Road Sign Detection And Recognition System-A Review

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Abstract- *This paper presents a survey on the detection and recognition of Traffic signs which has a number of important application areas that include advanced driver assistance systems, road surveying and autonomous vehicles. A challenging problem in computer vision due to the different types and the huge variability of information's present in them. This problem can be divided into two stages; first stage will be detection of region that contains traffic sign candidates and second will be character recognition. For the detection and recognition of text and sign from traffic boards, appropriate methods must be applied to obtain accuracy. This method can be achieved by doing a survey on different methods used to detect and recognize text and signs from traffic boards. Safety and comfort of road users is becoming mandatory. Hence a reliable and safe system for traffic control and management is required. Various literatures are included representing the idea of vehicle speed control and traffic rules violation using the concepts of Radio Frequency Identification and Image Processing. In this paper, various techniques for the detection and recognition of traffic signs are explained. A comparative study is performed on these techniques and their performance is explained.*

Keywords- Sign Board Detection and Recognition, RGB Model, HOG feature, SVM and CCN Classifier, GSM, RFID Technology

AIM: recognition and detection of road sign using cascaded process and traffic rule violation using rfid technology.

I. INTRODUCTION

Road signs are used to regulate traffic, warn drivers, and provide useful information to help make driving safe and convenient. The traffic signs can be divided into several categories, based on their colour and shape. The design and use of road signs have been established long, they do not provide a perfect solution to make driving a safe one, partly because due to the fact that drivers are human only. Most of the accidents have been caused by the failure of the driver to notice a stop sign, due to the lack of concentration at that moment or due to adverse conditions that impede visibility. In bad weather situations traffic signs are less likely than normal to attract driver's attention. All these situations make driving more difficult and so, can lead to more and more traffic accidents. The computer vision systems are now increasingly being used to aid or replace human beings. Traffic Sign Recognition technology with ADAS systems help the driver in the driving process. They automate vehicle systems for safety and better driving. Safety features are efficiently designed to avoid traffic collisions and accidents by offering methods that alert the driver to potential traffic problems, taking control over the vehicle. Automatic traffic sign detection and recognition enhances safety by informing the driver about speed limits or possible dangers. Several methods have been proposed to detect and recognize the traffic signs present on the roads. Traffic Control and Management System is important nowadays, to have a safer and much reliable system. The existing system needs monitoring of traffic rule violation automatically without manual help. It is done with the help of active RFID tag and reader. With the help of GSM, the UART messages are sent to user and RTO. This paper presents a survey on various techniques. A comparative study is performed on these techniques and their performance is explained.

II. LITERATURE SURVEY

Yubing Dong, Mingjing Li et al [1] has proposed a Canny Edge Detection Algorithm involving several modules for edge detection technique. Gaussian filter is applied for smoothening the image for suppressing the noise components. After this the intensity gradients of the image are calculated using Sobel filter. Then a particular threshold is selected in order to suppress the noise component and to determine the exact edges. Then double threshold is applied in order to determine the accurate edges. After the determination of strong and weak edges, in which weak edges are the actual edges. This is implement using hysteresis and it is carried out in such a fashion to determine the final strong edges. Finally, the weak edges are set the value to zero, which results in the final image. This algorithm is used to highlight the edges so as to compare the traffic sign with the provided data set for image recognition.

Yi, Hengliang Luo, Huarong Xu et al [2], deals with real time traffic sign recognition. To achieve this goal, two module frame work is proposed [detection module and classification module]. In detection module input image is transformed into probability maps using colour probability model. Later the Traffic sign proposals are extracted on recognizing the maximally stable extremal regions in probability maps. After this, an SVM classifier with colour HOG feature is used to filter out the false positives and to classify the remaining proposals to the super classes. Finally, in classification module, CNN is used to classify the detected signs to their subclasses within the super classes.

Yi yang, Fuchao Wu et al [3], deals with real time traffic sign recognition system where the area of an input image requires faster processing time. The traffic sign extraction and the classification of the system will be built upon a colour probability model and MSER. This model was used to enhance particular colours (red, green, blue) of traffic signs used to reduce the background colour and space. To reduce the detection time and to classify traffic signs some machine learning techniques where used as (SVM, CNN). The traffic sign detection was to find the actual location and the sizes of traffic signs using region of interest (ROI) and the sliding window. The sliding window uses HOG and SVM techniques. The traffic sign ROI can be done for smaller and larger sized window. The traffic sign classification can reduce the traffic sign into sub classes. A good method of classification will be Convolution network. CNN has outperformed the human performance in the classification of the signs.

