ANNAMACHARYA EDUCATIONAL TRUST ★ VIDWAN SARVATRA PUJYATHE ★

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES,TIRUPATI (AUTONOMOUS)

PROJECT TITLE: ROAD LANE DETECTION

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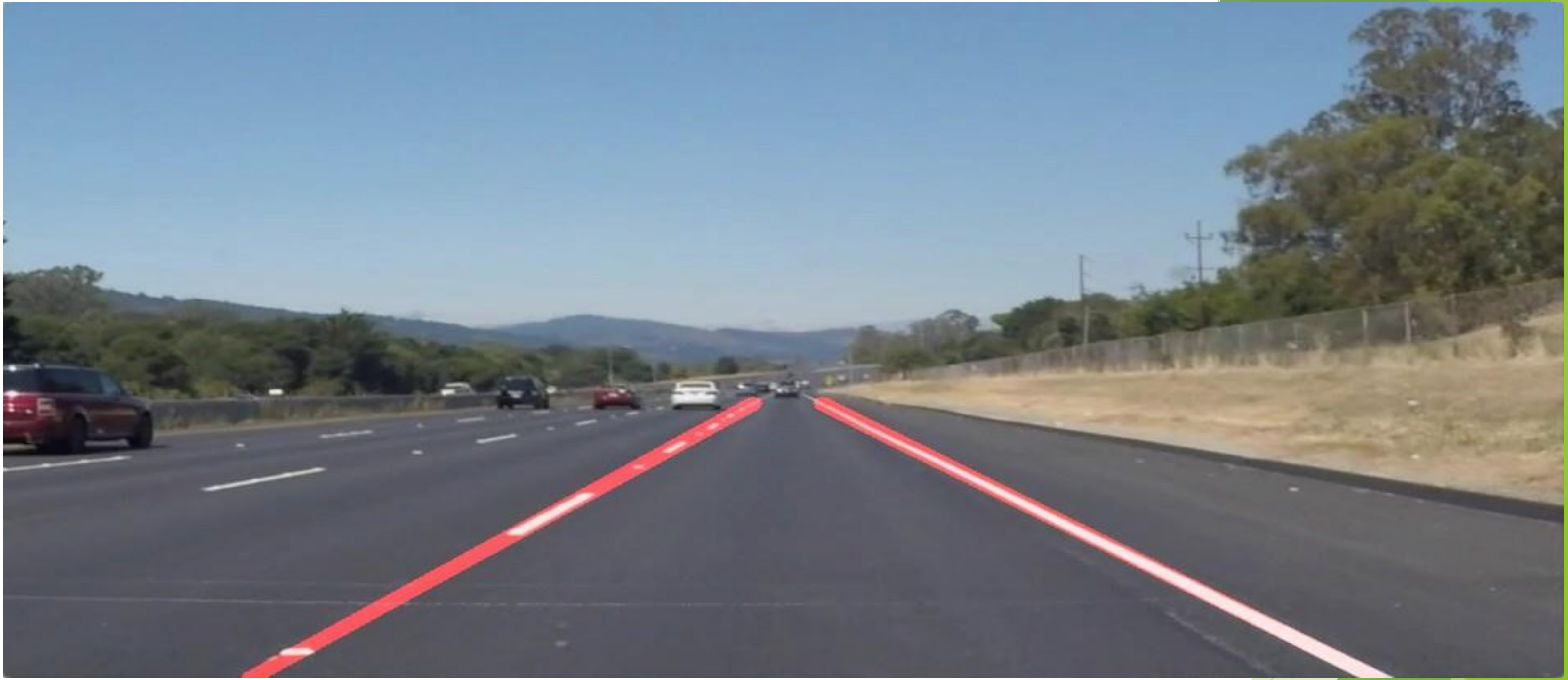


