**Robotic Hand Controlled by a VR Haptic Glove**

By Adam Erekson and Zachary Illum

Objective

Wirelessly communicate finger tracking data from a VR glove to a prosthetic hand.

Method

We used two ESP32 development boards with Wi-Fi for the wireless communication. To program them, we used the Arduino IDE with the servo, ESPNow, and WIFI libraries. ESPNow allows for use to connect the ESP32 boards with a peer-to-peer connect instead of a master-slave connection which allows us to communicate information back and further between the boards.

* Glove send finger tracking data from the potentiometers to the hand
* Hand can send servo position of the hand to the glove to lock the max curl of the glove.

Resources

* Prosthetic Hand
  + Flexy-Hand by Gyrobot Thingiverse page. Palm and fingers printed in PLA at 190 Celsius and 20% infill. Joints printed in ninja flex at 235 Celsius and 15mm/sec print speed.
    - <https://www.thingiverse.com/thing:242639/files>
  + 5 - 9g servos are needed for the robot hand, one for each finger. We also ran strings rather than fishing line through the fingers since it has much less stretch than the recommended fishing line.
  + Robotic hand – servo motor by 3dVolt Thingiverse page. Printed at 190 Celsius with 20 percent infill.
    - <https://www.thingiverse.com/thing:3940835>
* VR Haptic Glove
  + Lucid Glove VR GitHub page. Print the most recent version of each part of the glove available, we used the rigid mount versions. PLA is strong enough for the parts. The end caps need to be adjusted but stretching 30 percent wider for the thumb, 3 endcaps 20 percent wider for the three middle fingers, and 1 endcap 10 percent wider for the pinky seemed to fit well. There is also a full bill of materials with links to the needed components to build the gloves.
    - <https://github.com/LucidVR/lucidgloves>
  + These are the esp32 boards we used. They are also listed in the Lucid Gloves VR GitHub which also has the wiring diagram for the glove.
    - <https://www.amazon.com/dp/B07QCP2451?psc=1&ref=ppx_yo2ov_dt_b_product_details>
  + Our GitHub with the code for the glove and hand.
    - <https://github.com/ZachillumStudent/ECEN461esp32WIFIHand>