ROAD LANE LINE DETECTION USING DEEP LEARNING

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Abstract: This model introduces a many technical advancements have recently been made in the field of road safety, as accidents are being increasing day by day, and one of the main causes of such accidents is a driver's lack of attention. To reduce the incidence of accidents and keep safe, technological improvements should be made. One model is to use Lane Detection Systems, which function by identifying lane borders on the road and alerting the driver if he switches to an wrong lane marking. A lane detection system is an crucial part of many technologically advanced transportation systems.

Anyhow it is a difficult goal to fulfil due to the various road conditions that a person finds, particularly when driving at night or in daytime. A camera positioned on the front of the car catches the view of the road and detects lane boundaries. The model used in this research divides the video image into a series of sub-images and generates image-features for each of them, which are then used to recognize the lanes on the road. Several methods for detecting lane markings on the road have been presented.

Keywords: open cv , CNN, Deep Learning.

I. INTRODUCTION:

The road surface information and environment perception utilized in autonomous driving technology, which includes semantic information about road regions, determines the direction of drive, and improves guidance data, depend heavily on lane line detection.

Lane line detection technology is now able to give automated driving vehicles collision warning, lane departure warning, and auxiliary environment perception information. It can also assist the system in realizing lane path planning, all thanks to the rapid advancements in deep learning and artificial intelligence.As a result, autonomous driving is safer. The purpose of this research is to investigate the application of deep learning methods, specifically Convolutional Neural Networks (CNNs), for the recognition of road lane lines. The objective is to create a model that can precisely identify lane lines in real-time, opening the door for uses like driverless vehicles and lane departure warning systems. This initiative aims to enhance the development of safer and more effective transportation networks by utilizing deep learning.

II. LITERATURE REVIEW:

IET Intelligent Transport Systems Research Article

The authors argue that one of the most crucial functions of ADASs is the recognition of lane markings. Accurate detection results are essential for the safety of both human-driven and autonomous vehicles. The authors of this paper suggest a unique lane marker identification algorithm that relies on convolutional neural networks (CNNs) and lane structure analysis. Prior to lane markings being visible, the pavement serving as their backdrop is removed during a pre-processing step. Next, a zone of interest is created using a set of local waveforms from local photos. candidates for lane markings using interest and a CNN classifier. Ultimately, whether or not the candidate is a component of a lane marker is determined by a lane geometry analysis stage. Engineering

Technology and Science International Research Journal of Modernization The authors came at the conclusion that the Canny Function and the OpenCV library were utilized in order to accomplish edge detection. Next, we used the bitwise method to map our region of interest after creating a zero-intensity mask. The lane lines and straight lines in the picture were then located using the Hough Transform technique.

III. PROBLEM STATEMENT:

Building a model that can recognize and follow lane markings on roadways automatically from input photos or video streams is the process of applying deep learning to detect road lane lines. The primary objective is to increase traffic safety and facilitate autonomous driving by giving cars precise lane boundary information. The difficulty is in creating a model that can reliably identify lane lines in a variety of scenarios, such as varied illumination, weather, surfaces of the road, and intricate road layouts.
Because convolutional neural networks (CNNs) are so good at tasks involving images, they are frequently employed for this kind of work. Large datasets of road photos with annotations—which show the location and form of lane lines—are used to train these networks.

IV. METHODOLOGY

4.1 Existing System:

Convolutional Neural Networks (CNNs) are the mainstay of existing deep learning methods for lane line detection in road photos because of their capacity to automatically extract pertinent characteristics from images. To increase lane feature visibility and lower noise, the procedure usually starts with picture preparation techniques such contrast enhancement, edge detection, and grayscale conversion. Depending on the output format, loss functions such binary cross-entropy or mean squared error (MSE) are employed during training. postprocessing methods such as filtration,
The lane predictions are improved by curve smoothing and line fitting. Accuracy, precision, recall, and F1 score are some of the evaluation criteria, and real-world testing is important to gauge generalization. These models can be used in cars or traffic systems for real-time lane detection applications, like autonomous driving and lane departure warning systems, after they have been trained and assessed. This will increase driving efficiency and safety on the road.

4.2 Proposed System:

- Canny Edge Detector:

• Finding object boundaries in photos is the aim of edge detection. To find regions in a picture where there are significant variations in intensity, a detection is utilized. A matrix or an array of pixels can be used to identify an image. The amount of light existing at a particular location in an image is represented by a pixel.

Fig 4.2.0: Original image.