- Figure:Road lane detection

INTRODUCTION

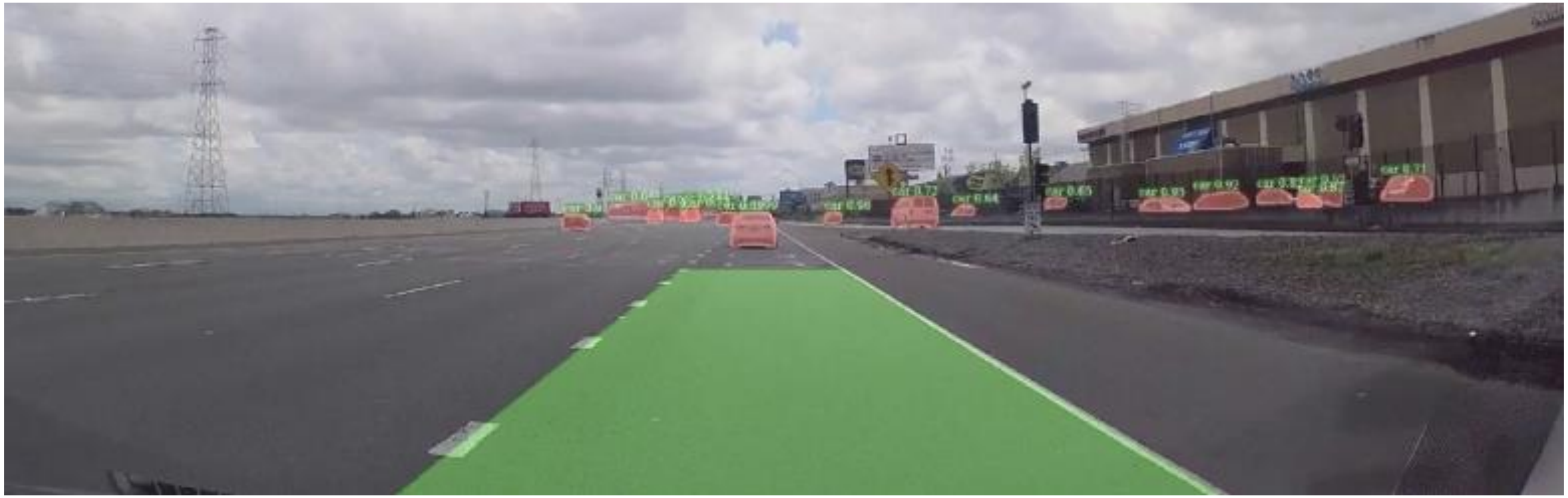
- An autonomous car is a vechile capable of sensing its environment and operating without human involvement. A human passenger is not required to take control of the vechile at any time,nor is a human passenger reuired to present in the vechile at all.an autonomous car can go anywhere a traditional car goes and do everthing that an experienced human driver does.
- The basic requirement for self driving cars is to detect the lanes and keep the cars in between the lanes.

What is road lane detection?

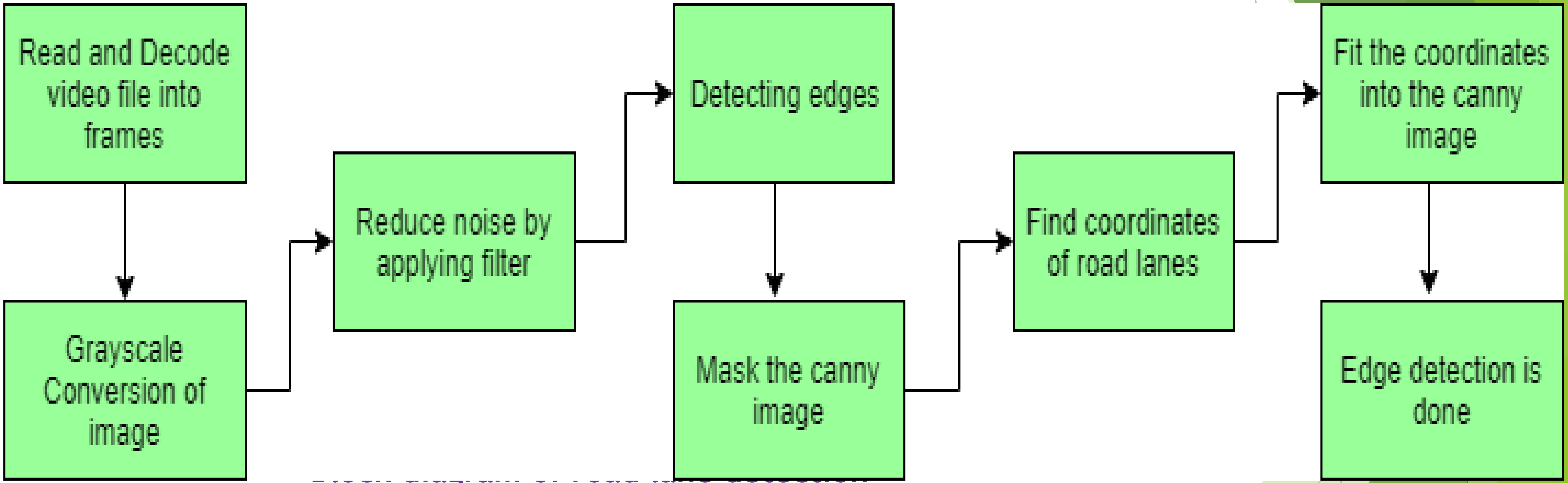
- Lane Detection is a computer vision task that involves identifying the boundaries of driving lanes in a video or image of a road scene. The goal is to accurately locate and track the lane markings in real-time, even in challenging conditions such as poor lighting, glare, or complex road layouts.
- Autonomous Driving Car is one of the most disruptive innovations in AI. Fuelled by Deep Learning algorithms, they are continuously driving our society forward and creating new opportunities in the mobility sector. An autonomous car can go anywhere a traditional car can go and does everything that an experienced human driver does. But it’s very essential to train it properly. One of the many steps involved during the training of an autonomous driving car is lane detection, which is the preliminary step. Today, we are going to learn how to perform lane detection using videos.

