iJRASET
International Journal For Research in
Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 11 **Issue:** IV **Month of publication:** April 2023

DOI: https://doi.org/10.22214/ijraset.2023.51261

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 11 Issue IV Apr 2023- Available at www.ijraset.com

Traffic Sign Detection using Convolutional Neural Networks

Sanjay J[1], Sandesh Saidapur[2], Sanjay CR[3], Shamanth Reddy[4], Sohara Banu A R[5]
[1, 2, 3, 4]School of CSE, Reva University Bangalore, India
[5]Assistant Professor, CSE, Reva University Bangalore, India

Abstract: Signs on the road are crucial making sure the flow of traffic is smooth. Disregard whilst watching the traffic sign board is one of the main causes of traffic accidents. Traffic signs are essential for controlling traffic, preventing accidents, and assuring safety.No entry, speed limit, traffic lights, left or right turn, children crossing, etc. are just a few examples of various sorts of signs. The human observation of traffic control signals under the current approaches could lead to a re-entry collision of cars. The fast-moving traffic may be delayed as a result. Additionally, they impede traffic by stopping cars at the intersection during rush hour. The revised approach uses Deep Learning to reduce the amount of time and effort required to monitor these
Keywords: Deep Learning , keras python , OpenCV , Convolutional Neural Network(CNN) , Road accidents.

I. INTRODUCTION

Traffic sign identification is extremely important, particularly in today's increasingly sophisticated world of automated driving systems. Intelligent sensors, navigational artificial intelligence, benefit greatly from it. Additionally, there may be significant advantages for both driver and pedestrian safety. However, it is challenging to identify a single such method that can be used to universalize a successful detection because traffic signs differ from nation to country in terms of both colors and shapes. The process of gathering data is also fraught with difficulties due to colour degradation, occlusion, and changes in lighting. Therefore, it is challenging to develop a single, universal system.We have chosen to use the GTSRB (German Traffic Sign Benchmarks) dataset for this study, with a focus on Thai traffic signs. We conducted a survey and discovered that India has alarmingly high rates of traffic accidents. According to reports, there are roughly 53 accidents on the roadways every hour. Furthermore, these accidents result in more than 16 deaths every hour. It's important to prevent those accidents.A sensor is attached to help decrease these actions.Without the drivers' observation, a four-wheeler can find the notice board. So, using a CNN deep learning model to automate the sensor, we were able to control these mishaps.

Machine learning, that is a part of deep learning that can be defined as a neural network having 3 or more layers. These neural networks make an effort to mimic how the human brain functions, however they fall far short of being able to match it, enabling it to "learn" from vast volumes of data. Even though a neural network using one layer can still produce approximation predictions, more hidden layers can aid in optimization and refinement for accuracy. Deep learning underpins a large number of artificial intelligence(AI) programs and services, enhancing automation by performing mental and muscular tasks without the need for human participation. Deep learning technology is used to power both established goods and services (such as digital assistants, voice-activated TV remote controls, etc.) and cutting-edge developments (such as self-driving cars). The first CNNs came into the picture in the 1980s. created and put to use. A CNN may have been used at the time only to recognize handwritten numbers to a certain extent. The postal sector primarily used it to read pin digits, zip codes, etc. The most crucial thing to keep in mind regarding any deep learning model that it is necessary for most of the computational power and data to train. Because of this significant disadvantage at the time, CNNs were restricted to the postal industry and were unable to enter the machine learning field.Convolutional neural networks (CNN/ConvNet) are a class of deep neural networks used most frequently to analyse visual data in deep learning.

II. LITERATURE SURVEY

In several research, the ability to recognize traffic signs has carried out using a number of methodologies.

According to the System for Automatic Sign Detection in Vehicles[1] report by Anushree A. S, Himanshu Kumar, Idah iram, Kumar Divyam, and Rajeshwari J. in the year 2021, failure to pay attention to and abide by road signs is a key contributor to accidents. By installing a detection of a signboard device in the car, which will identify both the symbol and alert the driver to its presence, this issue can be avoided. It uses the given LCD to display the alarm message or information and uses speakers to voice the alert.

