International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 05 Issue: 04 | April - 2021 ISSN: 2582-3930

A VISION BASED TRAFFIC SIGNAL DETECTION AND RECOGNITION SYSTEM USING KNN ALGORITHM

Manikandan S V[1], Mugilan B[2], Munikrishnan C[3], Ramesh kumar M[4]

[1, 2, 3] Dept of Computer Science and Engineering

[4] Assistant Professor, Dept of Computer Science and Engineering

[1, 2, 3, 4] Adhiyamaan College of Engineering, Hosur, India.

Abstract- *Traffic-sign detection and classification is an interesting topic in computer-vision and it is especially important in the context of autonomous vehicle technology. Robust and real-time* ***traffic****-sign detection algorithms have to be employed if self-driving cars are to become commonplace in the roads of the future. This project explores the effective approach of road sign detection and recognition. In today's world road conditions drastically improved as compared with past decade. In this method the road sign recognition system is to be divided into two parts, the first part is detection stage which is used to detect the signs from a whole image, and the second part is classification stage that classifies the detected sign in the first part into one of the reference signs which are presents in the dataset. The classification module present determines the type of detected road signs by using KNN algorithm. The extensive experimentation has shown that the proposed system approach is robust enough to detect and recognize road signs under varying lighting, rotation and translation conditions. The based recognize is developed by using gui as a front end and python server as a back end.*

Key Words: *Machine Learning, gui, PyTorch.*

I. INTRODUCTION

With increasing volume of vehicles, number of roads and thereby number of traffic signs have increased significantly. Traffic signs are primarily categorized into three types – mandatory signs, cautionary signs and informatory signs. It is difficult for a driver to learn all these traffic signs and pay attention to them while driving. A system with the capability to automatically detect and recognize these different traffic signs is needed in order to reduce traffic accidents and drive freely. Traffic signs are unique and specific shape defines specific meaning. It is essential to build a driver assistance system with these properties. Traffic sign detection and recognition system is not confined to driver assistance system besides it has its importance in various real world applications like urban scene understanding, autonomous vehicles, traffic sign monitoring and maintenance. Traffic sign plays vital role in routing traffic and avoiding accidents. To build traffic sign detection and recognition system is a challenging task. Various problems such as: Illumination or varied lightning conditions,Occlusion due to different obstacles such as trees, pedestrian's etc. Weather conditions such as rain, fog, Vandalism Background (e.g., advertising boards etc.),Non-uniform motion of vehicles makes it harder to detect and recognize traffic signs. In the field of intelligent transport system, traffic sign detection and recognition technology carry vast importance. It is difficult to build a system inhibiting fully automatic segmentation of traffic sign from the background or during its initial build as there is not an accurate methodology of doing so. Hence to develop such a system which can detect and recognize traffic signs in real time with high accuracy is a challenging task. Advanced driver assistance systems (ADAS) are one of the fastest-growing fields in automotive electronics. ADAS technology can be based upon vision systems , active sensors technology , car data networks , etc. These devices can be utilized to extract various kinds of data from the driving environments.

One of the most important difficulties that ADAS face is the understanding of the environment and guidance of the vehicles in real outdoor scenes. Traffic signs are installed to guide, warn, and regulate traffic. They supply information to help drivers. In the real world, drivers may not always notice road signs. At night or in bad weather, traffic signs are harder to recognize correctly and the drivers are easily affected by headlights of oncoming vehicles. These situations may lead to traffic accidents and serious injuries. A vision-based road sign detection and recognition system is thus desirable to catch the attention of a driver to avoid traffic hazards.

These systems are important tasks not only for ADAS, but also for other real- world applications including urban scene understanding, automated driving, or even sign monitoring for maintenance. It can enhance safety by informing the drivers about the current state of traffic signs on the road and giving valuable information about precaution. However, many factors make the road sign recognition problem difficult such as lighting condition changes, occlusion of signs due to obstacles, deformation of signs, motion blur in video images, etc.

To illustrate the problem of false alarms, consider the following: one hour of video shot at 24 frames per second consists of 86400 frames. If we assume that in the video under consideration traffic signs appear every three minutes and

typically span through 40 frames, there are a total of 800 frames which contain traffic signs and 85600 frames which do not contain any signs.