History of road lane detection?

- At KeepTruckin, Inc., we are developing artificial intelligence (AI)-based solutions to monitor drivers' behavior, identify unsafe driving practices, and eventually convert these patterns into scores. Lane-related actions, such as tailgating, unsafe lane changes, and cut-off tailgating, constitute an integral part of a driving assessment. We at KeepTruckin are exploring the latest tools and techniques for lane detection as part of our research. To establish a context, this blog orients you to the prevailing trends in this area, and highlights their shortcomings.
- As the number of self-driving cars increases, advanced driver assistance systems (ADAS) develop in parallel. One aspect of automation that we share with these autonomous systems is road lane detection.


car 0.72
car 0.84
car 0.65
car 0.93
car 0.92
car 0.71

PROCESS



Read and Decode video file into frames

Grayscale Conversion of image

Reduce noise by applying filter

Detecting edges

Mask the canny image

Find coordinates of road lanes

Fit the coordinates into the canny image

Edge detection is done

Block diagram of road lane detection

- **Capturing and decoding video file:** We will capture the video using VideoFileClip object and after the capturing has been initialized every video frame is decoded (i.e. converting into a sequence of images).
- **Grayscale conversion of image:** The video frames are in RGB format, RGB is converted to grayscale because processing a single channel image is faster than processing a three-channel colored image.
- **Reduce noise:** Noise can create false edges, therefore before going further, it's imperative to perform image smoothening. Gaussian blur is used to perform this process
- **Canny Edge Detector:** It computes gradient in all directions of our blurred image and traces the edges with large changes in intensity. For more explanation please go through this article: Canny Edge Detector

- **Region of Interest:** This step is to take into account only the region covered by the road lane. A mask is created here, which is of the same dimension as our road image. Furthermore, bitwise AND operation is performed between each pixel of our canny image and this mask. It ultimately masks the canny image and shows the region of interest traced by the polygonal contour of the mask.
- **Hough Line Transform:** In image processing, the Hough transformation is a feature extraction method used to find basic geometric objects like lines and circles. By converting the picture space into a parameter space, it makes it possible to identify shapes by accumulating voting points. We'll use the probabilistic Hough Line Transform in our algorithm.
- **Draw lines on the Image or Video:** After identifying lane lines in our field of interest using Hough Line Transform, we overlay them on our visual input(video stream/image).

PROCESS

- Lane Detection is a computer vision task that involves identifying the boundaries of driving lanes in a video or image of a road scene. The goal is to accurately locate and track the lane markings in real-time, even in challenging conditions such as poor lighting, glare, or complex road layouts.
- ane detection is an important component of advanced driver assistance systems (ADAS) and autonomous vehicles, as it provides information about the road layout and the position of the vehicle within the lane, which is crucial for navigation and safety. The algorithms typically use a combination of computer vision techniques, such as edge detection, color filtering, and Hough transforms, to identify and track the lane markings in a road scene.

Benefits of road lane detection

- Research shows that when used correctly, lane departure warning systems can decrease these types of accidents by as much as 21%.
- Among the other safety features Cicchino researched, blind spot detection systems have also proven to help decrease the rate of auto accidents.
- with the lane departure system, blind spot detection systems only work if drivers are aware of their surroundings.

Implementation of program using python

```
import cv2import numpy as np


def detect_lines(image):
    # Convert image to grayscale
    gray = cv2.cvtColor(image, cv2.COLOR_BGR2GRAY)

    # Apply Gaussian blur
    blurred = cv2.GaussianBlur(gray, (5, 5), 0)

    # Apply Canny edge detection
    edges = cv2.Canny(blurred, 50, 150)
```

```
# Perform Hough line transform
    lines = cv2.HoughLinesP(edges, 1, np.pi/180, threshold=100, minLineLength=100, maxLineGap=50)

    # Draw detected lines on the image
    line_image = np.zeros_like(image)
    if lines is not None:
        for line in lines:
            x1, y1, x2, y2 = line[0]
            cv2.line(line_image, (x1, y1), (x2, y2), (0, 255, 0), 5)
```

```
 # Combine the original image with the line image
    result = cv2.addWeighted(image, 0.8, line_image, 1, 0)

    return result


# Read the input image
image = cv2.imread('road_image.jpg')


# Detect lines
result = detect_lines(image)


# Display the result
cv2.imshow('Road Lines Detection', result)
cv2.waitKey(0)
A.destroyAllWindows()
```

Advantages

- There are many advantages of self driving cars.
- Our roads will be safer
- We will be more productive
- We will move more efficiently

Conclusion

- The review on lane detection has shown that the most of the researchers has neglected the problem of the fog and noise in images. Thus noise and fog may reduce the accuracy of the existing systems. one can use bilateral filter and dark channel prior methods to improve the results further.

Thank you