# LITERATURE SURVEY ON A COLOR AND SHAPE BASED REAL TIME TRAFFIC SIGN DETECTION AND RECOGNITION SYSTEM

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**Abstract**

Traffic or Road sign Detection and recognition is a new research area in traffic control system. It is a real time system. It is also known as a Driver Assistant System(DAS) which is useful to the driver to provide information regarding the traffic rules, instructions and information given on the road at the time of driving. This paper gives brief about literature survey of traffic sign recognition and detection system and proposes a new model for the same to overcome the limitations of existing systems.

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## Introduction

A traffic sign detection and recognition system is basically a real time system. Lots of work has been done in last decade in this field. This paper gives the brief information regarding the traffic signs recognition system and the work done in past. Traffic sign detection and recognition system is a Driver Assistant System (DAS).

Traffic signs or road signs are signs erected at the side of or above roads to provide information to road users. In the earlier time stones and wooden signs were used. Later, signs with directional arms were introduced. Now a day pictorial signs are used which use symbols rather than words. Such signs were first developed in Europe and adopted by the most of the countries.

## Types of traffic signs

There are several hundreds of traffic signs available to handle different situation at the time of driving. They can be classified into three main categories:

- Mandatory Signs
- Cautionary Signs
- Informatory Signs

**Mandatory Signs**: These signs require the driver to obey the signs for the safety of other road users. These signs use red circular or octagon boarder with white blue or background and black pictogram.

**Cautionary Signs**: These signs are for the safety of drivers and advice them to obey these signs. Generally it uses red triangle with white background and black pictogram.

**Informatory Signs**: These signs provide information to the driver about the facilities available ahead, and the route and distance to reach the specific destinations. These signs use rectangle shape of blue boarder with white background and black pictogram.

Figure 1 shows the examples of traffic signs.


| Straight prohibited or no entry | Speed limit | Horn prohibited | Right turn prohibited | Trucks prohibited |
|---|---|---|---|---|

(a)

| Right hand curve | Narrow road ahead | Cross road | Dangerous dip | Gap in Median |
|---|---|---|---|---|

(b)


| First - aid post | Eating place | Public telephone | Petrol pump | Hospital |
|---|---|---|---|---|

(c)

Figure 1: (a) Mandatory Signs , (b) Cautionary Signs and (c) Informatory Signs

Types of approaches used in Traffic Sign Recognition (TSR) are:

- Color based recognition
- Shape based recognition

**Challenges in TSR:**

- The Location of the signboard.
- Lighting condition

- Weather condition
- Shadow effect
- Signboards may be occluded by trees, poles, or other vehicles.

## Previous work

The research for detection of signs had been started in the recent past (from 1984 onwards). Many researchers have done lots of work, but the satisfactory results are pouring in since 2000 onwards.

The following table 1 shows the summarized work previously done by the researchers.

| Year of Research | Researcher | model used | Interested color | Techniques used |
|---|---|---|---|---|
| 1994 | Giulia Piccioli, Enrico De Micheli, and Marco Campani.[1] | Shape based | - | Geometrical analysis of the edges |
| 2000 | J. Miura, T. Kanda, and Y. Shirai[2] | Shape based | - | Pattern Matching |
| 2001 | S.-H. Hsu, C.-L. Huang[3] | Color bsed | Red | matching pursuit (MP) filters |
| **Year of Research** | **Researcher** | **model used** | **Interested color** | **Techniques used** |
| 2002 | A. de la Escalera, L.E. Moreno, M.A. Salichs, and J.M. Armingol[4] | Color based | Red | color thresholding and Neural Network |
| 2003 | Chiung-Yao Fang, Sei-Wang Chen, and Chiou-Shann Fuh[5] | Color and Shaped based | Any | color thresholding and Neural Network |
| 2004 | G. Loy and N. Barnes[6] | Shape based | - | symmetry transform |
| 2005 | Aryuanto Soetedjo and Koichi Yamada.[7] | Color based | Gray | color thresholding and ring partitioned method |
| 2005 | Hasan Fleyeh.[8] | Color based | Any | color thresholding and Fuzzey sets |
| 2005 | P. Gil-Jiménez, S. Lafuente-Arroyo, S. Maldonado-Bascón, H. Gómez-Moreno[9] | Shape based | - | Support Vector Machine (SVM) |
| 2005 | C. Bahlmann, Y. Zhu, Visvanathan | Color and | Gray | Ada-Boost and Haar |