The transportation system on the highway or road depends on drivers being able to read traffic signs. The main tactic is to locate traffic signs and openCV to extract them.
Signage on the road crucial to ensuring easily moving traffic without bottlenecks or accidents, according to a clever driver warning system for vehicular transportation employing image detection and identification technique[2] released by Harini S, Abhiram V, Rajath Hegde, and Bharadwaj D D Samarth in the year 2021. Drivers must be able to recognize road symbols, which are visual representations of diverse information. Traffic signs regularly go unnoticed in front of vehicles by drivers, which can have disastrous results. This study uses a method to take a road sign out of a naturally complicated image, process it, and warn the motorist using voice command. It also provides an overview of the detection and recognition of traffic sign boards.
In 2020, Shu-Chun Huang and Chin-Chen Chang's in-car video system for recognising and detecting traffic signs[3] will be released. The current system is Android based and requires third party software to function. This raises system expenses and is not very helpful. A good driver assistance system can significantly reduce the likelihood of a car accident. a vehicle assistance system for the monitoring and identification of highway signs is presented in this research. Two subsystems are included in the suggested technique for identification and detection. In order to remove the majority of unnecessary image regions, the road sign identification subsystem first adopts colour information. Using methods for hierarchical grouping and photo segmentation, the area for the potential road sign is then chosen.
A key component of intelligent vehicle technology that relies on using vision to gather information about roads is traffic sign recognition, according to a study on the topic by Chuanwei Zhang, Yupeng Ding, Rui Wang, and Niuniu Li that was published in 2019[4]. The TSR method has been proposed based on the enhanced Lenet-5 algorithm since conventional Technology for computer vision identification cannot the demands of real-time accuracy. First, we enhanced and removed image noise from a selection of traffic sign photos. Second, for thethe convolution layer's convolution procedure, we employed the Gabor filter kernel. We decreased the data dimension and added the Batch Normality (BN) normalization layer following each convolution layer.The down sampling layer contains swapped out Sigmoid activator for activator of relu. At last, we made the choice to conduct the Caff platform comparison experiment using the bigger German traffic sign database. The test results demonstrated that the suggested revised network test of set Lenet-5 surpassed the approach that combined Gabor and In terms of real-time performance and recognition accuracy, Support Vector Machine (SVM) is superior.

III. PROBLEM STATEMENT

With the help of this research, traffic sign boards will be automatically classified using a model of deep learning. By extending the current system and installing a voice alert sensor in a four-wheeler, traffic signs can be brought to the driver's attention.
We have made an effort to do the following:

1) To put into practise a model of deep learning to automatically classify traffic sign boards.
2) A voice alert sensor is added to a four-wheeler as part of the expansion of this system to notify the driver of traffic signs.

IV. PROPOSED SYSTEM

A. Dataset

The test results demonstrated that In terms of real-time performance and recognition precision, the updated Lenet-5 network test set outperformed the strategy that integrated Gabor and Support Vector Machine (SVM). Fig. displays the total number of images by class. There is no misunderstanding because the photographs only highlight the individual traffic signs, each of which is distinct.

Fig. 1. Highway signs that are brought into account

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 11 Issue IV Apr 2023- Available at www.ijraset.com

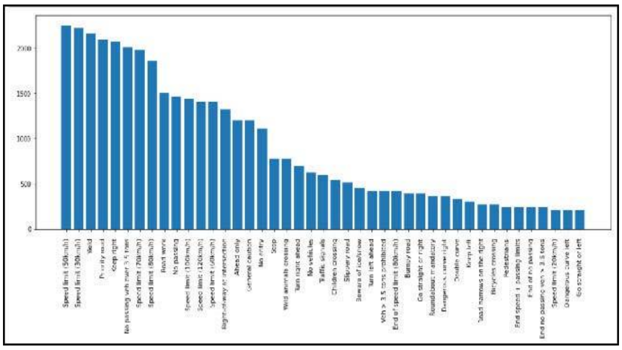


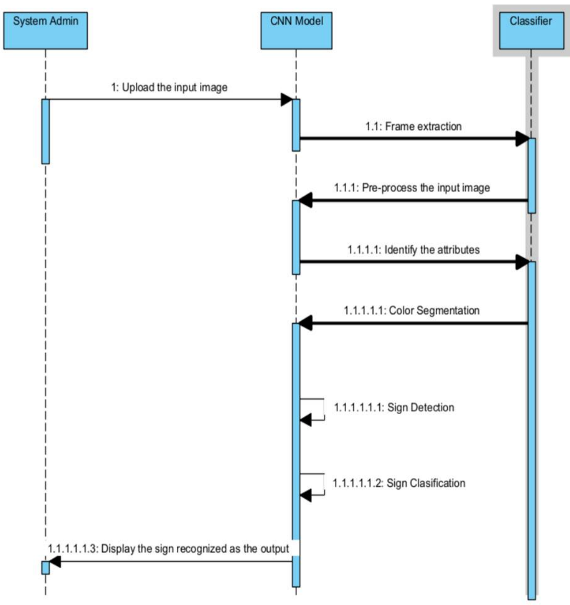
Fig. 2. No.of photographs in the collection divided by class