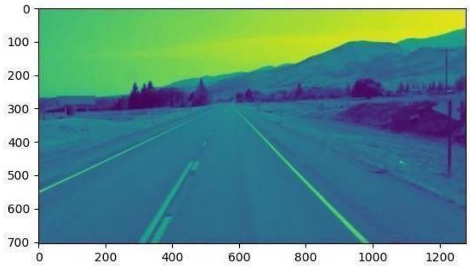

Fig 4.2.1 : Grayscale Image

- Edge Detection:

• An edge is a section of an image where there is a noticeable change in color or intensity between adjacent pixels. A noteworthy gradient is represented by a high change, whereas a shallow change is the reverse. An image can be compared in this way to a matrix with intensities arranged in rows and columns. This implies that an image can also be represented in two-dimensional coordinate space, where the image height (rows) and width (columns) are traversed by the y axis.

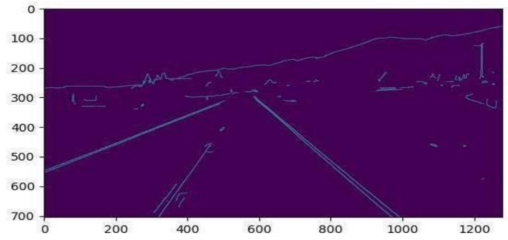

Fig 4.2.2: After applying the Canny function.

- Region on interest:
  • The triangle is designated as our zone of interest, and the image's size are set to reflect the presence of traffic lanes. Next, an array of all zeros is created as a mask, which has the same dimensions as the image. In order to render the dimensions of our region of interest white, we will now fill the triangle dimension in this mask with 255. To obtain our final region of interest, we will now use a bitwise AND operation to combine the clever image and the mask.

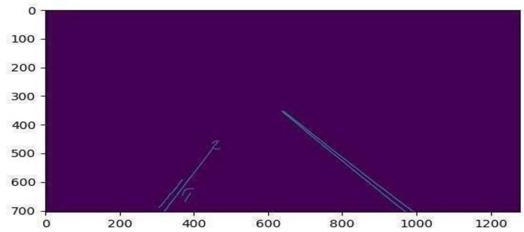

Fig 4.2.3: Masked Image.

- Hough Transform:

In order to identify the lane lines, we use the Hough transform method to find straight lines in the picture. The formula for describing a straight line is y= mx + b. The slope of the line is just a climb over a run. The line can be plotted in Hough Space as a single dot if the slope and y intercept are specified. There are multiple lines, each with a different'm' and 'b' value, that can pass through this dot. Numerous lines, each with a unique slope and y intercept value, can intersect any given location. Nonetheless, a single line unites the two locations.

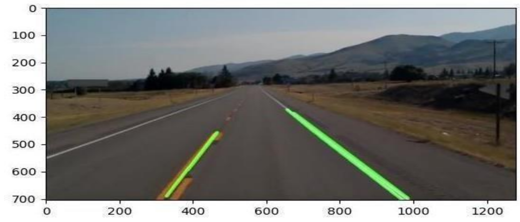

Fig 4.2.4: Below is the combined image.

V. EXPERIMENTAL RESULTS

In our deep learning project, we used YOLO object detection, which stands for "You Only Look Once," for real-time processing. We trained the model on a dataset of different object classes and evaluated its performance on both accuracy and speed metrics. To improve accuracy, we experimented with different backbone architectures such as Darknet and ResNet.

VI CONCLUSION

In conclusion, considerable progress has been made in deep learning-based road lane line recognition, resulting in improved driving economy and road safety. Convolutional Neural Networks (CNNs) have surpassed conventional computer vision techniques in automating the detection and tracking of lane markings. Real-time performance and increased robustness to a variety of driving conditions are two persistent issues, nevertheless. More complex CNN architectures, the integration of new sensor inputs, and the investigation of cutting-edge methods like attention processes and reinforcement learning are some of the future research objectives. All things considered, deep learning-based road lane line identification has enormous potential to transform autonomous driving and advance transportation systems toward safer and more effective roadways.

VII. FUTURE WORK

Future deep learning improvements for road lane line identification may concentrate on enhancing robustness, efficiency, and adaptability. This can entail creating innovative designs and utilizing cutting-edge methods, such attention processes, to deal with difficult situations like occlusions and changing road conditions. With these improvements, lane detecting systems should become more dependable, effective, and appropriate for general use in driverless cars and intelligent transportation networks.

VIII. REFERENCES

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