

# An Evaluative Survey on Traffic Sign Detection and Recognition Methods: A Review

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**Abstract**—Traffic sign detection and recognition system is an imperative technology in emerging world to identify, detect, recognize and monitor the traffic signs to help the driver to provide robust and reliable drive based on image data retrieved. TSDR system recognizes the traffic sign from a large database on the basis of color, shape & texture. To retrieve the images of traffic signs, the driver holds a large database formed by various feature vectors. In this paper we present the comprehensive survey on various traffic sign detection and recognition methods evolved over the decade. The main objective of this paper is to study and analyze the growing changes made in TSDR over past few years.

**Keywords**—TSDR (Traffic sign detection and recognition), color, shape, texture, image retrieval.

## I. INTRODUCTION

The Traffic sign Detection & Recognition (TSDR) system is an extensive need of our daily vehicles. It is an advanced emerging technology by which a vehicle is able to recognize, detect and identify the traffic signs leading to provide vital information to the driver. TSDR uses various image processing techniques to uniquely identify the traffic signs. The traffic signs are detected based on some features such as colour, shape, size etc. There are various methods to identify the traffic signs based on colors and shapes and hybrid methods. Traffic sign detection & recognition (TSDR) helps the driver to identify the signs even in adverse climatic conditions which leads to reminding the driver to reduce the speed or perform necessary action according to the sign. With

the increasing necessity of intelligence in vehicles, it is extremely important to detect, recognize and identify the signs accurately and respond the respective information to the driver to perform the action. Earlier the research started in 1980s to overcome the problem of not being able to identify the signs that are at significant distances or damaged signs due to some climatic events. Image color and shape based detection methods are used to locate and determine the potential signs in each frame. The main challenging problems in TSDR are visual obstacles due to bad climatic conditions, blurred images of signs as vehicle is in motion, multiple signs in one single frame of image, Images gets distorted due to various angles of road signs, Signs varies in sizes as the vehicle is moving, the shape detection may be disturbed due to visual obstacles. Our aim is to comprehend the evolution of TSDR system over the period of decade and to review the various concepts on methods used to identify the traffic signs based on various color, shape, size and texture features. And to finally draw the conclusion on how we can enhance the TSDR system to generate highly efficient performing system which is reliable and robust even in bad weathers. We identify the various techniques used in TSDR based on different feature vectors.

## II. RELATED WORK

In Early 90s the emerging technology for detection of traffic signs was developed to help the drivers understand the traffic signs from distance and robust their drive on the basis of warning generated to give them direction or vital information about the sign. As the technology trends emerges towards the new inventions there was a rapid growth in performances of TSDR by overcoming the challenges over a decade. The following works depicts the increment in enhancement of technology in TSDR. As of now machine learning and Artificial intelligence techniques

such as Convolution neural networks and deep learning provides the system with great capabilities. **Ravindra S. Hegadi** [4] proposed an algorithm for automatic recognition of traffic sign that mainly resolves the problems existed in the process of recognition and detection of traffic signs. The proposed method detects the location of the sign in the image and on the basis of geometrical characteristics identifies the signs using color information. **Ruben Laguma et al** [5], they presented a novel approach by developing an application software that recognizes and classifies traffic signs from an input image. Application software build by them follows image processing techniques to uniquely identify the traffic sign patterns. The performance of their application is dependent on the quality of input image in relation to its size, contrast and appearances'. **Mohamed Yusof Radzak et al** [6] presented an algorithm on traffic sign recognition & detection. The computational stages involved are detection and classification. The proposed algorithm detects the traffic signs by using convert of region of interest (ROI) to region mask methods. The proposed method extracts the sign by using black and white pixels which are further classified into groups. Resulting to this it provides less complexity in computation, more accurate results and adaptive mechanisms to detect the traffic signs more efficiently than before. **Safat B wali et al** [7], they presented an comprehensive survey on traffic sign detection and recognition system based on image and video data. It also focused on the current trends and challenges emerging the field of TSDR. It identifies the various difficulties and challenges that need to be considered while building TSDR system to provide robust and efficient and reliable performance of the system. **Prof. Abhinav V. Deshpande** [8], proposed an brief overview of traffic sign detection methods. The methods described in this brief are mainly divided into three major categories. First one is the methods based on color, whereas second is methods based on shape followed by learning-based detection methods. In the proposed study the various mechanisms and techniques used based on color, shape and learning vectors. It provides a brief understanding of how different colors, shapes and sizes can be used to detect the signs. **Majid Khalilikhah et.al** [9], provides an analysis of factors temporarily impacting traffic sign readability. It focuses on identifying the most relevant factors contributes to affect the traffic signs and make the signs dirty or not understandable. Tests like Chi-square was implemented to analyze the data which helps in ranking the factors affecting the traffic signs. Random forests statistical methods were also used.

