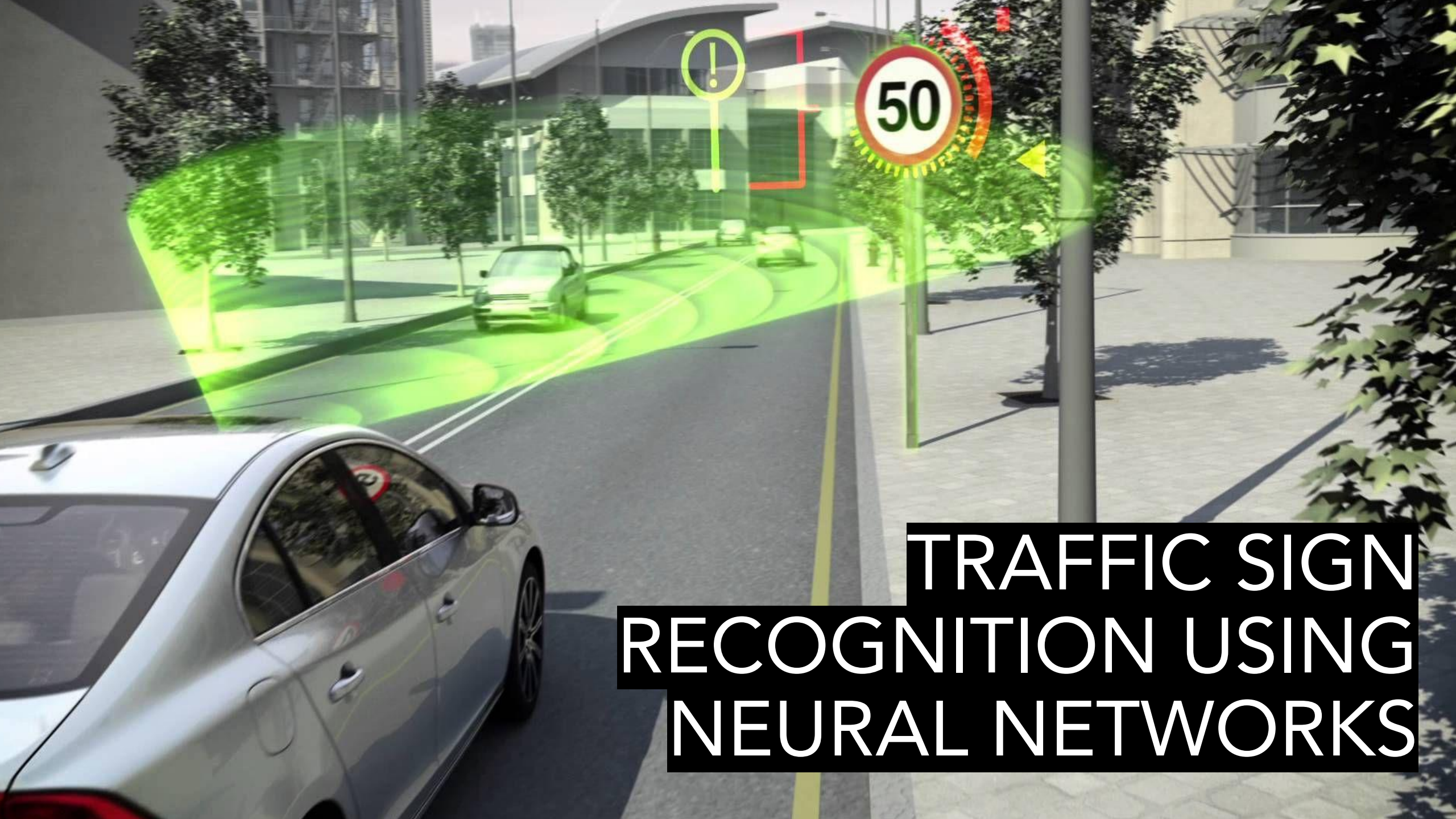

TRAFFIC SIGN RECOGNITION USING NEURAL NETWORKS

UNDER THE GUIDANCE OF PROF. MANOJ KUMAR MISHRA

MINOR PROJECT BY

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- DIPENDRA UPADHYA
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INTRODUCTION

