EMG ARM

TEAM ID 44

Abstract

The basic idea is to use Electromyography to control the motion of a mechanical arm. This can be extended to a robot that can be controlled from the confines of a safe-house as a substitute for direct human involvement in hazardous situations.

Pre-requisite Knowledge

Signal Processing

Physiology of Human Arm

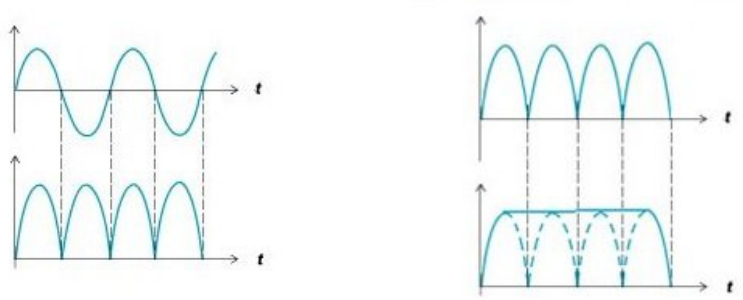
Fabrication of Mechanical Parts

Arduino

Structure

The shoulder of the arm is fixed to a wall/vertical support. EMG electrodes sense flexion at the bicep. The EMG sensory circuit records the nerve impulses, processes it and relays it to the arduino. With these readings, we can control the servo, which forms the elbow of the arm.

Signal Processing



We use the INA106 chip for the signal acquisition. The INA106 is a difference amplifier which will measure and amplify (G=10) the very small voltage differences between the two electrodes you place on your muscle. Then we use an inverting amplifier with a gain of -15. Next, using a capacitor we AC couple the signal to remove the offset. Also we add a high pass filter to remove any low frequency noise. Then we use an active full wave rectifier. Lastly we use an active low pass filter to produce a smooth signal for the microcontroller. We need to invert the signal once more since an active filter was used. Finally we feed this processed signal to the analog input of the Arduino.

Timeline

Week 1: Procurement of parts, read up on signal processing and start building circuit

Week 2: Begin work on the arms and EMG electrodes

Week 3: Completion of signal processing module and arm.

Week 4: Integration of EMG Circuit and Mechanical arm.

Week 5: Testing and calibration

Week 6: Buffer period

Cost Estimate

Component	Price per piece	No. of pieces	Total cost
TL072	*25*	*4*	*100*
INA106	*850*	*1*	*900*
EMG Cables	*600*	*1(x 3)*	*600*
EMG Electrodes	*10*	*10*	*100*
Capacitors, Resistors, Wires, Diodes	-	-	*300*
Servo	*2000*	*1*	*2000*
Miscellaneous	-	-	*2000*

Total Rs. 6000

References

http://www.instructables.com/id/Muscle-EMG-Sensor-for-a-Microcontroller/?ALLSTEPS

http://www.instructables.com/id/IRON-MAN-EXOSKELETON/step4/Muscle-Sensor-EMG/