

Lane Detection System Using MATLAB

Muhammad Hamza Aslam

Hamzaaslam380@gmail.com

ABSTRACT ----- in this paper I present a video based lane detection system which take input video file and after all processing it detect lane and show on output video file to maximize the output of this system I use cheap hardware and software to full fill all users. This proposed system is designed specially for low or cheap cost camera and then it processing depends upon your laptop or any other device where you run your software. So today we face many difficulties in road while driving also we see many accidents on road this system detect lines and also you make route according to it. This system is able to detect the lines on highways where minimum of 3 lanes in a road. This system specially design for highways or long roads where speed of vehicle are high. Our system work properly on every road but have some issue on some road where road quality low or paint of road is differ. Although accuracy of our system is 90% and we apply our algorithm on multiple videos and get good result we take input files from git hub image processing video bank.

1. Introduction

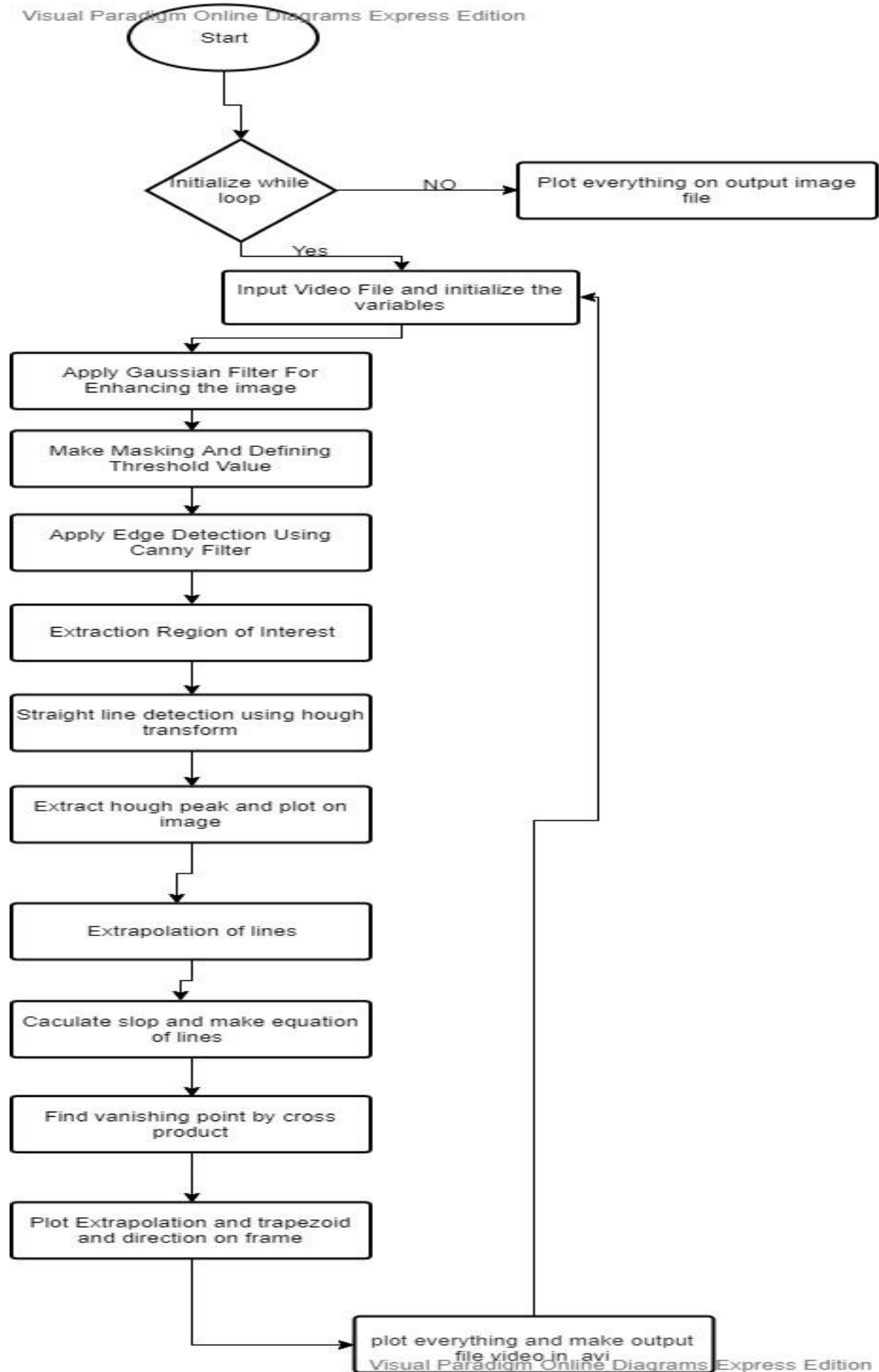
To detect lane on road first we have to knowledge about the road how road are made and how they make lane on roads.so almost of 3.5 meter which means 350 cm width each lane contains so if we consider 3 lane highways we have 1300 cm total width. But our algorithm work on first lane most probably because its idle to drive in first lane so rather then 350cm we see yellow line but on left side of yellow line we see some extra width which we have to ignore its almost about 550cm because our car work in a lane not in extra space.

