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VOICE BASED TRAFFIC SIGN RECOGNITION SYSTEM FOR ENHANED DRIVER ASSISTANCE

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ABSTRACT
The increasing number of road accidents has highlighted the importance of developing systems to enhance safety for drivers, pedestrians, vehicles. One crucial aspect is the detection and recognition of traffic signs which is vital for driver assistance systems. Although traffic sign detection has been studied for years and great progress has been made with rise of deep learning techniques, there are still many problems remaining to be addressed. In real world scenarios there are two main challenges. Firstly, traffic signs are usually small size object, which makes them more difficult to detect than large ones secondly, the driver unwittingly may miss the traffic sign or misinterpret it while driving. Also, it is hard to distinguish false signs which may resemble an actual traffic sign. In the recent advancement of object detection, algorithms like R-CCN, fast R-CCN have provided result yet not efficient enough to be implemented in real-time. In this paper, an approach to assist the driver through traffic sign recognition with much more faster recognition with much faster detection in conjunction with human like general voice feedback has been presented.
Keywords: R-CNN, Fast R-CNN, Traffic sign detection, Traffic sign Recognition, Voice feedback

INTRODUCTION

The system continuously monitors the environment through cameras to detect and recognize traffic signs in real-time. This process involves analyzing the captured images or video frames to identify the presence and type of traffic signs such as stop signs, speed limit signs, etc. Once a traffic sign is detected and recognized, the system interprets its meaning and relevance to the current driving situation. For example, if a speed limit sign is detected, the system assistant the driver to maintain the below speed. Based on the interpretation of the traffic sign and the driving context, the system generates appropriate voice feedback to assist the driver. This feedback could include verbal instructions or alerts related to the detected traffic sign. For instance, if a stop sign is recognized, the system may generate a voice prompt saying "Please come to a complete stop" or "Stop sign ahead, prepare to stop. "The system enhances driver awareness, improves safety, and helps in better adherence to traffic regulations, especially in situations where visual distractions or conditions may hinder direct observation of traffic signs".

LITERATURE SURVEY

Evgenij M.Macheev,Aleksej V.Devyatkin,Alksender R.Muzalevsky, "Advanced Traffic Sign Recognition System"[1]: Solving the problem of identifying and recognizing traffic signs is one of the most important research topics necessary for designing unmanned vehicles. The paper describes the general implementation of the sign detection subsystem and suggests a solution to the problem of the absence of individual traffic signs in open datasets based on the use of convolutional neural networks.

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Zhilong He, Zhongjun Xiao, Zhiguo Yan, “Traffic sign recognition based on convolutional neural network model” [2]: Traffic sign recognition (TSR) is a significance research branch in the field of unmanned driving, which is very important for driverless driving and is often used to read permanent or temporary road signs on the roadside. Traffic sign detection (TSD) and traffic sign classification (TSC) constitute a complete recognition system. The paper mainly studies the traffic sign recognition. Traffic sign recognition is mostly applied to portable devices, so the size and detection speed of the model are important factors to be considered. Under the condition of ensuring the speed, the detection accuracy of the model is guaranteed. The accuracy of the model designed in this paper on the German traffic sign recognition benchmark (GTSRB) is 99.30%, the parameter size is only 1.3M, and the trained network model is 4.0M. The results of final experiment show that the network is valid for the classification of traffic signs.

Rudri Mahesh Oza, Angelina Geisen, Taehyung Wang, “Traffic sign recognition and detection using deep learning” [3]: The Advanced Driver Assistance System includes traffic sign identification and recognition. Traffic signs warn drivers of traffic laws, road conditions, and route directions, assisting them in driving more efficiently and safely. Traffic Sign Recognition is a technique for regulating traffic signals, warning drivers, and commanding or prohibiting specific acts. A quick real-time and reliable automated traffic sign detection and recognition system can assist and relieve the driver, improving driving safety and comfort significantly. For autonomous intelligent driving vehicles or driver assistance systems, automatic identification of traffic signals is also important. This paper aims to use Neural Networks to identify traffic sign patterns. Several image processing methods are used to pre-process the images. Then, to understand traffic sign patterns, Neural Networks stages are performed. To find the best network architecture, the system is trained and validated. The results of the experiments show that traffic sign patterns with complex backgrounds can be classified very accurately.

