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Traffic Sign Detection and Recognition by Voice Alert using Image Processing and Deep Learning Techniques

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ABSTRACT

The management of the traffic-sign inventory depends heavily on the automatic detection and recognition of traffic signs. In this paper, we address the problem of categorizing a large number of traffic signs suitable for automated traffic sign inventory management, and still photographs acquired from a moving camera may be affected by motion blur. We propose several improvements that are evaluated on the detection and recognition of traffic signs and to alert drivers by audio message in time for them to take the appropriate action, to find objects up to 300 metres away to inform the driver about traffic sign which helps to avoid accident. This approach is applied for detection of 200 traffic sign categories represented in our novel dataset it contains 51,839 German traffic sign from 43 classes(39,209 training Images and 12,630 test images). Our proposed work uses convolutional neural network (CNN) algorithm and canny edge detection algorithm for fast detection and recognition of traffic sign that improves the accuracy rate to 93%. This study helps in use the drivers to make decision early and avoid road accidents.

KEYWORDS:: Deep Learning, convolutional neural network(CNN), Lane Detection.

1. INTRODUCTION

In order to ensure traffic flow efficiency and safety, proper inventory management of traffic signs is crucial [1], [2]. This task is often carried out manually. Using a camera mounted on a moving vehicle, traffic signs are photographed, and manual localization and recognition are carried out offline by a human operator to ensure compatibility with the database. Applying such hard labour to thousands of kilometres of roads, however, might take a very long period. A large reduction in human labour would result from automating this process, which would also increase safety by allowing for speedier identification of broken or missing traffic signs [3].System for identifying traffic signs in images captured by a vehicle's camera. Segmentation is used to separate the sign from background when the edge of the sign is recognized. Recent years have seen a worldwide increase in the frequency and severity of traffic accidents. 400 traffic accidents are said to happen in India every day, according to government figures. In this research, we address the problem of detecting and Recognizing traffic signs, as well as the possibility that still pictures taken by a moving camera can be blurry. These issues can be resolved by employing the CNN algorithm and the canny edge detection algorithm to identify signs, inform drivers through audio output, and prompt them to make the best choices. Find objects up to 300 metres away a method for finding and recognizing traffic signs that may be applied to pictures taken by a car's camera. When the boundaries of the sign are recognized, segmentation is performed to separate the sign from the backdrop. Automation would greatly minimize the amount of manual labor required for this activity while also enhancing safety by allowing for speedier identification of broken or missing traffic signs. Replace human localization and traffic sign identification with automated detection as a vital first step in automating this work. The recognition of traffic signs has already sparked a great deal of attention in the field of computer vision and effective detection. How to detect and identify different traffic-sign classes is still a mystery. The challenge of identifying and detecting traffic signs has been addressed by a variety of earlier standards. The issue with traffic-sign detection Only a tiny number of traffic-sign categories are covered by other benchmarks that do handle TSD, frequently those that are essential for ADAS and autonomous vehicle applications.We do this by offering annotations for 200 types of traffic signs, each with at least 20 entries. Our qualitative research also contributes to a significant study on the suitability of deep learning for the identification of a wide range of traffic-sign categories. To collect the realistic traffic sign pictures for this project we employed thermal image/infrared cameras, which can record video up to a distance of 300 meters.

The remaining sections of the essay are structured as follows. A summary of the associated work is given in Section II, the proposed system is described in Section III, the results are shown in Section IV, and the conclusion is given in Section V