Yan Han and Erdal Oruklu et al [4], deals with the NVIDIA jetson TX1 based traffic sign recognition system for driver assistance application. This system is implemented on NVIDIA jetson TX1 board with web camera. The system performs two operations namely traffic sign detection and recognition. Image colour and shape-based detection is used to locate potential signs in each frame. The pre-trained convolution neural network performs classification on potential sign candidates.

Jian-He Shi and Huei-Yung Lin et al [5], deals with an automatic traffic sign recognition system were the videos are recorded from an on-board dashcam. The images captured from the dashcam are processed using histogram, followed by vector machines to detect traffic signs. New sensing technologies including laser rangefinder, GPS, computer visions are very popular for advanced driver assistance system (ADAS). In the recent times, people drive cars more frequently, causing more safety problems. To make the drivers pay more attention to the traffic signs, different colours and simple shapes are usually used. Most traffic sign detection techniques use colour information to select the road sign region in the image. Either the RGB image input is used directly, or transformed to HSI colour space and using hue channel to extract the red colour region. For e.g. tires, advertisement sign boards and lane stripes could also be detected as traffic signs. To remove the wrong detection regions, Vertex and Bisector transform (VBT) and colour information were used to view the road signs. The input images are resized from original image to smaller ones so that detection can be done faster.

D R Agarwal, Kasliwal komal S et al [6], deals with the traffic violation detection through RFID sensors, reader and capturing the image of the violating vehicle's number as a proof of violation. The paper also involves in updating of the violation of traffic rules to both public sector (traffic police department) and private user (violator) through a common APP - Vehitrack. Every vehicle with unique RFID tag has data of the owner such as name of the owner, address, licence number, photo, passing number, mobile number, mail address and bank account details. Android application will deduct the penalty as per the allocation from the violators account directly with a notification to the vehicle's owner. This method reduces the corruption by the traffic police and benefit to the government. A severe action can be taken against the owner if there are many traffic violations with proof of violations in the database of the application.

Chunsheng Liu, Faliang Chang et al [7], deals with high-performance traffic sign recognition (TSR) framework to rapidly detect and recognize multiclass traffic signs using high-resolution images with high accuracy, blurred edges and partial occlusions that can be used for autonomous driving. ROI extraction is used to reduce the search space. Traffic sign detection is used to locate the accurate position of traffic signs in an entire image extracted. After the segmentation of ROI, multiclass traffic sign detection based on the SFC-tree detector is used to detect different types of traffic signs. The SFC-tree detector is fast and accurate multiclass system, which can rapidly detect a wide variety of traffic signs without using any colour information, but are not reliable. Identity. SVM provides an effective tool with HOG features for verification problem and have high accuracy. SFC-tree traffic has very quick detection time when combined with the HCRE.

Saritha M, Rajalakshmi S, Angle Deborah S et al [8], deals with main features (a) Traffic violation detection and (b) Traffic flow analysis system where both uses RFID technology. Each vehicle consists of unique RFID tag either passive or active with an inbuilt microchip which consists of necessary data. RFID reader along with Arduino Uno board

reads the data from RFID tag using radio frequency waves and data is transmitted to the RFID database. The information processed by the server and if there is any violation penalty is imposed as per the allotted charges. In Traffic Flow Analysis System RFID reader recognises and calculates the traffic of the area depending on the length, width of the road and the density of vehicles within the range.

T K Sethuramalingum, R Narthana Devi et al [9], proposed the idea of speed control of motor vehicles using GPS and GSM. A combination of both these technologies is used for improving the accuracy and reliability, GPS value obtained from the satellite's continuously displayed on the LCD screen. When vehicle enters a pedestrian zone, the GPS value of the zone is transmitted to the vehicle through ZigBee transmitter fixed in the zone. The GPS values of vehicle and pedestrian zone are compared and then the instantaneous speed of the vehicle is compared with the speed limit prescribed. If instantaneous speed is greater, then the speed is reduced by sending appropriate commands to ECU. By referring these values, the condition of the vehicle can be sent through GSM as a SMS and can be displayed on LCD.

Leena Thomas, Swetha Anaujames et al [10], proposed the idea of Traffic sign recognition using RFID technology and control the vehicle without intervention of the driver if the signs are not followed. The RFID tags contain speed limiting information mounted at the beginning and end of the speed limit zones. The receivermodule placed in vehicle detects the signal transmitted and the decoded information is conveyed to the driver by means of LCD placed on the dashboard of the car. If the driver does not limit the speed within the specific interval of time then the controlling unit placed in the car takes corrective measures by itself and the required speed limit is achieved. For demonstration purposes a 12V DC motor is used to represent the engine of the car.

