LE_ROAD SIGN DETECTION

A Project Work Synopsis

Submitted in the partial fulfillment for the award of the degree of

BACHELOR OF ENGINEERING

IN

COMPUTER SCIENCE WITH SPECIALIZATION IN

ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

Submitted by:

20BCS6689 Sarthak Jain

20BCS6671 Toshiba Ansari

Under the Supervision of:

Namit Chawla

CHANDIGARH UNIVERSITY, GHARUAN, MOHALI - 140413,

PUNJAB

March, 2023

Abstract

This paper presents an overview of the road and business sign discovery and recognition. It describes the characteristics of the road signs, the conditions and difficulties behind road signs discovery and recognition, how to deal with out-of-door images, and the different ways used in the image segmentation grounded on the colour analysis, shape analysis. It shows also the ways used for the recognition and bracket of the road signs. Although image processing plays a central part in the road signs recognition, especially in colour analysis, but the paper points to numerous problems regarding the stability of the entered information of colours, variations of these colours with respect to the daylight conditions, and absence of a colour model that can led to a good result. This means that there's a lot of work to be done in the field, and a lot of enhancement can be achieved. Neural networks were extensively used in the discovery and the recognition of the road signs. The maturity of the authors used neural networks as a recognizer, and as classifier. Some other ways similar as template matching or classical classifiers were also used.

Table of Contents

1. INTRODUCTION

1.1 Problem Definition

According to global road crash data, roughly1.3 million people die in traffic accidents each time, making up,287 deaths each day. Unfortunately, drunk driving, reckless driving, fatigue, and motorist distraction continue to be the leading causes of road deaths. With moment's business control technologies, there is a good chance the auto mobilist will miss part of the business. An on- board computer vision system that can descry and identify business signs could help motorists avoid accidents in a variety of ways. The on- board vision technology might condense reality by displaying forthcoming warning signs ahead of time, or indeed keeping them shown on a screen after the sign has history. This would make it less likely that the motorist would miss an important sign. Business sign recognition is a system that allows a vehicle to descry business signs placed on the road, similar as" speed limit,"" children," or" turn ahead." It detects business signs using image processing ways.

1.2 Problem Overview

Considering the object recognition and interpretation capacities of humans, it's a hard task to try to develop a computer grounded system which should be suitable to support people in everyday life. There are a lot of conditions which are changing continuously similar as luminance and visibility, which are handled by the mortal recognition system with ease but present serious problems for computer grounded recognition. Looking at the problem of road and business sign recognition shows that the thing is well defined and it seems to be a simple problem. Road signs are located in standard positions and they've standard shapes, standard colours, and their pictograms are known. To see the problem in its full scale, still, a number of parameters that affect the performance of the discovery system need to be studied precisely. Road sign images are acquired using a digital camera for the purpose of the current analysis. Still, still images captured from a moving camera may suffer from stir blur. Also, these images can contain road signs which are incompletely or completely clotted by other objects similar as vehicles or climbers. Other problems, similar as the

presence of objects analogous to road signs, similar as structures or billboards, can affect the system and make sign discovery delicate. The system should be suitable to deal with business and road signs in a wide range of rainfall and illumination variant surroundings similar as different seasons, different rainfall condition. E.g. Sunny, foggy, stormy and snowy conditions. Different implicit difficulties are depicted in one section of this chapter. Using the system in different countries can make the problem indeed worse. Different countries use different colours and different pictograms. The system should also be adaptive, which means it should allow nonstop literacy else the training should be repeated for every country. To deal with all these constraints, road sign recognition should be handed with a large number of sign exemplifications to allow the system to respond rightly when a business sign is encountered.

