Driver Assist Traffic Signs Detection and Recognition System

Manisha, U.K.D.N. and Liyanage, S.R.

Department of Statistics and Computer Science, Faculty of Science, University of Kelaniya, Sri Lanka.

Faculty of Computing and Technology, University of Kelaniya, Sri Lanka.

Email: nisalmudawatta@gmail.com,sidath@kln.ac.lk

Abstract

Traffic signs or road signs are signs that are initiated at the roads to provide information of the overcoming behavior of the road to drivers and pedestrians. Since 1930s with the increment of the use of vehicles, road signs were introduced in Europe. Latterly many countries have adopted them to standardize their signs to enhance the safety of road users.

Since the number of vehicles is an increasing factor in the world, road traffic became an increasing factor. Specially in urban areas the pedestrian activities at the road is generally high along with the road traffic. It is possible that drivers may lose their concentration to the traffic signs because of closing vehicles and pedestrian activities. There are many notification boards with various colors and textures at road sides. This also may cause the problem that hard to detect the traffic signs clearly to the eyes. Violating traffic signs may cause drivers to make accidents and also unnecessary problems like penalties from the law.

To ensure more safety and convenient drive, automation of traffic signs recognition took apart. Computer Vision is a promising approach for addressing this problem which is an interdisciplinary field that emphasis, how the computers can be made to gain high level understanding from digital images. First automated traffic signs recognition was reported in Japan in 1984. Since then number of methods have been developed for traffic signs detection and recognition.

This paper presents 'Driver Assist Traffic Signs Detection and Recognition System' which is capable of detecting, recognizing and indicating traffic signs at the road side to the driver to ensure a safety and convenient drive by acknowledging the behavior of the road.

The proposed system mainly consists with two phases which are detection phase and recognition phase. In both phases I have used classifiers with different technologies which are computer vision image processing techniques and machine learning techniques respectively.

In detection phase I have used a cascade classifier to analyze the each frame of the input to find traffic signs of it. For the purpose of training the classifier I have provided over 3000 positive samples of images with region of interests (ROIs) which includes traffic signs and provided over 15000 negative samples of images which does not include any traffic signs. Haar-like features of the images were used to train the classifier with a proper false alarm rate. Aspect ratio changes for most of 3D objects with the location of the camera. Since the classifier is very sensitive to the aspect

ratio of the traffic sign I have to use many training images as possible to achieve almost all the orientations of traffic signs to the training set of images. The main objective of the detection phase is to classify the presence of traffic signs and return the coordinates of the sign for each frame.

In recognition phase I have used machine learning techniques to train a category classifier support vector machine (SVM) to recognize and indicate the detected traffic signs by the detector.

Histogram of Oriented Gradient (HOG) features were used to train the SVM by extracting the features from the training sets and stores them in separate classes as separate categories. For each coordinate that returned by the detector, used to crop the original frame and make an input image to the category classifier. For each input image the category classifier gives a separate score for each category by matching the HOG features of the image. The highest score gives the nearest category and I have obtained an optimal score value to ensure the accuracy of the recognition phase. The main objective of the recognition phase is to choose the correct category of the detected traffic sign by the detector and indicates the traffic sign category.

In the detection phase I used LBP and HOG as the feature extraction methods along with the Haar like feature and obtained that the higher accurate technique is to use Haar like features. In recognition phase I chose 11 categories of traffic signs for the training process. I have obtained an optimal value of -0.04 as the score for the best accuracy of the recognition phase.

The proposed system can detect, recognize and indicates traffic signs with great accuracy not only at the daylight but at night also and can be implemented to use in any vehicle. Detection process achieves over 88% accuracy and in recognition process accuracy of classify the category of a detected sign is over 98%. In real time testing overall system achieves over 88% of accuracy over 45-50 km/h speed.

Key words: *Computer Vision, Machine Learning, Image Processing, Object Detection, Image Classification*