Gesture Recognition using Kinect, Leap, and Myo devices

With the use of Machine Learning and the South African Sign Language Alphabet

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Gesture recognition deals with the interpretation of human gestures by computers, after being read by cameras or motion sensing devices. This study explores gesture recognition of the 26 South African Sign Language alphabet (SASL) gestures, using the Microsoft Kinect, Leap Motion Controller, and Myo Armband, along with machine learning techniques.

Devices

Microsoft Kinect

A motion sensing input device featuring an RGB camera and a depth sensor

Leap Motion Controller

A sensor device tracking hands and fingers as input

Myo Armband

Uses electromyographic (EMG) sensors that detect electrical activity in the forearm

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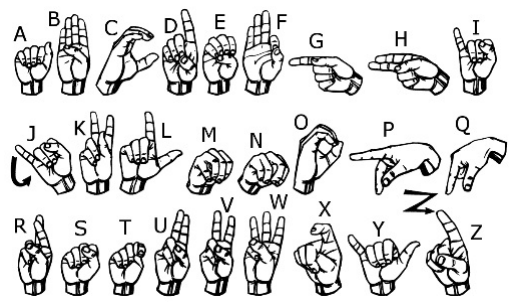
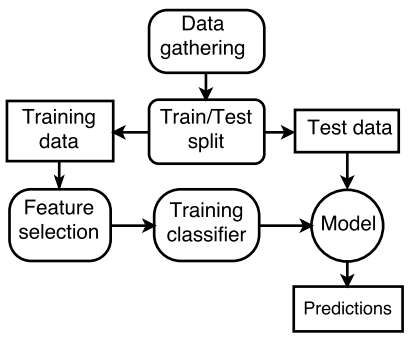
Objectives

- Investigate machine learning classifiers and their effectiveness in recognising SASL alphabet gestures
- Obtain a large dataset of alphabet gestures, using the Kinect, the Leap, and the Myo devices



SASL alphabet gestures



Machine Learning Pipeline

Machine Learning

Machine learning is a way to solve the problem of gesture recognition. It allows computers to learn patterns from given data, and then use this learned information to make predictions regarding new data.

Classifiers explored

- k-Nearest Neighbour Algorithm
- Artificial Neural Networks
- Support Vector Machines
- Hidden Markov Models
- Ensemble Classifiers

Data gathering setup

Conclusions

Varied results were obtained. Support vector machines proved to be the most promising for both the Kinect and Leap devices. Future work should look into whether combinations of devices can boost low performances, such as that of the Myo.

Device	Best Classifier	Accuracy Rate
Kinect	Support Vector Machine	75.9%
Leap	Support Vector Machine	52.0%
Myo	Random Forests (Ensemble)	11.6%

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