

# Traffic Sign Recognition

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**Abstract:** A smart transport system is an important part of road sign recognition. The project was designed to improve driving and safety, accurately and effectively. It teaches traffic rules, road conditions, and lane guidance and helps drivers to drive better and safer. It has two main stages: acquisition and recognition. The challenges involved in obtaining real-time traffic signals and recognition are provided by this project. It tells us about how to deal with external images and the different approaches to colour and shape analysis. Although image processing plays an important role in attention to the road signs, especially in colour analysis. Convolutional Neural networks are widely used in the detection and recognition of road signs.

**Keywords:** Convolutional Neural Networks, detection, and recognition, image processing, shape and colour analysis.

## I. INTRODUCTION

Traffic signals are road resources that transmit, direct, impose, warn, or teach information using words or symbols. With the advancement of smart car technologies, well-known car companies, such as Mercedes-Benz, BMW, etc., have invested heavily in the ADAS (Advanced Driver Assistance System) study. Includes TSR (Traffic Sign Recognition) programs to remind drivers to pay attention to speed. If drivers and pedestrians do not notice this information, it could lead to road accidents. With the growing need for automotive intelligence, it is becoming increasingly important to identify and automatically detect road signs with the help of computer technology. Research in this area began in the 1980s, to solve this problem. For drivers to read and see, the road signs are usually designed in a certain way and have a certain colour inside, so that there is a big difference between the road signs and the rear. For example, a speed limit of 60 traffic signs is a circle with a solid number "60". These features are also important information for traffic signalling systems. However, recognizing traffic signals is not an easy task, as there are many negative factors, such as bad weather, variability of view, physical injury, etc.

## II. LITERATURE SURVEY:

The first research on road signage recognition can be traced back to 1987; Akatsuka and Imai tried to set up a traffic alert system early. A system that can automatically detect a road sign could be used as an aid to drivers, alerting them to the presence of a particular sign (example, a one-way street) or a dangerous situation (e.g.) driving at a higher speed than the allowed speed). It can also be used to provide autonomous unmanned specific design features. Generally, the process of a traffic signal recognition system can be divided into approximately two phases namely detection and classification.

## DETECTION

The principle of the detection of traffic signals is to determine the regions of interest (ROI) where the traffic signal is most likely to be located and to confirm the assumptions of the presence of the sign. The first phase of the detection of the traffic signalling system provides a high cost due to the large detection rate in a single complete image. To reduce space, the original location information should be disconnected. This process is called ROI. ROI detects traffic signs in an image based on the shape. Road signs are cut off and announced as an informed signal. The background image is advertised as an unwanted signal and removed by being described as a black pixel. With this in mind, much of the image can be overlooked. Traffic signs are designed with a specific colour and shape that makes them easily visible. Detecting traffic signals using only one frame image has some problems:

- 1) it is difficult to accurately see road signs when a temporary closure occurs; and
- 2) The accuracy of road signs is difficult to verify. Increasing the speed and accuracy of the acquisition of traffic signs in the following images by using information about previous images, such as the number of road signs and their predicted size and location, can be used. In addition, the information provided by the latest images is used to help ensure the correct acquisition of traffic signals, and thus those acquired and tracked traffic signals can reduce the processor load.

## CLASSIFICATION

Image segregation is the process of dividing a digital image into several segments (pixel sets, also known as large pixels). The goal of separation is to make it easier and/or to transform the representation of an image into something realistic and easy to analyse. Binary image classification is a digital image with only two values possible per pixel. The pixels used to represent the object and background are white and black respectively. Based on the partitioning process, the method used to distinguish a traffic signal is a binary split method. Indicators for each traffic are collected based on the value of white and black pixels. These values are matched to the number of white and black pixels in the image data.

**PROPOSED SYSTEM**

The contribution of this paper will be double; one is to create a new Indian Traffic website and road signs and the other develops and designs CNN's deep architecture of Indian Traffic sign recognition. The set of data collected is provided as an input into CNN's proposed structure for training, validation, and testing. Once CNN is trained, it is ready to be used to separate new images that were not part of the collected data. The AATS system relies on a group of standard Indian Traffic signs. In recent years, several writers have done work in the field but according to the author, it is the first time that the full Indian Traffic database has been developed. Deep CNN Architecture is also proposed to recognize Indian traffic signals. In general, CNN incorporates many hidden layers between inputs and outputs. The proposed CNN construction was done using Python.