In recent years many algorithms for the traffic sign detection and classification have been introduced. Extensive research is being made by major car manufacturing companies in collaboration with Universities and other institutes on real-time and automatic recognition of traffic signs so that it can be a part of the so-called “Driver Support Systems”. Traffic sign recognition (TSR) can be considered part of the bigger problem of autonomous vehicles. An autonomous vehicle system relies on vision-based recognition of the surrounding area in order to make driving decisions. This vision-based recognition system may function as the feedback provider for control of steering wheel, accelerator, brake, etc. It may recognize road and lane to allow control system follow the course of own vehicle, detect obstacles on the road till control system avoids them, detect the passing vehicles (e.g. by side or back cameras) to notify the control system about probable hazards and detect and interpret the traffic signs to provide feedback for safe driving.

WHAT IS TRAFFIC SIGN RECOGNITION (TSR)?

Traffic-sign recognition (TSR) is a technology by which a vehicle is able to recognize the traffic signs put on the road e.g. "speed limit" or "children" or "turn ahead". This is part of the features collectively called ADAS. The technology is being developed by a variety of automotive suppliers. It uses image processing techniques to detect the traffic signs. The detection methods can be generally divided into color based, shape based and learning based methods.

OUR VISION

Traffic signs provide important information for drivers about road condition and hazards. Their discriminating shape and colors make them easily recognizable by humans. Besides the application of Traffic sign recognition (TSR) in autonomous vehicles, it can also serve as an assistant driver (e.g. when combined with speedometer output) to notify the driver about approaching a traffic sign (e.g. even before driver sees it) or his risky behavior (like driving above the speed limit). Our motive is to identify “traffic signs” for the self-driving automated cars and further enhancing the detection techniques that currently prevail.

OBJECTIVE

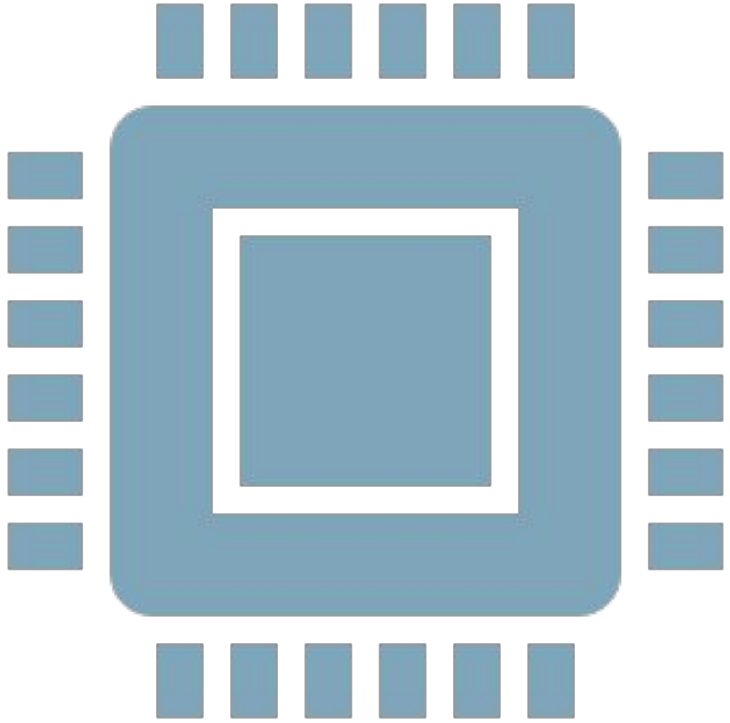
The objective of this project is to work on the development of an algorithm for the automatic recognition of traffic signs. Two major problems exist in the process of detection and recognition of traffic signals. Road signs are frequently occluded partially by other vehicles and many objects are present in traffic scenes which make the sign detection hard and pedestrians, other vehicles, buildings and billboards may confuse the detection system by patterns similar to that of road signs. Also, information from traffic scene images is affected by varying illumination caused by weather conditions, time (day-night) and shadowing. This method detects the location of the sign in the image, based on its geometrical characteristics and recognizes it using color information. For the road sign recognition subsystem, a convolutional neural network (CNN) is adopted to classify traffic signs for candidate regions. Experimental results show that our approach can obtain the desired results effectively.