1.3 Hardware Specification

1. Laptop with 8 GB RAM
2. Internet Connectivity

1.4 Software Specification

1. Python language
2. Deep learning framework such as TensorFlow, Keras, PyTorch.
3. Computer Vision libraries such as OpenCV, Scikit learn
4. Data Visualization libraries such as matplotlib, seaborn.
5. IDE such as Jupyter Notebook, VS Code
6. Python web framework such as Flask

2. LITERATURE SURVEY

2.1 Existing System

Important information about road limitations and conditions is conveyed to motorists via visual signals, similar as traffic signs and traffic lanes, in all countries throughout the world. Traffic signs are an important aspect of road structure since they convey information about the current condition of the road, as well as limitations, bans, cautions, and other nautical aids. The visual features of traffic signs render this information shape, colour and cipher. Disregarding or failing to see these traffic signs may contribute to a traffic accident, either directly or laterally. In bad traffic, still, the motorist may fail to observe traffic signs on purpose or by accident. However, the system can reduce a motorist's fatigue by aiding him in following the traffic sign, making driving safer and easier. If a motorist's inattention is compensated for by an automatic discovery and recognition system for traffic signs.

2.2 Proposed System

With the introduction of augmented reality technologies in some current automobiles, the field of traffic sign identification has gotten a lot of attention. The system is being developed in three stages: picture pre-processing, detection, and recognition. The traffic sign is captured by the camera and then pre-processed, which includes scaling, rotation. This information is then given to CNN, which predicts the proper traffic sign. This output is used to send a text message and a voice message to the driver. Scale conversion, and normalization, before feature extraction.

2.3 Literature Review Summary

Year and Citation	Article/ Author	Tools/ Software	Technique
2017	Tong Guofeng, etal. (IEEE Access, 2017).	Jupyter Notebook	Traffic Sign Recognition Based on SVM and Convolutional Neural Network
2019	Aashrith Vennelakanti, et al. (IEEE Access, 2019).	Jupyter Notebook/ VS Code	Traffic sign detection and recognition using a CNN Ensemble

2016	Sudha S.K, et al. (IJERT, 2016).	Jupyter Notebook/VS code	A Real-Time System for Detection and Recognition of Traffic Signs
2020	Nazmul Hassan, et al. (ICICCT, 2020).	Jupyter Notebook	Traffic Sign Recognition System (TSRS): SVM and Convolutional neural Network
2017	Swathi M, et al. (IEEE Access, 2017).	Jupyter Notebook	Automatic Traffic sign Detection and recognition in Video Sequences

3. Problem Formulation

Considering the object recognition and interpretation capacities of humans, it's a hard task to try to develop a computer grounded system which should be suitable to support people in everyday life. There are a lot of conditions which are changing continuously similar as luminance and visibility, which are handled by the mortal recognition system with ease but present serious problems for computer grounded recognition. Looking at the problem of road and business sign recognition shows that the thing is well defined and it seems to be a simple problem. Road signs are located in standard positions and they've standard shapes, standard colours, and their pictograms are known. To see the problem in its full scale, still, a number of parameters that affect the performance of the discovery

system need to be studied precisely. Road sign images are acquired using a digital camera for the purpose of the current analysis. Still, still images captured from a moving camera may suffer from stir blur. Also, these images can contain road signs which are incompletely or completely clotted by other objects similar as vehicles or climbers. Other problems, similar as the presence of objects analogous to road signs, similar as structures or billboards, can affect the system and make sign discovery delicate. The system should be suitable to deal with business and road signs in a wide range of rainfall and illumination variant surroundings similar as different seasons, different rainfall condition. E.g. Sunny, foggy, stormy and snowy conditions. Different implicit difficulties are depicted in one section of this chapter. Using the system in different countries can make the problem indeed worse. Different countries use different colours and different pictograms. The system should also be adaptive, which means it should allow nonstop literacy else the training should be repeated for every country. To deal with all these constraints, road sign recognition should be handed with a large number of sign exemplifications to allow the system to respond rightly when a business sign is encountered.

4. OBJECTIVE

The use of traffic sign recognition system is veritably grueling. Since rain, fog, snow etc. Affect the whole system. Another thing is the light variation i.e., murk, sun, shadows etc. The geometrical shape of the object and the perspective is also a big concern. So, we must be suitable to come up with a system which can work under light variation and geometrical metamorphosis of the objects in a scene. However, we're particularly interested in discovery of these signs

under low light condition. If we constrict down the compass. In short, our ideal is to make the system veritably accurate and effective. In the discovery stage, colour information is exploited to descry regions of interest (ROI) that may correspond to traffic signs. The shape of these regions is tested in the bracket stage, allowing rejecting numerous of the original campaigners and grouping traffic signs into classes. The cipher contained on each ROI (if exist) is uprooted, anatomized and compared with the cipher database. The stylish match between the ROI and database cipher, if high enough, is considered the sign that's more likely to appear in that ROI. Each honoured sign is part of the affair result of the recognition stage.

