Project: Advanced Lane Finding

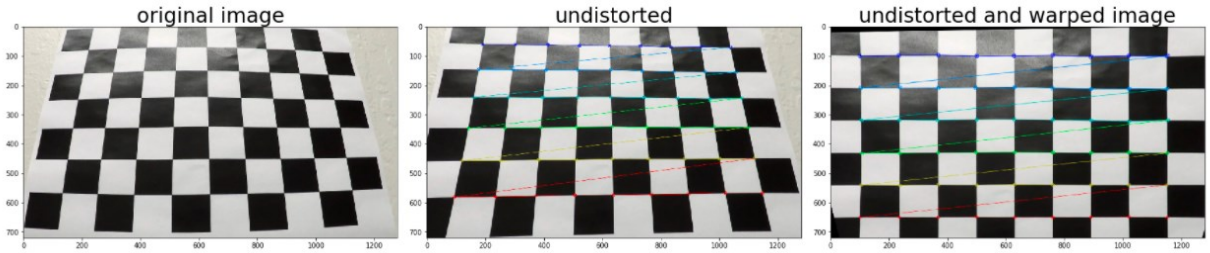
The goals / steps of this project are the following:

* Make a pipeline that finds lane lines on the road during color variation and curves

* Reflect on your work in a written report

1. Introduction:

Provided test images were used for calibration, undistortion and wrapping/perspective transform of image.



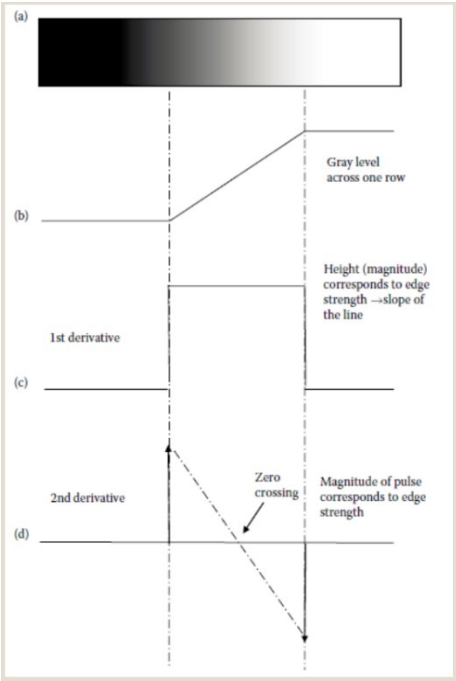
2. From the undistorted warped image, region of interest (ROI) is selected.

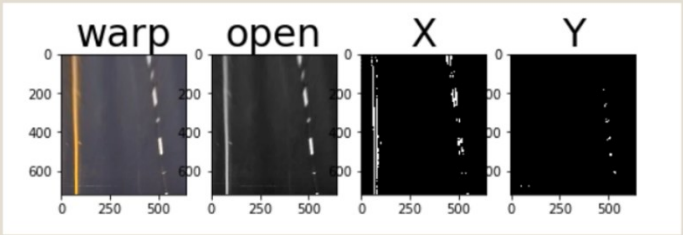
3. On a grayscale image, Region of interest (ROI) is found and later warped.

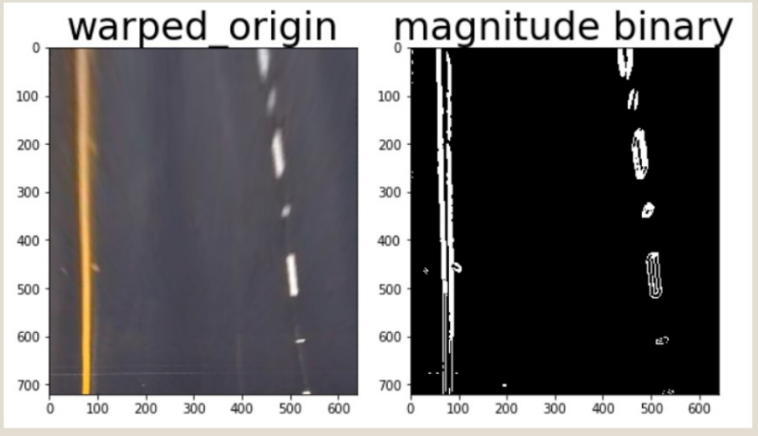
4. As explained in the course, that RGB color scheme is not very effective for lane finding applications, hence HLS based color scheme has been used here.

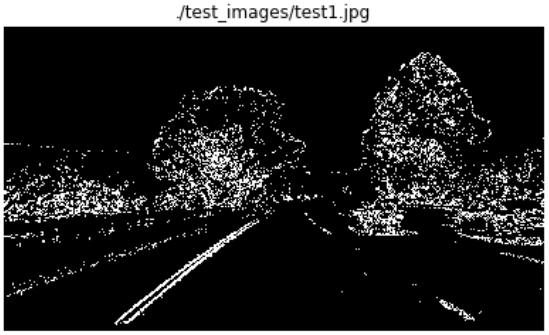
There various other color schemes are also available. S- channel image is taken and concerted to binary image.

