Name(s)	Project Number
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Project Title
A HOG-AdaBoost Method for Stop Sign Detection

Abstract

Objectives/Goals
Creating a new method of stop sign detection that generates more accurate results than a heavily used traditional method (neural network)

Determine a equation relating the size of stop sign with the distance between the stop sign and the camera

Methods/Materials
Collect one thousand positive and one million negative samples of stop signs. Histogram of Oriented Gradients (HOG) features were extracted from the training set and the Adaboost algorithm was applied to train the strong classifier with different number of weak classifiers.

Test the HOG-Adaboost and Neural Network algorithms. Compare the results of the neural network algorithm to the results of the Adaboost algorithm.

Results
The accuracy of my HOG-AdaBoost algorithm was 99.832% while the accuracy of the neural network algorithm was 99.74% with the same feature set, implying that my HOG-AdaBoost algorithm had a better detection accuracy. My HOG-AdaBoost algorithm also ran much faster than the neural network algorithm. I also found an equation relating the size of the stop sign with the distance between the stop sign and the camera. The equation had an average error of less than 0.13 feet compared with the ground truth.

Conclusions/Discussion
In my hypothesis, I stated that my HOG-AdaBoost method would detect stop signs more accurately and faster than the neural network algorithm. Also, I stated that if I am given the size of a stop sign, I will be able to find how far away the stop sign is.

According to my data, my hypothesis was supported. My HOG-AdaBoost algorithm had a better detection accuracy than the neural network algorithm due to the effective strong classifiers. With the same training set of 324 features, my HOG-AdaBoost algorithm also ran 30 times faster than the neural network algorithm because the neural network had much more features and weights to deal with.

Summary Statement
Creating a new method of stop sign detection that is more accurate and efficient than the traditional neural network method

Help Received
Dr. Wang helped guide the project