Computer Vision Final Project Proposal

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1. Automatic Document Scanner

1.1 Objectives

The goal of this project is to develop a system that takes an image of a physical document and outputs a corrected, binarized, and flattened version, similar to what a real scanner would produce.

- **Input:** A photograph of a document (e.g., from a smartphone or webcam).
- **Output:** A top-down, perspective-corrected, black-and-white image of the document.

The system must:

- Detect the borders of the document in the image.
- Correct the perspective distortion.
- Enhance the readability (binarization, contrast adjustment).

Limitations:

- The system is not required to perform OCR or understand document content.
- It assumes a single document per image and that the document is reasonably well-lit and not severely wrinkled.

1.2 Applications

This system is useful in scenarios where users need to scan documents but lack a physical scanner. It has practical applications in:

- Mobile document scanning apps.
- Digital archiving of paper records.
- Simplified digitization in educational or bureaucratic contexts.

1.3 Performance Evaluation Metrics

- **Corner Detection Accuracy:** Distance error between detected and truth corners.
- **IoU (Intersection over Union):** Between the detected document area and the truth.
- **Processing Time:** Time taken per image.

2. Traffic Sign Detection System

2.1 Objectives

This project aims to detect some traffic signs (e.g., STOP signs) from road images. The focus is on detection.

- **Input:** A photo or frame from a video containing road scenes.
- **Output:** Bounding boxes or mask of detected signs.

The system must:

- Isolate the regions in the image.
- Define what type of signal is present.

Limitations:

- The system is not required to classify signs that are not in the dataset.
- Detection is limited under reasonably good lighting conditions.

2.2 Applications

This system contributes to the field of intelligent transportation systems and driver-assistance technology. Its applications include:

- Basic Advanced Driver-Assistance Systems (ADAS).
- Autonomous vehicle.
- Traffic monitoring from surveillance systems.

2.3 Performance Evaluation Metrics

- **Precision:** On detected signs compared to manually annotated truth.
- **False Positive Rate:** Proportion of non-sign regions incorrectly detected.
- **Detection Latency:** Time taken per processing.