WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

Traffic Sign Recognition System Using CNN

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A B S T R A C T

Due to the increasing number of cars with self-driving capabilities, the attention paid to such vehicles has also increased. One of the crucial features that a self-driving car should have is its ability to recognize and interpret the signs of approaching traffic. This will allow it to provide the necessary safety and security for its occupants and the surrounding area. In developing countries, the use of traffic sign recognition and detection systems is an emerging technology that can help improve the efficiency and safety of self-driving cars. This technology can be used to identify and monitor the road signs in real timeThe traffic sign recognition system uses various features such as shape, texture, and color to identify and monitor the road signs. This paper presents a comprehensive study of the different detection methods and techniques used in this field.

Keywords: Traffic sign, detection, recognition, colour, shape, texture, object, colour space.

1. Introduction

Traffic sign recognition has high industrial potential in intelligent autonomous vehicle and driver assistance system. Improvement in traffic quality and safety cannot be achieved without correctly applying and maintaining road traffic signs, traffic signals and road markings. The traffic indication sign recognition is essential to the ITS (Intelligent Transport System). Every year 1.3 million people worldwide are killed on roads, and between 20 and 40 million are injured. A good solution to this problem would be to develop system, which take into account the environment. That is why today, driving safety is becoming a popular topic in many fields, from small projects to large car factories.

However this topic also raises many questions and problems. It is required to define the width of the edges of the road, recognize road signs, traffic lights, pedestrians, and other objects which contribute the driving safely[1].

There are many methods for solving these tasks. Road sign detection is a technique due to which vehicle is able to recognize the different signs put on the road. Traffic signs are used to regulate traffic. Traffic signs are used to provide guidance to driver. Automatic traffic sign recognition is essential task of traffic regulation and guiding and warning driver[2].

2. Literature Review

Sermanet et al. (2011) proposed a deep learning architecture for traffic sign recognition using a Convolutional Neural Network (CNN). They used a multi-scale and multi-channel network to classify traffic signs, achieving state-of-the-art performance on the German Traffic Sign Recognition Benchmark (GTSRB) dataset[1]. Stallkamp et al. (2012) proposed a benchmark dataset for traffic sign recognition, called the German Traffic Sign Recognition Benchmark (GTSRB), which includes over 50,000 annotated traffic sign images. They also evaluated various CNN architectures for traffic sign recognition and achieved state-of-the-art performance using a CNN with five convolutional layers and three fully connected layers[2].

Zhu et al. (2016) proposed a deep learning architecture for traffic sign recognition using a multi-column CNN, which consists of multiple parallel CNNs with different filter sizes and receptive fields. They achieved state-of-the-art performance on the GTSRB dataset and showed that their model is robust to variations in lighting and weather conditions [3]. Huval et al. (2015) proposed a deep learning architecture for image classification tasks, including traffic sign recognition, called the Inception model. The Inception model uses a combination of convolutional layers with varying filter sizes, max pooling layers, and inception modules to extract features from images. They achieved state-of-the-art performance on the GTSRB dataset using the Inception model[4].

[4] In the paper titled "An Overview on Image Classification Methods in Image Processing," K. Ganapathi Babu, Dakannagari Harith Reddy, P. Divya Teja, and C. Yosepu provide a brief yet informative overview of various supervised classification methods used in image classification. Images are represented by pixels, and image classification involves grouping these pixels into different classes. Non-parametric approaches are commonly used for image classification. This survey covers different classification methods and their limitations, providing readers with a diverse understanding of the topic.

3. System Design

The system design for a traffic sign recognition system using CNN typically involves the following components:

1.Dataset creation: A large and diverse dataset of traffic signs is required to train the CNN model. The dataset should include images of traffic signs in different lighting conditions, weather conditions, and camera angles.
2.Image Pre-processing: The images in the dataset are pre-processed to enhance their quality and prepare them for training. This may involve tasks such as image resizing, normalization, and augmentation.
3.CNN architecture: The CNN architecture is the core component of the system. It should be designed to effectively detect and classify traffic signs in the input images. The architecture typically includes multiple convolutional layers, pooling layers, and fully connected layers.
4.Training: The CNN model is trained on the preprocessed dataset using techniques such as backpropagation and gradient descent. The goal is to minimize the loss function and improve the accuracy of the model that it does not require an internet connection, making it useful in areas
5.Testing: The trained CNN model is tested on a separate dataset to evaluate its performance. The testing dataset should include images of traffic signs that are different from those used in the training dataset.
6.Deployment: The final step is to deploy the trained CNN model in a real-world application. This may involve integrating the model with a camera system, a microcontroller, or a mobile device. The final step is to deploy the CNN in a real-world application. This involves integrating the CNN with other software and hardware components, such as cameras and microcontrollers, and optimizing the system for real-time performance.
7.In addition to these core components, the system design may also include features such as real-time processing, multi-camera support, and localization and mapping.

4. Proposed Work

Our framework is divided into three phases: discovery and disclosure and validation. Detection time is only used to find content. While the car is traveli ng at a certain speed, the camera captures a sign at the scene and in our calculations we check whether the sign is valid in the description or in that area.

Distinguish traffic signs by shape and color. In the feature extraction phase, the concept calculates different landmarks.
This is done with the help of the "Convolutional Neural Network" algorithm, which divides the image into subclasses.

