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Enhancement in Web based Traffic Sign Recognition application using CNN Algorithm

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ABSTRACT: Traffic signs play a crucial role in managing traffic on the road, and disciplining the drivers, thereby preventing injury, property damage, and fatalities. Traffic sign management with automatic detection and recognition is very much part of any Intelligent Transportation System (ITS). In this era of self-driving vehicles, calls for automatic detection and recognition of traffic signs cannot be overstated. This project presents a deep-learning-based autonomous scheme for cognizance of traffic signs in India. The automatic traffic sign detection and recognition were conceived on a Convolutional Neural Network (CNN)- Refined Mask R-CNN (RM R-CNN)- based end-to-end learning. The proffered concept was appraised via an innovative dataset comprised of 6480 images that constituted 7056 instances of Indian traffic signs grouped into 87 categories. We present several refinements to the Mask R-CNN model both in architecture and data augmentation. We have considered highly challenging Indian traffic sign categories which are not yet been reported in previous works. The dataset for training and testing of the proposed model is obtained by capturing images in real time on Indian roads. The evaluation results indicate a lower than 3% error. Furthermore, RM R-CNN's performance was compared with the conventional deep neural network architectures such as Fast R-CNN and Mask R-CNN

KEYWORDS: Traffic Sign Recognition, Convolutional Neural Network, Deep Learning, Machine Learning, Data Science.

I. INTRODUCTION

Advanced driver assistance systems currently installed in vehicles, such as autonomous driving vehicles, have achieved favorable results. These systems greatly reduce the necessity of driver control in locations with invariable landscapes, such as highways and enclosed parks. They are also capable of planning routes and navigating vehicles to destinations while helping them to avoid obstacles. However, for self-driving technology to be more widely applicable, additional landscapes (e.g., city streets) must be incorporated into these systems. Specifically, self-driving technology must be able to detect traffic conditions and determine whether to continue driving or stop according to traffic signals. Traffic light detection techniques are typically categorized into two classes. One class involves the detection of traffic lights and communicating with neighboring vehicles through vehicle-to-infrastructure (V2I) communications. The second class involves the detection of traffic light positions and states by using vehicle sensors. The first class is usually more expensive to implement than the second class. Traffic light recognition methods that use vehicle onboard sensors have been extensively studied. In several methods, advanced image processing techniques are primarily applied to the sequence images captured by in-vehicle cameras. Learning-based methods have become increasingly popular because of their excellent classification performance. However, detection accuracy remains unsatisfactory due to the presence of multiple disturbance factors in outdoor environments, such as incomplete light shapes, dark light states, and

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partial occlusion. These issues are troublesome to overcome with computer vision and image processing techniques. However, the research on convolutional neural networks (CNN) for traffic light detection has contributed to the development of learning-based methods with effective feature extraction for classification.

II. LITERATURE SURVEY

Traffic sign detection — A new approach and recognition using convolution neural network Traffic Sign Recognition (TSR) system is a component of the Driving Assistance System (ADAS). The TSR system assists drivers in safe driving as road signs provide important information on the road. This research focuses to design and develop a TSR system by using color cues and Convolution Neural Network (CNN) as both features extractor and classifier for Bangladeshi traffic signs. In the first step, after image acquisition, some pre-processing taskis performed. Then the image is segmented using the color information of the HSV color model.

Traffic Sign Detection and Recognition Based on Convolutional Neural Network 2019 Chinese Automation Congress(CAC)

Traffic sign recognition system (TSRS) is a significant portion of the intelligent transportation system (ITS). Being able to identify traffic signs accurately and effectively can improve the driving safety. This paper brings forward a traffic sign recognition technique on the strength of deep learning, which mainly aims at detecting and classifying circular signs.

Road sign feature extraction and recognition using dynamic image processing

The development of a system that can provide road information to the driver at any time is already underway. This system uses wireless communication with special narrow-band signal transmitters installed on the roadside, a technology that has already been commercialized with ETC. With the construction of this type of infrastructure, it is believed that there will be a change in the method of providing road sign information from the current method of providing visual information. However, much time will be required before this infrastructure covers all roads in local areas, and it is likely that as long as vehicles are driven by human drivers, road signs will never disappear as a means of providing traffic information.