II. LITERATURE REVIEW

Every person, whether a passenger, driver, pedestrian would have noticed along the roadside various sign board that serve important purposes. These important road paraphernalia help us as route guides, warnings and traffic regulators. As control devices for traffic, signs need full attention, respect and appropriate driver's response. With the advent of motorized traffic and its increasing pressure on road, many have adopted pictorial signs and standardized their signs to facilitate international travel, where language differences would create barriers. In adverse traffic conditions, the driver may not notice traffic signs, which may cause accidents. In such scenarios, automatic road sign detection comes into effect. Driver has to view the road signs and control the speed or makes the turn according to it. Due to various issues, drivers are less attentive to road signs which lead to accidents. In Existing System, an idea is proposed to avoid accidents in which road signs are recognized automatically by web camera using Image processing techniques and Raspberry Pi .

Our worked focused on a low cost, off the shelf solution, specifically, a mini embedded computer Raspberry Pi. In order to provide fast processed results, this system aimed to demonstrate use of simple shape recognition algorithms and open-source optical character recognition (Tesseract OCR) on Raspberry Pi. Tesseract OCR is an open-source optical character recognition module for various operating systems. This attempt was followed by several methods introduced by different researchers to develop an efficient TSDR system and minimize all the issues stated above. An efficient TSDR system can be divided into several stages: preprocessing, detection, tracking, and recognition. In the preprocessing stage the visual appearance of images hs been enhanced. Different colour and shape-based approaches are used to minimize the effect of environment on the test images.

III. EXISTING SYSTEM

The YOLOv2 Existing system of recognition of road signs and putting them on a city map was implemented on the Histogram of Oriented Gradients (HOG). This solution was tested to recognize two categories of road signs. The dataset was taken from Google Street View and it contained 10 symbols. The AdaBoost and Convolutional Neural Network (CNN) algorithms were used for architecture is used for the classification of the road signs in realtime.

IV. PROPOSED SYSTEM

- In proposed system the first section is Image Extraction and Sign Detection and Extraction parts. Then the output of traffic sign recognition will be presented. The description of the traffic sign recognition system can be explained into Traffic Sign Pre- processing Stage and Recognition Core. For Traffic Sign Pre-processing Stage, it is divided in two parts:

- Sign Detection and Extraction and Form Recognition Stage. This stage is the image processing procedure. Image input from video sequence which is the natural background viewing image fed into the system.

- The image data is read in both colours, black and white mode. Due to the black and white mode image is the base image that used to find the threshold of this image, this threshold is the criterion to change image from black and white to binary image. Using KNN algorithm for fast detection of traffic symbols.so that autonomous car will take fast response to movement without any interrupt.

V. MODULES

A. PREPROCESSING MODULE:

In this module we go to process our input image, for example size normalize, convert colour to BN. When down sampling an image ,it is common to apply a low-pass filter to the image prior to re-sampling. This is to ensure that spurious high frequency information does not appear in the down sampling image(aliasing). Gaussian blurs have nice properties, such as having no sharp edges, and thus do not introduce ringing into the filtered image.

B . FEATURE EXTRACTIONMODULE:

In this module we convert our image processed to a characteristic vector of features to classify, it can be the pixels matrix convert to vector or get contour chain codes data representation. The system were trained with training data set, and validated with validating data set to find the best network architecture. The cross-validation technique was implemented with training data set,validating data set, and test set.

C . CLASSIFICATION MODULE:

This module gets the feature vectors and train our system or classify input feature vector with a classify method as KNN. Each image we get is pre-processed and then convert the data in a feature vector we use. After processed and get train data and classes we then trainour model with this data,

In our sample we use KNN method then:

KNN=new CvKNearest (train Data, train Classes, 0, false, K);

Then we now can test our model, and we can use the test result to compare to other methods we can use, or if we reduce the image scale or similar. There is a function to create the test in

