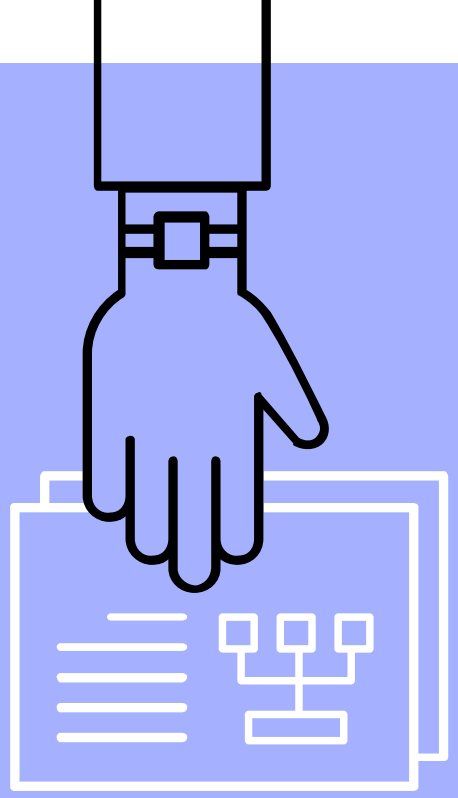
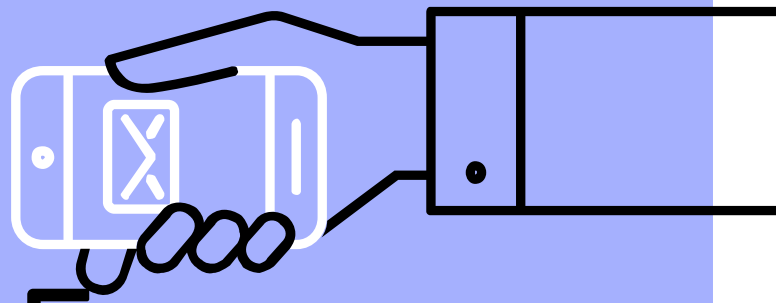
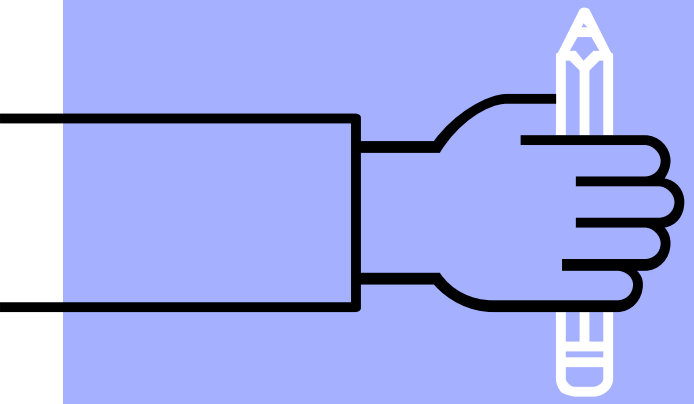
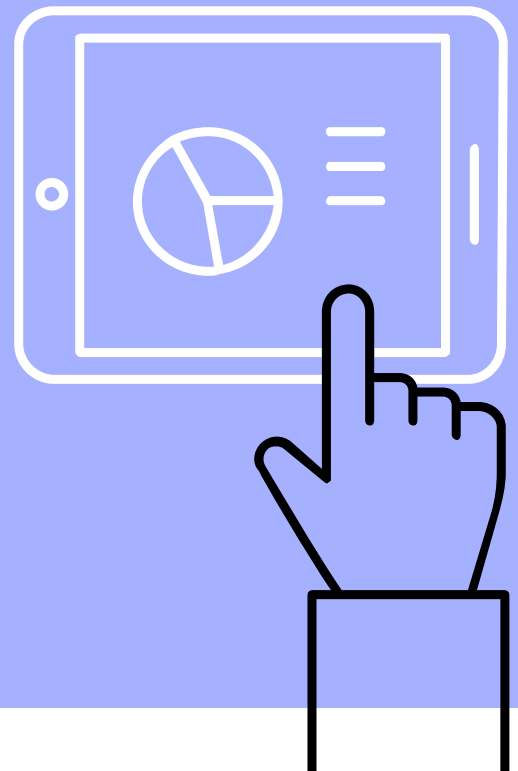




ADVANCED LANE DETECTION

Made by:
Ashirbad Pany
Anurag Mahapatra
(Team Genesis)





