

Project Results

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Advanced Computer Vision
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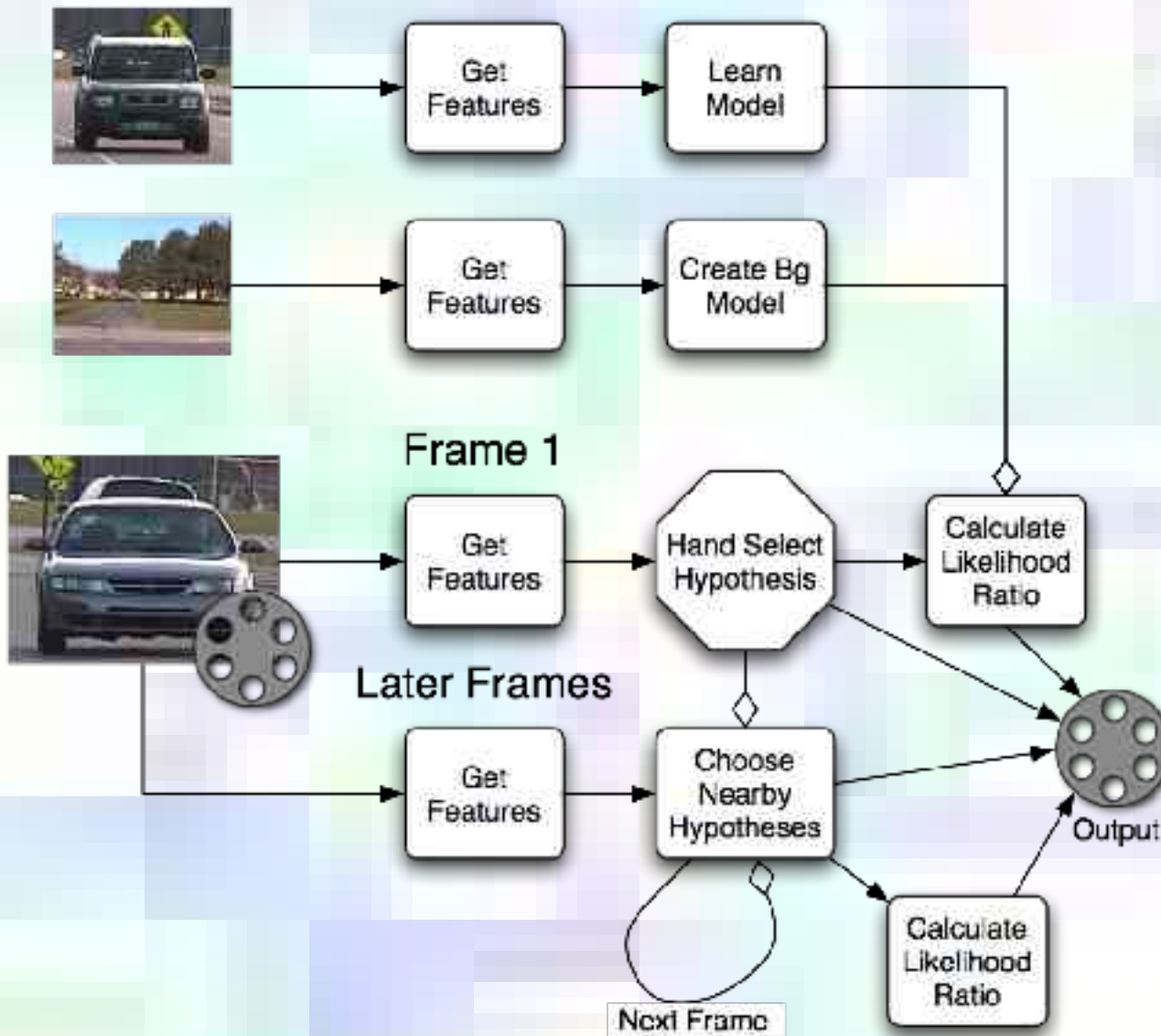
Constellation of Parts [2]

- Probabilistically modeling a category of objects
- Model: a collection of “parts”
 - Appearance: somewhat lighting invariant
 - Location: translation and scale invariant
 - Size: scale invariant
 - ...all modeled as (multivariate) Gaussians
 - Joint probability of occlusion
- Recognition
 - Get candidate parts, calculate likelihood ratio of matching model
- Unsupervised learning via EM algorithm

Completed Work

- Feature generation for each image
 - Interest point selection using Kadir & Brady's operator [1]
 - Pixel patches projected via PCA into 15-D vectors
- Background model from [2] completed
- Initialization of model in preparation for EM algorithm
- Small fg/bg training and test databases
- Hand selection of hypothesis
- Recognition algorithm from [2] completed
- Semi-automatic tracking using temporal coherence

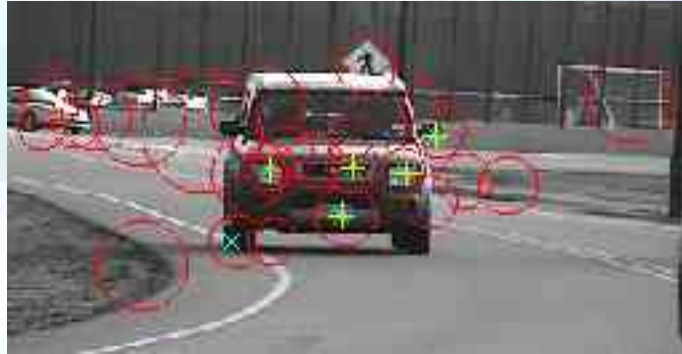
System Overview



Unfinished Work

- A* implementation for selecting max-likelihood hypothesis
 - Calculation of heuristic $h(x)$ completed
 - Do not know what cost function $g(x)$ should be
- EM algorithm for unsupervised model learning
 - Usefulness depends on A* implementation
 - Do not fully understand the “sufficient statistic” calculations of [2]

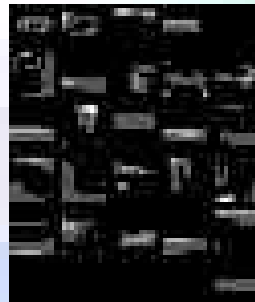
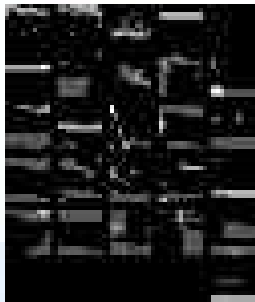
Results



Hand selection of a hypothesis



Recognition results



Feature patch databases

Results

- Video example.
- About 5–15 minutes for 100 frames
 - Kadir & Brady interest operator may be the slowest part
 - MATLAB implemented could be optimized or moved to OpenCV

References

- [1] Kadir & Brady Scale Saliency operator, Matlab binaries available at <http://www.robots.ox.ac.uk/~timork/salscale.html>
- [2] Robert Fergus, “Visual Object Category Recognition,” Ph. D. thesis, Oxford, 2005.