Robotic Hand

A robotic hand controlled by electromyography and voice recognition
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“every $1 dollar spent on rehabilitation saves the economy $11 in various welfare and disability benefits. On the other hand, a person who does not receive a prosthetic within 2 years of amputation has a greater likelihood of social welfare, increased health concerns including obesity related diseases and conditions and is more likely to suffer depression. The US amputee population is approximately 1.9 million persons and growing, however science and medicine provide the technology to restoring a person's dignity, self-reliance, productivity and ability to contribute to society.”

http://www.disabled-world.com
OPEN SOURCE

... why we should use
System wide view

- Bluetooth BLE
- Voice commands
- 2x USB ports
- USB serial comm
- 5x PWM control signals to servo motors
- USER
- UART
What kind of Motors?

DC Motor?

Stepper Motor?

Servo Motor?
Arduino mega board

- ATmega2560 microcontroller
- 5V operating voltage
- 15 digital I/O provide PWM output (+)
  - perfect for controlling our servo motors
  - 40 mA DC current per I/O pin (won’t drive servos) (-)
- 16 MHz clock speed (-)
- 256 KB flash memory (-)
- Easy hardware integration with VR module (+)

*Note: No OS*
Arduino side (C)

- Servo library
  - mediate PWM comm with servo motors

- EasyVR library (MIT license)
  - provide API for communication with VR module

- Serial library
  - receive raspberry pi USB serial messages
Arduino Side

```c
easyvr.setPinOutput(EasyVR::IO1, HIGH); // LED on (listening)
Serial.println("Say a command in Group ");
Serial.println(group);
easyvr.recognizeCommand(group);
do {
    if (Serial.available()) {
        int received = Serial.read() - '0';
        process(received);
    }
}while (!easyvr.hasFinished());
easyvr.setPinOutput(EasyVR::IO1, LOW); // LED off
idx = easyvr.getWord();
```
Raspberry Pi board

- 512 MB RAM
- 2 USB ports
- 700 MHz processor (+)
- hosts Linux OS
  - easily interfaced with dongles
  - good for running
    - BLE stack
    - Python libraries (machine learning)
Raspberry Pi side (Python)

- Bluetooth (BLE) stack library
  - under MIT license
- Myo-specific protocol (hacked old version)
  - raw data streaming VS processed result
  - under MIT license
- sklearn library for training and classification
  - nearest neighbor classifier
  - 25 neighbors, 15 samples
Video Demo
Video links

http://www.youtube.com/watch?v=hO9Z_722qHo&feature=youtu.be

https://www.youtube.com/watch?v=O4oDQ8jbVLA&feature=youtu.be
Thank You