EXISTING METHOD

The existing system was trained using Convolutional Neural Network (CNN) which helps in traffic sign image recognition and classification. A set of classes were defined and trained on a particular dataset to make it more accurate. Following the detection of the sign by the system, a voice alert is sent through the speaker which notifies the driver. The existed system also contains a section where the vehicle driver is alerted about the traffic signs in the near proximity which helps them to be aware of what rules to follow on the route.

DISADVANTAGES

Limited Object detection: The CNN-based system struggles with detecting smaller or if they're hidden behind other objects.

Processing Speed: CNN's slower processing speed may result in delayed recognition and response to traffic signs.

PROPOSED METHOD

The proposed system utilizes Faster Regional Convolutional Neural Network (FRCNN) to accurately detect and recognize traffic signs in real-time. FR-CNN is known for its efficiency in object detection and will enhance the performance of the overall system. Following the detection of the sign by the system, a voice alert is sent through the speaker which notifies the driver. The existed system also contains a section where the vehicle driver is alerted about the traffic signs in the near proximity which helps them to be aware of what rules to follow on the route.

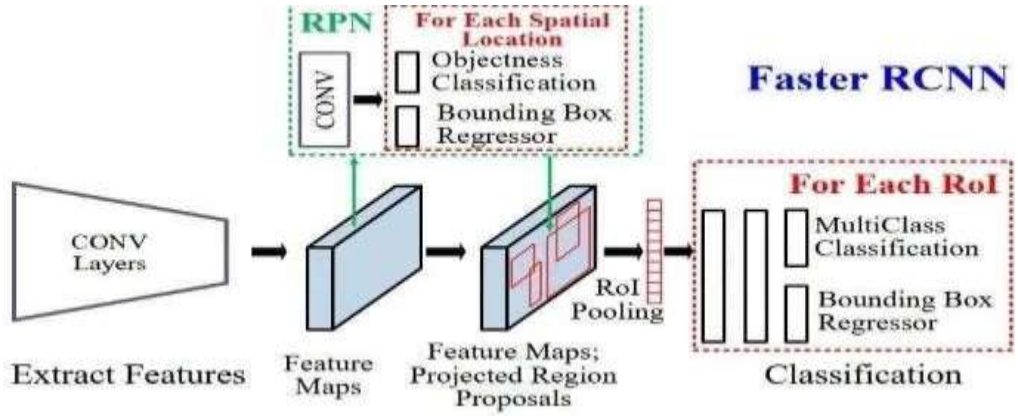
ADVANTAGES

Using FRCNN, it can detect more than one object at a time from an image. Unlike RCNN, FRCNN avoids detecting unnecessary space from the image. Processing speed is more for FRCNN when compared to CNN and RCNN

THE DESIGN STRUCTURE OF THE SYSTEM

The camera captures the images here the camera is collecting the data by capturing the images of the outside scenario. The collected images are sent through the convolutional layers, pooling layers and fully connected layers where data preprocessing is done. During preprocessing the image is resized to a particular size to maintain consistency, normalized for better generalization, data augmentation takes place to prevent overfitting of data. After preprocessing training and testing of data is done where 80%of the data is for training 10% is for validation and 10% is for testing the data. During the evaluation Accuracy, Precision, Recall, F1-Score are generated this is process taking place during CNN. The same process is repeated for the FRCNN algorithm but the only difference is that CNN takes a lot of time to process the data whereas FRCNN takes less time to process. So, when compared accuracy precision recall f1-score is high for FRCNN algorithm.