5. METHODOLOGY

1. DATASET:

Although the complication neural network has made remarkable achievements, the current operations in the field of traffic sign discovery and recognition are still not important. The reason for this is largely due to the lack of traffic sign data sets. Training and vindicating a deep complication neural network traffic sign recognition model requires a large quantum of traffic sign data as a base. Still, the open traffic sign datasets in India is fairly scarce compared with developing countries. More well- known traffic sign datasets now include GTSRB in Germany, GTSDB in Germany and KUL in Belgium. In this paper, GTSRB, GTSDB traffic sign datasets is used to traffic sign discovery and recognition. These two datasets

include numerous types of complex traffic signs similar as sign cock, uneven lighting, and traffic sign with distraction, occlusion and analogous background colors, as well as factual scene charts. Through a variety of complex and delicate to distinguish traffic signs to corroborate the capability of the algorithm.

2. PROPOSED METHOD:

The objective of this work is to develop a method to segment the traffic sign from the background image by applying various techniques like filtering, edge detection. The YCBCR conversion process used to compare the detected image with the datasets and Feature selection extraction is used to get the accurate symbol from the compared images.

6. EXPERIMENTAL SETUP

The trial was conducted on a CPU Intel Core i7- 6700K@4.00 GHz, a GPU GTX1080Ti, 12 GB of videotape memory, the Ubuntu Linux operating system, and a deep literacy frame PyTorch1.6. In addition, Python3.7 and Open CV3.41 were used for data addition. The proposed TS- Yolo model was trained using a back- propagation literacy algorithm with CIOU (Complete- IOU) as the loss function and the stochastic grade descent (SGD) as the optimizer. In the training, the literacy rate was set to0.001, the weight decay was0.0005, and 600 ages were executed for each training. CIO Loss (49) contained three corridor, i.e., object loss, bracket loss, and box loss. The proposed model was compared with the being state- of- art one- stage object discovery models, similar as Retina Net,

SSD, YoloV3, YoloV4, and YoloV5. These models were trained with the over- stoked dataset and validated with the confirmation dataset.

7. CONCLUSION

This study proposed an automatic traffic sign discovery, bracket and recognition system. The discovery of traffic signs, assumes a pivotal part in any traffic sign recognition operation. In fact, a sign that isn't rightly detected cannot be classified and honored to inform the motorist. In discovery step, the distinctive features of traffic signs shall be considered. Since, traffic signs are regulated to be in specific color and shape it's accessible to use those features to decide the campaigners. Also, in recent times, several point birth ways are preferred to get further distinctive features those cannot be observed directly, like color or shape. Thus, the discovery algorithms can be studied under “Color Analysis”. There are dominant colors used on traffic signs which are red, blue, green, orange, brown, unheroic and white. These colors can be set with certain thresholds and the relationships can be used to localize traffic sign. On captured images of real- world scenes, it isn't always possible to gain needed colored regions by applying thresholds directly to RGB color space, because of the changing illumination of the terrain. Thus, this willful factor shall be separated from color information. For this purpose, preferred approach is to work on different color spaces. The most generally used space in image processing is RGB color space; this space is grounded on mortal eye recognition. The RGB model assigns a range of intensity values from 0 to 255 for each pixel of RGB factors in images. Still, intensity values can be mixed in different rates, showing up to (256, 256, 256) colors on the screen. The bracket module takes the detected ROIs and classifies them into one of the considered classes peril, information, obligation or prohibition, or as anon-sign. In addition, Yield, Wrong Way and STOP signs are honored as special cases.

8. TENTATIVE CHAPTER PLAN FOR THE PROPOSED WORK

CHAPTER 1: INTRODUCTION

This chapter describe the brief information about the project on which we are working on i.e. Road Sign Detection.

