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Traffic Sign Recognition For Self Driving cars

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Abstract: This paper presents an automated traffic sign recognition system for self-driving cars using deep learning techniques. The system detects and classifies traffic signs from real-time images captured by vehicle cameras. Convolutional Neural Networks (CNN) are used to extract features and accurately recognize different traffic signs. The system improves road safety by providing real-time alerts and assisting autonomous driving decisions. It reduces human effort and enhances driving efficiency by enabling vehicles to understand road signs automatically.

Keywords: Traffic Sign Recognition, Deep Learning, CNN, Computer Vision, Autonomous Vehicles, Image Processing1.

1.INTRODUCTION

Traffic sign recognition is an essential component in self-driving cars and advanced driver assistance systems. It helps vehicles understand road rules by identifying signs such as speed limits, stop signs, and warnings. This project uses deep learning and computer vision techniques to automatically detect and classify traffic signs from images. The system ensures real-time processing and high accuracy, making it useful for safe and intelligent transportation systems.

2. Literature Surve

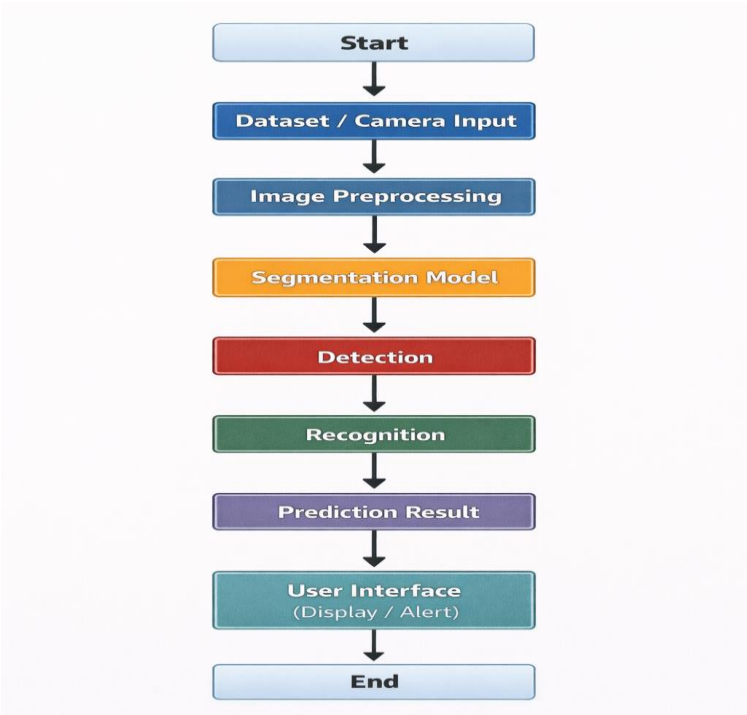
Literature survey is an important step in the software development process. It helps to understand project requirements such as time, cost, resources, and system feasibility. Before development, it is necessary to analyze the company's strength and available manpower. It also helps in selecting suitable operating systems and programming languages for the project. Developers can gain knowledge and support from books, research papers, websites, and experienced programmers. A proper survey ensures better planning and efficient system design. It helps identify existing solutions and improves the proposed system. Overall, literature survey plays a key role in successful project

Key observations:

- Traditional methods had limited accuracy in real-world conditions
- Deep learning improves detection and classification performance
- Real-time recognition is essential for autonomous vehicle

3.Proposed System

The proposed system uses deep learning techniques, specifically Convolutional Neural Networks (CNN) and Mask R-CNN, to automatically detect and recognize traffic signs from images.The system processes real-world traffic-sign images using a pipeline that includes dataset loading, preprocessing, feature extraction, classification, and prediction. This approach enables automatic detection and recognition of traffic signs with improved accuracy and speed. According to the project report, the proposed system is designed to detect and recognizetraffic signs in real time using datasets such as GTSRB, making it suitable for autonomous vehicles and driver-assistance systems. The deep-learning model reduces manual work and improves safety by helping drivers identify traffic signs correctly.



4. Methodology

The methodology of the proposed traffic-sign detection and recognition system explains the sequence of steps followed to design and implement the system using deep learning and image-processing techniques. The system processes traffic-sign images through multiple stages, including data preparation, preprocessing, detection, recognition, and result generation.

1.Data Collection

The first step in the methodology is collecting traffic-sign images from publicly available datasets such as the German Traffic Sign Recognition Benchmark (GTSRB). These datasets contain labeled images representing different categories of traffic signs. The collected data is used for training and testing the deep-learning model.

2.Data Pre-processing

After collecting the dataset, preprocessing is performed to prepare images for training. Images are resized to a fixed dimension, normalized, and converted into numerical arrays. Noise and unnecessary image details are removed to improve model accuracy and reduce computational complexity.

3.Traffic-Sign Detection

In the detection stage, the system identifies the location of traffic signs within an image. A deep-learning detection model such as Mask R-CNN is used to detect traffic-sign objects from real-world images. This step ensures that only relevant regions of the image are passed to the recognition module.