ARCHITECTURE



RESULT ANALYSIS

Fig1: Output Screen

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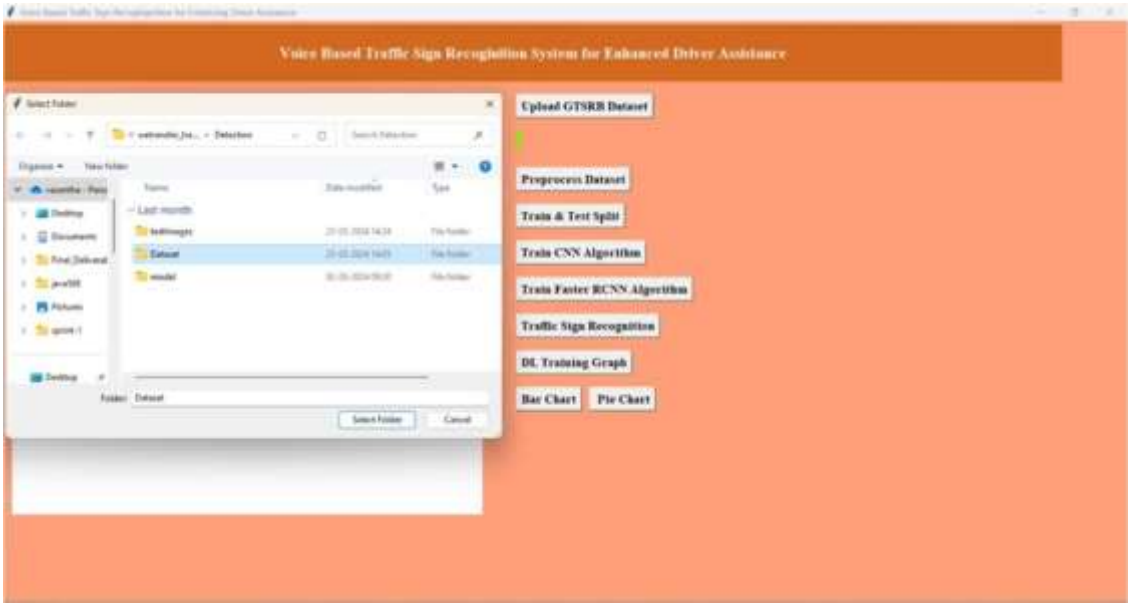

Fig2: uploading dataset

Fig3: Train and Test

Fig4: After FRCNN Training

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Fig5: Traffic sign recognition