After all this knowledge now you should know about MATLAB built in function which we use in my project like edge, imgaussfilt ,video writer, imread, etc. Also you should have knowledge about mathematics because most of the work is base on calculation like cross product, slope calculation,theta,sin,cos etc.

Then main part some concept like edge detection, lane detection,RGB into Grey scale, extrapolation of line, region of interest which we use further and I also explain bellow.

2. METHADODOLOGY

Our main objective to detect lane on a road which help our user in improving his driving and later on we enhance our system for self driving assistant system when we practically apply our system in cars where system take real time video input from camera deploy on car front and processing show on their screen in real time which decrease or low accidents and also save people time who don't know driving or they are not be able to drive I use following methodology for my system which I use to deploy my system



3. Take Input File

The first part and most important part is to input the video file by using built in function of MATLAB video reader and also create some variable and while loop for processing in each frame of video file which we use further.

```
VideoFile = VideoReader('project.mp4');
```



Fig 1: Simple image

4. Initialize variable and create output file

The second part is to create a output video file in .avi format where my all frames where my system do processing save in a file using built in function in MATLAB video writer

```
outputVideo=VideoWriter('result_video');  
outputVideo.FrameRate= 25;
```

5. Enhance image

I enhance image using Gaussian filter which is best among all other options it sharpen the image by sharpening the edge and all detail of image which hep us later



```
frameOfImage = imgaussfilt3(frame);  
figure('Name','Gaussian Filtered Image'), imshow(frameOfImage);
```

Fig 2: Gaussian Filtered image

6. Masking or define threshold value

As I discuss above we have two line yellow and white so I have to write values for both color and also involve hue and saturation and also decide max range because we only need yellow and white line of road with some ratio as shown in bellow image how I separate yellow and white line for processing further.



Fig 3: Yellow Lane

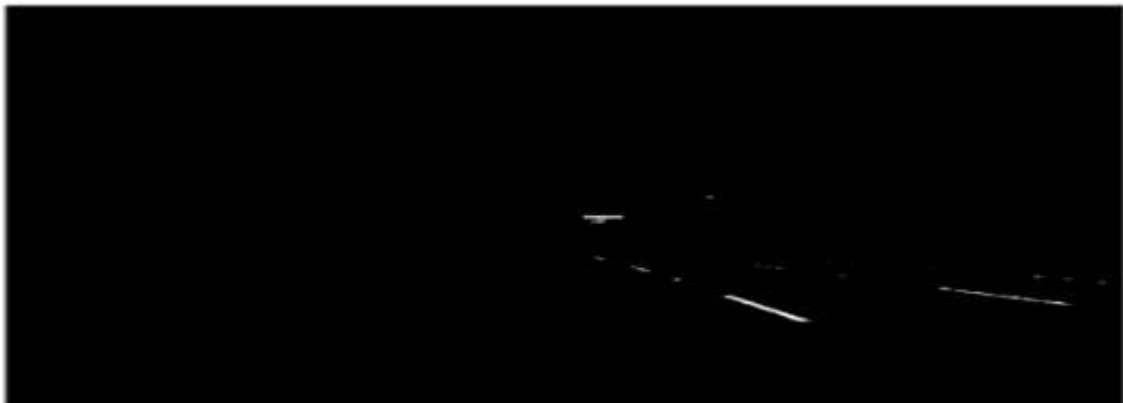


Fig 4: White Lane

7. Edge Detection

Now after defining all the value of for hue saturation and also maximum value for image frame now the main part come of edge detection is there any edge or not I use canny filter For both yellow and white lane. So we have two color lane as we all know

```
frameForWhite = edge (White, 'canny', 0.5);  
frameForYellow = edge (Yellow, 'canny', 0.5);
```