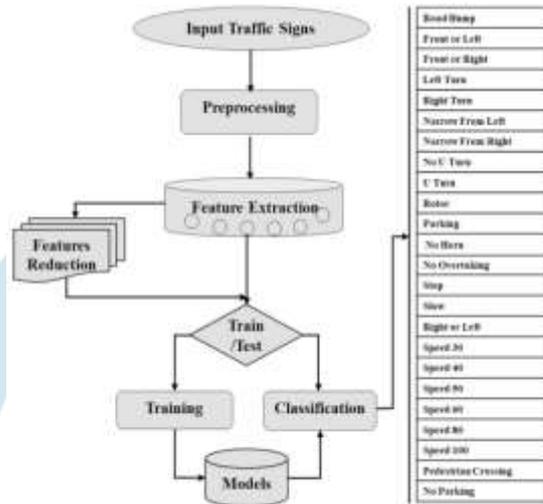


Figure 1 block diagram of supervised learning

**III. METHODOLOGY**

The algorithm for detecting traffic signals using the image processing method has been developed by combining several methods such as binarization, ROI, and pixel matching. Binarization is the first process used in a traffic signal image. The binarization method ensures that the image is in good condition before using the ROI method.

**Binarization:**

In the first step, all images are converted from the RGB colour space to black and white colour space. Therefore, the red circles for each image are obtained by the black and white pixels that fill the space. Figure 2 shows the image converted from RGB colour (Red, Green, and Green) to black and white pixels using the image processing toolbox.



Figure 2(a)



Figure 2(b)

**Figure 2: RGB to binary image conversion.**

**Region of interest:** Region of Interest (ROI) places a traffic sign in the image frame. Using the ROI method, most of the images can be ignored by declaring another pixel as a background. A circular road sign is a commonly used shape for a road sign. Therefore, the shape of the circle was the first sign of the initial reduction of the search area, followed by the geometric edges and corners. The algorithm of ROI is formulated as equation 1.

$$ROI = poly2mask (r*\cos (t) + c (1), r*\sin (t) + c (2) \dots \dots \dots \text{equation 1}$$

Where

t = Approximate circle with 50 points

r = radius

c = [X axis, Y axis]

Figure 3 shows the different levels of the shape of the circle. ROI is based on the various radius of the circle. Figure 3(a), (b), and (c) show the real image of the no entry sign, circle cropped method with 70 points, and circle cropped method with 100 points respectively. The cropped circle is converted from RGB to a binary image.



**Figure 3(a):** No entry sign

**(b):** ROI with 70 points

**(c):** ROI with 100 points

**Pixel Classification Method:** Image classification is often used to classify objects or important information into several groups. Focusing on the purpose of the project, white and black pixels are allocated to different regions based on their strength values. Each pixel in the same group contains the same pixel thickness. Based on the partition method, the total pixel value is calculated separately and compared to the total pixel value on the template website. Different values for the total number of pixels show images of different traffic signals. The algorithm for pixel classification is as follows:

- 1) Amount of black pixel = Sum (Sum (Image==0));
- 2) Amount of white pixel = Sum (Sum (Image));
- 3) Total amount of pixel = Rows\*Columns
- 4) Percentage of black pixel =  $100.0 * \text{amount of black pixel} / \text{Total amount of pixel}$
- 5) Percentage of white pixel =  $100.0 * \text{amount of white pixel} / \text{Total amount of pixel}$

#### IV. CONCLUSION:

Traffic sign recognition is a very useful way to assist drivers in increasing traffic and driver safety. In this project, low computational complexity, and flexible and precise methods were used to extract and monitor the contents of each road sign. Several strategies and methods have been used to identify traffic signals such as binarization, region of interest (ROI), and pixel segments proved effective. The system has been proven to produce high accuracy detection based on various conditions such as image capture angle, day, night, and more. Tests show that average visibility can be up to 35% on a blocked traffic sign. The highest accuracy was obtained at 99.9% during the day. Honesty is a very important factor. However, the acquisition of a traffic signal may involve the same difficulty as the detection of an object in an external environment as light conditions change depending on the weather. The presence of other objects at the scene such as moving cars, bicycles, pedestrians, and shop signs also gives visual impairment. Prolonged exposure to sunlight and the reaction of paint reduce the color of road signs. Photographs were taken in a moving car also reduce the quality of the image due to the blurring of movement and vibration of the vehicle. For these reasons, the reliable detection of traffic signals in such forums becomes a challenge.

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