SOFTWARE SPECIFICATIONS

For the project we have used python as our programming language and several python packages like open CV, keras, numpy, matplotlib, pandas etc.

NumPy is a general-purpose array-processing package. It provides a high-performance multidimensional array object, and tools for working with these arrays.

pandas is a fast, powerful, flexible and easy to use open source data analysis and manipulation tool, built on top of the Python programming language.

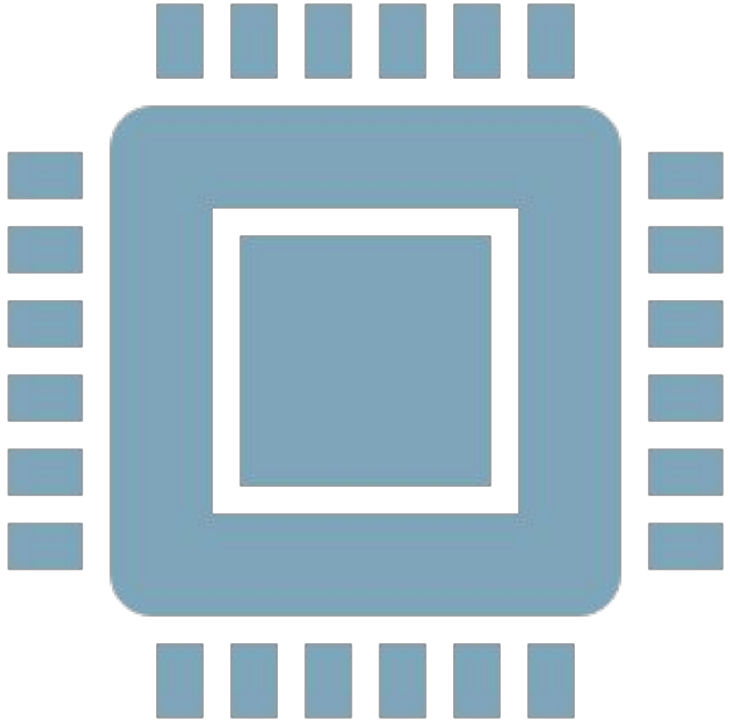


SOFTWARE SPECIFICATIONS

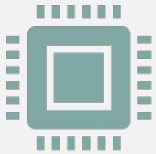
OpenCV (*Open Source Computer Vision Library*) is a library of programming functions mainly aimed at real-time computer vision. For the project we have used python as our programming language and several python packages like open cv, keras, numpy, matplotlib, pandas etc

Keras is an open-source neural-network library written in Python. It is capable of running on top of TensorFlow, Microsoft Cognitive Toolkit, R, Theano, or PlaidML. Designed to enable fast experimentation with deep neural networks, it focuses on being user-friendly, modular, and extensible.

Pickle module implements binary protocols for serializing and de-serializing a Python object structure.

