**On-Road Vehicle and Lane Detection**

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**Motivation**
- Facilitate self-driving car

**Objective**
- Detect lanes/vehicles; estimate distance from monocular vision

**Lane Detection**
1. Edge Detection
2. Hough Transform
3. Vanishing Point Filter
4. Lane Detection

**3D Ground Plane Reconstruction**
0. Camera matrix known
1. Vanishing point $\overline{d}_{3D}$
2. Lane width = 3.6 m
3. Camera height = 1.6 m

**Car Detection**
- Positive training data
- Negative training data
- HOG model
- Extract HOG features
- Linear SVM
- Hard negative mining
- Evaluation
- Test model
- Test image

**Results and Demo**

**Difficulty & Future Plans**
- Curved lanes are not considered.
- Car detection precision/recall not good enough; bounding box not tight enough
  $\rightarrow$ RBF Kernel SVM + Optimization
  $\rightarrow$ Refine positive training data: tight bounding box
- Occlusion is not resolved
  $\rightarrow$ object tracking
- Program is too slow
  $\rightarrow$ reduce search

**Reference**
[3] Matlab Lane Departure Warning System