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*15-112 G*

*Term Project Proposal*

*The Project:* Program a prosthetic hand to play rock-paper scissors with another individual, determine a winner, and keep score. Program hand movement in C; use OpenCV to identify the hands and determine the winner; communicate with the hand using Serial; display the score and game UI with Tkinter.

*What Exists:*

*The Hardware*

The prosthetic hand is called the Wearable-Control Bionic Arm, and was built by me. It can be built with low-cost, open-source 3D printed parts, making it more easily accessible to amputees with low incomes or living in developing countries. Using noninvasive EMG (electromyography) sensors and the open-source Pupil eye-tracking headset, the Wearable- Control Bionic Arm provides extreme dexterity with fine motor control (individual finger and wrist control), mimicking the motions and movements of a natural human hand. It costs less than $2500, is easy-to-control, has a wide range of movement, is easy to build and use, requires no therapy to learn to use, is modifiable, repairable, and leverages a vast library of free, high- quality, open-source software and hardware.

*The Software*

I have already written code for the Arduino microcontroller in the prosthetic hand to control its servos.

*My Contribution:*

*The Software*

I will write two programs in Python and C.

**The first program**, in Python, will use the Serial, OpenCV, and Tkinter modules.

First, the Python program will randomly determine one of four moves to make (rock-paper-scissors- and gun as a rare Easter egg), store the move name in a string, and transmit the string to the Arduino microcontroller using Serial communication.

Next, using OpenCV, the program will identify the opponent’s hand. It will also identify how many of their fingers are extended and determine, most likely based on the number of extended fingers, what move the player made and store that information in a string. The opponent string will be compared to the hand string sent to the Arduino with Serial to determine the winner. Once a winner is chosen, the score will be incremented and the program will repeat.

Tkinter will be used for the GUI – it will keep track of the scores, display the score, and start or end the game based on the Mode animation demos that we have learned in class.

**The second program**, in C, will be for the Arduino microcontroller. It will receive the hand move string as incoming Serial data, read the string, and operate the microcontrollers based on the string input.