

An Automatic Alerting System for Road Symbol Detection in Vehicle Using Machine Learning

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Abstract— The major subject which focuses the attention of many of the researchers to reduce the death rate in India is Road accident. So it is the challenges task to work with road safety in India nowadays. Most of the accidents are either due to reduced attention of drivers or that they simply choose to ignore the road sign. A traffic sign warns you of possible dangers and provide information. This paper is introducing the proposed work to detect a road side symbol from a moving vehicle. Also, the proposed system can detect the road symbols from the videos and classify into different class labels on real time basis. Symbol based detection system will be act automatically when vehicle is running. This system will provide long distance signal or symbol to drivers from the front glass of a car so that drivers can take decision as fast as possible which leads to decrease in number of accidents. Symbols are detected using image processing technique. This helps the drivers to understand the road conditions while driving during night time and also in hazardous condition.

Keywords— Computer Vision; Image Processing; Traffic Sign Detection; Traffic Sign Recognition

I. INTRODUCTION

Road safety is one of the major subjects especially in India today. Most of the accidents are either due to reduced attention of drivers or that they simply choose to ignore the road sign. A traffic sign warns you of possible dangers and provide information. They tell you what the rules are and what the road conditions are like. There are many symbols related to driving on roads. But all road drivers do not follow traffic signs and symbols and lack of knowledge increase accidents. [1][2] Finally, there are two exceptions: (a) the yield sign, (b) an inverted triangle; and the stop sign, a hexagon. To detect the position of the sign in the image, we must know the two properties i.e., color and shape. The applications and the difficulty of road sign detection make road sign detection an interesting problem. In terms of applications, road sign detection is quite important for the road sign recognition problem, since it is the most important step for a road sign recognition system. So far, the researchers have mainly focused on the road sign recognition problem, in which the task of finding road sign in an arbitrary background is usually avoided by either manual segmentation of the input image, or

by capturing faces against a known uniform background. In the last decade, road sign detection has attracted great attention, as road sign recognition system requires automatic road sign detection as a first step, especially for images with cluttered background. Road sign detection also has potential applications in human computer interface and surveillance systems.

II. PROBLEM IDENTIFICATION

1, 37,000 people were killed in road accidents in 2013 only, 17 death on India's every hour where Chennai & Delhi all most dangerous as per report, 34.59% accidents death occur on national highways while 27.9% accidents death took place on sates highway, in future added that speeding appears to be the biggest cause of concern other than usage of mobile phones while driving vehicles.

Top 10 cities with highest number of road crash death Delhi, Chennai, Jaipur, Bangalore, Mumbai, Kanpur, Lucknow, Agra, Hyderabad, Pune. Road drivers do not follow traffic signs and symbols and lack of knowledge increase accidents. That's why it is necessary to create awareness among drivers related to traffic signs.

There are so many techniques are available that was developed to detect and recognize the symbols or road sign [3][4][5][6]. But there are basically two main methods or phases are used in the algorithm for road sign detection and recognition, which are: detection and recognition [7].

Siti Sarah Md Sallah *et. Al*[8] propose a road sign detection and recognition algorithm for an embedded application, which was developed by using the Hue Saturation Intensity (HSI) color space to segment the road signs color (red, yellow, blue and white) and the regions of interest (ROI) in order to locate and determine the shape of the road sign (diamond, square, hexagonal and circular) in real street-view images. This algorithm implemented in a real time embedded system using Xilinx Video Starter Kit Board- Spartan-3a DSP 3400A Edition.

Jack Greenhalgh and Majid Mirmehdi [9] proposed worked on traffic sign detection and recognition automatically. They worked for hazardous conditions such as variations in lighting conditions. For this they had used Maximally Stable Extremely Stable Regions (MSERs) to detect the candidate regions. In their proposed worked they used SVM classifier and the model had been trained using Histogram Of Gradient (HOG) features. This system is more accurate for high speed vehicles under different weather conditions.

Harini S *et. al* [10] worked on natural complex images. They implemented the method to detect the road sign, classify it and alerts the driver using voice.

III. PROPOSED WORK

In the proposed work, the main objective is to detect the road symbol/sign and followed by the classification of them into different classes. This work is carried out in the consideration of the real time environment. The system is working in such a way that, the continuous video (i.e. set of image frames) are captured, followed by the identification of the key frame, detect the road/traffic symbol and then classify into the specific class. Later, the system will display the symbol on to the screen and also the driver will be alert by voice message. This system will provide long distance signal or symbol to drivers from the front glass of a car so that drivers can take decision as fast as possible which leads to decrease in number of accidents. Symbols are detected using image processing technique. This way the system plays important role for the driver to understand the road condition. This will also be helpful to the driver in night and hazardous condition as well.