4.Traffic-Sign Recognition

Once the traffic sign is detected, the recognition module classifies it into predefined categories using a Convolutional Neural Network (CNN). CNN automatically extracts important visual features such as edges, shapes, and patterns from the detected traffic-sign image. The trained model predicts the correct traffic-sign class based on these learned features.

5.Result Generation

Finally, the system displays the prediction results through a graphical user interface (GUI). The output confirms whether the traffic sign has been correctly detected and recognized. This methodology enables accurate and efficient traffic-sign recognition suitable for intelligent transportation systems and autonomous vehicles.

5. Proposed System Hardware Results

The proposed system hardware successfully detects and recognizes traffic signs in real-time using a camera and processing unit. The camera captures live road images, and the system processes them using a trained deep learning model.

- The system successfully detects and recognizes traffic signs in real-time
- A camera is used to capture live road images continuously
- The processing unit analyzes images using a trained deep learning model
- High accuracy is achieved in identifying different traffic signs
- The system provides fast response time suitable for real-time applications
- Hardware components work efficiently without noticeable delay
- It performs well in different conditions like daytime and moderate nighttime
- Detected traffic signs are clearly displayed on the output screen
- Overall, the system is reliable, accurate, and effective for self-driving cars

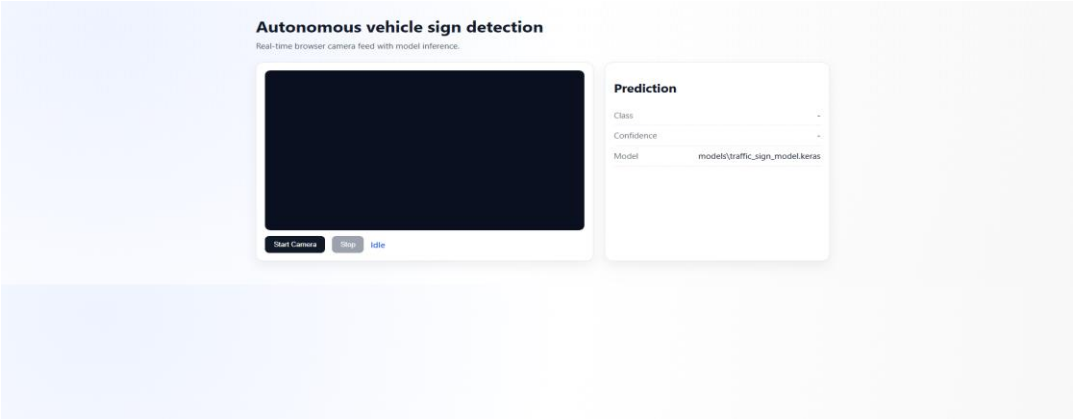


Fig.1 Interface of our project

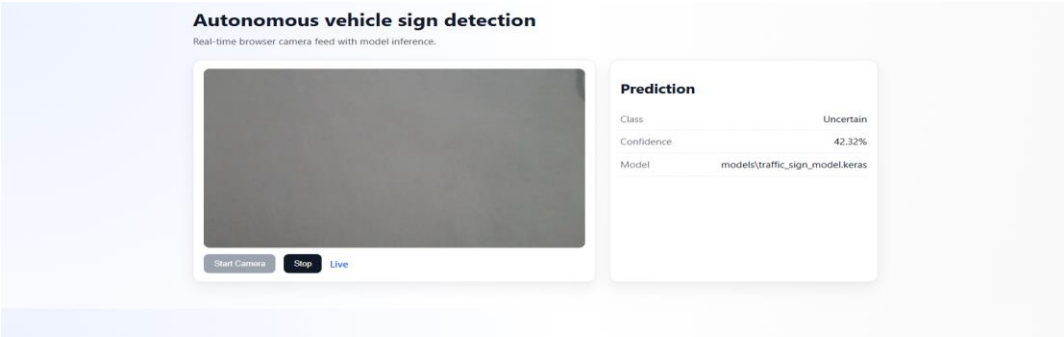


Fig.2 Live camera on for sign detection

Fig.3 live camera detection of signs and providing outpt

6. CONCLUSION

In this project, a traffic-sign detection and recognition system has been developed using deep-learning techniques to improve road safety and support intelligent transportation systems. The proposed system effectively detects and recognizes traffic signs from images by applying image preprocessing, deep-learning-based detection, and classification using Convolutional Neural Networks (CNN). By automating the process of traffic-sign recognition, the system reduces human effort and minimizes the chances of errors caused by driver distraction or poor visibility. The results demonstrate that deep learning provides accurate and reliable performance in recognizing traffic signs, making the system suitable for real-time applications such as driver-assistance systems and autonomous vehicles. Overall, the project successfully meets its objectives by providing an efficient, scalable, and accurate solution for traffic-sign recognition.

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