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TRAFIC (Traffic Real Time Analysis Facilitates Intelligent Controlling System)

[1]Dan K Thankachan, [2]Joby James
[1] M.Tech Scholar [2] Assistant Professor
[1][2] Department of ECE
College of Engineering Kidangoor ,Kottayam, Kerala,India
[1]dankaduppil@gmail.com,[2] jamesjoby@gmail.com

Abstract: **The paper presents a noval system for controlling the speed of a vehicle in a real time manner by detecting road traffic signs. Also the proposed intelligent system consists of as alcohol sensor as well as the facility for sleep detection. The system finds Maximum Stable regions in a processed image and consider it as the candidate region. The recognition of traffic sign is based on Optimum Path Forest classifier trained with Histogram of Oriented Gradients. The vehicle speed is controlled by Pulse Width Modulation**

***Index Terms*— MSER, PWM, OPF, Sleep Detection**

I. INTRODUCTION

In 21st century even a single day without vehicle can't be imagined. The number of vehicles coming to road goes on increasing day by day. As the number of vehicles increases, accidents are also increasing because of reckless driving, ignoring traffic rules and signs etc. The best solution to reduce the number of road accidents due to improper driving is to automatically controlling vehicles. This paper aims at automatic controlling of vehicles as well as providing the maximum safety to the people inside the vehicle with the help of alcohol sensor and sleep detection sensor.

II. METHODOLOGY

In this section the method for the detection of Road traffic sign is described in detail.

The system consists of the following stages: Detection and Recognition. Detection is using Maximally Stable Extremal Region (MSER), since it is very robust to variation in contrast and lighting conditions. Based on the background color the candidate regions are detected. Recognition is using the cascade of Optimum Path Forest classifier trained using Histogram of Oriented Gradient (HOG) features.

For Detection of Road traffic Symbol with white background, first a gray scale image is formed and and from this grayscale image, the maximum stable region (MSER) is found. The connected components at each level are found by binarizing each frames at different thresholds and the maximum stable region after this thresholding is taken as MSER. Other features such as width, height, aspect ratio etc are considered to reduce the number of MSER regions. Removing such stable regions help to increase the accuracy.

For the detection of traffic symbol with red or blue background, each image is first transformed from normal red-green-blue (RGB) image to a normalized red/blue image ΩRB such that, for each pixel of the original image, values are found for the ratio of the blue channel to the sum of all channel and the ratio of red channel to the sum of all channel. The pixel value of the normalized image will the greater of these values and the image will have a greater pixel value for red and blue colors compared to other colours.

From the image HOG features are extracted for the classification of candidate regions, which represent the occurrence of gradient orientation in the image. For each candidate region HOG feature vector are calculated. A Sobel filter is used to find the magnitude and orientation by finding the vertical and horizontal derivatives of each pixel. For each cell a nine-bin histogram of unsigned pixel

orientations weighted by magnitude is created. These histograms are then normalized over each overlapping blocks.

Optimum Path Forest classifier which is a linear classifier allows the design of fast, simple and multi class classifiers, which can handle some degree of overlapping between classes. Image Forest Transform (IFT) algorithm is used to find the optimal path for the new samples. Any sequence of distinct samples forms a path which connects terminal node and connectivity function assigns a cost to the path. The basic idea is to find prototypes in every class so that each sample is assigned to the class of its most strongly connected prototype, by considering the optimum cost path among all possible paths from the prototype.

The output of the OPF Classifier is the detected speed limit and it is then given to a microcontroller which compares the detected speed with the original speed of the vehicle at that time. If it is moving at a high speed the microcontroller then gives instruction to set the vehicle speed to the desired speed by Pulse with Modulation (PWM). Width of PWM signals increases as the acceleration increases. The microcontroller limits the speed of the PWM based on the traffic sign detected by putting an upper limit for the PWM. Once this limit is reached the width of the PWM won't increase further and thus speed control is achieved.

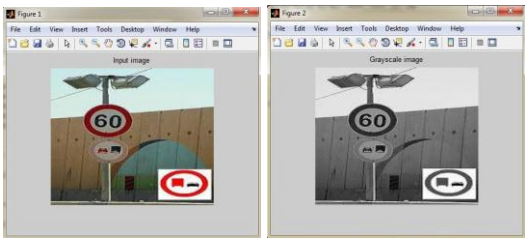
An alcohol sensor is used to detect whether the person on driving seat is drunken or not. If alcohol sensor is active, that is if the driver is drunken, then the system won't allow the driver to start the vehicle.