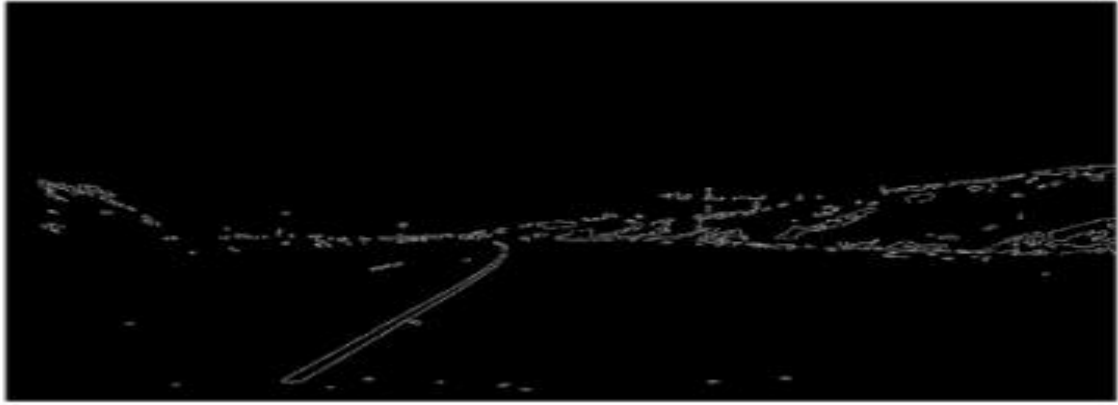


Fig 5: Edges for White Lane



Fig 6: Edges for White Lane

8. Extraction of Region of interest

So region of interest we defined as the part of image you want so in our system we want lane which is between yellow and white line so I use `roipoly` function which is built in MATLAB to extract region of interest for both yellow and white color

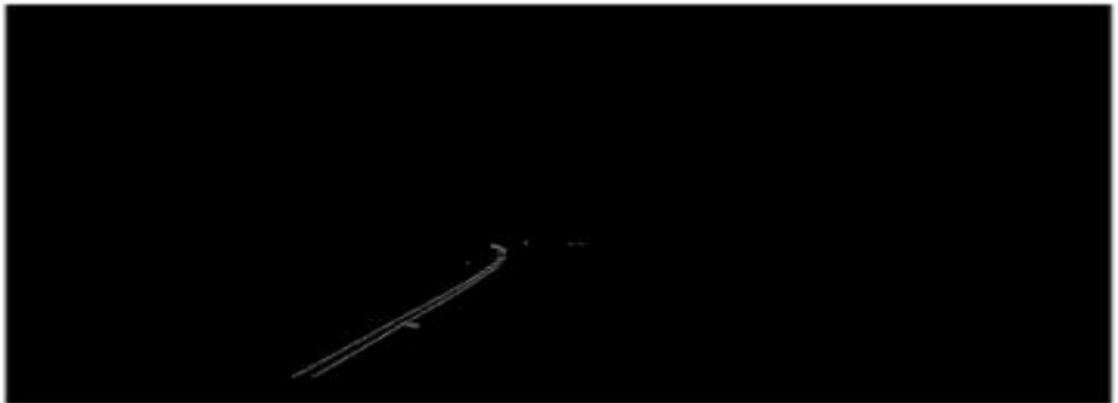


Fig 7: Region of interest for yellow lane



Fig 8: Region of interest for white lane

9. Hough transform

For straight line detection I use hough transform which is built in function of MATLAB I use hough peak for hough transform frame and use hough for theta values which we further use for both lane yellow and white. I use built in function

hough
houghlines

10. Extrapolation of Lines

We need start and end point because we don't process on whole road we divide video file into frames 25 per second and later on we use just small part where we do processing. So after hough peak we plot on left and right side and after that we calculate slope and make right and left equation of line which I extrapolate



Fig 9: hough peaks extracted lines

11. Turn Prediction

Now main part after all processing we have to predict so I use built in function name cross to write left right point also consider all value which we calculate like theta rho and also value of saturation hue etc.



12. Result and analysis

So as you see after the all processing we can say that our algorithm is properly working it also detect the lane properly. It only work on highways as I discuss in introduction our proposed system is only for lane detection not for proper driving assistant system we further working on it also the one more thing I add is detect lane on first because our algorithm made for first lane but it also work on second lane of road just by few changes.

Although it work properly but it not detect lane on highways where tree or more traffic is here but we are working on it as you see in above image they properly show the direction where to turn the car. Its accuracy rate if 90% because it work properly on every input video where wee just want to detect lane and show on screen.

13. Conclusion

This system is made just for detect lane on the road not for proper driver assistant system also they don't detect curved, obstacle, divider, footpath they re not included in our system to detect but we further process on it and also working to improve our system for future.

14. References

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