



CALIFORNIA SCIENCE & ENGINEERING FAIR 2019 PROJECT SUMMARY

Name(s) Abhinav Harikrishna; Tanish Swarnapuri	Project Number J0314
Project Title Need a Hand? Arduino-based Prosthetic Hand	
<p style="text-align: center;">Abstract</p> <p>Objectives Our goal is to build a low-cost prosthetic hand to perform certain pre-defined hand movements.</p> <p>Methods Arduino Uno R3, USB cable, Laptop Computer, Arduino IDE, C++ Code, Yarn, Duct Tape, Hot glue, Breadboard, Jumper wires (single sided and double sided), Servo Motors, Remote Controller, IR Receiver, Plastic straws, Cardboard.</p> <p>Results Based on the experimental data, the hand can perform certain grips and movement for object relocation. If the object size is above 50% of the prosthetic hand model, the grips are successful. The prosthetic hand had challenges to grip smaller objects. Some of the more sophisticated grips were also not possible given the limited degrees of freedom (up to 4) of the design. By using 3d printed hand design we achieve more complex hand movements and very sophisticated hand grips such as Tripod grip. The brainwave signals capture by the neuro recorder is very basic. This is because the brainwaves for hand motions are very weak signals and the recorder we used couldn't capture that well. With a more expensive commercial neuro recorder we can capture the hand movement related signals in a better way.</p> <p>Our hand model and experiments prove that a low-cost prosthetic can be designed to mime bionic hand. However, it needs more revisions of the product to make it useful in day to day life.</p> <p>Conclusions The Arduino Prosthesis is a low-cost alternative to commercially available prosthetic hand. As the components are not expensive, it's very easy to go for multiple iterations in its design and complexity. It can be expanded by adding more controls, 3d printing the hand and fingers, incorporating touch sensing and force sensing. Also since the components are plug and play it can be quickly replaced and rest of the arm can be repaired or restored to its original specifications.</p> <p>We hope to recreate the human limb through robotics and engineering to make a bionic hand. We hope to learn about prosthesis and how the arm is being run by brainwaves from the EEG, and how to code in python for the Arduino. We would like to continue working on v2.0 and beyond to make the hand smart enabled, sophistication in the finger movement and more receptive to brain EEG.</p>	
Summary Statement Build a low-cost prosthetic hand to perform certain pre-defined hand movements	
Help Received My project mate and I designed and built all prototype prosthetic hands. My Mom helped me with programming Arduino.	