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2. RELATED WORK

[4] J. M. Lillo-Castellano et al. In this work, we addressissue of moving camera may be affected images by motion blur. Sign detection and recognition use HOG algorithm its technology gives 83% result to detect traffic sign. [5] M. Haloi et al.In this study, we focus on the challenge of finding and classifying a wide range of traffic-sign categories that may be used to automate traffic-sign inventory management. The recognition and detection of traffic signs is a well-studied subject, therefore we employ a convolutional neural network (CNN) technique, the Mask R-CNN. In the computer vision community, it may be given results with 90% accuracy. The great majority of currently used methods successfully operate on traffic signs required for advanced driver assistance and autonomous systems. [6]Zhu et al. in this paper, Many additional kinds of traffic signs that are not included in the standards and have significant disparities in appearance might be exceedingly challenging to find. The majority of the studies on TSDR's application to traffic signs in nations outside of India have been published. However, there aren't many benchmark datasets that the general public may access. [7] R. Timofte and othersthis paper just a few categories (thousands of photos, tens of categories) were captured by Belgium and Germany, therefore the issue of detecting sign was only addressed there. For detection, make use of the model HOG characteristics. Performance for this model is in the range of 85%.

[8] A. Despite the fact that Mogelmose et alstudy .'s addresses the issue using computer systems, categorising traffic signs still appears to be a difficult pattern recognition task. Algorithms for machine learning and image processing are also employed to enhance this task.[9] J. This study by Stallkamp et al. addresses the issue of how variations in lighting, changing weather, and partial occlusions affect how road signs are seen. Increase the accuracy range using CNN. [10] S. In their study, Houben et al. tackle the issue of despite the several opposing techniques,This can be explained by the dearth of thorough, objective comparisons of such techniques. By using the German traffic sign detection benchmark, we hope to close this difference. [11] M. In this work, M. Trivedi et al. introduce the issue and offer 4 current papers on traffic sign categorization and 4 recent papers on traffic sign detection. In particular, the challenges that arise from the absence of study into the integration of tsr with a driver in the loop system. The hog approach is used in this model. [12] F. This study by Zalkouta et al. addresses the issue of a blackhat filter that mostly reduces false alerts. KD trees and HOG approaches are the techniques it uses.

3. PROPOSED METHODOLOGY

This framework develops a traffic and street sign detection and distinguishing proof framework using Deep Convolutional Neural Network (CNN). The suggested framework continually recognises and understands images of traffic signs. to provide drivers voice messages so they have enough time to respond appropriately. to locate up to 300 metres away.

We employ the CNN Technique and the clever edge detection algorithm in this work.

CNN

Convolutional neural networks (CNNs) are a subset of artificial neural networks that are made primarily to analyse pixel input and are used for image recognition and processing. CNNs are effective artificial intelligence (AI) systems for image processing that employ deep learning to carry out both generative and descriptive tasks. They frequently use machine vision, which includes image and video identification, recommender systems, and natural language processing (NLP). Two convolutional layers, a pooling layer, a dropout layer, a flattening layer, a dense layer, a subsequent dropout layer, and finally the dense layer are used. The convolutional layer's number of filters is predetermined. The original image is convolved, and a feature map is produced as a consequence.The ReLU uses the maximum function to convert negative values to zero without influencing positive ones in order to provide a rectified feature map. The downsampling procedure (such as Max Pooling or average pooling) used by the Pooling layer to reduce the dimensionality of the picture starts with the rectified feature map.

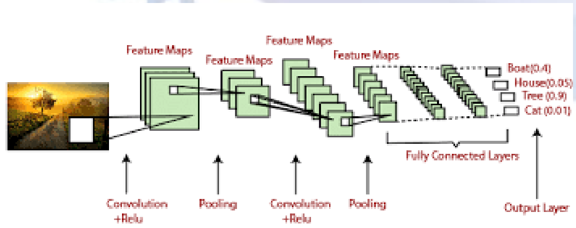

Figure 1. CNN Layer

Lane Line detection Algorithm

A key component of PC vision in general and self-driving cars is path line recognition. This idea is used to describe how self-driving automobiles can avoid going down an undesirable route. An ongoing AI effort to identify route lines will be created. We'll use the OpenCV library and PC vision techniques to do this. To locate the path, it must be possible to tell the white signs on the two sides apart. We will use Python PC vision techniques to describe the street path lines that independent automobiles should follow. This will be a key component of self-driving cars as they shouldn't go in the opposite direction of their path or cross it in order to avoid accidents.

