TRAFFIC SIGN BOARD DETECTION USING CNN

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ABSTRACT

Traffic sign board detection is an important task in the field of computer vision, with numerous practical applications in the area of autonomous driving, traffic analysis, and intelligent transportation systems. Convolutional neural networks (CNNs) have proven to be highly effective in detecting traffic signs due to their ability to learn hierarchical representations of features from input images. We propose a CNN-based approach for traffic sign board detection. We train our model on a large dataset of annotated traffic sign images, and employ a multi-scale sliding window approach to detect traffic signs of various sizes. Our model incorporates both local and global features to improve detection accuracy, and is able to detect traffic signs under a wide range of lighting and weather conditions. Our experimental results demonstrate that our CNN-based approach achieves state-of-the-art performance in traffic sign board detection, with a high detection rate and low false positive rate.

Keyword: - *Traffic signboard detection, URLs, Machine Learning, Convolution Neural Network, Rectified Linear Unit*

1. INTRODUCTION

Traffic management refers to the process of planning, monitoring, and controlling the movement of vehicles and pedestrians on roads, streets, and other transportation networks. It involves implementing various strategies and measures to optimize the flow of traffic, improve safety, and enhance efficiency in transportation systems. The primary goal of traffic management is to ensure the smooth and safe movement of people and goods while minimizing congestion, delays, accidents, and environmental impact. It encompasses a range of activities, including traffic planning, signal control, roadway design, public transportation management, and the use of technologies for data collection and analysis. Traffic signs recognition (TSR) is an important part of some advanced driver-assistance systems (ADASs) and auto driving systems (ADSs). As the first key step of TSR, traffic sign detection (TSD) is a challenging problem because of different types, small sizes, complex driving scenes, and occlusions. For some reviewed methods that lack comparisons on public datasets, we implemented part of these methods for comparison. The experimental comparisons and analyses are presented on the reported performance and the performance of our reimplemented methods. Traffic sign board detection is a computer vision task that involves the identification and localization of traffic signs in images or video frames. Traffic signs play a crucial role in regulating and managing road traffic by providing important information to drivers, pedestrians, and other road users. Detecting and understanding these signs is essential for developing intelligent transportation systems, driver assistance systems, and autonomous vehicles. The goal of traffic sign board detection is to automatically locate and classify traffic signs present in a given image or video stream. It typically involves a combination of object detection and image classification techniques. Object detection algorithms are employed to identify the presence of traffic sign boards within an image, while image classification algorithms are used to determine the specific type or category of each detected sign. Computer vision and pattern recognition-based traffic sign detection, tracking and classification methods have been studied for several purposes, such as Advanced Driver Assistance Systems (ADAS) and Auto

Driving Systems (ADS). Generally, traffic sign recognition (TSR) systems consist of two phases of detection and classification; for some TSR systems, a tracking phase is designed between detection and classification for dealing with video sequences. For TSR, camera and LIDAR are two most popular used sensing devices. In this paper, we review the literature on traffic sign detection (TSD) based on camera or LIDAR, and do comparison and analysis of the reviewed methods based on the reported performance and the performance of our reimplemented methods.

2. LITERATURE SURVEY

Our literature survey revealed that several common methods are employed in the detection of Traffic Sign Board Detection. One prevalent approach involves analyzing the URL, where researchers have focused on URL-based features such as domain similarity, subdomain analysis, and presence of suspicious keywords. Another approach utilizes machine learning algorithms, where features like content-based features (e.g., HTML and JavaScript analysis), visual similarity, and lexical analysis have been explored. Furthermore, researchers have also investigated based on different technologies and basic approaches(outdated). Other notable methods include the use of robustness, addressing class imbalance.
Overall, the literature survey highlights the importance of traffic sign board detection and provides insights into the various techniques, datasets, and challenges associated with this field of research.

