

# Sensor Based Safe Driving Using Road Sign Recognition and Image Analysis

<sup>[1]</sup> Mr.J.Biju,<sup>[2]</sup> Mrs.B.Kogilavani,<sup>[3]</sup> Mr.S.Mohanraj

<sup>[1]</sup> <sup>[2]</sup> <sup>[3]</sup> Assistant Professor, KGiSL Institute of Technology, Coimbatore.

*Abstract* With increasing technology to improve driving security, surrounding camera is increasing popular among recent models of family using vehicles. With abundant information collected by these cameras, there are few existing techniques that can automatically analyze and understand the content of recording and providing valuable information about behavior of driver and driving conditions. This paper explores the possibility of using combination of image processing and computer vision techniques to extract information about the driving behavior. The paper is collaborated with computer vision research. The data used in this paper is collected in urban streets of the cities. Along with the videos, there are also sensor data for acceleration of x,y,z directions for training of the model.

*Keywords:* Detection, Driving Conditions, Image Recognition..

## 1. INTRODUCTION

### 2. Objective:

Ultimate goal of the paper including the followings:

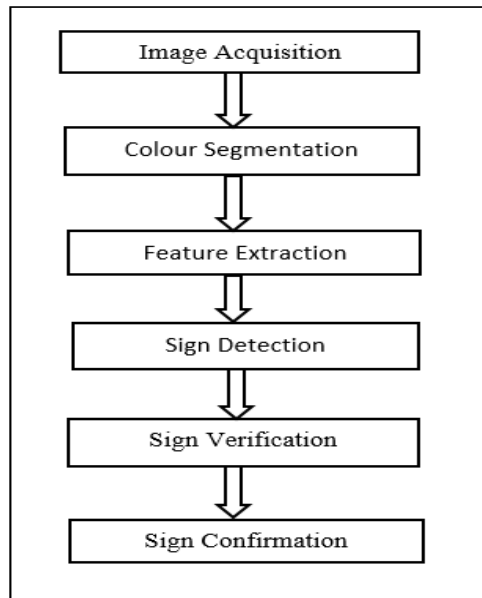
- Understand driving condition of the car, including road types (urban/highway), pedestrian detection, surrounding vehicles detection, road sign recognition, etc.
- Infer vehicle state from the video, such as speed, distance, acceleration/deceleration, turning, breaking, etc.
- Construct causality relationship between the environments the

vehicle is experiencing and the driver's behavior.

For example, understand the reason for a decision, such as acceleration/turning is caused by presence of an obstacle. The short term goal of paper majorly focuses on the image processing component. For speed analyze, due to pretense of many interfering objects moving at their own speeds, it is challenge to find still reference object to analyze absolute speed of the vehicle. With motion detection, we can acquire flow information of the video, which can be then used to analyze moving and still objects in the frame. The difference between flow of left half and right half scene can also be used to study the turning angle of the vehicle. With plate recognition, we can the plate (should be identical to flow of the plate if it's part of the same car), it is possible to identify and segment out the moving pixels of the interfering car and leave only the still references and forming a clean base for later machine learning on the video. Additionally, image processing can be used to detect road signs along the street to help understanding the environment of the vehicle. Due to the video is taken inside front window of the camera, there are reflection of the glass inconsistently appears in the video, which can be removed with image preprocessing.

### 3. Related Work:

There are existing studies on using videos taken by highway surveillance camera for speed detection. Our problem is more challenging as the video is taken inside a moving vehicle and many occasions, obstacles such as vehicle and pedestrian occupies a large region of the scene. There are many other existing techniques and libraries, such as road sign recognition of an image and license plate recognition, optical flow detection, Tensor Flow that are



relevant for this paper.

#### 4. SYSTEM ARCHITECTURE

#### 5. METHODOLOGY

This section discusses the process steps in detail.

##### Step1: Image Acquisition

The first stage of any vision system is the image acquisition stage. After the image has been obtained, various methods of processing can be applied to the image to perform the many

different vision tasks required today. However, if the image has not been acquired satisfactorily then the intended tasks may not be achievable, even with the aid of some form of image enhancement.

##### Step 2: Colour Segmentation

In traffic signals, colors used are mainly categorized into two classes: Red indicates a warning / stop sign and green indicates a go sign. Since colors play an important role in recognizing and understanding the meaning of the signals, it is important to be able to distinguish the signals based on colors. The goal of segmentation is to simplify and/or change the representation of an image into something that is more meaningful and easier to analyze. Image segmentation is typically used to locate objects and boundaries (lines, curves, etc.) in images. More precisely, image segmentation is the process of assigning a label to every pixel in an image such that pixels with the same label share certain characteristics. The color of every pixel is defined by three colors, red, green and blue. Segmentation is done using following formula:

$$f(x,y) = \begin{cases} Ra & dR > 0.5 \\ Ga & dG > 0.45 \\ Ba & dB > 0.5 \end{cases}$$

##### Step 3: Area Calculation

In order to detect the traffic signal we need to calculate the centroid and moments of the image

and our area of interest. In order to calculate the centroid and moments we need to calculate the area of the image. Before calculating the area, the image is divided into smaller blocks. Area is calculated to get the region of interest which is then used for calculation of centroid and moments. Also for each block the minimum and maximum coordinates are calculated.

##### Step 4: Calculating Centroid of Small Regions

Centroid of an image is the arithmetic mean position of all the points in a shape. The definition extends to any object in n-dimensional space: its

centroid is the mean position of all the points in all of the coordinate directions After the image is divided into smaller regions centroid of each region is calculated in this step

#### Step 5: Calculating Centroid of Entire Image

This step involves calculation of centroid for the entire image. Using centroid calculations of smaller regions.

#### Step 6: Calculating Moments

In image processing, computer vision and related fields, an image moment is a certain particular weighted average (moment) of the image pixels' intensities, or a function of such moments, usually chosen to have some attractive property or interpretation. Moments of images have been used extensively as they provide efficient local descriptors in image analysis applications. They provide invariant measures of shape which is their main advantage .

Image moments are useful to describe objects after segmentation. Simple properties of the image which are found via image moments include area (or total intensity), its centroid, and information about its orientation.

#### 6. Conclusions and Suggestion :

The major objective of the paper was to analyze the main direction of the research in the field of safe driving and to categorize the main approaches into particular sections to make the topics easy to understand and to visualize the overall research for future directions. Unlike most of the available review papers, the scope of this paper has been broadened to cover all recognition phases: Detection, tracking and classification. In addition, this paper has tried to discuss as many studies as possible, in an attempt to provide a comprehensive review of the various alternative methods available for traffic sign detection and recognition; including along with methods categorization, current trends and research challenges associated.

#### 7. REFERENCES

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