III. ABBREVIATIONS AND ACRONYMS

RFID-RadioFrequencyIdentification,GPS- Global Positioning System,COVID- Corona VirusDisease,
GDP-GrossDomesticProduct,
Wi-Fi- Wireless Fidelity,
DBMS-DatabaseManagementSystem,GUI-

GraphicalUserInterface,
ITC-Intelligent Transportation System,
CNN- Convolution neural network,
TRS- Traffic Recognition System,
ADAS- Advanced Driving Assistance System,

IV. OBJECTIVES

Prediction of traffic sign functional service life and factors mainly responsible for retro reflectivity deterioration are crucial for planned maintenance schemes to ensure a satisfactory level of service. In the past, several studies were initiated to explore factors contributing to sign retro-reflectivity. For example, Black et al. were pioneers in investigating the effect of factors such as signs elevation, orientation, solar radiation levels, temperature, precipitation, and age on sign retro-reflection. A total of over 5000 signs were surveyed. It was reported that precipitation, sign age, elevation, and temperature had a strong positive association with sign degradation patterns while there was no statistical evidence for the effect of sign direction on the same. However, this study does have a few limitations.

V. METHODOLOGY

This proposed system has put forth a machine learning-based approach for recognizing traffic sign images and predicting results. Here is a website in which users easily upload a picture of the traffic sign and receive results. Images are first accepted as input, followed by preprocessing, feature extraction, and finally training of a CNN Model to provide the required result.

It also enables faster debugging and greater project resiliency, and improved team morale, as this setup makes it easier for other developers to take over in case one of the developers has to leave the project.

The process of working on the code with a team or with another developer becomes easier.

The web UI allows the user to read, write and execute code. The web User Interfacethen also contains the drawing board to explain and visualize code logic.

Rich code editor - The code editor supports 6+ different languages and comes with syntax highlighting and auto-complete.

In-browser compiler - Compile or run your code in the browser using the high-performance compiler.

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Input:
A dataset of traffic sign images is supplied to the CNN network model during model training.

Pre-processing (Noise Removal)
The dataset may contain some incomplete, redundant, inconsistent data. Therefore, in this step, such redundant data should be filtered. Data should be normalized.

Feature Extraction (Attribute Selection)

Using these unprocessed pixel values as individual features is the simplest technique to extract features from an image feature. Fora grayscaleimage, Background Thresholdissetto (0,0,0) by default, for a colour edge, a pixel is seen as a pixel that is part of the black colour, and an object if any of the RGB values are greater thanthe corresponding value in the Background Threshold. Features are then retrieved from the photos, and feature selection is done. The dataset's most relevant attribute must be identified and used at this step.

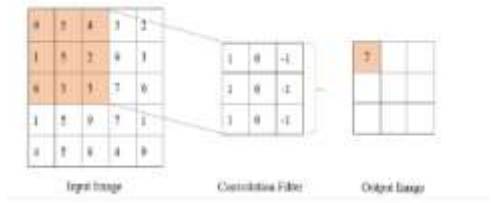
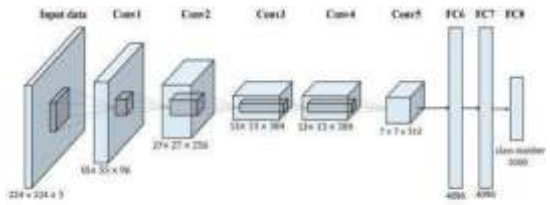


Image segmentation

Image segmentation is a crucial phase of data preparation where the actual item is divided intolittle pieces and identifies the key aspect of the photos resulting in more granular information about the shape of an image. Here segmentation is done i.e.dividing the images into regions of varied hues that aid in a clearer distinction between different objects.



Splitting dataset:
Next, an 80%-20% split of the processed dataset is made into train and test datasets. That is
80% of the dataset goes into the training set and 20% of the dataset goes into the testing set.

VI. CONCLUSION AND FUTURE WORK

CONCLUSION:

In this project, we have presented an overview of some recent and efficient traffic sign detection and classification methods. Detection methods are divided into three categories: color based that are classified according to the color space, shape-based, and learning based whichincludes deep learning methods. The recent detection methods achieve a detection rate varied from 90% to 100% with the available dataset described briefly in the project. In this project, we use deep learning methods such as CNN (Convolution Neural Network) and they achieved a high accuracy of >90% hence available dataset reached saturation. The proposed approach, despite its ability to detect and recognize traffic lights, achieves 94% accuracy, indicating room for improvement. For traffic light detection and recognition, a low tolerance for error is required because the safety of passengers and others is at stake. The proposed approach may be improved by future research through the improvement of the detection method and the dataset used.

VII. FUTURE WORK:

Testing the model on Test Data Calculating the accuracy with the test data. If accuracy is good then we will save the model After saving the model, we will create aUser interface using Flask which will connectour CNN model with the user. This Interface will help the user to upload the traffic sign and the system will return the output through the image.

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