3. ARCHITECTURE

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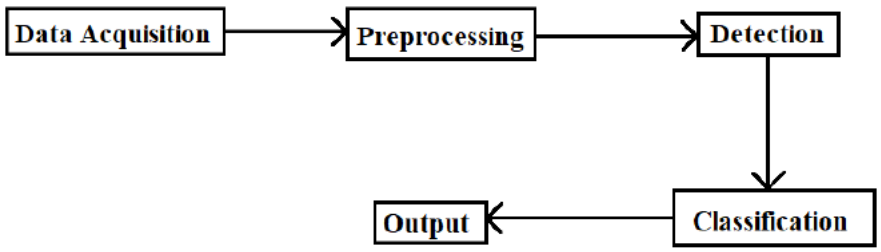

Traffic sign board detection architectures can vary depending on the specific approach and techniques used. However, one commonly employed architecture for traffic sign detection is the combination of a convolutional neural network (CNN) for feature extraction and a subsequent classifier for sign recognition. It's important to note that there are various architectures and modifications of this basic pipeline, depending on the specific research or application requirements. The field of traffic sign board detection continues to evolve, and researchers are constantly exploring new techniques and architectures to improve accuracy and efficiency. A CNN is employed to extract meaningful features from the input image. The CNN consists of multiple convolutional and pooling layers that learn hierarchical representations of the image. These layers capture low-level features like edges and textures and gradually progress to higher-level features. In this step, regions of interest (ROI) likely to contain traffic signs are identified. Techniques like selective search or sliding window approach can be used to propose potential regions for further analysis. This helps reduce the search space and focus the computation on relevant areas.

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4. EXISTING SYSTEM

Limited accuracy: Existing systems may have limited accuracy in detecting and classifying traffic signs, especially in adverse weather conditions or low light situations.
Limited adaptability: Existing systems may not be able to adapt to changes in the road environment, such as construction zones or temporary signs, which can result in inaccurate detection and classification of traffic signs.
Limited scalability: Existing systems may not be scalable enough to be deployed on a large scale, such as across an entire city or region.
Limited detection range: Some systems may have a limited detection range, which can result in missed or delayed detection of traffic signs.

5. PROPOSED SYSTEM

To detect and classify different types of traffic signs, including speed limit signs, stop signs, yield signs, and others. Additionally, the systems should be able to identify distorted images, blurry images etc. It system aims to accurately detect and classify traffic signs in real-world scenarios, providing valuable information for various transportation applications, such as advanced driver assistance systems, autonomous vehicles, and traffic management systems.

6. OVERVIEW

The traffic sign detection (TSD) methods are classified into two categories including shape-based methods and color-based methods. Now, it has been commonly accepted that the machine learning methods have some superiorities over the traditional color or shape-based methods in some aspects. The machine learning methods often need a large amount of training samples with informative both color and shape information. Besides machine learning methods, there are also some methods designed based on both color and shape characteristics. It is not appropriate to classify these TSD methods into color or shape-based methods. Furthermore, LIDAR based methods have developed rapidly in recent years, and previous review methods did not review LIDAR based TSD methods.
In this review, we divide the traffic sign detection methods into categories: color based methods, shape based methods, color and shape-based methods, machine learning based methods, and LIDAR based methods. The color-based methods are the methods mainly designed with color information. The shape detection-based methods are the methods mainly designed with shape information. The color and shape based detection methods are the methods designed with both color and shape information. Though some color or shape based methods are designed with machine learning methods.

7. RESULTS

The following is the welcome page of Traffic sign board detection website. As soon as you click the Traffic sign board detection button it will navigate to that page.

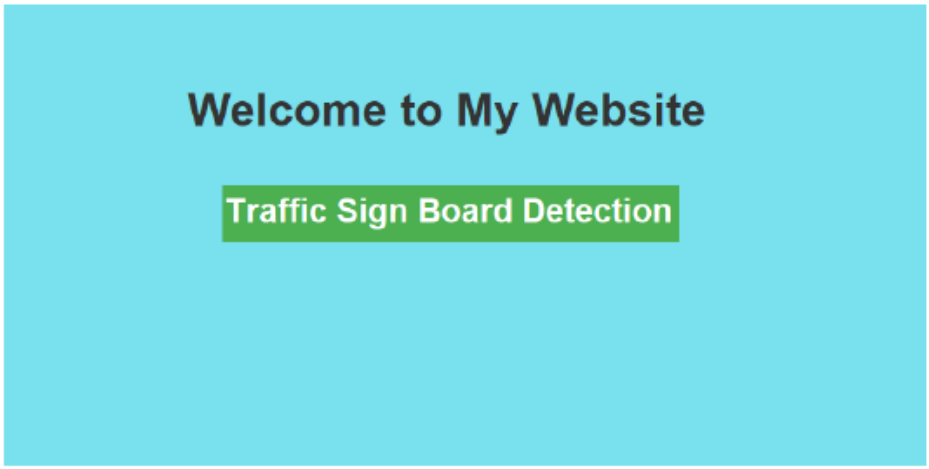

Fig. 8.1: Welcome page

The input images in ppx format are available in datasets. The traffic signs are detected and output for the images upto 30 pixels.