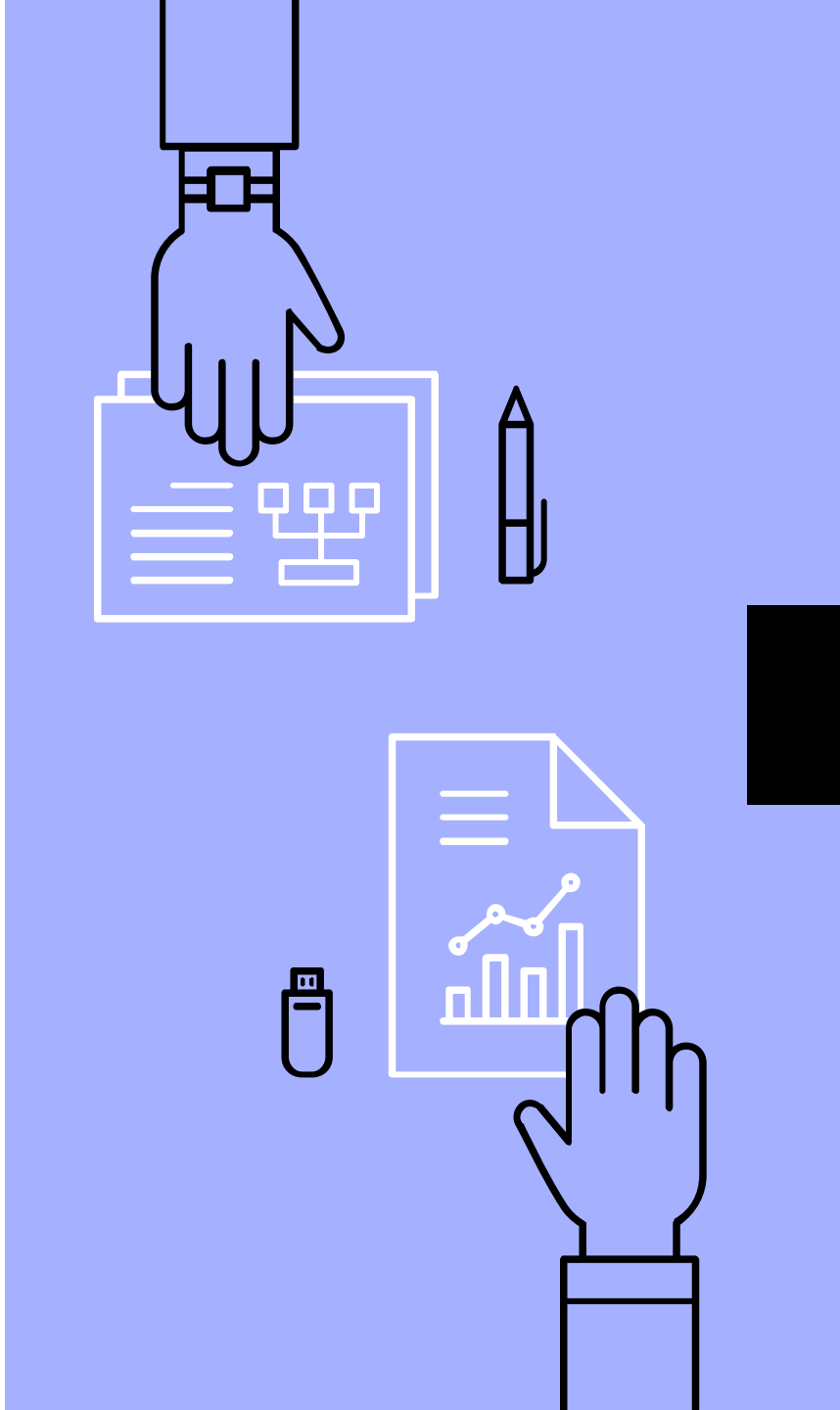
AIM

- ***Advanced Lane Detection****:* Computer Vision algorithm to compute road curvature and lane vehicle offset using OpenCV Image Processing, Camera Calibration, Perspective Transform, Colour Masks, Sobels, and Polynomial Fit.

- Using a video recording of highway driving, this project's goal is to compute the radius of the curvature of the road. Curved roads are a more challenging task than straight ones. To correctly compute the curvature, the lane lines need to be identified, but the images need to be undistorted. Image transformation is necessary for camera calibration and perspective to transform to obtain a bird's eye view of the road.

