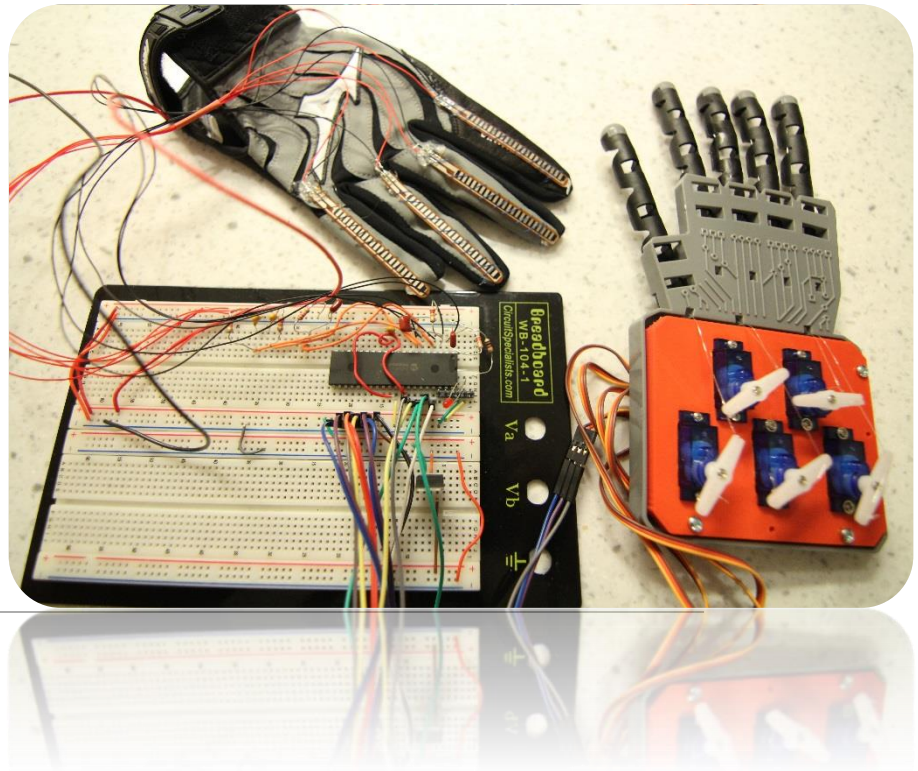
Gloves Controlled Robotic Hand



ME430: MECHATRONICS

WINTER 2014-2015

TEAM: **ELENA CHONG LOO** AND **DAVIS EVANS**

Project Objective

Create an interface between the user's hand (glove) and a robotic hand.

To sense the movement of the user who is wearing the glove with flex sensors attached on each finger. Each individual flex sensors changes its resistance as it bends. The change in resistance indicates the amount of rotation needed for each servos in the Robotic hand to imitate the user's hand movement

Part List

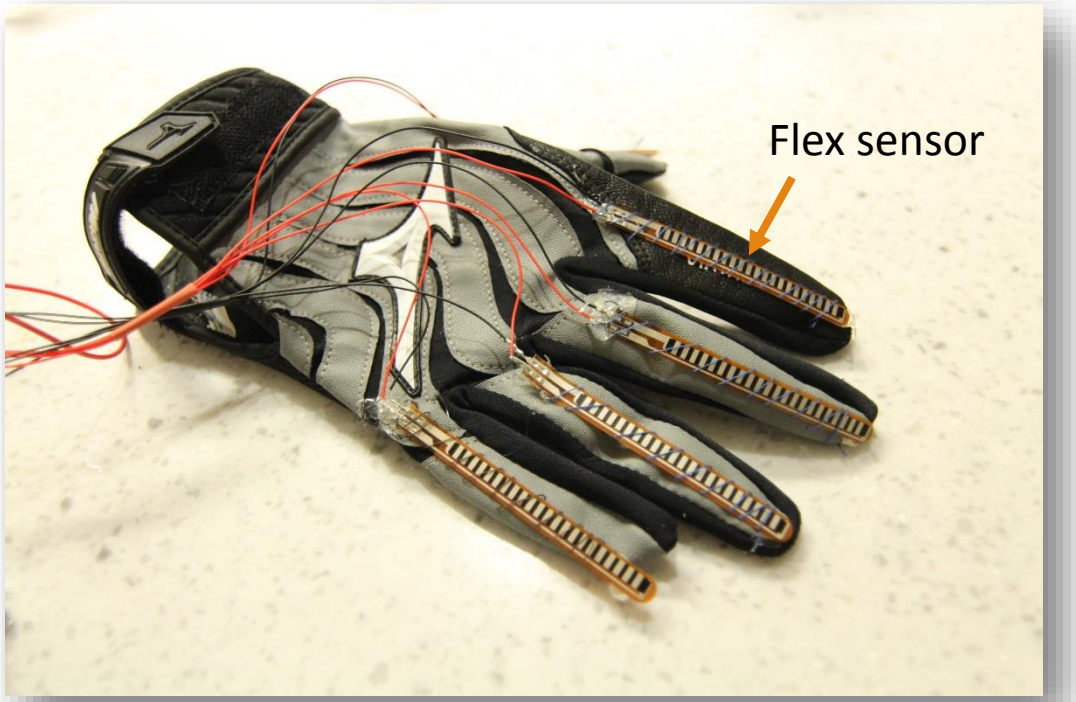
Item	Quantity	Link to Purchasing Location	Unit Cost	Total Cost
Robotic Hand	1	http://www.amazon.com/4M-3774-Robotic-Hand-Kit/dp/B005MK0OPO/ref=sr_1_1?ie=UTF8&qid=1420481843&sr=8-1&keywords=robotic+hand	$15.30	$15.30
Servo Motor	5	http://www.ebay.com/itm/5PCS-x-SG90-Micro-9g-Servo-For-RC-Airplane-Car-Boat-Genuine-/400471432862	$11.95	$11.95
Flex Sensor	5	http://www.adafruit.com/products/1070	$7.95	$39.75
PIC18F4520	1	PROVIDED by Microchip Samples	-	-
Miscellaneous		Breadboard Jumper Wires Wires Capacitors & Resistors	-	-
Power Supply 5V 6A	1	http://www.robotshop.com/en/power-supply-5v-6a.html	$14.96	$14.96
Gloves	1	http://www.amazon.com/gp/product/B008MIDU54/ref=cm_cr_ryp_prd_ttl_sol_0	$12.95	$12.95
			TOTAL COST	$94.91

