Uppsala University

Computer Assisted Image Analysis II

1TD398

Automatic detection of the International Sign Language Alphabet

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Inclusion is an important and widespread topic. Inclusive communication respects the restrictions deaf persons face every day. To ease the language barrier we want to implement a solution that translates videos or pictures of the American Sign Language Alphabet into Letters. We hope to be able to translate in real time.

Data

Various data sets for this project can be found open-source. Especially the American Sign Language (ASL) has many data sets to offer. We decided therefore to use the ASL alphabet as our base. We have found one feasible dataset at `kaggle.com` [1]. Every letter has 1000 images in different light settings, with motion blur and some rotation. We hope that this dataset is reasonable for our purposes.

Milestones

Object detection/segmentation Being able to segment a hand from data images.

Pre-processing Conduct contrast adjustments since detecting fingers from images with contrast in small range is harder. As the hand needs to be lined up if we try to classify them with a mask, rotation may be necessary.The same reasoning holds for scaling. However, this could also affect the performance of a DL method. Hence keeping the interesting region at the same scale could be beneficiary here too.

We want to achieve fingers which can be distinguished.

Feature extraction We want to be able to detect the position of the fingers. This could be done in a number of ways. One idea would be to use watershedding to get the position of the fingers, resulting in a skelleton-like structure. Other algorithms for this task includes edge detection with filters, Canny's edge detector or SIFT. For some ideas for how others have solved this one could look at [2] or [3].

Classification Depending on what way we do the feature extraction we could end up with a mask in which case we can look at how well the input image corresponds to the mask. Other ideas would be to look at how [3] did. We could also explore the possibility of using support vector machines as [2]

or [4] did with eigenvectors.

Extra Compare with a neural network/deep learning solution. If we have time we could also compare the non deep learning based solution to a deep learning solution, classification error, training/execution time etc. This could be seen as a extension to the project but due to time required to train a network we will start with this before finishing the non NN based feature extraction and classification part since both might benefit from the same object detection and pre-processing. For deep learning approaches there's a fairly large amount of papers to look at for inspiration a small sample includes [5] which discusses deep learning on the bangla sign language. [6] and [7] both investigating using a convolutional neural network on the American sign language. Furthermore, if we want to look at real time performance we would need to implement a hand detection algorithm in e.g. openCV for python.

Qualitaty Assesment Classification Error

References

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