Steps involved

- Camera calibration
- Perspective transform
- To process the binary threshold images
- Lane line detection using histogram
- Calculation of vehicle position and curve radius



CAMERA CALIBRATION:

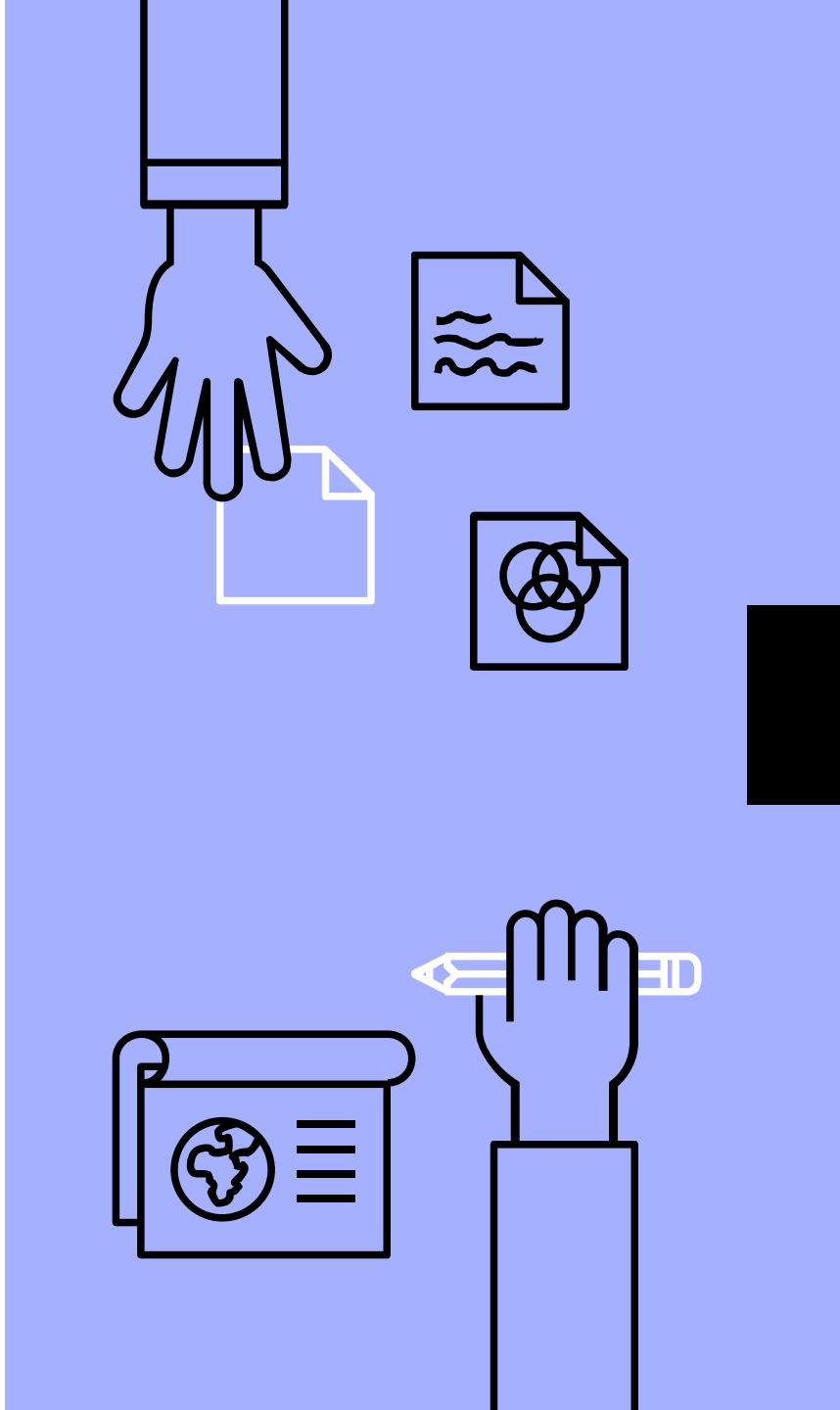
Optic distortion is a physical phenomenon that occurs in image recording, in which straight lines are projected as slightly curved ones when perceived through camera lenses. The highway driving video is recorded using the front-facing camera on the car and the images are distorted. The distortion coefficients are specific to each camera and can be calculated using known geometrical forms.

Used to convert the image into a grid line and change the distorted image into undistorted using the “undistort” function from the OpenCV library.