### III. TSDR FUNDAMENTALS

Traffic signs detection and recognition is that the new emerging advanced driver system that uses various emerging technologies to spot the traffic signs and help the driving force to robust the drive. The TSDR captures the image of the traffic sign and compares the image with the present large database available at the vehicle. There are many popular traffic datasets available round the world a number of them are given below :

- German TSR Benchmark (GTSRB)

- KUL Belgium Traffic Sign Dataset
- Swedish Traffic Sign Dataset

The traffic signs detection and recognition system is extremely divided into phases that has pre-processing of information, detection of signs from the image, tracking of signs and recognition of signs uniquely. Within the first phase of TSDR i.e. pre-processing phase, the foremost aim is to strengthen the visual quality and appearance of the photographs, whereas within the second phase signs are segmented on the premise of color HSI and Shape dimensions. The third phase tracks the signs and recognition is completed leading the system to retort to the driving force to perform the suitable actions. Few non-identifiable signs which ends in increasing in difficulty to spot the signs are partially occlude traffics sign, faded traffic signs, multiple traffic signs etc.

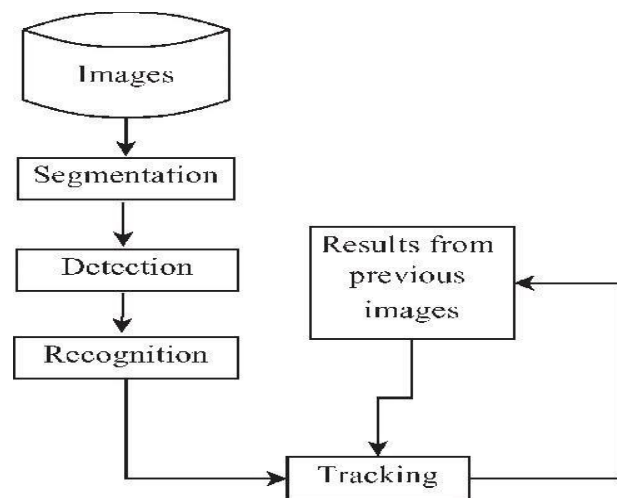


Fig 1. Block Diagram of TSDR

TSDR performs the sequence of process as given within the above block figure. The photographs are captured, segmented, detected and recognized to get useful information or warnings to the vehicle driver.

Traffic sign detection and recognition methods and techniques are majorly categorized on the feature vectors like color, shape and texture.

**I. Color Based Methods:** It mainly focuses on the on the red, green, blue (RGB) color space, the hue, saturation, and intensity (HSI) color space and various other color. The foremost commonly used methods are:

- Color thresholding
- REGION GROWING
- Color Indexing
- Dynamic Pixel Aggregation

**II. Shape Based Methods:** During this method it ignores the colour feature and detection is done by shape of the traffic sign. Number of contours defines the ultimate shape of the sign. The foremost commonly used shaped based methods are:

- Hough Transformation
- SIMILARITY DETECTION
- Distance Transform Matching

- Edge Detection Features
- Haar-like features.

**III.Texture Based Methods:** Texture refers to surface characteristics and appearance of an object given by the scale, shape density, arrangement, proportion of its elementary parts. A basic stage is to assemble features through texture analysis process called as **texture feature extraction**. The most commonly used methods in texture based methods are as follows :

- Structure Based methods
- Statistical methods
- Model Based methods
- Transform Based method

#### IV. CURRENT TREND AND CHALLENGES

In today's rapid emerging technologies, the TSDR has made a rising over a decade , the newest trends uses the colour, shape, size, texture and various other parameters that uniquely identifies and detects the signs. Machine learning technologies and methods like SVM for classification , Feature extraction, CNN, Hough transform, Neural networks to attenuate the effect of lightings and overcome the issues faced while capturing the images. There are many major issues that need to be considered while developing the TSDR a number of them are Variable lighting conditions, Fading and blurred effect, which may be resolved using adaptive thresholding method, Affected visibility and multiple appearances of sign may be resolved using HIS transform and Fuzzy shape recognizer so that the system identifies the signs even in difficult atmospheric conditions like sunny, cloudy, rainy etc. There are other effects like Motion artifacts which occur due to moving vehicle, Chaotic background and viewing angle problem which makes it difficult to focus and capture the image properly. Whereas the Damaged and Partially obscured signs may be reconstructed within the system. In real-time application , a quick non-complex computational algorithm is required to control even when the vehicle is moving and leading to high throughput of the system. Considering the varied factors mentioned , one stand-alone cannot resolve the problem, the TSDR must be enhanced and trained with multiple issue resolving capacity. Researchers have developed various techniques and methods to attenuate the effect of variable lightings ,motion blur, and blurring problem, But the perform all at once may be a trivial task.

