Finding Lane Lines on the Road
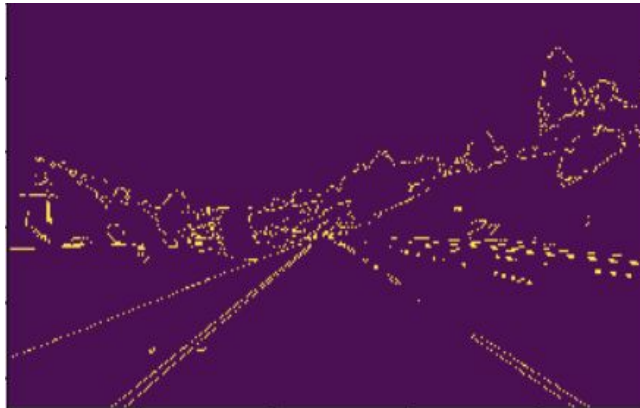
Pipeline:

The following section describes my implementation for finding the lane lines on the road.

Step1. The first step was to convert the 3-Channel color image into grayscale and apply Gaussian blurring to remove the noise.

Step2. To find the markers present on the highway, we use Canny filter (low_threshold =50, high_threshold = 150) to get the edge image.

Step3. To detect the markers which are present only in the some portion of the image, a trapezoidal mask has been created, and then hough transform is applied to get the lines.
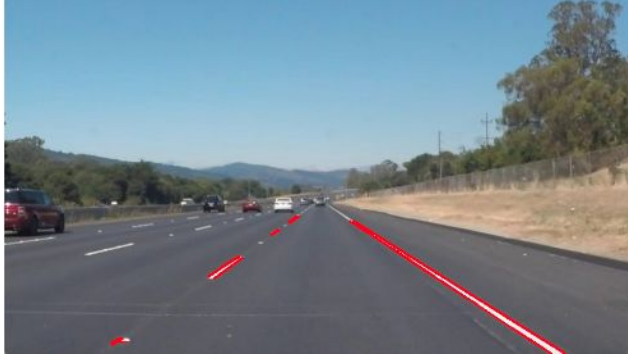
Step4. The challenge was to combine the line segments detected from hough transform. My idea was to divide the image into two parts vertically, where the coordinate was derived as the average of the trapezoid points (only the upper points). Once I had the image, its extreme points were extracted and a line was fitted on the same. Same steps were done for the other side.

Another detection pipeline includes detection of Yellow line and white marker lines using color space transformation.
I have transformed the image into HSV and HLS color space and detected the yellow and white colors respectively, using the threshold given below.

```
lower_yellow = np.array([20,100,100])
upper_yellow = np.array([30,255,255])

lower_white = np.array([0,200,0])
upper_white = np.array([180,255,255])
```

Similar process of trapezoidal masking and hough line detection is followed. Once we detect the line on both the images (white mask and yellow mask) a new image is then generated.

Potential shortcomings with Current Pipeline:

- The current pipeline works well for the straight roads with no curve lines.
- The estimation of the center line for getting points depends on the points used for masking in the trapezoid.

Possible Improvements to the Pipeline:

- Trying to fit a curved line instead of straight line.
- Detection of marker line through slope difference.
- In some images, it might be possible that the two lane line would meet, but further processing might overcome this.
- We can use Sobel or Prewitt filters to detect the vertical road lines instead of Canny edge filter.