Perspective Transform:

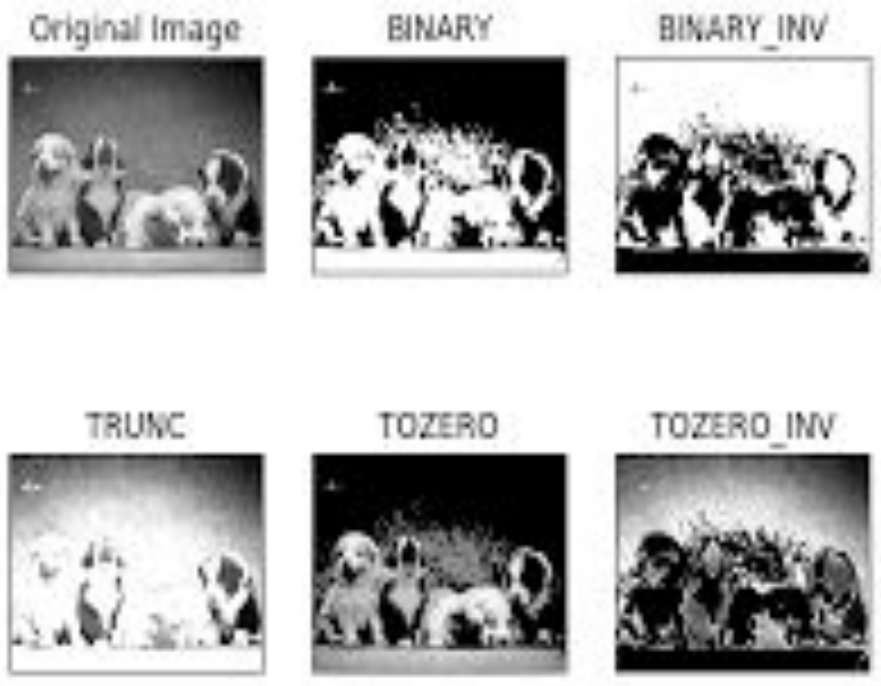
To calculate curvature, the ideal perspective is a bird's eye view. This means that the road is perceived from above, instead of at an angle through the vehicle's windshield. This perspective transform is computed using a straight lane scenario and prior common knowledge that the lane lines are in fact parallel. Source and destination points are identified directly from the image for the perspective transform.

The “warpPerspective” function from the OpenCV library is used for the bird's eye view perspective transform.



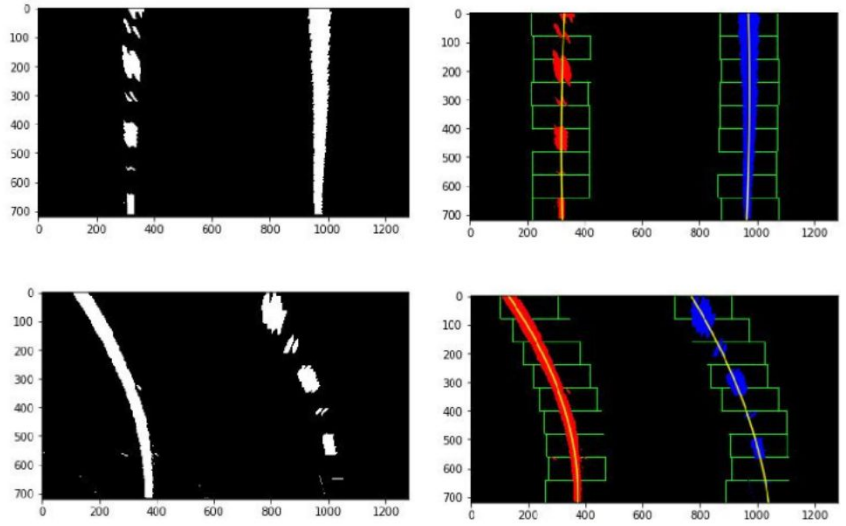
To process the binary threshold images:

The objective is to process the image in such a way that the lane line pixels are preserved and easily differentiated from the road. Four transformations are applied and then combined.