Figure 1. lane line detection

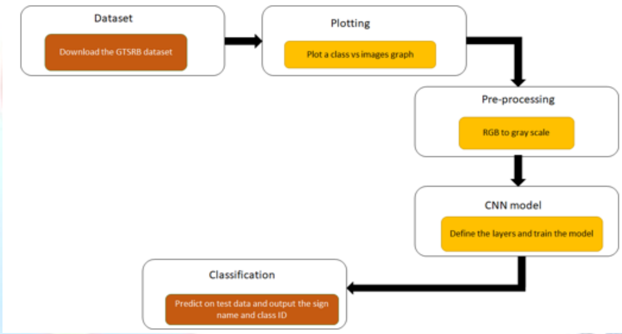

Figure 2. Block diagram

The working of architecture diagram first we collect the data into dataset and preprocess the data RGB image into grayscal color and used the cnn algorithm to identify the sign.

Edge Canny Detection

A multi-step approach called clever edge detection may be used to find the edges in any input picture. It use to noise reduction or Image smoothing.

4. RESULT AND DISCUSSION

In this study, we used the Thermal Image/ Infrared Cameras to capture the realistic traffic s ign cameras capture video upto the distance 300meterInstead of filming video of the traffic signs because they occur less frequently than people and cars, we shot still pictures of them.We present a novel dataset with 200 traffic-sign categories, 51,839 German traffic signs from 43 classes are included (39,209 training

Images and 12,630 test images). 10% of edges are present in images that range in size from 222 by 193 pixels to 15 by 15 pixels. To increase the size of our dataset, we used data augmentation. Basic data augmentation techniques include flipping, rotating, shearing, adding noise, and blurring photos. Based on our initial dataset in this scenario, we only conducted two augmentation operations—adding noise and blurring images—because these techniques could handle the warped objects.

Figure 3. Read Image

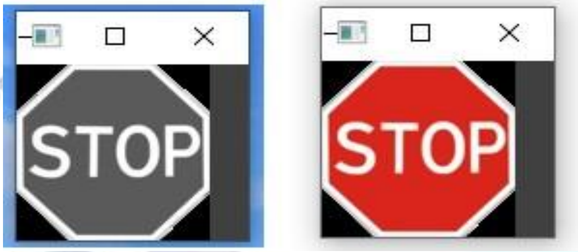

Figure 4. Preprocessing

This diagram is used to convert images to gray scale . RGB Images it will be converted to gray scale image.

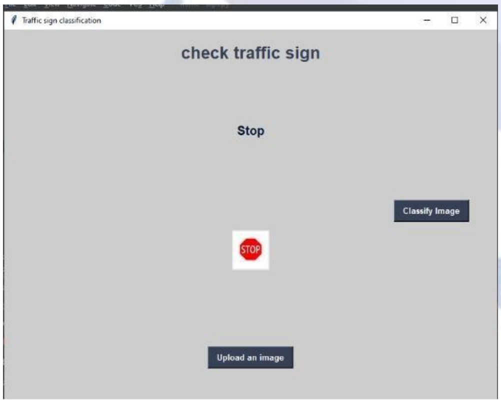

Figure 5. Sign Detection and voice message

These modules are critical for recognizing traffic signs while driving. If the car exceeds the speed limit (120 km/h), it will fail to recognize traffic signs. When a sign is identified, the speaker warns the driver with a voice message regarding the sign.

5. CONCLUSION

In this study, we presented a method for identifying traffic signs and remembering them in pictures caught by a vehicle camera. The sign is edge identified, and division is utilized to isolate it from the setting. We present two calculations for traffic sign recognizable proof and acknowledgment: CNN and Lane Line Detection. This calculation has a 93 percent exactness rate and incorporates various kinds of confounded traffic signs. To recognize and illuminate the driver about traffic signs upto a distance of 300 meters. we prepared CNN models to recognize traffic signs, consequently our dataset has an adequate number of more modest sizes. In future researches can employ extra sorts of traffic signs, making this task more enlightening in this subject. TSR, then again, will consolidate more item acknowledgment procedures.

Conflict of interest statement

Authors declare that they do not have any conflict of interest.

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