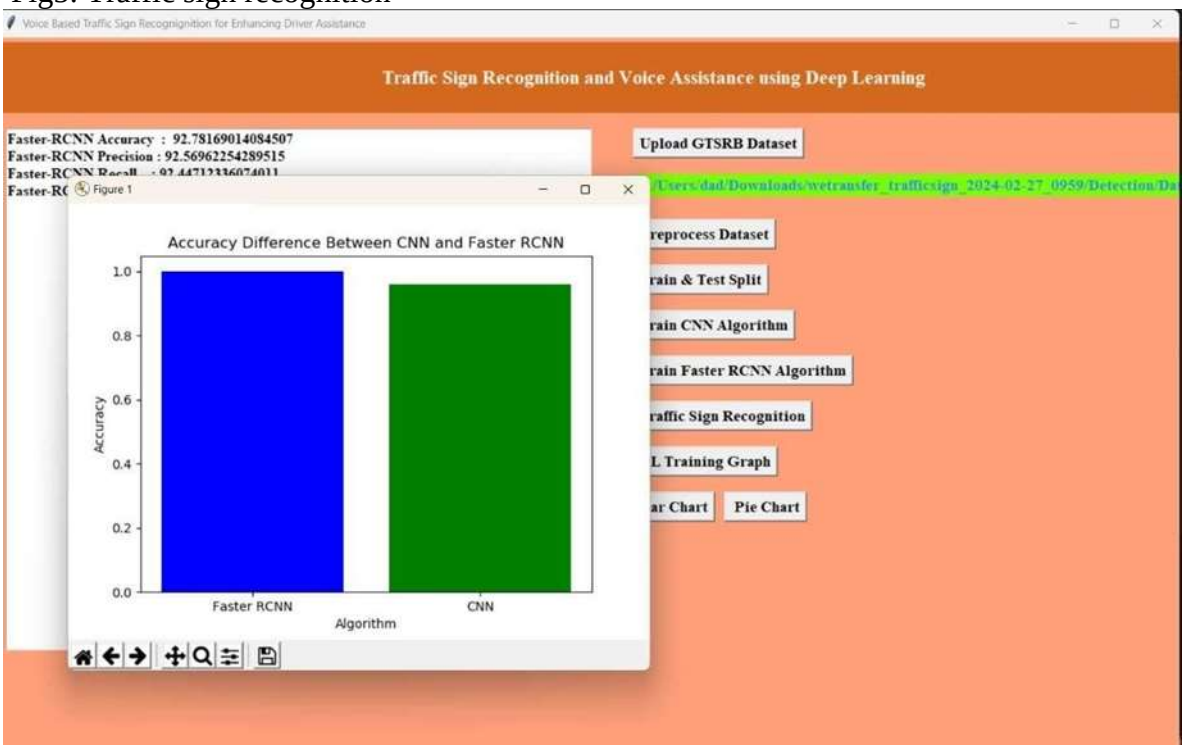

Fig6: Accuracy Comparison between CNN&FRCNN

CONCLUSION

In this paper, we have used FRCNN algorithm to detect and recognize traffic signs such as , stop, yield, and pedestrian crossing signs and alert the driver through voice notifications. A large dataset of Indian traffic signs was created containing over 10,000 images of various signs, sizes and orientations. A faster RCNN model was trained on the dataset achieving an accuracy of 96.5% on the test set. The model was integrated with a camera feed, enabling real time detection of traffic signs in various environments. The voice-based traffic sign recognition system using Faster R- CNN has demonstrated promising results in detecting and recognizing traffic signs in real-time. With further development and refinement, this system has the potential to revolutionize the driving experience in India, promoting road safety and reducing accidents.

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REFERENCES

Evgenij M.Macheev,Aleksej V.Devyatkin,Alksender R.Muzalevsky, “Advanced Traffic Sign Recognition System” 2022 XXV International Conference On Soft Computing And Measurements(SCM),
DOI: 10.1109/SCM55405.2022.9794877

Rudri Mahesh Oza, Angelina Geisen, Taehyung Wang, “Traffic sign recognition and detection using deep learning”2021 4th International Conference On Artificial Intelligence for industries(AI4I),
DOI: 10.1109/AI4I51902.2021.00012

W. Liu, D. Anguelov, D. Erhan, C. Szegedy, S. E. Reed, C. Fu, and A. C. Berg, “SSD: single shot multibox detector,” in ECCV (1), ser. Lecture Notes in Computer Science, vol. 9905. Springer, 2016, pp. 21–37.

E. Shelhamer, J. Long, and T. Darrell, “Fully convolutional networks for semantic segmentation,” IEEE Transactions on Pattern Analysis and Machine Intelligence, vol. 39, no. 4, pp. 640–651, April 2017.

Zhilong He , Zhongjun Xiao, Zhiguo Yan, “Traffic sign recognition based on convolutional neural network model” 2020 Chinese Automation Congress(CAC),
DOI:10.1109/CAC51589.2020.932783

Djebbara Yasmina, Rebai Karrima, Azouaoui Ouahiba,“Traffic recognition with deep learning”2018 International Conference On Applied Smart Systems(ICASS), DOI: 10.1109/ICASS.2018.8652024