#### CONCLUSION

The main objective of this paper is to research and evaluate the evolution of traffic sign recognition over a period of time. During this manuscript the overview of how the Traffic sign detection and recognition system evolved leading us to use the latest emerging technologies like machine learning and AI. After analysing number of paper we come to conclusion that TSDR uses multiple features of color, shape ,size,texture and plenty of more to come up with the knowledge to the driving force. We also encounter the very fact that for every feature vector there are multiple techniques and methods that helps us to reinforce the standard of the image. With the trendy evolution within the field of spontaneous TSDR system, Multiple machine

learning methods on various features will be implied. In future we can combine multiple techniques and methods to reduce the difficulties in TSDR especially to specialize in fast, reliable and real-time environments. We can hybrid different technologies together to develop an highly reliable system that is accurate and fast in computation of detection of the sign.

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#### REFERENCES

- [1] K. Rangarajan, M. Shah, and D. Van Brackle, "Optimal corner detector," Computer. Vision, Graph., Image Processing, vol. 48, no. 2, pp. 230–245, Nov. 1989.
- [2] Jacob Carlson and Sean St. Onge, "Traffic Sign Recognition Functional Description and Complete System Block Diagram", Project Report, Nov. 2007
- [3] Vavřík, J. Barták, P. & Čermák, R, "Traffic signs detection in image data", Advanced Engineering, Vol. 4, no. 2, 2010.
- [4] Ravindra S Hegadi "Automatic Traffic Sign Recognition", International Conference on Communication, Computation, Management & Nanotechnology
- [5] Rubén Laguna, Rubén Barrientos, L. Felipe Blázquez, Luis J. Miguel, "Traffic sign recognition application based on image processing techniques", The International Federation of Automatic Control Cape Town, South Africa. August 24-29, 2014
- [6] Rubén Laguna, Rubén Barrientos, L. Felipe Blázquez, Luis J. Miguel, "Traffic sign recognition application based on image processing techniques", The International Federation of Automatic Control Cape Town, South Africa. August 24-29, 2014
- [7] Safat B. Wali, Mohammad A. Hannan, Aini Hussain1, Salina A. Samad, "Comparative Survey on Traffic Sign Detection and Recognition: a Review", Przegląd elektrotechniczny, ISSN 0033-2097, R. 91 NR December 2015.
- [8] Prof. Abhinav V. Deshpande, "A Brief Overview of Traffic Sign Detection Methods", International Journal of Engineering Research ISSN:2319-6890 (online),2347-5013(print) Volume No.5, Issue No.2, pp: 141- 144 1 Feb. 2016.
- [9] Majid Khalilikhah, Kevin Heaslip, "Analysis of factors temporarily impacting traffic sign readability", International Journal of Transportation Science and Technology, Volume 5, Issue 2, Pages 47-110, October 2016
- [10] Yatham Sai Sangram Reddy, Devareddy Karthik1, Nikunj Rana, M Jasmine Pemeena Priyadarsini, G K Rajini and Shaik Naseera , "Traffic signs recognition for driving assistance" 14th International Conference on Science, Engineering and Technology (ICSET ) 2–3 May 2017, VIT University, Vellore, Tamil Nadu, India, Volume 263, Issue 5.
- [11] Jian-He Shi and Huei-Yung Lin, "A vision system for traffic sign detection and recognition", IEEE 26th International Symposium on Industrial Electronics (ISIE), PP 1596-1601, June 2017.

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- [12] Huei-Yung Lin and Shu-Chun Huang ,” Traffic Sign Detection and Recognition for Driving Assistance System”, Advances in Image and Video Processing, Vol 6 ,Issue No 3, PP 17-25 , ISSN 2054-7412,June 2018
- [13] A. de la Escalera, J. M. Armignol, and M. Mata, “Traffic sign recognition and analysis for intelligent vehicles,” Image and Vision Computing, vol. 21, no. 3, pp. 247–258.