CHAPTER 2: LITERATURE REVIEW

In this chapter a review of the literature and previous work is presented. It covers papers, technical reports and internet resources which were collected for review. The review includes the study and analysis of colour segmentation algorithms, shape identification and recognition, road sign classification, and pictogram classification. It also reviews the different techniques undertaken to achieve road sign recognition as a computer vision task. The chapter explores colour and its properties and stability when dealing with different light conditions and geometry. It concentrates on hue as the main source of information for colour segmentation.

CHAPTER 3: OBJECTIVE

This chapter describes the aims and objectives of this thesis and outlines its relationship to the field of intelligent transport systems.

CHAPTER 4: METHODOLOGIES

This chapter covers the methodology invoked to build the traffic sign recognition system. Image collection and the image database are presented at the beginning, followed by the colour

segmentation algorithms which were developed in this research. The chapter covers details of the recognition algorithm which was designed to identify traffic signs in the scene. Finally, the chapter describes the classification method used for traffic sign recognition.

CHAPTER 5: EXPERIMENTAL SETUP

This chapter presents details of the experimental work carried out to evaluate the various algorithms developed in the previous chapter. Colour segmentation algorithms were tested in different weather conditions, light conditions, and sign conditions. The same set of experiments was applied to the fuzzy shape recogniser. In the last part of this chapter another set of experiments was applied on the SVM classifier. The test includes training with different features, SVM types, kernels, and different moment orders. Finally, search for optimum values is presented.

CHAPTER 6: CONCLUSION AND FUTURE SCOPE

This chapter summarises the main contributions and conclusions gained from this research. It presents the future plans which can be implemented to improve the work and issues for further investigation.

9. REFERENCES

1. Traffic Sign Recognition for Computer Vision Project-Based Learning David Gerónimo, Joan Serrat, Antonio M. López, Member, IEEE, and Ramon Baldrich, August 2019
2. Road traffic sign detection and classification, A. De la Estalera, L.E.Moreno M.A.Salichs, J.M.Armingol, IEEE,December 1997.
3. An Automatic Traffic Sign Detection and Recognition System Based on Color Segmentation, Shape Matching, and SVM - Research Article,Safat B. Wali, Mahammad A. Hannan, Aini Hussain, and Salina A. Samad, November 2015.
4. R. Szeliski, Computer Vision: Algorithms and Applications. New York, NY, USA: Springer, 2010. G. Bebis, D. Egbert, and M. Shah, “Review of computer vision education,” IEEE Trans. Educ., vol. 46, no. 1, pp. 2–21, Feb. 2003.
5. P. Reimer, A. Albu, and G. Tzanetakis, “Raydiance: A tangible interface for teaching computer vision,” in Proc. 7th ISVC, Las Vegas, NV, USA, 2011, vol. 2, pp. 259–269.
6. C. Fang, S. Chen, and C. Fuh, "Road-sign detection and tracking," IEEE Trans. on Vehicular Technology, vol. 52, pp. 1329-1341, 2003.

7. J. Miura, T. Kanda, and Y. Shirai, "An active vision system for real-time traffic sign recognition," presented at 2000 IEEE Intelligent Transportation Systems, Dearborn, MI, USA, 2000.
8. S. Vitabile, A. Gentile, G. Dammone, and F. Sorbello, "Multi-layer perceptron mapping on a SIMD architecture," presented at The 2002 IEEE Signal Processing Society Workshop, 2002.
9. S. Vitabile, G. Pollaccia, G. Pilato, and F. Sorbello, "Road sign Recognition using a dynamic pixel aggregation technique in the HSV color space," presented at 11th Inter. Conf. Image Analysis and Processing, Palermo, Italy, 2001.
10. P. Paclik and J. Novovicova, "Road sign classification without color information," presented at Sixth Annual Conf. of the Advanced School for Computing and Imaging, Lommel, Belgium, 2000.
11. P. Paclik, J. Novovicova, P. Pudil, and P. Somol, "Road sign classification using Laplace kernel classifier," Pattern Recognition Letters, vol. 21, pp. 1165-1173, 2000.
12. E. Perez and B. Javidi, "Composite filter bank for road sign recognition," presented at 13th Annual Meeting IEEE Lasers and Electro-Optics Society, Rio Grande, Puerto Rico, 2000.