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|---|---|---|---|---|
| | Ramesh, M. Pellkofer, and T. Koehler[10] | Shaped based | | wavelet features |
| 2006 | XW Gao, L. Podladchikova, D. Shaposhnikov, K. Hong, and N. Shevtsova[11] | Color and Shape based | Red | FOSTS model |
| 2006 | M.A. Garcia-Garrido, M.A. Sotelo, and E. Martm-Gorostiza.[12] | Shape based | - | Nurual Network, Kalman Hough transform filter |
| 2007 | Andrzej Ruta, Yongmin Li, Xiaohui Liu[13] | Color and Shape based | Any | Hough transform, Colour Distance Transform (CDT), Kalman filter |
| 2007 | Bram Alefs, Guy Eschemann, Herbert Ramoser, Csaba Beleznai[14] | Shape based | - | Edge orientation histograms. |
| 2008 | Pedro Gil Jimenez, Saturnino [15] Maldonado Bascon, Hilario Gomez | Shape based | - | Fast Fourier Transform (FFT) |
| **Year of Research** | **Researcher** | **model used** | **Interested color** | **Techniques used** |
| 2008 | Paolo Medici, Claudio Caraffi, Elena Cardarelli, Pier Paolo Porta[16] | Color and shape based | Red, Blue, Yellow and White | multi-layer perceptron neural network |
| 2008 | Carlos Filipe Paulo, Paulo Lobato Correia[17] | Color and shape based | Red and Blue | Pictogram Contours, curvature scale space (CSS) representation |
| 2010 | Jerome Ninot,Laurent Smadja, Kevin Heggarty[18] | Shape based | - | Hybrid evolutionary algorithm |
| 2011 | H. Fleyeh and E. Davami[19] | Color and shape based | Red, Yellow and White | Eigen based , color thresholding |
| 2011 | Fredrik Larsson and Michael Felsberg[20] | Shape based | - | Fourier descriptors |
| 2011 | Pierre Sermanet and Yann | Color based | Gray | Convolutional |

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|---|---|---|---|---|
| | LeCun[21] | | | Networks |
| 2011 | Radu Timofte _ Karel Zimmermann _ Luc Van Gool[22] | Color and shape based | Any | AdaBoost and Haar like features, SVM and Hough transform |
| 2012 | Thongchai Surinwarangkoon, Supot Nitsuwat, Elvin J. Moore[23] | Color based | Any | Color filtering and segmentation, particle swarm optimization |
| 2012 | Miguel A. Garcia-Garrido, Manuel Ocana , David F. Llorca , Estefania Arroyo , Jorge Pozuelo and Miguel Gavilan[24] | Shape based | - | Hough transform, Support Vector Machines (SVM). |
| 2012 | Xiaoguang HU , Xinyan ZHU , Deren LI [25] | Shape based | - | visual attention mechanism |

Table 1 : literature survey of TSR

Hence, there is a need of a traffic sign detection and recognition system, which can overcome the limitations of existing system for the same.

**Structure of traffic sign detection and recognition system:**

The new traffic sign detection and recognition system has following modules and flow of the modules are as below:

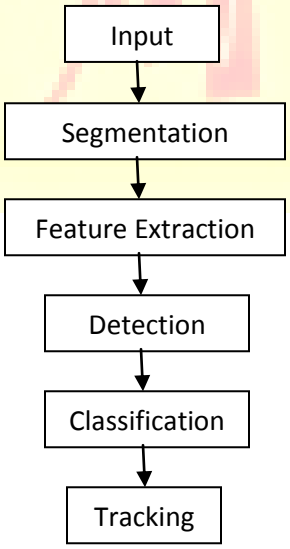

Figure 2: Flow of Traffic Sign Detection and Recognition

**Input** : Video file captured by the camera mounted on the top of the vehicle desk can be used as an input

**Segmentation** : The segmentation block generates a number of binary masks to separate the objects of interest from the background

**Feature Extraction**: Information about traffic symbols, such as shape and color,can be used to place traffic symbols into specific groups

**Detection** : A common implementation is the identification of the shape of the blob, and its classification into a small number of reference shapes. Normally, the equilateral triangle, the octagon, the rectangle and the circle are the most common.

**Classification** : This is the step where the decision has been made that whether the selected sign is in the predefined list or not.

**Tracking** : Tracking is the act of following a sign through several frames.

**Experimental Results**


Figure 3: images of the traffic sign recognition system

**Conclusion**

In previous research work it can be noted that no one method is found which produced 100% success result. Some methods work only with day time. Some are not appropriate for bad weather condition etc. In proposed traffic sign recognition system efforts will be done to remove the limitations found in the previous work and to develop a system with minimal difficulties which are faced due to weather conditions, lighting condition, shadow effect etc. The prototype of the model is implemented and experimental results are discussed here.

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