Automated Traffic Sign Recognition System using Computer Vision

M. Prabu, Pooja Patil, Mallika Yadav, Nidhi Ranjan

Abstract: ***There are many existing companies who are developing cars on the autonomous driving technology. With the help of GPS and internet connectivity they create a dynamic map which helps the cars to navigate. This technology is still new and undergoing rigorous changes. There are many shortcomings to this existing technology. They are capable of navigating through those areas which are accounted for and surveyed but when the car enters in any unchartered terrain or there is any internet connectivity issues, the updation in the map is not possible, which leaves the car to navigate on its own. This can cause many troubles like you can get late or maybe lost. So to overcome these problems we need such an intelligent system with the help of camera feeds can monitor and identify the traffic signals dynamically. Traffic sign recognition is based on Advanced Driving Assistance System (ADAS) which is used by vehicles to recognise various traffic signs ahead. The system takes continuous video input from the dashboard camera or the camera mounted on the bonnet of the car. The underlying algorithm extracts the features of the input image and matches them with an existing library of traffic sign. The output is fed to the driving assistance system and it in turn drives the car accordingly. This intelligent system uses computer vision. This device will take camera feeds and upgrade the ADA system instantaneously. The algorithm has been implemented using Python language.***

Keywords: ***Traffic signal recognition, Support vector machine, ADA, image segregation.***

I. INTRODUCTION

Traffic Signal Recognition is considered as an important aspect in Autonomous Driving. The Traffic Signal consists of two methods, observation and categorization. Traffic sign recognition. There are basically two forms of traffic sign recognition: detection and categorization. Camera and TSR are most popular detecting appliances.
Traffic sign detection (TSD) is the most important procedure in TSR which is a process of recognizing and locating signs. These recognized signs are taken as inputs for the system.

Revised Manuscript Received on November 06, 2019.
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The proper interpretation of road signs and traffic signs therefore plays a vital role and impacts on the process. Depending on the analysis of major colors such as black, red and yellow, previously various ideas of detection were developed that were primarily used to minimize the search space preferring. There are many ways designed for detecting shapes. Shape and edge detection methods are one of the methods used to draw out the correct position of the presented traffic sign. Recently, the methods of analysis that rely on machine learning are now common algorithms. Following are the important traffic sign detection systems: AdaBoost based detection, Support Vector Machine (SVM) based detection and Neural Networks (NN) based detection which have many derivatives with unlike input characteristic, distinct detection procedures.

II. LITERATURE SURVEY

In one of the papers [1] the study's main objective is to establish an effective TSDR program that comprises the purified collection of Malaysian traffic signs. The technique evolved is asymptotic in lighting, movement, adjustment and rendering angles and has low analytical duration of minimal misdiagnosis rate. Device design has three phases of work: object pre-processing, identification, and recognition. The software overview using RGB hue optimization and structure mapping accompanied by support vector machine (SVM) classification resulted in successful results in accuracy of 95.71 percent, misdiagnosis rate (0.9 percent) and CPU cycles (0.43 s).In order to statistically test the recognition efficiency, the field under the receiver operating characteristic (ROC) curves were added. The predictability of the program developed is comparatively high and the quantitative time is comparatively low, which will be useful in the identification of traffic signs, particularly in Malaysia. The small misdiagnosis rate on real-time application would improve system stability and performance.

In another paper [2], detection and identification of road signs are an important matter in recent research. Traffic lights and road signs have been constructed in compliance with strict guidelines using special colors and patterns that are very distinct from the surroundings. The ability for spatial interpretation depends on the individual's physically and psychologically circumstances. Under certain circumstances, these abilities may be impaired by several influences such as exhaustion and powers of observation. Tracking of administrative road markings from moving vehicles in external photos will allow the operator make the right choice on time, which ensures fewer accidents, minimal noise and improved safety. Road sign identification and recognition are two of the most important roles of

automated traffic sign control and in a network support for the tactile operator. This paper addresses automated identification of administrative road signs using attribute vectors from limit distance (DtBs) and middle distance (DfCs).Our program can recognize and interpret administrative street signs. The suggested identification system relies on the logical fallacy property of SVMs. The system includes of the aforementioned methods: pixel color optimization using linear SVM and Gaussian-kernel SVM object recognition, type detection traffic-sign analysis. In the final detection process, a study shows a significant accuracy rate and quite a small amount of detections.