B. Theoretical background

In this project, we'll create and put into practise a deep learning model that uses our dataset, the German Traffic Sign Dataset, to learn to recognize traffic signs. Convolutional neural networks will be used to categorize the photos in this dataset. ConvNets were chosen because they can recognize visual patterns straight from pixel images with little pre-processing. From data, they automatically learn invariant feature hierarchies at every level. Two of the most well-known ConvNets will be used.

C. Processing

Images must be transformed into numpy arrays (i.e., numerical values) in order to execute image processing. The photos are reduced in size to 30x30 pixels after loading. After that, the image labels are connected to the picture, making the dataset available for training.



Data Flow diagram

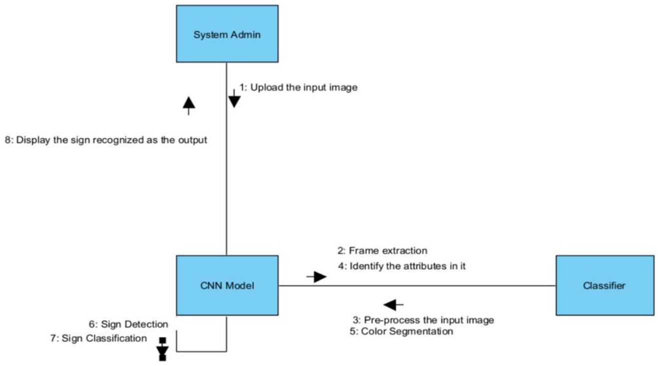
The sequence diagram for our suggested system is shown in the diagram above. The system administrator enters the input image into CNN Model, which can classify images. Frame extraction, input image preprocessing, attribute identification, colour segmentation, sign detection, and sign classification are the steps that are used.

The process known as "frame extraction" is used to get rid of frames from an input image that are redundant or similar without impacting the semantic aspects of the material.

~The pre-processing procedure is in charge of reshaping the data into a 30x30 grid and converting it into a numerical array.

~The process of colour segmentation involves comparing each pixel's colour characteristics to those of its neighbours or to a trained colour classifier. The background clutter and interesting coloured objects can be distinguished using this technique.

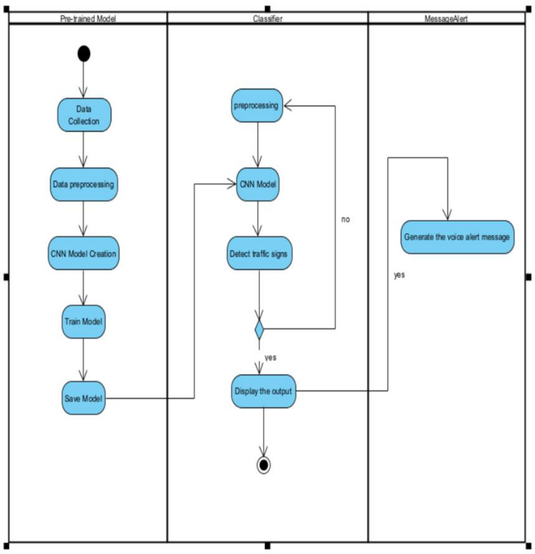
~Using the test dataset, traffic signs are found using sign detection. The technique of classifying signs involves dividing the input image of a traffic sign into 43 different categories. After image categorization, the system will display the recognized symbol.



Procedure Flow Diagram

The entity relationship diagram, which shows how the system's components are related to one another, is shown in the diagram above. Once it has been uploaded by the system, the input image is first received by the CNN model. Following that, the CNN model extracts the frames and provides them to the classifier.
The process known as "frame extraction" is used to get rid of frames from an input image that are redundant or similar without impacting the semantic aspects of the material.
~ After the classifier has preprocessed the image, it is then returned to the CNN model. The CNN model has now determined the attributes and has sent the photos to the classifier. After performing colour segmentation, the classifier delivers the output to the CNN model.
~The process of colour segmentation involves comparing each pixel's colour characteristics to those of its neighbours or to a trained colour classifier. The background clutter and interesting coloured objects can be distinguished using this technique.

