American Sign Language Recognition

Project type: A (option 2 and 3)

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Project Description:

There are so many people who are not able to speak and hear. They use sign languages for communication and most of us are not well versed with sign languages. This creates communication barrier between disable people and able people. This work address the problem and provide solution which converts hand gesture to text.

In this project the american sign language is converted to text using classification and regression models learned in the class. Hidden Markov Model(HMM) is also used as one of the model not taught in the class and compared accuracy of the models.

Motivation:

People who have disability in speaking and hearing face lot of trouble in communicating with people around them. The only thing which distinguish them from able people is communication. If we solve that problem by interpreting sign language into the language understood by normal people we can reduce the communication gap.

Background:

Sign language recognition has been well known research topic for a long time. Lots of research had been done and many different solutions are proposed. We can divide all the solutions in two categories: vision based solutions and wearable technology based solutions.

Vision based solutions includes use of Hidden Markov Model(Gaolin Fang, Fang, & Gao, n.d.), Support Vector Machine(Sun, Zhang, Bao, & Xu, 2013), CNN(Liu et al., 2016) etc.

Wearable technology uses various sensors such as accelerometer, gyroscope and mount those sensor on user's hand directly or prepare data gloves(Mehdi & Khan, 2002), some methods use colored gloves(Watanabe, Iwai, Yagi, & Yachida, 1999) as well.

Dataset:

https://www.kaggle.com/grassknoted/asl-alphabet

Data set contains 3000 images per letter in alphabet for training and 1 image per character for testing. Total size of data set is more than 1GB

Algorithms:

Implementation of all the models learned in class and also explore other different models. Some of the models will be used:

CNN, Logistic Regression, Gaussian Naive Bayes, HMM, Fully Connected Neural Network

Evaluation Plan:

Find accuracy or RMSE, whichever is appropriate, for each model and create confusion matrix.

References:

Gaolin Fang, Fang, G., & Gao, W. (n.d.). A SRN/HMM system for signer-independent continuous sign language recognition. In *Proceedings of Fifth IEEE International Conference on Automatic Face Gesture Recognition*. https://doi.org/10.1109/afgr.2002.1004172

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