[3] In this article, they provide a literature Traffic sign identification summary, definition of traffic sign recognition (TSR) driver support detection-systems. Current works ' approaches to the different phases of traffic sign analysis are described separately: optimization, removal of characteristics, and detection of specific signs. While TSR is a well acknowledged area of research, they deal with problems relevant to open literature studies, including lack of use of accessible to the public image tools of European traffic signs. In general, we are discussing potential approaches for TSR research, involving synchronization and interpretation of meanings. They are also introducing a new central registry of U.S. street signs.

This paper [4] presents the basic concept of an approach to the identification and interpretation of traffic signs in existing settings. The evolved technique is focused on the well-known Scale Invariant Feature Transform (SIFT) algorithm and the word process bag (BoW). The technique has the advantages of being effective in storage capacity and endurance and being able in the designs to accommodate design iterations. The results of rigorous testing on statistical data collections indicate that over 90% of traffic signs have been detected accurately by the methodology presented.

[5] The problem of identification of traffic signs is tackled with a CNN applied at 99.33 percent accuracy in Tensor Flow. The highlights of this strategy would be data pre-production, data increase stream, semi-training and network trailing links. Python is used as the language for programming and Tensor Flow as a system for machine learning that is relatively low.

A. Existing System

Summary of some reported TSR applications:

1. A TSR vendor support process can aid the operators by alerting forward road sign particulars, along with prohibitions, warnings and restrictions.
2. TSR systems are a very crucial part of driverless cars getting them aware of the current public road traffic regulations.
3. By sensing those types of signs forward, TSR can reduce energy intake by finding ideal traffic signs of velocity, reducing the use of breakage.

The drawbacks of existing system are:-

a) During internet connectivity issues or in unchartered terrain.
b) Small fuzzy traffic signs and high-resolution pictures. During bad weather and in nights.
c) Colour detection in RGB.
d) Costlier installation.

III. PROPOSED SYSTEM

Advanced Driving Assistance (ADA) system takes continuous video input from the console monitor or camera installed on the car's bonnet. The underlying algorithm extracts the features of the input image and matches them with an existing library of traffic sign. The output is fed to the driving assistance system and in turn drives the car accordingly. We have developed this intelligent system using computer vision (CV) or machine vision. This device will take camera feeds and upgrade your ADA system instantaneously. This algorithm has been implemented using the Python language.

IV. MATERIALS AND METHODS

A. Traffic Signs

Traffic sign are the road signs which are used to convey people or drivers about the condition ahead. It may be restrictions, warnings, text or image information. The mandatory traffic signs have basic shapes like triangle or circle.

Fig. 1. Traffic signs

Some common traffic signs are:

Fig. 2. Speed limit sign

i. It is used to set legitimate maximum or minimum speed at which the vehicle has to drive in that particular area.

Fig. 3. No u- turn sign

ii. It is used to inform the driver that there is no u turn or making a u turn will cause traffic problem.

Fig. 4. Stop sign

iii. It is usually used when traffic signal goes red, informing the cars drivers to stop and does not start the car until the pedestrians are crossing the road.

Fig. 5. No two lane

iv. It is used to inform the drivers that current road does not contain two lane.