5. On the warped grayscale image, sobel operator is applied for x and y direction and later absolute value is taken for finite transition as shown in below figure on gray scale image.
   (1st order derivative generally produces edges in an image. 2nd order derivatives have a stronger response to find detail such as thin line isolated points and noise 2nd order derivatives produce at double edge response at ramp and step transitions in intensity. The sign of the second derivative can be used to determine whether a transition into an edge is from light to dark or dark to light.)
   Similarly, we can apply threshold on direction of the gradient. Appropriate tan values could be used cover that angle range.

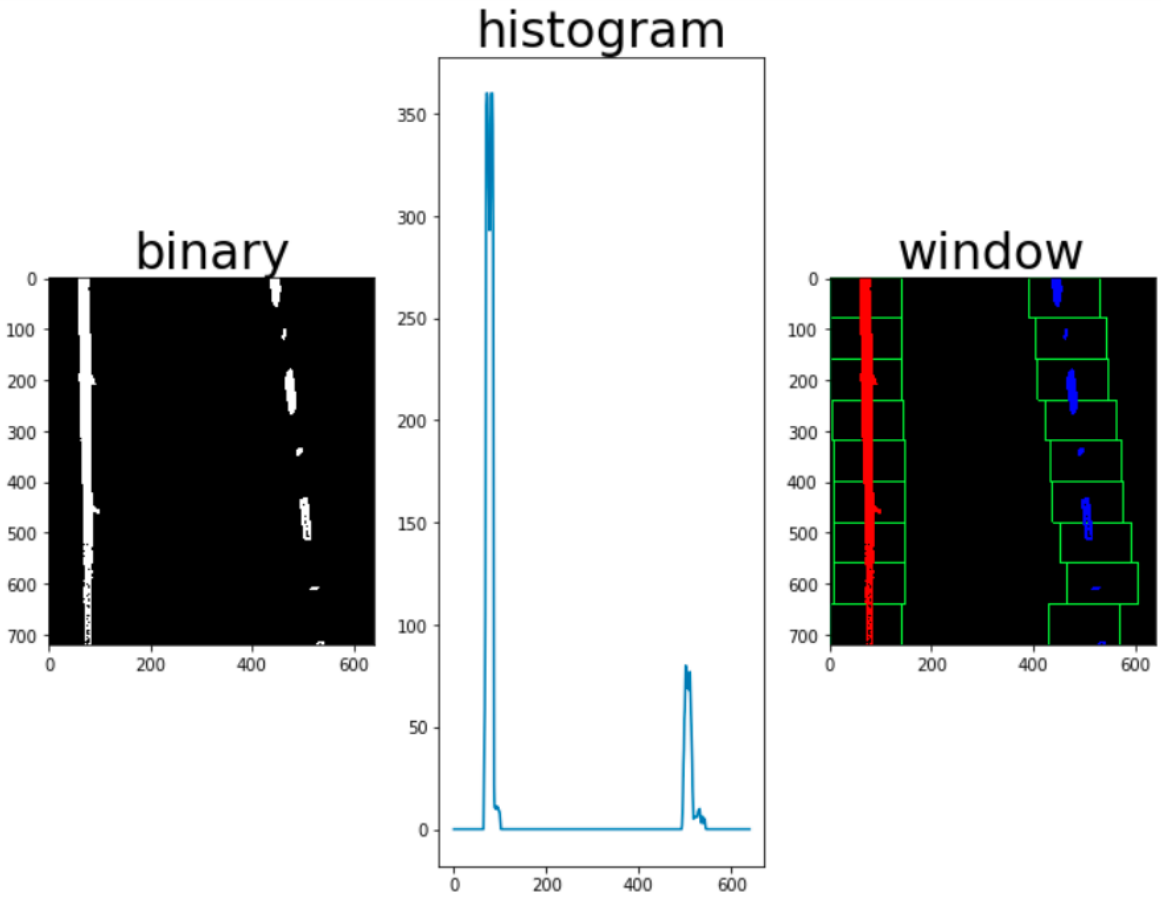








6. On the warped binary image, then applied histogram at the bottom and later in for the entire image in parts of increments in y-axis (called the sliding window).



7. Once we have all the good pixel candidates for lanes in the entire image, a second degree polynomial is fitted through them and the same is repeated for left and right lane separately.
   By this time we have a clear fit and we can predict the possibility of availability of lane in the next frame of the video, hence instead of searching the entire image, only a margin is been search w.r.t previous line position from previous frame.

8. Next the real time distance is computed w.r.t image and the final out put passed through a sequence of steps/pipeline to get the desired output.

9. Further, project_video is used for testing the pipeline. It basically works on the frames from the video itself and the processed frames (passing through the pipeline) are again stitched back.to form the required video , and the same has been stored in ‘output_images’ folder with the name ‘output_video’. Also during curves in road, radius of curvature value is less than 1000 and for straight road it is more than 1000.

./test_images/test1.jpg

./test_images/test3.jpg