# Flexion Defined Gesture Recognition Glove

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In the 21st century, the speed of digital communications is crucial, and is often limited only by the speed at which people can interact with devices such as cell phones and computers. The purpose of this project was to create a glove that would provide an alternative method of interaction with today's electronics, by recognizing the user's gestures, and translating them into characters, words or commands. Currently the gesture processing occurs on an arduino, with sensor readings taken from flex sensors on the glove. Although a simplistic recognition algorithm was implemented on the arduino, more complex algorithms were explored in matlab. These algorithms could be used to obtain better accuracy on future versions of the glove, provided higher processing power. Since the glove allows users to input their own gestures, and specify the corresponding output characters, the glove could eventually be used to store whole words associated with single gestures, allowing for extremely rapid communication.
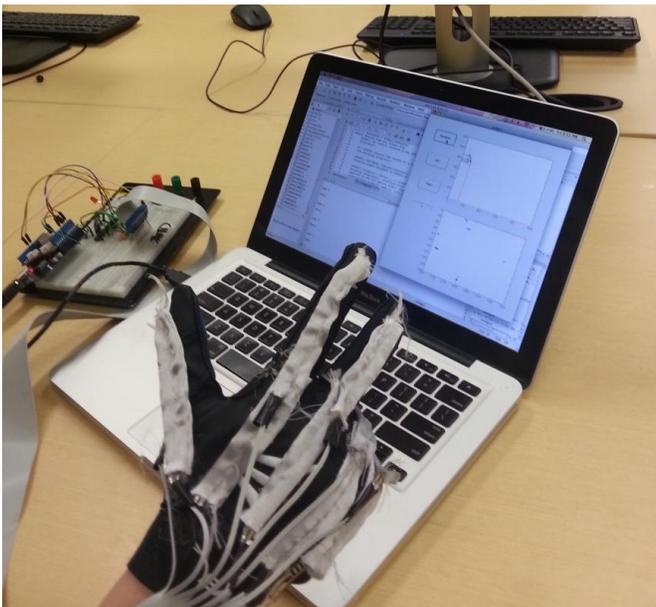
Design:

The current glove uses 10 flex sensors. These sensors provide readings which are used to create a 10-dimensional vector. Each gesture is stored as a region in 10-dimensional space, which is defined by a set of training data input by the user. The processing occurs on an Arduino Uno, which then uses a Bluetooth shield to send the interpreted gesture to a user interface on a computer. The recognition system is very accurate, and requires little processing power, but requires that there be no overlap between gestures, which leads to problems when using a set of gestures, such as American sign language, which contain gestures very similar to each other. Although the relatively low capacity of the arduino necessitates a simple algorithm to allow real-time processing, we implemented other recognition algorithms, such as K-nearest neighbors and Naïve Bayes classifiers, in matlab in an effort to find a classification method which could be used on a system with a more powerful processor. Naïve Bayes seemed to be the most accurate, yielding 99.97% accuracy when tested on a dataset of gesture readings from the American sign language alphabet.