# ROAD LANE DETECTION

Revision Number: 2.0
Last date of revision: 09-08-2021

# Document Version Control

| Date Issued | Version | Description | Author |
|---|---|---|---|
| 09-08-2021 | 1 | Preparing Draft | Ghanta Sai Kirshna |
| 09-08-2021 | 2 | Updated KPI,Conclusion | Ghanta Sai Krishna |
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## Abstract

Nowadays accidents are an increasing concern all over the world. In present scenario accidents are happening due to the factors of improper implementation and usage of helmets while driving Un-Prediction of other vehicle motions, utilizing low-quality helmets. All this carelessness and irresponsible activities play a dominant role in accidents that are leading to cause of death and disability. Helmets play a major role in protecting a human head injury in case of accidents. The purpose of this research is to create a smart and secure electronic helmet that plays a vital role in protecting human lives from accidents and this helmet help to send and monitor the information about the vehicle and also the person driving the vehicle. This research mainly focuses on indicating alerts to the driver about the surrounding vehicle movements while “changing the lane” and also helps to navigate the driver incorrect way for travelling.

# 1 Introduction

## 1.1 Why this High-Level Design Document?

The purpose of this High-Level Design (HLD) Document is to add the necessary detail to the current project description to represent a suitable model for coding. This document is also intended to help detect contradictions prior to coding, and can be used as a reference manual for how the modules interact at a high level.

The HLD will:

- Present all of the design aspects and define them in detail
- Describe the user interface being implemented
- Describe the hardware and software interfaces
- Describe the performance requirements
- Include design features and the architecture of the project
- List and describe the non-functional attributes like:
    - Security
    - Reliability
    - Maintainability
    - Portability
    - Reusability
    - Application compatibility
    - Resource utilization
    - Serviceability

## 1.2 Scope

Preprocessing steps are taken to remove the noise from the images. The gradient and HLS thresholding are used to detect the lane lines on the images. The perspective transform visualizes the lane line properly.

## 1.3 Definitions

| *Term* | *Description* |
|---|---|
| *Database* | Collection of all the information monitored by this system |
| *IDE* | Integrated Development Environment |

# 2 General Description

Automatic lane detection to help the driver is an issue considered for the advancement of Advanced Driver Assistance Systems (ADAS) and a high level of application frameworks because of its importance in drivers and passerby safety in vehicular streets

## 2.1 Product Perspective

**I** introduced a computer vision-based techniques that can efficiently detect the lanes in any ambient environment. We have mainly used gradient and
HLS thresholding for lane detection.

## 2.2 Problem statement

Using computer vision techniques in Python, we will identify road lane lines in which autonomous cars must run. This will be a critical part of autonomous cars, as the self-driving cars should not cross its lane and should not go in opposite lane to avoid accidents.

## 2.3 PROPOSED SOLUTION

The paper presents a lane detection system using computer vision-based technologies that can efficiently detect the lanes on the road. Different techniques like preprocessing, thresholding, perspective transform are
fused together in the proposed lane detection system. Gradient and HLS thresholding detect the lane line in binary images efficiently. Sliding window search is used to recognize the left and right lane on the road. The cropping technique worked only the particular region that consists of the lane lines. From the experimental results, it can be concluded that the system detects the lanes efficiently with any conditions of the environment. The system can be applied to any road having well-marked lines and implemented to the embedded system for the assistance of Advanced Driver Assistance Systems and the visually impaired people for navigation to keep them in proper track.

## 2.4 FURTHER IMPROVEMENTS

In future, a real-time system with hardware implementation will be developed that will capture the images from the real-time scenario and detect the lanes based on the proposed technique as well as generate a warning for the concerned persons (drivers or visually impaired people).

## 2.5 Data Requirements

Data requirement completely depend on our problem statement.
User can input any type of inputs specifying the path and type of input when asked
Automatically the code generates the output file in the needed location by the user

## 2.6 Tools used

Python programming language and frameworks such as NumPy, Pandas, Opencv are used to build the whole model.

- PyCharm is used as IDE.
- For visualization of the plots, Matplotlib, Seaborn and Plotly are used.
- GitHub is used as version control system.

## 2.7 Constraints

The techniques that have been already proposed have some difficulties to detect lane in case the lanes are not fully visible.

## 2.8 Assumptions

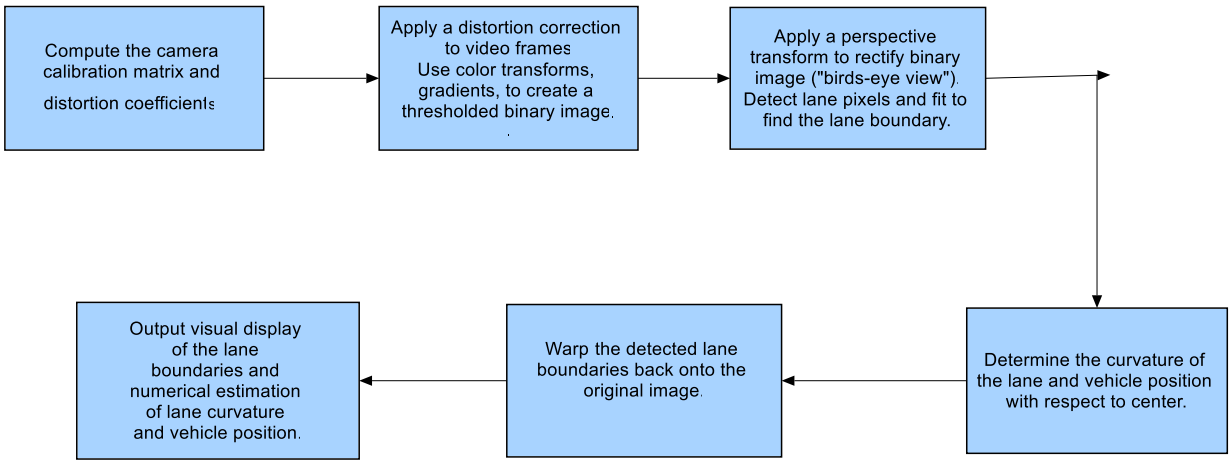
The proposed system also shows some error because of the width of the lane unexpectedly changes in the spatiotemporal image due to the pitch angle changes and thus disrupts the temporal consistency assumption.

