ENPM 673 ROBOT PERCEPTION

PROJECT 1 REPORT

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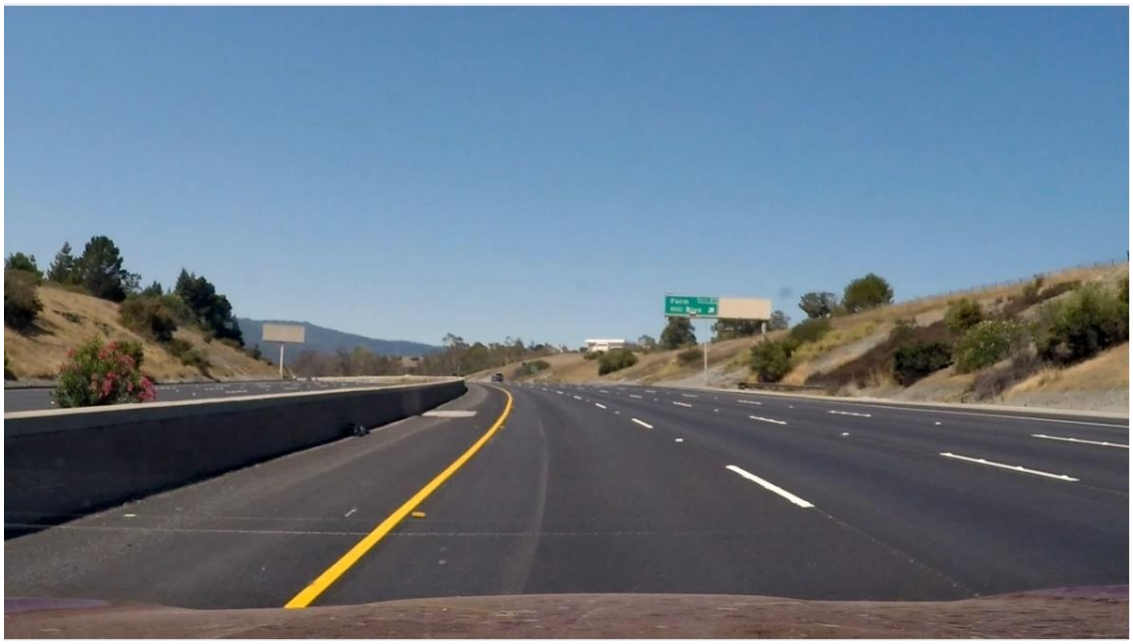
METHODOLOGY:

1. IMAGE PREPROCESSING

The video ‘project_video.mp4’ is first divided into multiple frames using the MATLAB code snippet:

```
vid = VideoReader('project_video.mp4');
while(hasFrame(vid))
    img = readFrame(vid);
end
```



The obtained RGB image is further converted to a grayscale image using the snippet:

```
Gray = rgb2gray(img);
```

Once the image is converted to grayscale, it is denoised using a combination of the median filter and the wiener filter with a kernel size of 5.

```
Median = medfilt2(Gray,[5 5]);

Wiener = wiener2( Median,[5 5]);
```

The edges in the images are detected using the sobel filter using the fspecial and imfilter functions as follows:

```
H = (fspecial('sobel'))';

Edge = imfilter(Wiener,H);
```

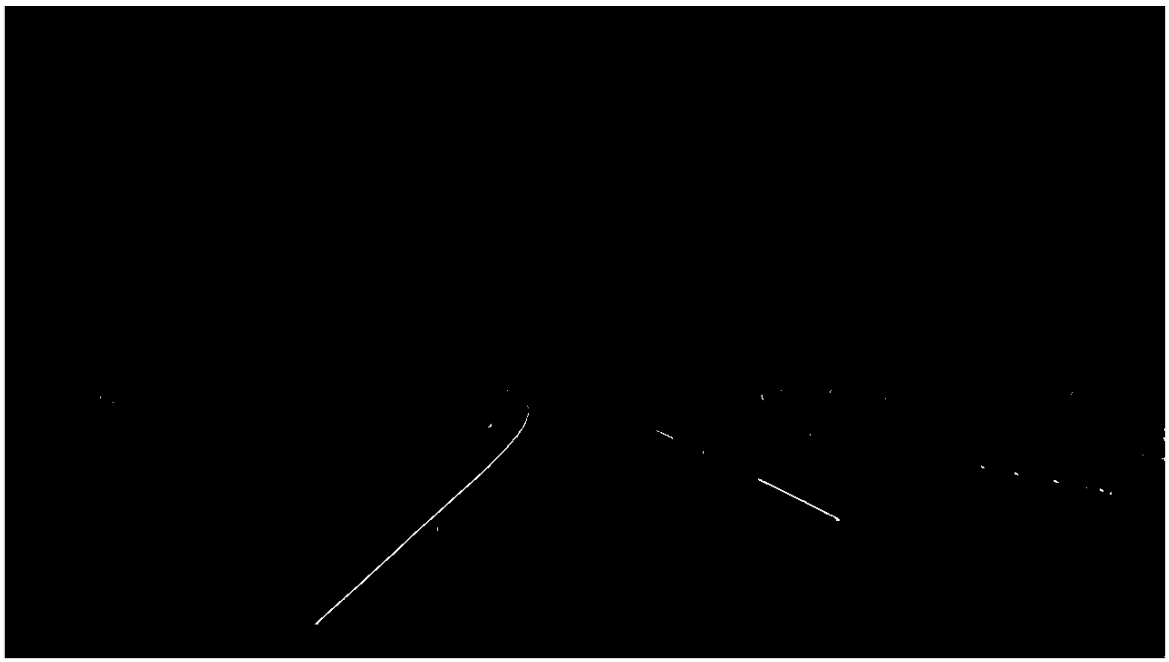
The processed image was then binarized and eroded using the imbinarize and imerode functions. The pixel value of the top half of the image was set to zero. This was done to separate the region of interest(Assuming the top half of the image does not contain lane information). The image is now ready for Hough transforms to be applied.

```
Binarize = imbinarize(Edge);

SE = strel('line',3,3);

Erode = imerode(Binarize,SE);

Erode(1:425,:) = 0;
```



2. LANE DETECTION USING HOUGH TRANSFORM

Hough Transform is a feature extraction technique is used to find imperfect instances of objects within a certain class of shapes by a voting procedure, carried out in a parameter space, from which the object candidates are obtained as local maxima in a so-called accumulator space constructed by the algorithm for computing the Hough transform.

The Hough transform for the eroded image is given by

```
[H,T,R] = hough(Erode);
```

The Peak Hough Lines are then obtained using the houghpeaks function by setting the threshold to 0.4 times the maximum value.

```
P = houghpeaks(H,5,'threshold',ceil(0.4*max(H(:))))
```

The Hough lines are then obtained using the Hough Peaks(P)

```
Lines = houghlines(Erode,T,R,P,'FillGap',5,'MinLength',9);
```

The lines are then extrapolated by iterating to through them, calculating the slope, grouping them based on the slope values and extending the detected lines to the center.

3. CURVE DETECTION

The slope of the central line is calculated by averaging the slopes over the left and right lanes. If the central line has a positive gradient, i.e. curving towards right, the turn is predicted to be right.