Lane line detection using histogram:

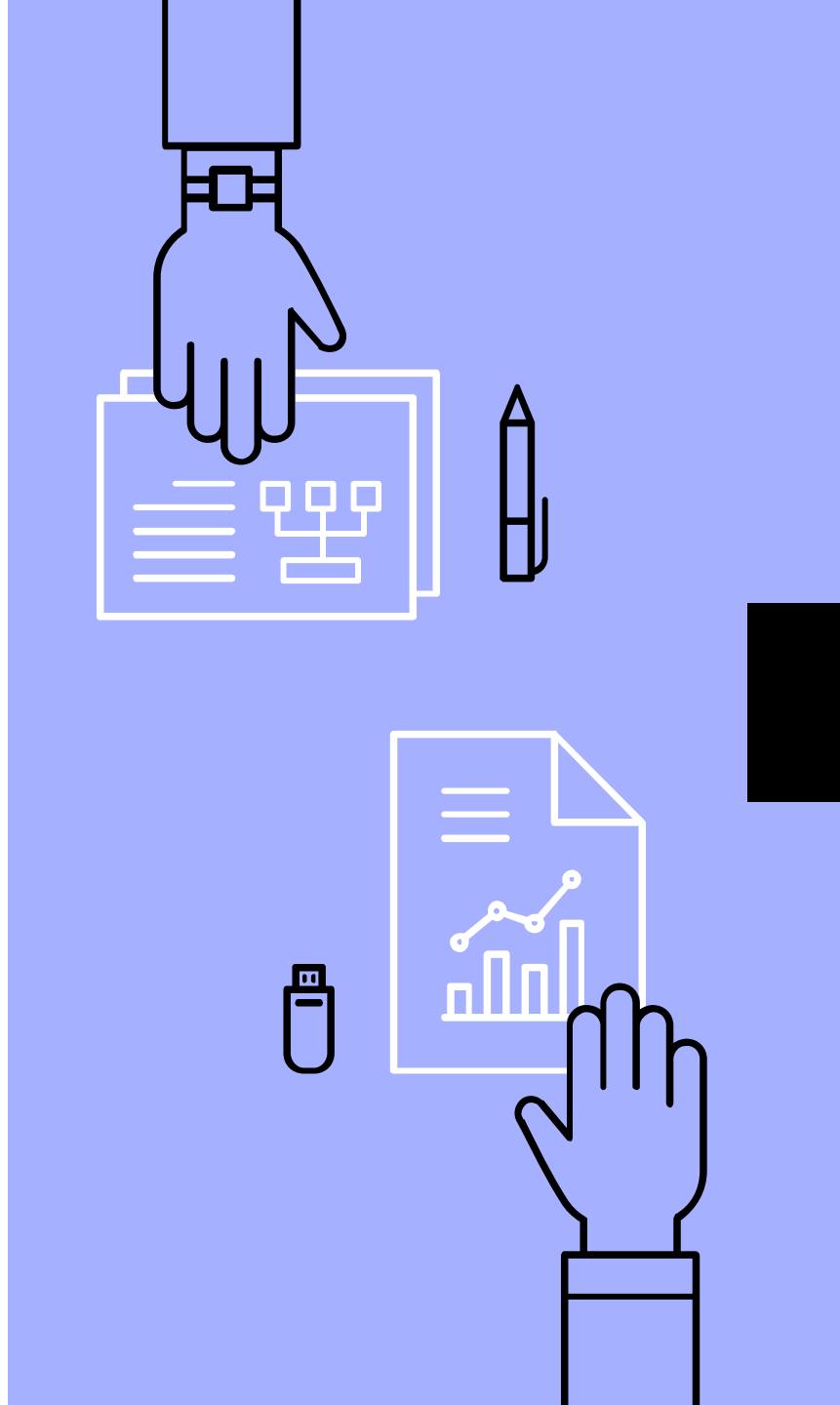
The lane line detection is performed on binary thresholded images that have already been undistorted and warped. Initially, a histogram is computed on the image. This means that the pixel values are summed on each column to detect the most probable x position of the left and right lane lines.



Calculation of vehicle position and curve radius:

To speed up the lane line search from one video frame to the next, information from the previous cycle is used. It is more likely that the next image will have lane lines in proximity to the previous lane lines. This is where the polynomial fit for the left line and right line of the previous image is used to define the searching area.

To calculate the radius and the vehicle's position on the road in meters, scaling factors are needed to convert from pixels. The corresponding scaling values are 30 meters to 720 pixels in the y-direction and 3.7 meters to 700 pixels in the x dimension.



Libraries used

matplotlib.pyplot as plt
matplotlib.image as mpimg
NumPy as np
cv2
glob
os
moviepy.editor