Lane Detection Pipeline for ADAS
Technical Summary Report

1 Introduction

This report summarizes an efficient computer vision pipeline for lane detection, designed for Advanced Driver Assistance Systems (ADAS). The method relies on robust preprocessing steps, Region of Interest (ROI) selection, edge detection, and Hough transform line extraction. This approach achieves real–time, stable detection of white and yellow lane markings under common road conditions.

2 1. Image Acquisition

The input is an RGB image captured from a forward-facing vehicle camera. The image is copied into a working buffer to preserve the original data for overlay visualization.

3 Best Camera Placement for ADAS Lane Detection

Accurate ROI computation depends heavily on camera position. The optimal configuration is:

3.1 1. Mounting Location

- Behind the windshield, centered horizontally.
- Height: 1.2–1.4 meters from the ground (typical windshield height).
- Distance from dashboard: near the top center of the windshield to reduce reflections.

3.2 2. Camera Orientation

- Pitch angle: approximately 5–15° downward to maximize road coverage.
- Roll angle: must be zero to avoid lane tilt distortions.
- Yaw angle: aligned perfectly with vehicle center axis.

3.3 3. Field of View (FOV)

- Horizontal FOV: 60–90°.
- Vertical FOV: 40–55°.

A narrower FOV reduces distortion and makes lane lines more consistent in the ROI.

3.4 4. Impact on ROI Accuracy

A properly mounted camera ensures:

- the horizon appears between 55–65% of the image height,
- lane convergence appears near the top of the trapezoid,
- lane width is proportional across the bottom region,
- road curvature is captured clearly.

4 Conclusion

The implemented pipeline combines geometric ROI selection, color filtering in HSV space, edge detection, and line extraction. When paired with an optimally placed forward-facing camera, the system achieves high reliability in detecting lane markings, forming a solid foundation for ADAS applications such as lane keeping, lane departure warning, and road tracking.