III. COMPARISON TABLE

SL NO	Name of the paper	Methodology	Merits	Demerits
1	Traffic Sign Recognition improved based on Canny Edge Detection Algorithm.	Canny Edge Detection Algorithm.	1) Presence of Gaussian Filter removes noise. 2) Detection of edges in a noisy state by applying threshold method.	Consumes a lot of time due to its complex Computation and detection of Traffic Sign covered by snow is not possible.
2	Towards Real Time Traffic Sign Detection and Classification.	Color Probability Model, SVM classifier and HOG based approach.	1) Improved Computational Efficiency. 2) Fast processing time.	Classification results needs improvement with varying illumination.
3	Traffic Sign Recognition using Multi task Convolution Neural Network.	Multi task convolution neutral network and ROI based system.	1) Results in higher accuracy up to 96%. 2) Could be accelerated using the GPU, to improve efficiency.	Complex algorithmic procedures are implemented which is a major challenge
4	Traffic Sign Recognition on NVIDIA Jetson TX1 embedded system using convolution Neural Network.	Image color and shape based with convolution neural network.	Traffic sign is recognized properly with no disturbance in different weather conditions.	Blurred images due to moving car.
5	A Vision System for Traffic Sign Detection and Recognition.	VBT, Colour information, RGB to HSI extraction.	Used in more difficult regions like bad weather, dim light to recognize the traffic signs.	Detection Accuracy should be more or it may not be effective.

6	Android based Traffic Rules Violation Detection System "Vehitrack	Using RFID Technology.	Reduce corruption as there is no manual allocation or collection of the penalty.	Access to the application by all the users may be practically tough.
7	Fast Traffic Sign Recognition via High-Contrast Region Extraction and Extended Sparse Representation.	TSR, ROI Extraction and SFC Tree detector.	1) Detection of signs is faster. 2) Lesser duration time using SFC-tree detector.	Detection should be faster or it may cause problems.
8	RFID based Traffic Violation Detection and Traffic flow analysis system	GSM, GPS and Zigbee Technology.	RFID tag and reader need not to be exactly in the line of sight for data transmission with accurate performance.	Implementation in real time is difficult for the large vehicles.
9	Speed Control for Motor Vehicles Using Global Positioning System	GSM, GPS and RFID Technology.	Reduce the accidents caused by over speeding in sensitive areas like school or hospital zones.	Maintenance of the transmitting devices would be difficult.
10	Automatic Speed Control of Vehicle Using RFID	RFID Technology	Low complexity, High accuracy and reliability make this system highly feasible.	Chances of manipulation by drivers

IV. CONCLUSION

In this paper, we studied and compared multiple methodologies used for the detection andrecognition of traffic signs along with traffic rules violation and management and mainlyfocused on the detection and recognition of traffic signs. SVM classifier, CCN are used forrecognition and classification purpose, but only less have been conducted on text contained onthe traffic signs where MSER and OCR are the most efficient method used. For detection,methods like color segmentation, HSV thresholding, Gaussian and Laplacian filter forenhancing image and have clear results. Overall it is essential to have methods which canprovide better results. Additional structural and temporal constraints can be used to furtherreduce the false positives detected. Future scope in this area includes introducing more efficienttechniques for text detection and recognition from traffic signs.

REFERENCES

[1] YubingDong, Mingjing Li, Jie LI, "Traffic Sign Recognition improved based on Canny Edge Detection Algorithm", 2016.

[2] Yi, Hengliang Luo, Huarong Xu and Fuchan WuYang, "Towards Real Time Traffic Sign Detection and Classification", [2014].

[3] Swati M and K. V. Suresh, "Automatic Traffic Sign Detection and Recognition in Video Sequences", 2nd IEEE
International Conference on Recent Trends in Electronics Information and Communication Technology, May 2017.

[4] Yi Yang, Hengliang Luo, et al, "Towards Real time Traffic Sign Detection and Classification", IEEE Transactions on Intelligent Transportation Systems, July 2017.

[5] Author-Hengliang luo, Yi yang, et al, "Traffic Sign Recognition using Multi task Convolution Neural Network", [2017]

[6] Author-Yan Han and Erdal Oruklu, "Traffic Sign Recognition on NVIDIA Jetson TX1 embedded system
using convolution Neural Network", [2017]

[7] Jian-He Shi and Huei-Yung Lin, "A Vision System for Traffic Sign Detection and Recognition". [2017]

[8] D R Agarwal, Kasliwal komal S, et al, "Android based Traffic Rules Violation Detection System "Vehitrack", [2015]

[9] T K Sethuramalingum, R Narthana Devi, et al, "Speed Control for Motor Vehicles Using Global Positioning System", [2016]

[10] Leena Thomas, Swetha Anaujames, et al, "Automatic Speed Control of Vehicle Using RFID", [2013]