program displayed



### Outcomes

HOPE Devices provides two type of emotion sensors, a MyoWare Muscle Sensor and a SoftPot Membrane Potentiometer, that can be connected to an Arduino. The Arduino is connected to the SGD that was chosen by the user. The sensors enable the user to select emotions in different ways and sends the selected emotion to the SGD, which then speaks in the selected emotion's rate, range, intensity, and frequency.

The software enables every connected device to work effectively and with power usage. The product set-up is low-cost, user friendly, and easy. The connections are made through the use of an Universal Serial Bus (USB) that is easy to plug in and out. The sensors can be unplugged while the software is running and changed to another sensor, without receiving any errors.