A. Proposed System Work Architecture

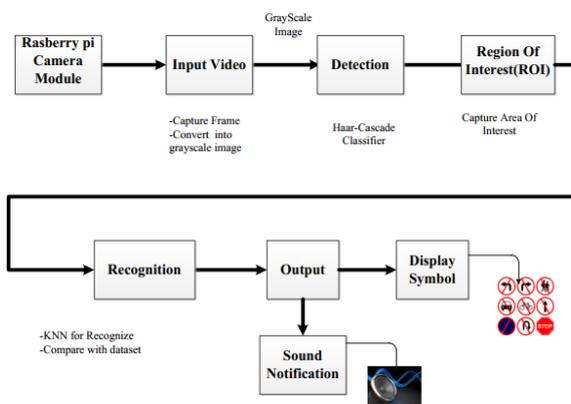


Fig. 1 System Architecture for road symbol detection (using Raspberry Camera Module) and recognition (KNN machine learning classifier)

B. System Architecture Introduction

The general block diagram of the proposed work is as shown in fig.1. The hardware used for the technique is

Raspberry Pi 3 Model B, which contains processor Raspberry Pi, using OS like, Raspbian, Fedora, and Ubuntu. The Raspberry Pi is attached with JPEG encoder and hence it can capture the sequence of frames outside the vehicle. However several issues need to be considered: The video port of raspberry pi processor is captured the road signs in the time of travelling. The particular sign is processed by the following parameters to done the proposed system operation. We used OpenCV methods to extract the important features of the frames.

In this system, the capture sequence method was chosen, as it is the fastest method by far. The available road signs are classified into four shapes. Such as square, rectangular, round and triangular during the travelling time the camera port detect the road sign means immediately that signal given into the processor. User applied breaking system for the vehicle when entered into the restricted zone. The round shape signs are given the more importance than the other shape signs. When the round shaped signs are received by the camera means the vehicle speed is reduced to the notified value. Any other shaped signs are located means the system given the notification via buzzer. The image processing technique takes the necessary action when the histogram value can be equalized with the original image.

C. Detection

OpenCV stands for Open source Computer Vision and it is mainly used for machine learning with image manipulation and processing too. *Haar* is the machine learning algorithm which is based on feature-based cascade classification. The cascade function is trained for lots of negative and positive images. Perform operations between two pictures in which one picture is scan in background of another picture which has python as interface which is powerful high level object oriented language mostly used in human computer interaction for symbol identification and recognition is being used in our project *OpenCV* comes with a trainer as well as detector if you want to train your own classifier for any object like car, plans, road sign etc. we have use *OpenCV* to create this and detect road signs according to that.

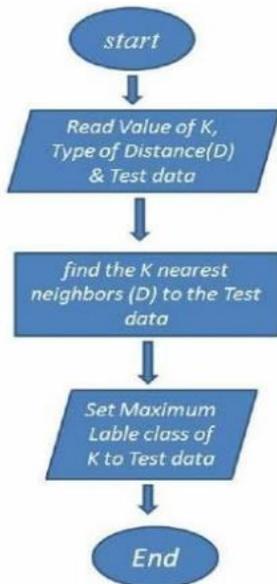
D. Recognition

In our research project, K Nearest Neighbour classifier has been used as a machine learning algorithm to classify the road symbol. As we know that it is lazy learning algorithm with consideration of no parameters, hence it is also known as non-parametric algorithm. Non-parametric mean it does not make any assumptions on the distribution of data which are of interest. In the real world, Gaussian mixtures and other typical theoretical assumptions are not obeyed by the practical data. In KNN, there is no explicit training phase or it is very minimal. The training phase is very fast. The

interesting thing of KNN is, it keeps all the training data to use at the time of testing phase. In other classification algorithm like SVM, where the non support vectors i.e. training data are discarded without any problem. The KNN makes the decision on the entire training set. It stores the entire training data set for its future representation and it makes “just-in-time” prediction by calculating the similarity between input sample and each training instance based on some distance measure.

E. Flow chart for Machine Learning KNN Classifier

As shown in figure 2, here the KNN classification work flow has been discussed. The value of K need to provide, the training data set D is supplied too. Then the testing data set is supplied, it labels the sample with the similarity of distance measure.



IV. EXPERIMENTAL SNAPSHOT

In our experiment, we set the Raspberry Pi camera with the Kit attached in the vehicle. In our experiment we considered car and fix the camera near to the front class. This camera continuously captures the video and sends it to the Pi kit. The Pi kit works on machine learning in two phases. The first phase is to detect the key frame with the road symbol and second phase is to class it with accurate label. Few of the snap shots have been displayed here in this paper.

Step 1: system start



V. CONCLSION

Step 2: symbol Detected



The road safety is the major issue which not to be avoided

Step 3: symbol recognition and alert will be in the form of buzzer



to reduce the accident and the death rate in India. Many researchers have worked on different areas to reduce the accident rate. In this paper, prior road condition has been identified by detecting and recognizing the road symbol from the real time video frames. The KNN based classification works with good accuracy near to 95.31% to identify the road symbol.

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