

Muscle Memory

EGR485/486 Senior Project 2021

Problem Statement:

The project sponsor, the Biomedical Engineering (BME) Committee at Grand Valley State University, does outreach events to K-12 students and would like a device to demonstrate the application of surface electromyography (EMG) recordings to actuate a robotic limb. The device should excite students and spark their interest in the biomedical engineering field. In addition, such a device must be able to be used in classes like EGR 434/534, EGR 635, EGR 447/547, and EGR 345/346. The device must have some way of capturing biological data in the form of EMG from the surface of muscles. The robotic limb will resemble a human arm in appearance and movement. The movement of the limb must be caused by input determined by processed EMG signals. The device is to be used in future classes and projects such that it must use open-source software and be easily updated by other students and professors to include more functionality in the future.

Key Project Specifications

Portable Robotic Limb & Harness

EMG Signal from Muscle(s) on Participant

Anatomically-Proportioned Limb

Open-Source Platform

Device Description:

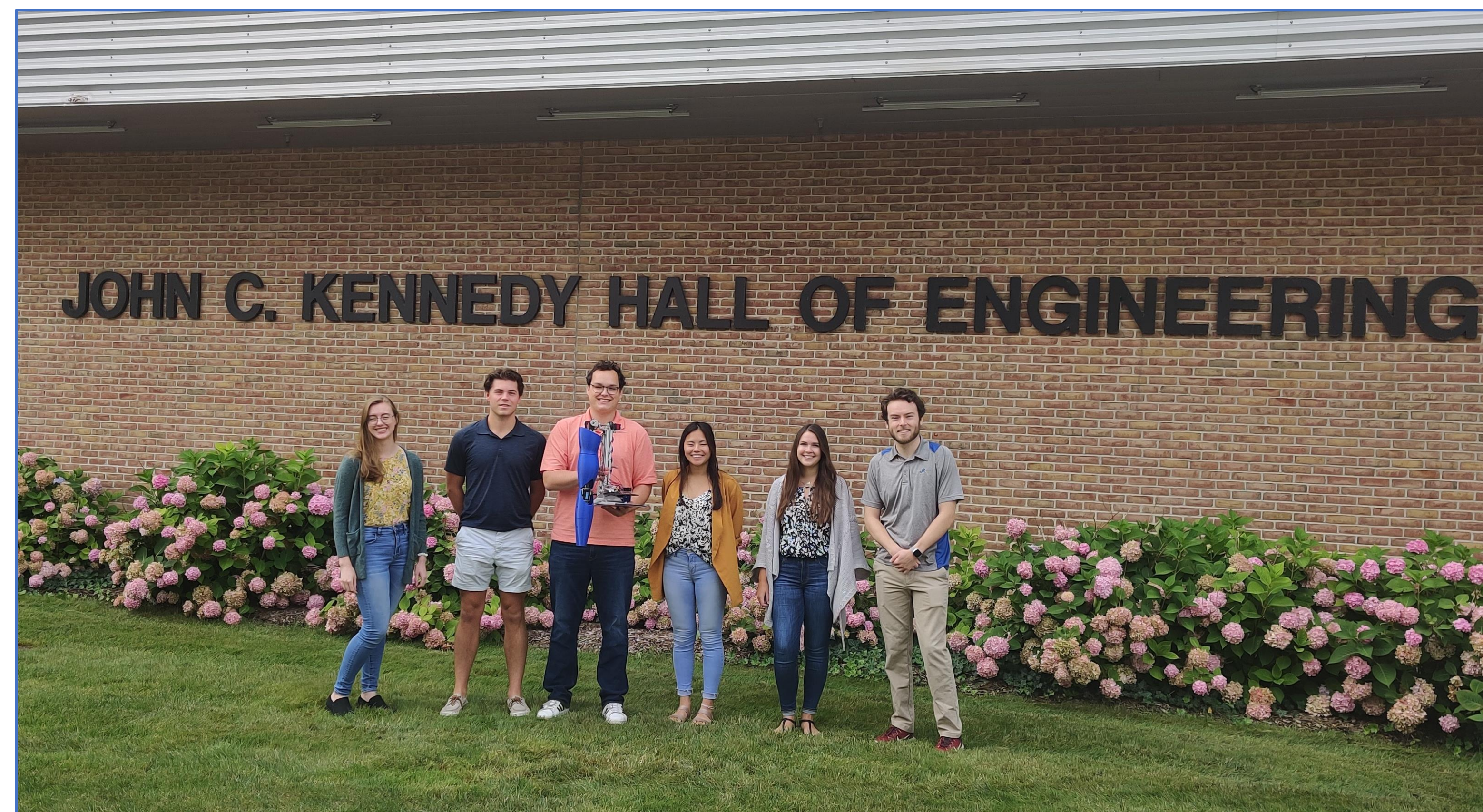
Four EMG sensors attach to both arms of a participant. The data collected is processed and transmitted by a microcontroller through RF signals to the arm and to a computer. While the computer displays the EMG data to a classroom, the arm actuates according to the sensor data. Three servo motors perform abduction/ adduction at the shoulder, extension/ flexion at the shoulder, and extension/ flexion at the elbow. The servos travel to a position indicated by the strength of the EMG signals, which is also displayed on four LED rings on the base of the limb.

Team Members:

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Advisors:

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Challenges:

- Considerations for future modifications by students in the code for the three microcontrollers
- Multiple EMG data inputs and signal processing
- Custom parts machined/modified at GVSU
- Ease of setup and teardown in a classroom



Myoware Muscle
EMG Sensor