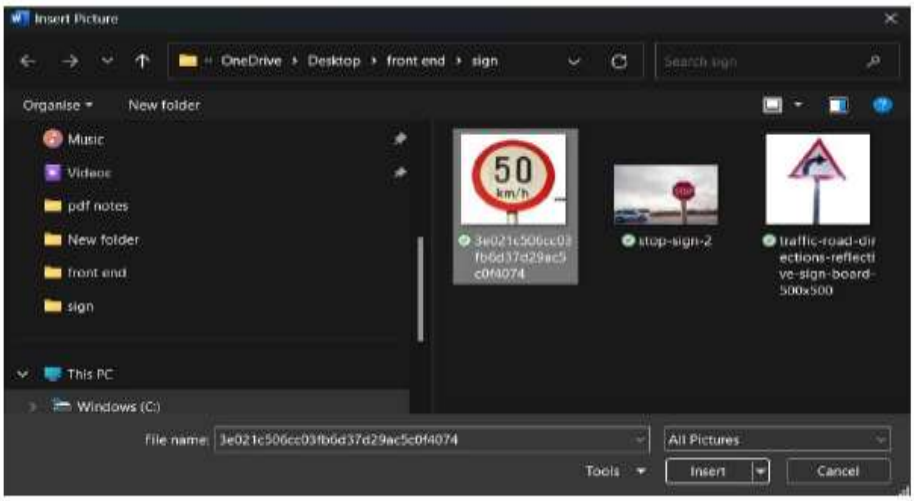

Fig 8.3: Images to be Uploaded.

The final result, traffic signs are depicted in this slide.

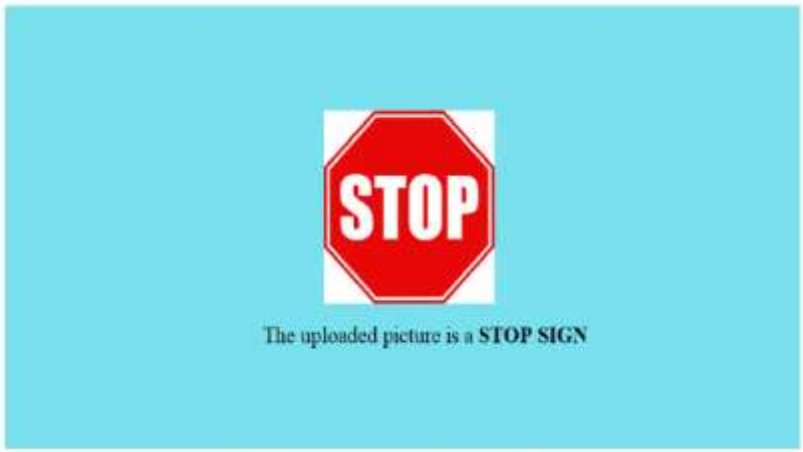

Fig 8.4: Recognition of the uploaded image.

8. CONCLUSIONS

Traffic sign board detection is a crucial task in the field of computer vision and plays a significant role in applications such as intelligent transportation systems, driver assistance systems, and autonomous vehicles. Traffic sign board detection still faces challenges such as occlusions, variations in lighting and weather conditions, and the presence of similar objects in the scene. Handling these challenges requires the development of more robust algorithms and the integration of contextual information to improve detection accuracy. Both traditional computer vision techniques and deep learning-based approaches have been explored for traffic sign board detection. Traditional methods include color-based segmentation, edge detection, and template matching, while deep learning techniques, particularly convolutional neural networks (CNNs), have shown significant success due to their ability to learn complex visual patterns.

Overall, traffic sign board detection research has made significant progress in improving the accuracy and efficiency of detecting and recognizing traffic signs. These advancements contribute to enhancing road safety, facilitating

navigation systems, and enabling the development of autonomous driving technologies. Continued research and innovation in this field will further refine and optimize traffic sign board detection systems, ultimately leading to safer and more efficient road transportation.

9. REFERENCES

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