# 3 Design Details

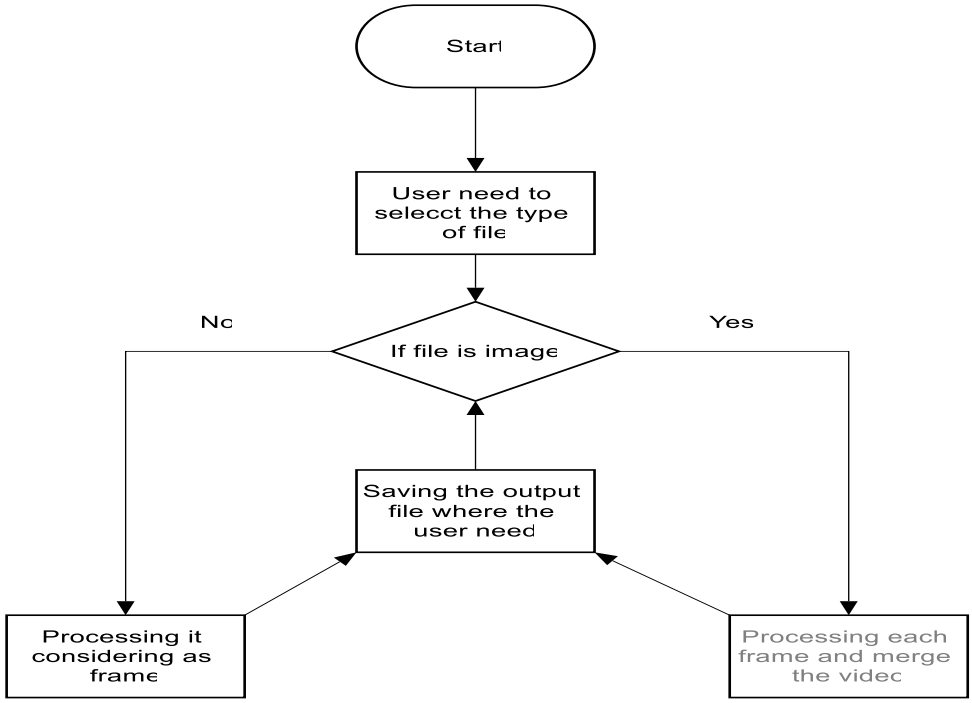
## 3.1 Process Flow

For identifying the different types of anomalies, we will use a Computer Vision base model. Below is the process flow diagram is as shown below.

## Proposed methodology




## Deployment Process:



## 3.2 Event log

The system should log every event so that the user will know what process is running internally.

**Initial Step-By-Step Description:**

1. The System identifies at what step logging required
2. The System should be able to log each and every system flow.
3. Developer can choose logging method. You can choose database logging/ File logging as well.
4. System should not hang even after using so many loggings. Logging just because we can easily debug issues so logging is mandatory to do.

## 3.3 Error Handling

Should errors be encountered, an explanation will be displayed as to what went wrong? An error will be defined as anything that falls outside the normal and intended usage.

# 4 Performance

The detected lanes are expressed as straight lines with pink color. Some failed cases are occurred due to shadows or broken lanes on the road surface. The proposed algorithm generates satisfying results with sharp curvature, sharp lane changes,hindrances, and lens flashes due to using the temporal consistency of lane width on each scan line. The experimental results show that the proposed technique identifies the lane accurately in different circumstances of environment like weather conditions and various illumination.

## 4.1 Reusability

The code written and the components used should have the ability to be reused with no problems.

## 4.2 Application Compatibility

The different components for this project will be using Python as an interface between them. Each component will have its own task to perform, and it is the job of the Python to ensure proper transfer of information.

## 4.3 Resource Utilization

When any task is performed, it will likely use all the processing power available until that function is finished.

## 4.4 Deployment

Personal Computer as the hosting platform

### 4.5 KPIs (Key Performance Indicators)

- Optimized angles and the detected lane and the service guide to the driver to make decisions

# 5 Conclusion

The paper presents a lane detection system using computer vision-based technologies that can efficiently detect the lanes on the road. Different techniques like preprocessing, thresholding, perspective transform are fused together in the proposed lane detection system. Gradient and HLS thresholding detect the lane line in binary images efficiently. Sliding window search is used to recognize the left and right lane on the road. The cropping technique worked only the particular region that consists of the lane lines. From the experimental results, it can be concluded that the system detects the lanes efficiently with any conditions of the environment. The system can be applied to any road having well-marked lines and implemented to the embedded system for the assistance of Advanced Driver Assistance Systems and the visually impaired people for navigation to keep them in proper track.