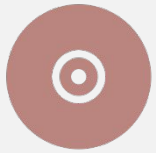


Hardware specifications

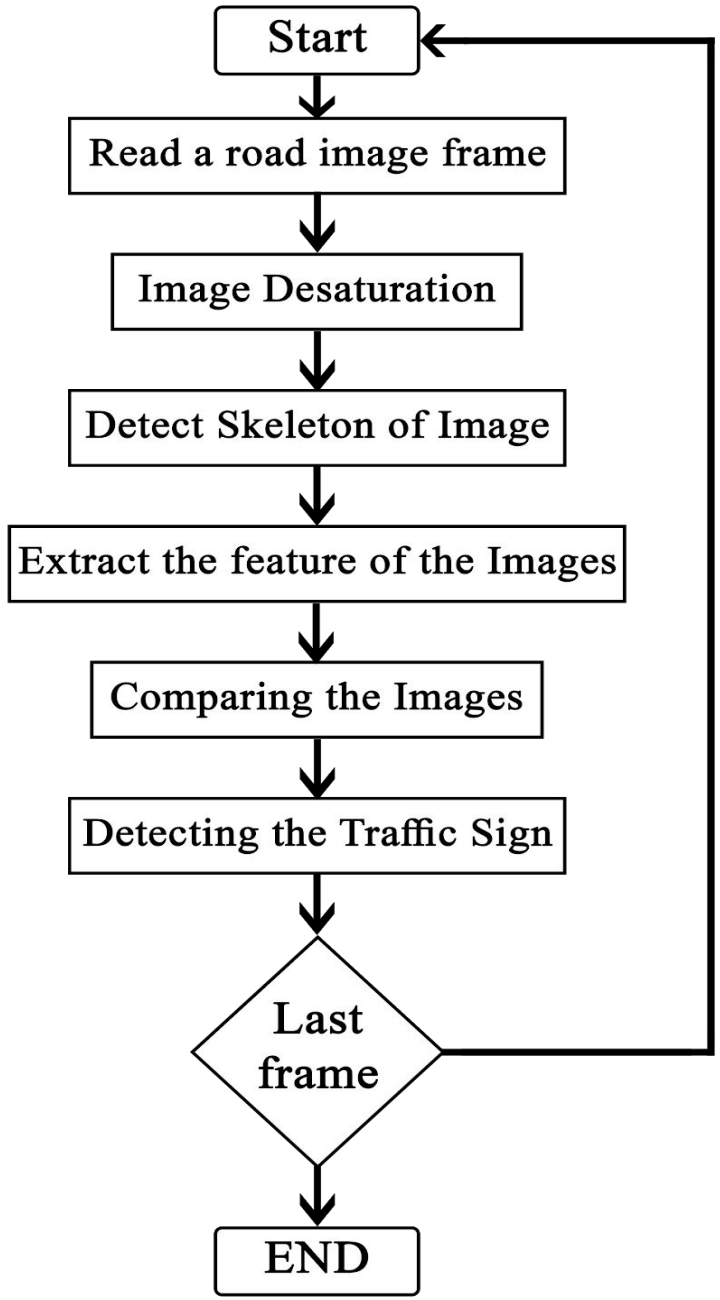


Processor: Intel i5

Primary Memory(RAM): 8Gb



Secondary Memory(HDD): 1TB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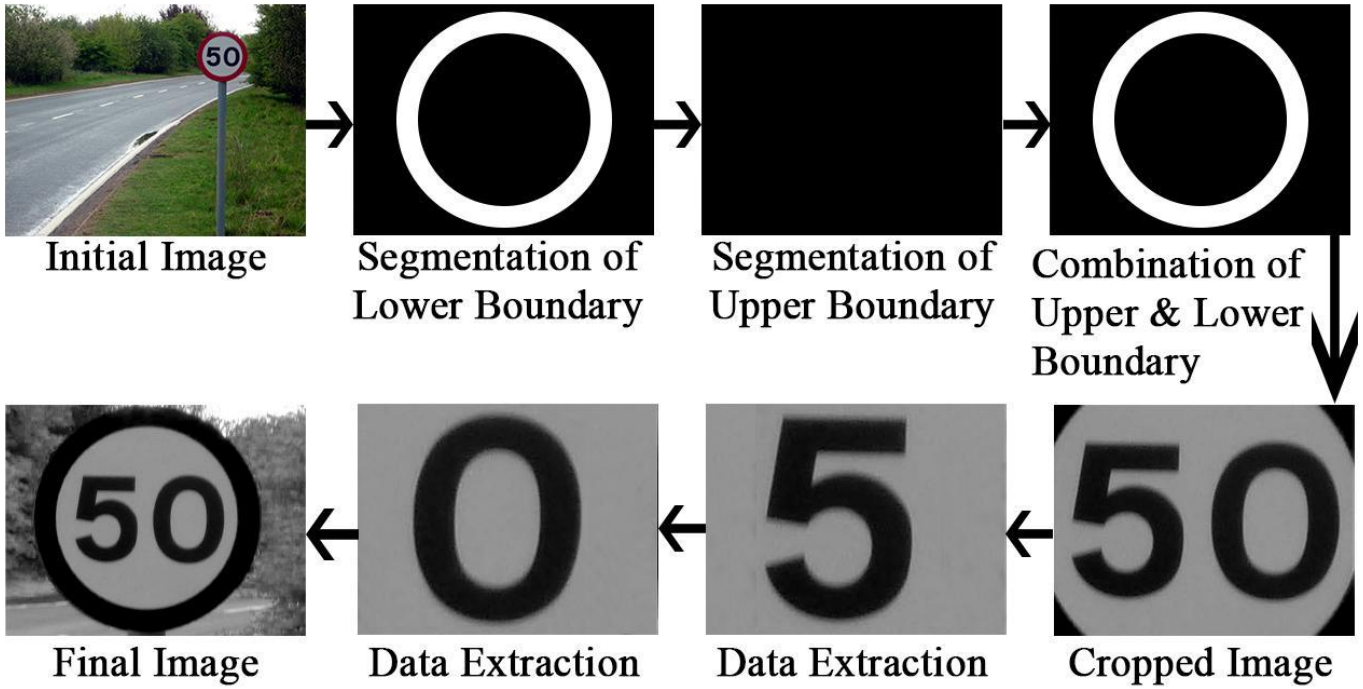
Read a road image frame
Image Desaturation
Detect Skeleton of Image
Extract the feature of the Images
Comparing the Images
Detecting the Traffic Sign
Last frame
END

Process of data extraction from frame



Process of Data Extraction from a frame

IMPLEMENTING THE TECHNOLOGY

Read a Road image frame: Read the image(frame) from the camera.

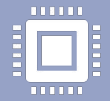


Image Desaturation: Here the colored image(frame)is converted to black and white frames for faster calculation for the algorithm.

Skeleton of Image: Using shape-based detection, OpenCV detects specific circular objects in a given gravy scale image.

Extract the Feature of the images: Using Keras package the feature of the image i.e the various distinguishing characteristics of the sign image is captured like whether the shown sign is of speed limit, stiff end, school ahead etc.

IMPLEMENTING THE TECHNOLOGY

Comparing the images: After extracting the features of the sign image the algorithm now compares the two images i.e the image detected in the camera with the images that the machine is being trained.

Detecting the traffic sign: If after comparing the two signs matches then the traffic sign's name is displayed on the screen.

Last Frame: If it does not detect any traffic sign then it again checks the new frame.

ADVANTAGES

Traffic sign recognition algorithm enhances the driving safety of intelligent vehicles in the actual driving environments by effectively meeting the real-time target requirements of smart cars.

In the future, the inclusiveness and anti-error recognition of the traffic sign recognition algorithm can be further optimized and improved to exploit the overall performance of the algorithm.

The fully shortened average processing time is conducive to meet the real-time target requirements of intelligent vehicles in the actual driving environments effectively.

CONCLUSION

In this project, an improved traffic sign detection and recognition algorithm is proposed for intelligent vehicles. From the viewpoint of traffic sign recognition accuracy and algorithm time-consuming, the proposed traffic sign detection and recognition algorithm has remarkable advantages. Considerably enhancing the driving safety of intelligent vehicles in the actual driving environments and effectively meeting the real-time target requirements of smart cars are conducive. Furthermore, a strong technical guarantee is provided for the steady development of intelligent vehicle driving assistance.