D. Experimental setup



V. RESULTS AND DISCUSSION

Alternative CNN Architectures were outperformed by the neural network that was trained using 4 convolutional layers, 2 maximum pooling layers, dropout, dense layers, and a flat surface.

VI. CONCLUSION

The Traffic Sign Recognition and Voice Alerting System is implemented using convolutional neural networks. After testing a number of CNN models, the one that performed the best on the GTSRB dataset was chosen.The model's accuracy has increased as a result of the numerous classes that have been created for each traffic sign. Once the sign is recognized, a voice message warns the driver.

VII. ACKNOWLEDGMENT

The authors would like to thank Sohra Banu AR, Assistant Professor, for providing guidance as we conducted research and developed the Convolutional Neural Network-based Traffic Sign Board Recognition and Voice Alert System. She was instrumental in helping the paper fulfil its function, which it was designed to do. The authors thank the Reva Institute of Technology and Management for supplying all the materials needed to finish this work.

.

REFERENCES

[1] Shubham Yadav, Anuj Patwa, Saiprasad Rane, and Chhaya Narvekar. (2019). Machine Learning Based Recognition and Driver Alert System for Indian Traffic Sign Boards. 1. 1–10, 10.24071/ijasst.v1i1.1843, International Journal of Applied Sciences and Smart Technologies.

[2] Anushree.A., S., Kumar, H., Iram, I., and Divyam, K. Vehicle Automatic Signboard Detection System.

[3] S. Harini, V. Abhiram, R. Hegde, B. D. D. Samarth, S. A. Shreyas, and K. H. Gowranga, in their article "3," A smart driver alert system for traffic utilising image detection and identification technique, 2nd IEEE International Conference on Recent Trends in Electronics, Information & Communication Technology (RTEICT), Bangalore, India, 2017, pp. 1540–1543, doi: 10.1109/RTEICT.2017.8256856.

[4] C. Wang, "Research and Application of Traffic Sign Detection and Recognition Based on Deep Learning," in 2018 International Conference on Robots & Intelligent System (ICRIS), Changsha, China, pp. 150–152, doi: 10.1109/ICRIS.2018.00047.

[5] M. A. Muchtar et al. 2017, Journal of Physics, Conf. Ser. 801 012010

[6] "VSSA-NET: Vertical Spatial Sequence Attention Network for Traffic Sign Detection," by Y. Yuan, Z. Xiong, and Q. Wang, appeared in the July 2019 issue of IEEE Transactions on Image Processing, vol. 28, no. 7, pp. 3423–3434, with the following DOI: 10.1109/TIP.2019.2896952.

[7] "An in-car camera system for traffic sign detection and recognition," 2017 Joint 17th World Congress of International Fuzzy Systems Association and 9th International Conference on Soft Computing and Intelligent Systems (IFSA-SCIS), Otsu, Japan, pp. 1-6, doi: 10.1109/IFSA SCIS.2017.8023239.

[8] Yu, L., Gao, H., Bi, Z., et al. improved, effective traffic sign based on VGG model2021–2022, REVA University, School of CSE

[9] Recognition for safe driving in 5G settings is found on Progress Report page number 12/3. Int. J. Machine Learning and Cybernetics (2020).

[10] Chuanwei Zhang et al., "Study on Traffic Sign Recognition by Optimised Lenet-5 Algorithm," International Journal of Pattern Recognition and Artificial Intelligence, doi:0.1142/S0218001420550034. Han, C., Gao, G., and Zhang, Y. Multimed Tools Appl 78, 13263–13278 (2019). Real-time tiny traffic sign detection with enhanced faster–RCNN. https://doi.org/10.100 7/s11042-018-6428-0.

[11] K. Kim and H. S. Lee, "Simultaneous Traffic Sign Detection and Boundary Estimation Using Convolutional Neural Network," IEEE Transactions on Intelligent Transportation Systems, vol. 19, no. 5, May 2018, pp. 1652–1663.

[12] "Traffic sign recognition with convolutional neural network based on max pooling positions," 12th International Conference on Natural Computation, Fuzzy Systems and Knowledge Discovery (ICNC-FSKD), Changsha, China, 2016, pp. 578–582, doi: 10.1109/FSKD.2016.7603237.