ENPM673: Perception for Autonomous Robots

Project 2

Umang Rastogi UID: 116773232
Sayani Roy UID: 116818766
Prateek Bhargava UID: 116947992

Date: 11 March 2020

1. Problem 1

2. Problem 2

2.1 Introduction

In this problem, the following pipeline has been followed to do simple Lane Detection to mimic Lane Departure Warning systems used in Self Driving Cars.

Correction of distortion and removal of noise: The given camera calibration matrix and distortion matrix are used to remove distortion from each frame of the video. The openCV function undistort() has been used for this step. The function takes the frame, camera calibration matrix and distortion matrix as input and returns an undistorted frame as output. To remove the noise from the undistorted frames, openCV function fastNlMeansDenoisingColored is used. The function suppresses the noise from each frame.

Detection of edges: The next step after frame rectification is to detect the edges present in the frames. For this reason, Canny Edge Detector is used.

Extraction of ROI: For this problem, the region of interest is bottom half the image where the lane of the road is visible.

Detection of lane candidates:

Prediction of turns:

2.2 Homography

Homography can be explained as a perspective transformation of a plane or re-projection of a plane from one camera view into a different camera view.

2.3 Hough Lines

Hough Lines transform in its simplest form is used to detect straight lines. This transformation can be applied on images after edge detection techniques like Canny.
A straight line can be represented in terms of 'ρ' and 'θ', where the parameters 'ρ' is the distance from the line to the origin and 'θ' is the angle of the line.
For any point detected in the image, a group of lines can be drawn that goes through that point, i.e, for all values of (ρ,θ) there will be a line passing through the point. This group of lines for all the points in the image plane when plotted in Hough space, different sinusoidal curves are generated. The points where most of the curves intersect in the graph represent straight lines in the image plane. Now, those corresponding values of (ρ,θ) are selected to draw lines on the image. This is how Hough Line transform results in drawing of lines over the edges detected in the image.

Points which form a line

Bunch of sinusoids intersecting at one point
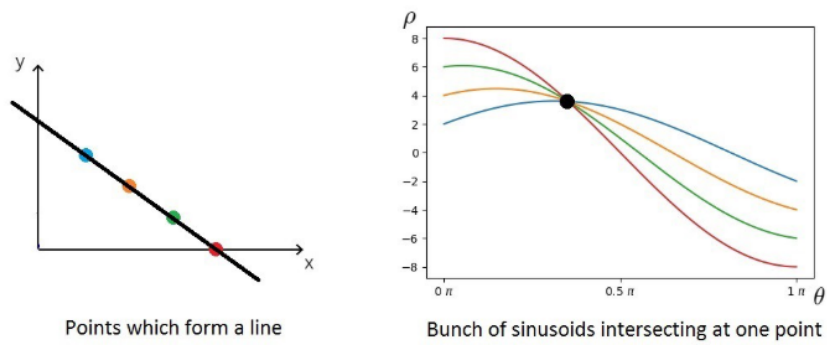
We tried Hough Line transform after edge detection step to identify the lanes on the road. However, due to «»>, the Hough Line transform was not a suitable method to identify the lanes.

2.4 Pipeline generalization for similar datasets

.

3. References

- Understanding the logic behind Hough Line transformation