TREK: Autonomous Car Lane Detection for Rural Roads

(Tracking **R**ural **E**nvironments **K**eenly)

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Introduction and Objectives

Figure 1: Unmarked Road from KITTI Vision Benchmark Suite

- Autonomous cars rely on lane markings to detect road lane.
- Unmarked roads require use of expensive equipment such as LIDAR.
- Our goal was to detect unmarked roads using only optical cameras.
- Our intent is to create a method for tracking unmarked roads with cheaper components to make autonomous cars more accessible.

Figure 2: Sensor Setup KITTI Vision Benchmark Suit

Overall System Diagram

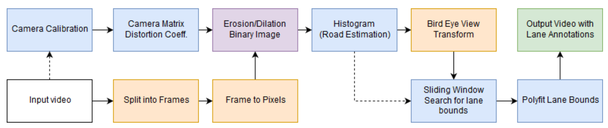

Figure 3: System Block Diagram

- Video input split it into frames
- Transform frames to a binary image, highlighting road.
- Histogram of binary image to estimate vanishing point to perform PerspectiveTransform.
- Take histogram again and more accurately estimate road boundaries .

Transform Examples

Morphology and Binary Transform

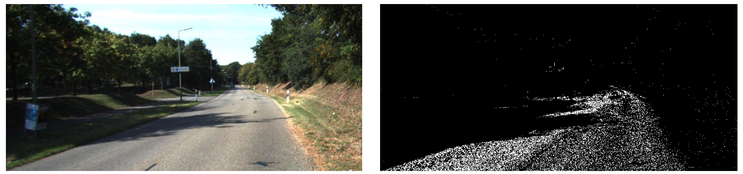

Figure 4: Original image (left) and Transformed Image (right)

Perspective Transform

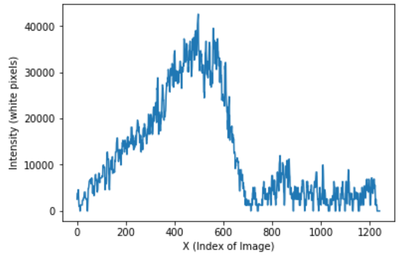

Figure 6: Histogram of Binary Image in Figure 4 (left) and Perspective Transformed image (right)

Results

Environment	Accuracy %
Umarked, Bright	OMITTED
Unmarked, Dark	OMITTED
Laned, Bright	OMITTED

Table 1: Accuracy of algorithm under different conditions

- Performance much better in well-lit environments
- Figure 7 shows how our code for meant for unmarked roads performed on laned roads.

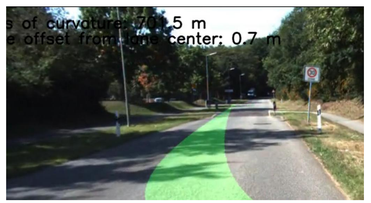

Figure 6: Example Unmarked Road Annotation

Figure 7: Example Marked Road Annotation

Future Work

Figure 8: Marked Lane Detection Example (from original code this project was based on, from Udacity dataset).

- Refine image processing pipeline to better highlight road vs environment
- Create decision rule for switching between marked and unmarked road detection.
- Design Kalman Filter for road prediction

References and Links

- Our code and references can be found at our GitHub, linked below (with scannable barcode)

https://github.com/ftrang88/EC601-Fall2017-Seamless-Track-Detection

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