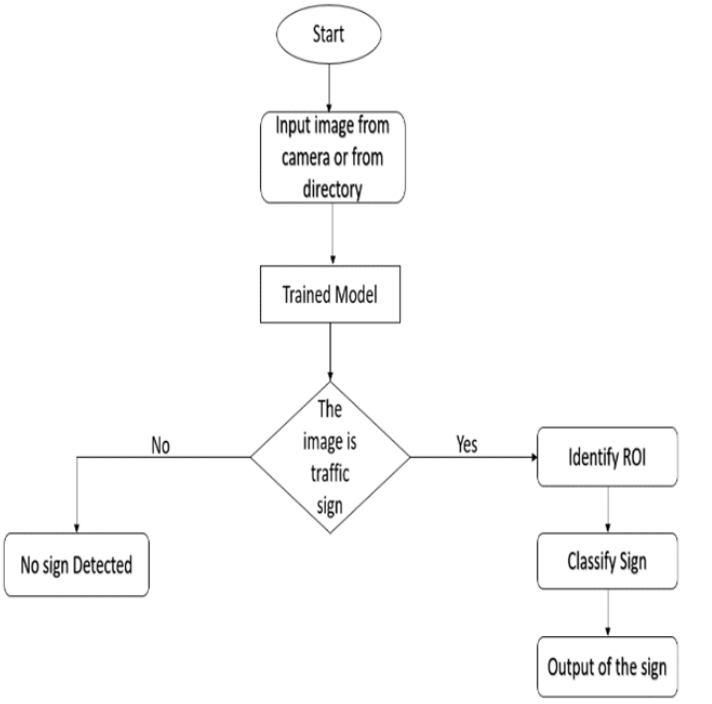

Fig. 1. Flowchart of System

5. Objective

Automatic Vehicle Guidance Systems (AVDS) identify hazards, threats, driving restrictions and capabilities. An important factor in the successful development of AVDS is the establishment of appropriate traffic rules for a particular road section or intersection. The initial solution focused on optical-

based microprogrammed hardware to avoid computer competition and other limitations associated with modern computing [1]. Then software-based solutions first appeared at the joint [2], [3]. Embeds in the car should be real-time image processing, but they still use parallel hardware components for acceleration and very little camera resolution and frame rate to reduce big data complexity.

6. Implementation

Convolutional neural network (CNN) is a deep learning neural network architecture widely used in computer vision. Computer vision is a specialty that enables computers to understand and interpret visual images or data. When it comes to machine learning, neural networks are very effective. Neural networks are used for many types of data such as images, sounds, and text.

.The picture input convolutional neural network, then forwards the network through the forward propagation of the network to obtain the actual output of the network. By calculating the error of the actual output and the label, the weight and offset of the network are updated, and the principle is as follows.

1] Find random N samples from the sample set as training.

2] Set all weights and parameters to their initial values to start the run.

3] Put the image in the mesh and calculate the correct output vector of the mesh.

4] calculates the output error by comparing the elements in the output vector with the elements in the target vector.

5] Calculate each weight and offset change and set the weight and threshold.

6] After meeting M, determine if the measure meets the requirements, if not, return to [3], if so, continue and go to the next step..

7] At the end of the tutorial, save the weights and offsets to a file. In this case, it can be concluded that the weight is fixed and the product is produced.

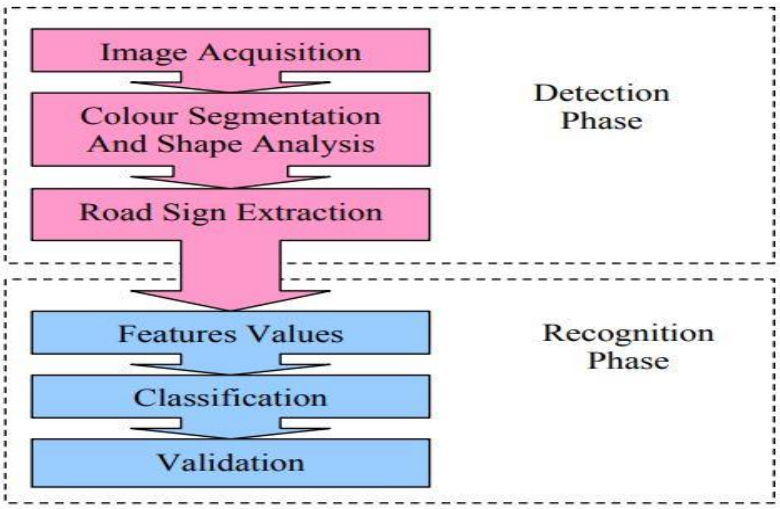

Fig. 2. Block Diagram of the model

7. Conclusion

Train certification is a very useful driver service that improves vehicle and driver safety. This project uses low computational complexity, adaptive and accurate mechanisms to extract and recognize the contents of each bus. Many techniques and methods such as binaryization, region of interest (ROI) and pixel classification have proven successful for recognizing traffic signs. The system depends on the angle at which the image is taken, day, night, etc. It has been proven to produce accurate perceptions depending on the Tests show that the average recognition rate for train signals can reach 35%.

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