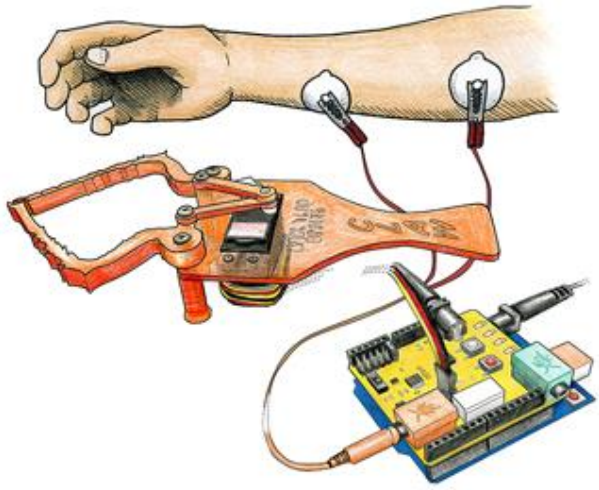
The Claw

BACKYARD BRAINS

STEM
UNITED STATES NAVAL ACADEMY

1. Plug 2 batteries into black ports on orange SpikerShield and blue Arduino board.
2. Plug orange cable into orange port on SpikerShield.
3. Place 2 large electrodes on your forearm muscle and connect red leads as shown. Attach black lead to a 3rd electrode anywhere on your hand.
4. Black switch on board near orange port must be on 'Control'.
5. Flex your forearm muscles to light up the LEDs on the SpikerShield board. If needed, press the white button under the LEDs to change between high and low sensitivity to make it easier or harder to light up.
6. Plug the servo cable attached to the Claw into the 3-pins labeled 'SERVO' on the SpikerShield board. Orient the cable so the black strand is closest to the orange port.
7. Flex your arm to close the claw. Relax to open it. Press the red button to change whether the Claw opens or closes with each flex. Try picking up a small object with the Claw!



Motor-Driven

The Claw uses a **servomotor** to open and close. This type of small DC motor is often used in robots due to its small size, low power consumption, and high accuracy.

The servomotor has 3 wires: red for power, black for ground, and yellow to generate a signal to the motor from the microcontroller.

Command and Control

The SpikerShield records electrical activity from your muscles and sends this electromyogram (EMG) signal to the Arduino **microcontroller**. A microcontroller takes input signals and uses them to control a device, such as the Claw.

The SpikerShield records EMG signal as analog (continuously varying), but it must be converted to digital (discrete numbers) to be used by the Arduino. Arduino is programmed with code to specify how to use the **digitized inputs** to send commands to the Claw.

NAVY NOTES

DARPA's Hand Proprioception and Touch Interfaces (**HAPTIX**) program is developing an advanced prosthetic hand for wounded warriors that provides sensation. The device interacts with implanted electrodes connected to peripheral nerves, allowing users to experience sensory signals.

Learn more at backyardbrains.com