Tone of Voice in Augmentative and Alternative Communication

Overview
More than 2 million Americans are affected by a severe communication disorder that impairs their ability to talk. Many of these people use Augmentative Alternative Communication (AAC) devices to help resolve this. The goal is that the team generate original solutions to the challenge of providing users with expressive control over the tone of speech produced by the AAC device.

Objectives
Our team aimed to automate the capture of the AAC user’s emotion so that the expression of emotions could be done in real time without extra effort from the user. To do this, our team researched various physical indicators of emotion and selected several as potential paths of progression.

Approach
- Discussed with sponsor how we wanted to augment the capabilities of AAC devices to give emotion capabilities.
- Established we wanted to detect emotions in AAC users in order to automate output.
- Researched physical indicators of emotion.
- Narrowed our list of indicators we were interested in using down to facial emotion detection, heart rate, and blood pressure.
- Purchased devices to allow for heart rate and blood pressure detection in real time.
- Received Intel Real Sense Camera from sponsor to allow for facial emotion detection.
- Removed blood pressure from our list of paths as it was too slow and uncomfortable.
- Had difficulty getting real time input from purchased devices but discovered a way to get heart rate information from the Real Sense Camera.
- Used Real Sense camera’s heart rate and facial recognition together to establish positive, neutral, and negative attitudes in the user.

Outcomes
- Sponsor now has access to a dual source emotion detector as a starting point for future emotion detection devices.
- Obtained insight into the limitations of physical indicators of emotion including:
  - Blood pressure is physically uncomfortable to regularly detect with current devices and is also too slow for real time use.
  - Image detection requires good lighting and would most likely have to be mounted on something for everyday use. Shaking would also be an issue.
  - Heart rate baselines are different for everybody so the emotion detection through heart rate would have to be calibrated for each specific user. Heart rate can also be changed through physical activity which can interfere with the detection of emotion.