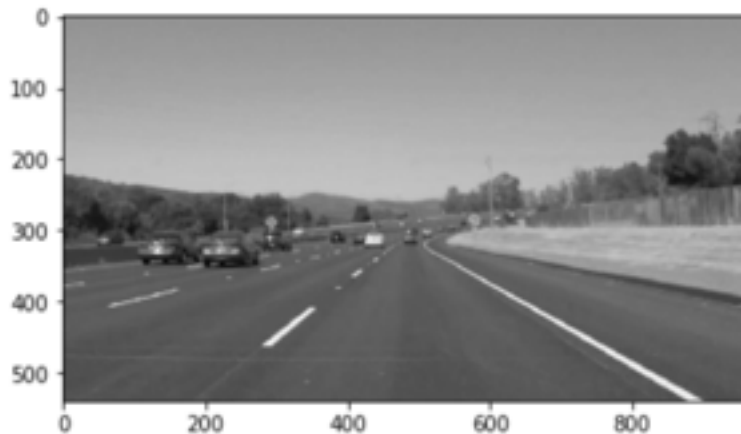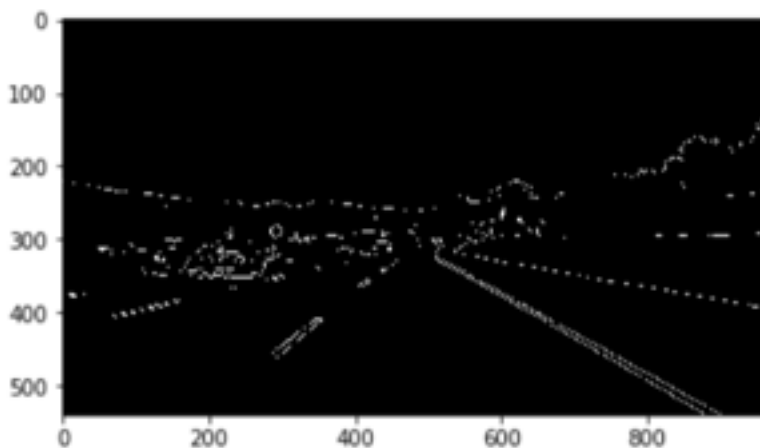**Finding Lane Lines on the Road**

<u>Writeup</u>
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The detection of lane marking is achieved using the following pipeline.
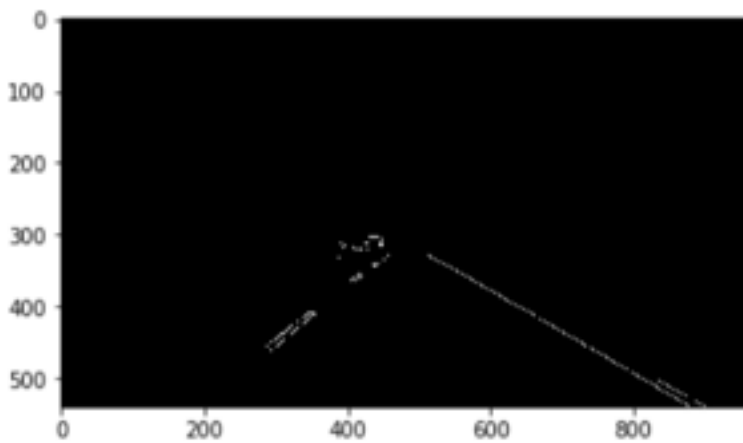
1. Convert RGB image to grayscale.

2. A Gaussian blur with kernel size 5 is applied to smoothen the curve.

3. Next the edges are detected using the CV2 canny function.

A min threshold of 120 and max threshold of 140 brings out the edges in a satisfactory way,

4. The region of interest is chosen as quadrilateral by masking the edges with a CV2 polyfill function.

Challenges in this scenario. One of the white car has strong edges close to the region of interest. This is solved by considering the slope factor to remove any edges below a slope threshold.

5. The detect masked edges are transformed from X and Y space into Hough Space. The CV2 hough lines function helps to identify the edges that have strong votes and minimum length and max gap values specified by us.

Values for hough lines chosen are as below.
Rho = 2, Theta = 1 degree, Threshold = 30, Minimum Line length = 7 Pixels, Max Line Gap = 1 pixel.
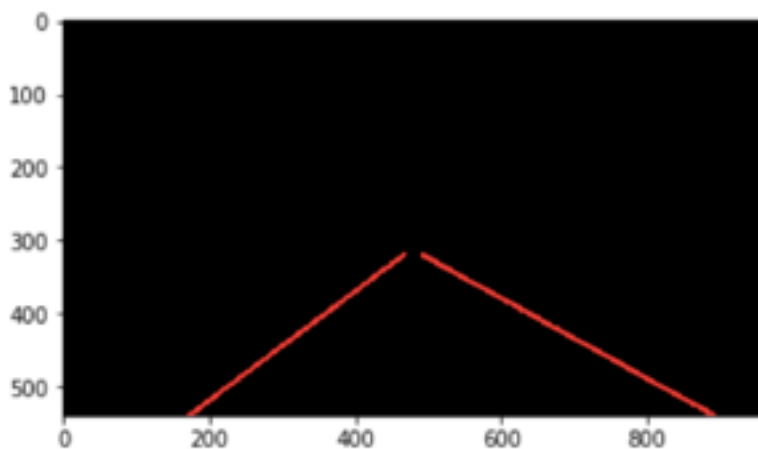
6. Image is then superimposed on the original image.
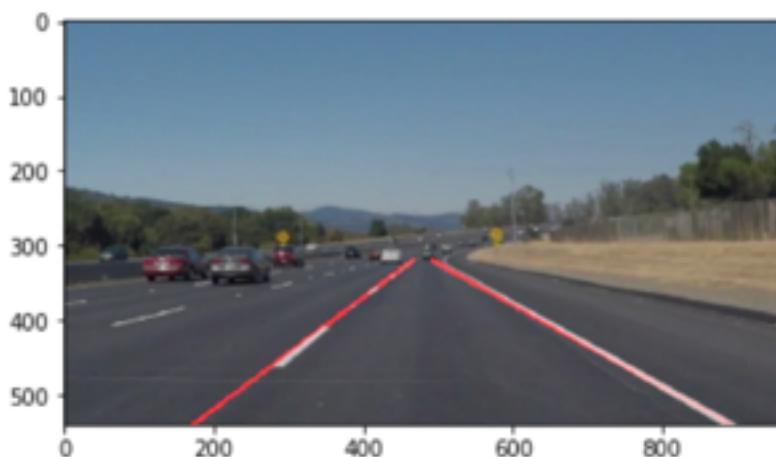
Reflection

In order to extrapolate the detected lane. We used a slope threshold to identify left and right lane. For each lane, using the lines returned by Hough transform we found the X coordinates in the two half (Upper and lower). Upper half is close to horizon. Lower half is closest to X axis of the image itself. We then draw a line between the averaged out X coordinates. Providing us a continuous lane detection.

One short coming was that, some frames returned no lane marking (left or right or both) causing the program to crash because of further operation on an empty list NaN. Problem was handled using a check for empty lists.

Shortcomings: Vehicle movement in the area of interest cause fluctuation in the lane identification even though not significant.
Current approach does not work well in optional challenge scenario, which involves varying light intensity and curved lane marking. The program goes haywire in the optional challenge.