Computer vision CS 766

Ancy Philip
Aribhit Mishra
Pavan Kemparaju

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Overview

The problem we are trying to solve:

Detect hand sign language (American Sign Language system)

In this project we intend to develop a ASL fingerspelling translator using image processing and machine learning.

Why

ASL is the one of the main forms of communication for deaf people in the USA and Canada.

The current sign language detection systems are trained and so have good to one set of symbols (ex: a-g of the ASL alphabet)

Experimental-Exploration aspects of the problem:

- Detect multiple signs in a single image - Other sign language systems

The ASL system has fingerspelling and composite symbols, both of which use one hand. Other sign language systems such as the British system have symbols with two hands.
One of the experimental aspects we want to explore is being able to detect two-handed symbols. This presents a challenge due to the different positioning of hands for different symbols and the need to segment images of the two hands.

- Detect sign gesture from videos/motion & interpret word

The references quoted below apply their algorithms to datasets of images, i.e. static hand gestures. We hope to extend the possible gesture set by considering motion as well.

- Generic sign detection and convert it to action

In pursuit of the previous two goals, we hope to come up with a framework for sign & gesture detection that allows for different actions other than speech. Our framework should be capable of sign to action conversion for different sign systems and actions.

Possible steps to the solution

There are 3 main phases to hand-gesture recognition

1. Detection
2. Tracking
3. Recognition

The final system will consist of two components:

- An image processing system
- A machine learning system

We will first create a data set with hand gestures of the ASL system that we wish to classify. The next step will be to detect and segment out the hand region from each image and encode this in a way that a machine learning algorithm can make sense of it. This will be used to train a classifier to recognize the symbols.

Timetable :

Time period	Milestone
15th Feb- 17 Feb	Data Acquisition
18 Feb - 24 Feb	Hand segmentation - Feature extraction
25 Feb- 3 March	Train ML models
4th Mar- 18 Mar	Update model for Low quality data set
19 Mar- 31 Mar	Extension to multiple signs and other systems
1 April - 14 April	Motion detection - Video
15 April - 20 April	Generic sign detection
21-24th April	Results, documentation

REFERENCES

https://www.hindawi.com/journals/tswj/2014/267872/abs/

https://link.springer.com/article/10.1007/s10462-012-9356-9

https://dl.acm.org/citation.cfm?id=2668566