Abstraction of Lane Detection Project

TEAM = 17

Project Title: Lane Detection System Using Computer Vision

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Introduction:

Lane detection is a crucial aspect of autonomous driving and advanced driver-assistance systems (ADAS). This project focuses on developing a lane detection system using computer vision and deep learning techniques to enhance road safety by identifying and marking lane boundaries in real time.

Objective:

The primary objective of this project is to design and implement an efficient lane detection system capable of accurately identifying lane markings under various road conditions. This system will assist drivers and autonomous vehicles in lane-keeping, reducing the risk of accidents caused by lane deviation.

Methodology:

Data Collection:

- Gathering road images and videos from open-source datasets and real-world environments.

Preprocessing:

- Converting images to grayscale.
- Applying Gaussian blur for noise reduction.
- Implementing edge detection techniques like Canny edge detection.
- Using region-of-interest (ROI) selection to focus on relevant lane areas.

Lane Detection Techniques:

- Hough Transform for detecting straight lane lines.
- Polynomial fitting for detecting curved lane lines.
- Deep learning models (e.g., CNN-based approaches) for robust lane detection in complex scenarios.

Post-processing and Optimization:

- Implementing sliding window techniques for lane tracking.
- Integrating Kalman filters for improving lane stability.
- Enhancing real-time performance using optimized algorithms.

Expected Outcome:

- A functional lane detection system capable of accurately identifying lane boundaries in real-time.
- Improved lane-keeping assistance for vehicles, enhancing road safety.
- Adaptability to different lighting and weather conditions.

Technologies :

- **Language:** Python
- **Libraries:** OpenCV, NumPy
- **Techniques:** Grayscale, Gaussian Blur, Canny Edge, Hough Transform, Color Thresholding, Perspective Transform
- **ML/DL (Optional):** CNNs, TensorFlow/PyTorch
- **Tools:** Jupyter, PyCharm, VS Code
- **Hardware (Optional):** Raspberry Pi, Camera Module

Conclusion:

This lane detection project aims to contribute to the field of autonomous driving and driver assistance technologies by providing a reliable system for lane identification. The integration of computer vision and deep learning techniques ensures robust performance, paving the way for safer transportation systems.