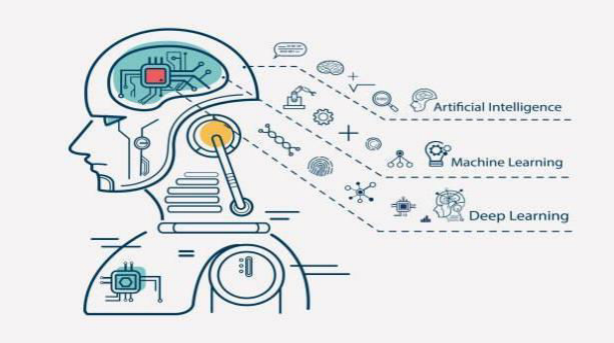
our basic OCR class, test function. This function get the other 500 samples and classify this in our selected method and check the obtained result. Test use the classify function that get image to classify, process image, get feature vector and classify it with a find nearest of KNN class. This function we use to classify the input user video

VI. BACKGROUND OF THE STUDY

A. MACHINE LEARNING:

Machine Learning or ML is a study of computer algorithms that learns and enhance automatically through experience. It seems to be a subset of artificial intelligence. A machine learning algorithm builds a mathematical model based on "training data", in order to make decisions or predictions without being explicitly programmed to do so.

Machine learning algorithms are used in a variety of applications from email filtering to computer recognition, where itis difficult or impossible to develop general skills to perform the required tasks. These studies are closely related to computer statistics, which focus on computer-generated domain. The data prediction and mining is a coherent field of study, focusing on the analysis of experimental data by unsupervised learning. In its application to business problems, machine learning is also called predictive analytics.



B. PYTORCH:

PyTorch is an open source machine learning library based on the Torch library, used for applications such as computer vision and natural language processing, primarily developed by Facebook's AI Research lab. It is free and open-source software released undertheModified BSDlicense. Although the Python interface is more polished and the primary focus of development, PyTorch also has a C++ interface. A number of pieces of deep learning software are built on top of PyTorch, including Tesla Autopilot, Uber's Pyro, Hugging Face's Transformers, PyTorch Lightning, and Catalyst.

VII. CONCLUSION

A new traffic sign recognition system has been presented in this project. The application software developed in this work recognizes and classifies traffic signs from an input image. The image processing techniques used in this software include a preprocessing stage, regions of interest detection, potential traffic sign detection, according to the traffic sign shape patterns, and finally, the recognition and classification of these potential traffic signs according to a database of traffic sign patterns. The performance of this application depends on the quality of the input image, in relation to its size, contrast and the way the signs appear in the image. With this consideration, the percentages of recognized signs for this application are high.

VIII. RESULTS

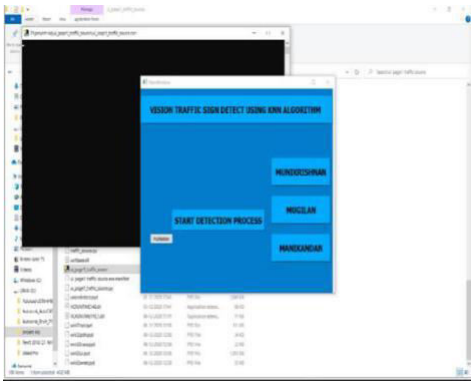


Figure 1 Home Page

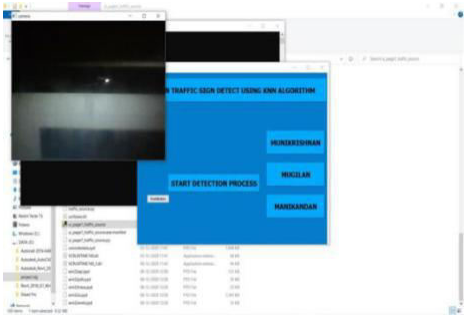


Figure 2 Image Capturing

Figure 3 Sign Detection

REFERENCES

[1] R. Qian, Y. Yue, F. Coeneny and B. Zhang, **"Traffic Sign** Recognition with Convolutional Neural Network Based on Max Pooling Positions," In 2016 12th International Conference on Natural Computation, Fuzzy Systems and Knowledge Discovery (ICNC-FSKD), August 2018, pp. 578- 582.

