NEUROMUSCULAR CONTROL SYSTEMS

BACKGROUND
The use of electromyography (EMG) signals allows the MYO Armband to understand specific gestures based on muscle contractions such as a wave in and a fist, to name a few. The EMG signals detect the electric potential generated by muscle cells. Coupled with IMU and accelerometers, the sensors housed in the MYO armband work together to identify different gestures and orientations.

The MYO Armband can be used to control a wide variety of devices. For the purpose of this project, a drone will be the device of choice. The drone industry is growing rapidly. However, properly controlling a drone requires significant practice and skill. Many of the influential companies in the industry have been developing gesture control systems, focusing their efforts on image processing. The main issue with image processing is that it requires line of sight. Leveraging the gestural control offered by the MYO armband for unmanned applications can have a wide range of applications, especially military.

MYO AND SOFTWARE DEVELOPMENT
• Neuromuscular information is sent to the Edison, for processing and translation into commands.
• The team created a software flowchart that will serve as the “road map” for controlling the drone.
• Programming used included, Command Line Interfacing, C++ and Python
• Information is sent through WiFi to the Solo’s on-board controller.

SOFTWARE FLOWCHART
The flowchart is a visual representation of the decision making logic behind the control code.

OBJECTIVE
• To develop a direct connection between the MYO armband and the 3DR Solo drone to accurately manipulate the drone, without the use of a third party application.
• Safety features such as a geo-fence and heart rate sensor will also be incorporated during development.

RESULTS
• A direct connection between the MYO and the Intel Edison board was achieved through the use of Python 2.7.
• connection between the drone and the Intel Edison was made to send commands.
• A test flight was conducted and the drone responded to the different gestures that were employed.
• Pulse sensors are able to read a person’s heart rate.
• GPS receiver is able to locate the sensor and give real time location data.
• The flowchart below shows the logic behind the code that will be implemented into the Edison.

GESTURE IDENTIFICATION FROM MYO EMG SIGNALS

REFERENCES
1. 3DR Solo Drone <https://3dr.com/solo-drone/>
4. Deirel, Paul and Harvey Deirel. C++ How To Program. upper saddle river:

ACKNOWLEDGMENTS
Dr. Eduardo Divo, Associate Chair of Department of Mechanical Engineering, ERAU
Dr. Victor Huynh, Visiting Assistant Professor of Mechanical Engineering, ERAU