Also a IR sensor is used as a sleep detection sensor which emits IR rays continuously and the pulse timings are calculated. When the driver is sleeping there will be difference in the pulse timings and an alarm is given to wake up the driver.

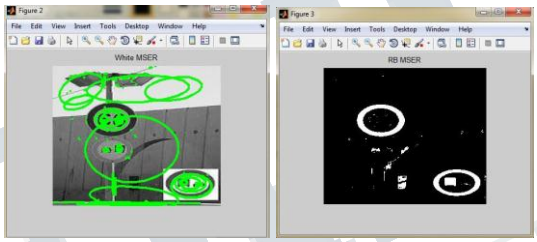
Also a comparison between Support Vector Machine (SVM) classifier which is also a linear classifier and OPF classifier is performed.

III. RESULTS

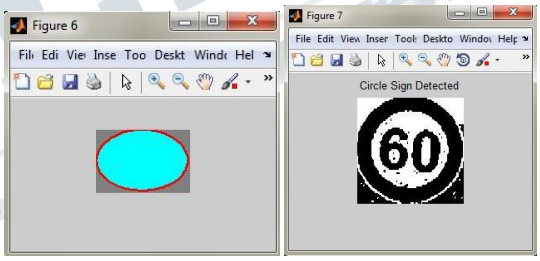
The first step of the simulation is to read an image from the computer. The image read is resized into 250 rows x 300 columns and this resized image is taken as the input image for further processing and the corresponding grayscale image is found. The simulation result is shown below.



Input Image And Corresponding Grayscale Image



White MSER And RB MSER



Verification as Circle and Corresponding Grayscale Image

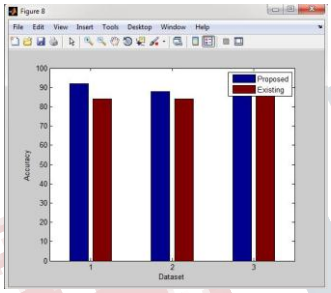
Now the training data is loaded and based on the Histogram of Oriented Gradient (HOG) features extracted from the image the OPF classifier classifies the speed limit sign in the image and sets the speed limit. The result after OPF classification is given below.

Dialogue Box Showing Speed Limit Set

IV. PERFORMANCE EVALUATION

For the evaluation of the performance of the system three different datasets with different traffic signs are created and tested with both OPF classifier and SVM classifier and the number of correctly classified traffic signs is found more with OPF classification compared to SVM classification. The performance evaluation graph obtained by comparing the results obtained from OPF classification and SVM classification is given below.

EXISTING METHOD Classification : Linear Support Vector Machine Classifier		PROPOSED METHOD Classification : Optimum Path Forest Classifier	
Data set	Accuracy	Data set	Accuracy
1	84	1	92
2	84	2	88
3	88	3	92



Performance Evaluation Graph

V. HARDWARE IMPLEMENTED

Picture of the Implemented Hardware

In the hardware PIC16F87XA microcontroller is used and the Alcohol sensor used is MQ-3 Gas sensor which is having high sensitivity to alcohol and low sensitivity to benzene. IR trans-receiver is used for sleep detection.

VI. CONCLUSION

Here an idea about controlling the speed of a vehicle in a real time manner by detection of road traffic sign and an intelligent system with alcohol sensor and sleep detection sensor is presented. The system offers high protection for the passengers even if the driver fall asleep or if the driver is drunken as the intelligent system controls the vehicle at this situations.

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BIOGRAPHY

Dan K Thankachan received the B.Tech degree in Electronics and Instrumentation Engineering from College of Engineering,Kidagoor, Kerala India, in 2014. He is currently pursuing M.Tech.degree in WIRELESS TECHNOLOGY in College of Engineering Kidangoor, Kottayam, Kerala, India.

Joby James received the B.Tech degree in Electronics and Communication Engineering from Cochin University of Science and Technology,Kerala India, and completed his M.Tech in Signal Processing from Kerala University, Kerala India. Currently he is working as Assistant Professor in Electronics and Communication Department in College of Engineering Kidangoor, Kerala India