[2] Z. Zhu, D. Liang, S. Zhang, X. Huang, B. Li, and S. Hu, **"Traffic**-Sign **Detection and Classification in the Wild,"** In 2016 IEEE Conference on Computer Vision and Pattern Recognition, June 2018, pp. 2110 -2118.

[3] K. He, X. Zhang, S. Ren, and J. Sun, "Spatial Pyramid Pooling in Deep Convolutional Networks for Visual Recognition". CoRR, abs/1406.4729v4, 23April, 2017.

[4] S. Ren, K. He, R. Girshick, and J. Sun, "Faster R-CNN: Towards Real-Time Object Detection with RegionProposal Networks". CoRR, abs/1506.01497v3, 6 Jan, 2016.

[5] D. Tom**'e, F. Monti, L. Baroffio, L. Bondi, M.** Tagliasacchi, andS. Tubaro, "Deep convolutional neural networks for pedestrian detection". CoRR, abs/1510.03608v5, 7 Mar, 2016.

[6] K. He, X. Zhang, S. Ren, and J. Sun, "Deep Residual Learning for Image Recognition". CoRR, abs/1512.03385v1, 10 Dec, 2016.

[7] S. Dodge and L. Karam, "Understanding How Image QualityAffects DeepNeural Networks," CoRR, abs/1604.04004v2, 21 April, 2016.

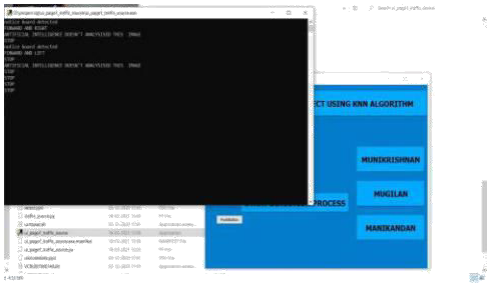
[8] de la Escalera, L.E. Moreno, M.A. Salichs, and J.M. Armingol, "Road traffic sign detection and classification," IEEE Transactions on Industrial Electronics, vol. 44, no. 6, pp. 848–859, Dec 2016.

[9] C.Y. Fang, S.W. Chen, and C.S. Fuh, "Road-sign detection and tracking," IEEE Transactions on Vehicular Technology, vol. 52, no. 5, pp. 1329–1341, Sept 2015.

[10] P.F. Felzenszwalb and D.P. Huttenlocher, "Efficient graph-based image segmentation," Int. J. Comput. Vision, vol. 59, no. 2, pp. 167–181, Sep. 2016.

[11] .J. Greenhalgh and M. Mirmehdi, "Real-time detection and recognition of road traffic signs," IEEE Transactions on Intelligent Transportation Systems, vol. 13, no. 4, pp. 1498–1506, Dec 2018.

[12] .S.C. Huang, H.Y. Lin, C.C. Chang. An in-car camera system for traffic sign. Proceedings of the Joint 17th World Congress of International Fuzzy Systems Association and 9th



International Conference on Soft Computing and Intelligent Systems, Detection and Recognition, Otsu, Japan, June 2017.

[13] .W.C. Huang and C.H. Wu, "Adaptive color image processing and recognition for varying backgrounds and illumination conditions," IEEE Transactions on Industrial Electronics, vol. 45, no. 2, pp. 351–357, Apr 2018.

[14] D.L. Kellmeyer and H.T. Zwahlen, "Detection of highway warning signs in natural video images using color image processing and neural networks," in Neural Networks, 2018. IEEE World Congress on Computational Intelligence. IEEE International Conference on, vol. 7, Jun 2018, pp. 4226–4231.

[15] Krizhevsky, I. Sutskever, and G.E. Hinton,"Imagenet classification with deep convolutional neural networks," in Proceedings of the 25th International Conference on Neural Information Processing Systems, ser. NIPS'12. USA: Curran Associates Inc., 2015, pp. 1097–1105.

[16. S. Arora, A. Bhaskara, R. Ge, and T. Ma, "Provable bounds for learning some deep representations," in Proceedings of the 31st International Conference on International Conference on MachineLearningVolume32, ser. ICML'14.JMLR.org, 2016, pp.I–584–I–592.