RUFHIS:

A Telerobotic Arm for Precision Manipulation of Objects

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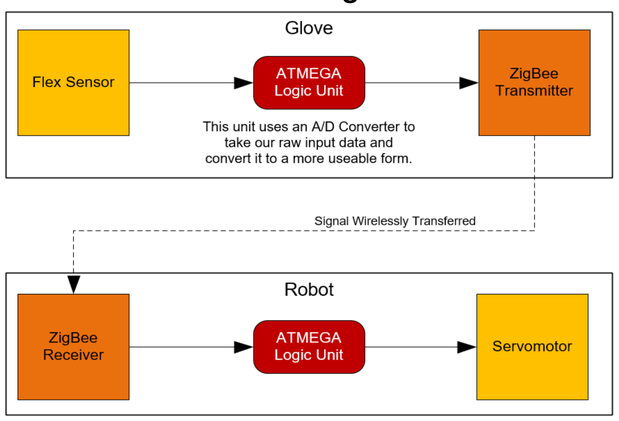
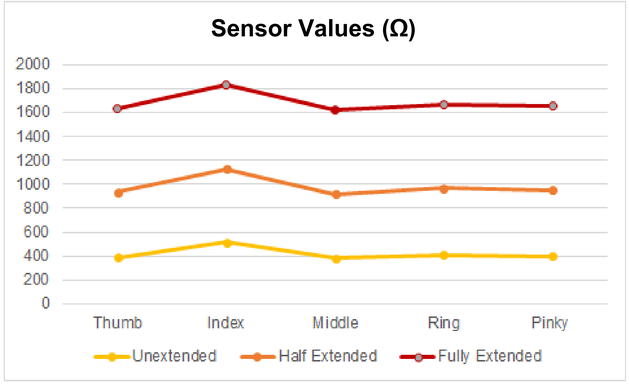
Abstract

The goal of the project is to develop a telerobotic arm, designed for precision manipulation of objects. The system is comprised of a wearable glove on the user side and a remote 3D printed robotic arm on the other. It will wirelessly communicate with RF signals. The robotic arm will directly replicate the movements of the user wearing the glove. The user wearing the glove will control the 1:1 replication of the robotic hand by moving their own hand. This project will have uses in controlled environments, from assisting impaired people and hospital inpatients to potential uses in research situations. Having an accurate and relatively efficient robotic arm will be a huge asset in many industries, such as biomedical research and development, robotics, and rehabilitation.

Block Diagram

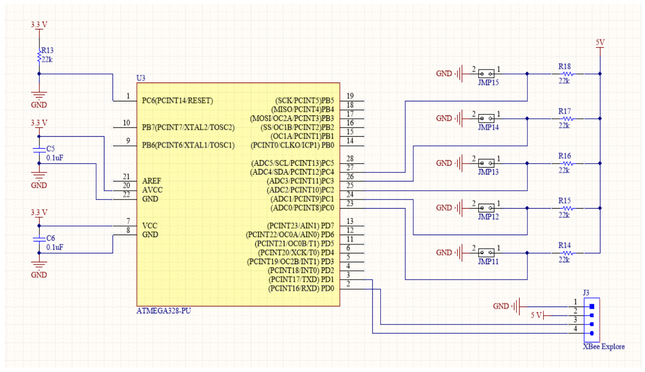


Data



The Glove

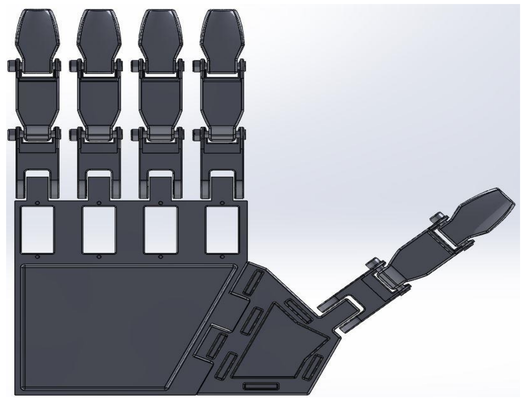
The glove is made to wirelessly send electrical signals from the flex sensors to the servo motors on the robotic hand. The glove is designed with arches for the wires to move back and forth with ease, allowing the sensors to "stretch" like skin.



The glove has a series of flex sensors arrayed throughout to accurately capture the hand's natural movements. The voltage signal associated with these movements is relayed to an ATMEGA328 chip which passes it to a ZigBee transmitter.

The robotic hand receives the signals sent from the glove through several ZigBee receivers. This signal is then modulated into a varying pulse-widths dependant on its voltage level. This modulated signal is sent to the corresponding servomotor which controls the hands movements.

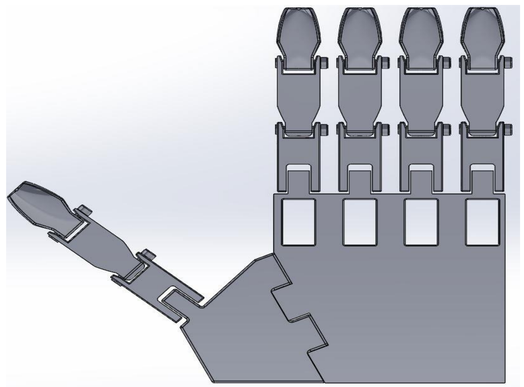
The Hand



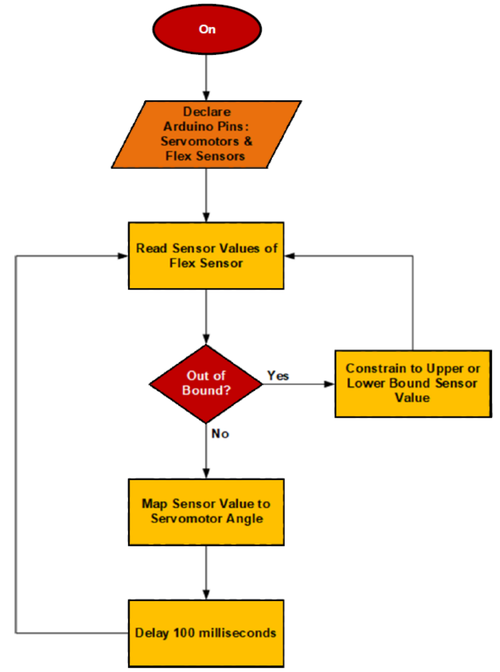
The hand is composed of 5 fingers and two sections that make up the palm. Each finger is controlled by two servo motors. One for side-to-side motion and one for bending.

The servo motors are wired through the hollow palm and strings are ran from along the fingers to the servo motors. The strings allow the servo motors to control the hand.

A cover for the palm is made to snap on to protect the wiring and strings from outside forces that could affect the accuracy. With this method, we are able to make adjustments while also protecting the most sensitive components.



The Flow Chart



The flow chart above shows the Arduino code used for prototype. Using the Arduino Uno Rev 3, the Fritzing circuit below was used for testing.