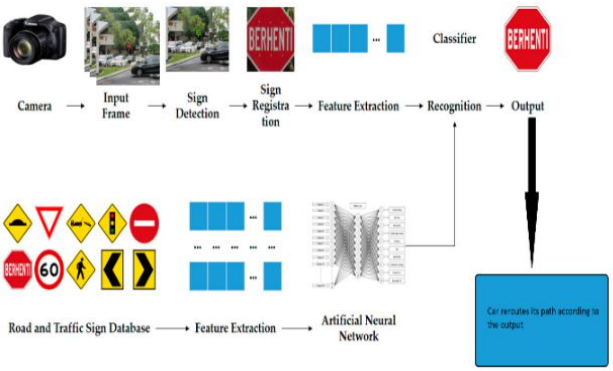

Fig. 6. Architecture diagram

V. MODULES

A. Camera

- Using a standard web camera mounted on a testing vehicle, an ongoing system has also been implemented.
- The web camera will take video feed as an input for further processing.
- First we have to analyse the images captured by the camera.

Fig. 7. Camera

B. Image/frame segregation

- It's a video feed acquisition system using web camera.
- It is used for segregation or partitioning of video feed into images or frames so that it becomes easier to analyse for ANN (Artificial Neural Network).
- After segregating the video into images, it partitions the image into different sets of pixels called super-pixels.
- Each pixel has some definite properties which helps in recognising the image.

Fig. 8. Segregation

C. Detection and evaluation engine

1. For the process of visual imagery, ANN (Artificial Neural Network) or CNN (Convolution Neural Networks) are used.
2. It is a self-learning network which uses deep learning domain to process pixel data.
3. From the input data, it will automatically detect theimage configuration fromthe previous given sample without the need of any new programmed tasks.
4. Then the image detected is verified by already stored library functions for further evaluations.

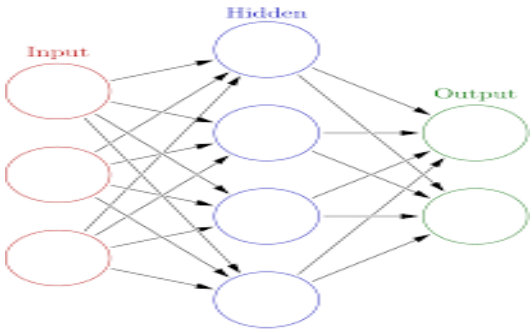

Fig. 9. ANN

D. Processed traffic sign

- The obtained output is then used to instruct the testing vehicle.
- The testing vehicle then automatically determines its path depending on the output.

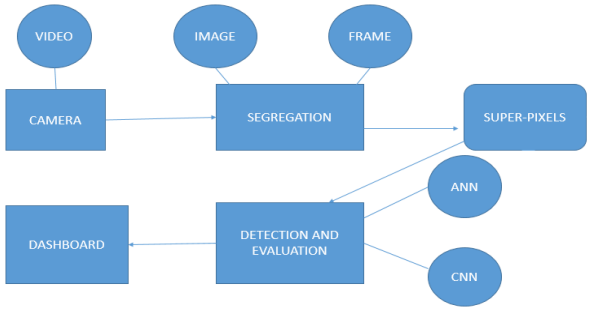

Fig. 10. Flowchart

VI. CONCLUSION

The color based techniques used in TSR are rather simpler to test and execute. Big methods for generating ROIs are available for detailed analysis. In order to quickly detect the color of vehicles color detection color detection method is a good way. Seeing the edge detection many shape based ways are acceptable. A good color enhancement technique is required to identify traffic signs with tiny edges. The color and shape-based procedures can be developed for ROI withdrawal. The province of the art outcomes are obtained through the learning methods of the computer. High performance has been reported by the previous TSD methods which have been tested on some public datasheets. To test TSD ways that are designed for traffic signs from many other countries, some new public data sets are needed. Bad or extreme weather such as heavy rain, fog, mist or snowfall have a great effect on the images captured by cameras.

So to tackle this problem new ways and datasets are needed to improve the image quality. All situations can be managed by LIDAR.

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