Input – Glove with flex sensors

The user wears the glove with flex sensors. Each flex sensor is a variable resistor.

The resistivity goes down when the flex sensor is bent.

The resistance change is read by the PIC18F4520 microcontroller using ADC.



PIC18F4520 Algorithm

Version 1: A copy of the servo control algorithm we did in class, uses timer interrupts for PWM control, with 5 hardcoded positions for certain input intervals. Each finger is read separately and the appropriate duty cycle is set for the output finger.

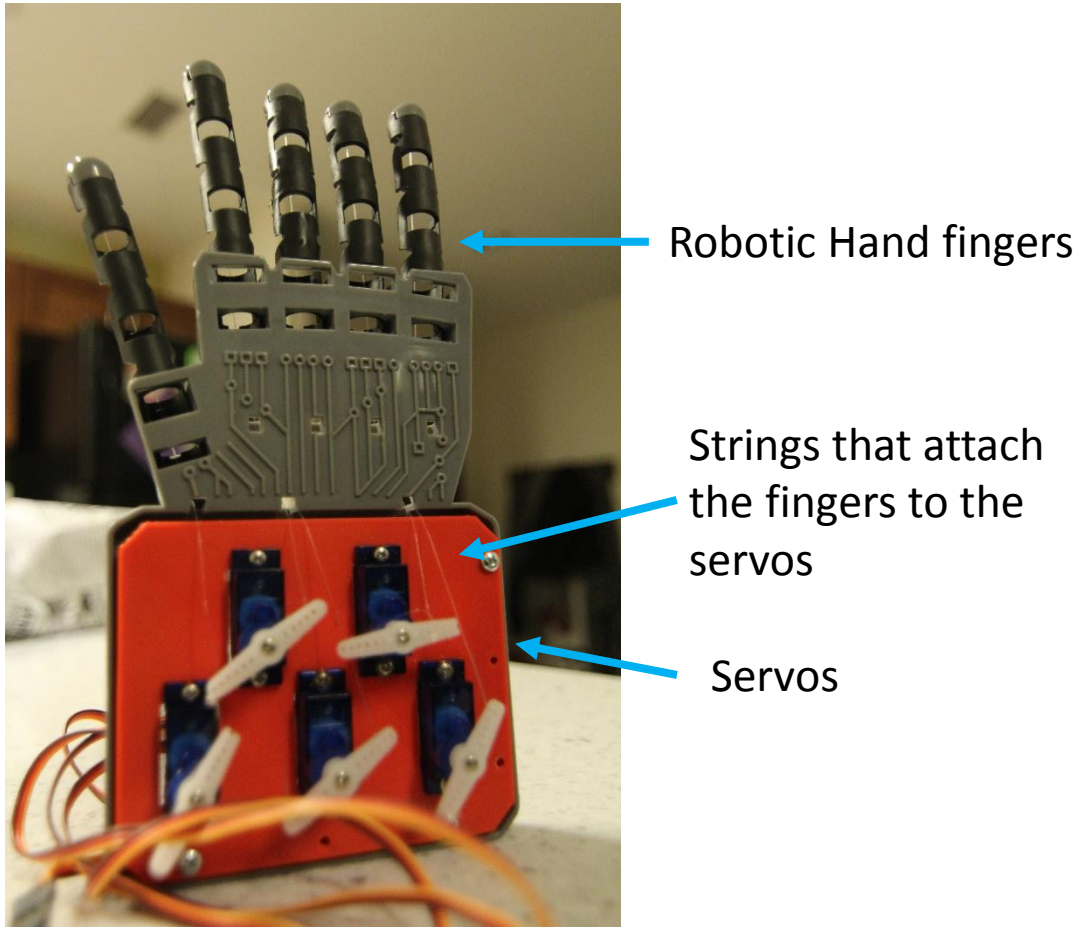
Version 2:Still uses timer int. PWM, but changes from hard coded positions to interpolation of input data. This allows for smoother output, and for adjustment and calibration of each finger separately.

Output – Robotic Hand with servos

As the user bends its fingers, the robotic hand imitates the same movement.

The servos rotate a certain amount of steps linear to the bend of the flex sensors.

Each finger is controlled by an individual servo.



Results – SUCCESS! (almost perfect)

The robotic hand tries to imitate the movement of its user, however, it is not very fluent.

Solution: Need to properly calibrate each finger to the characteristics of each finger-resistor system. Current version uses “best guess” values for calibration.

Advice to future “generations”

- Start project early
- Layout a plan and set deadlines
- Allow time to debug hardware
- Allow time to test code
- Have fun!