Matching Features Correctly through Semantic Understanding

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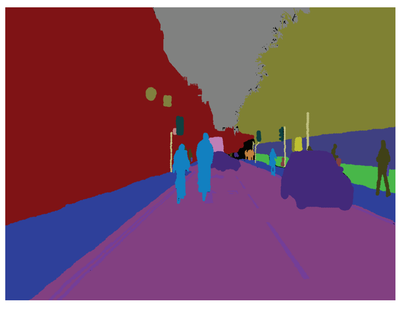
Motivation

Image-to-image feature matching has quadratic complexity and is **slow.**

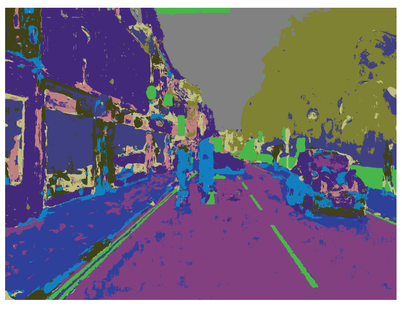
We use **semantic segmentation** as additional information to:

- **match only reliable features** and only
- **within small subsets,**
- **preserving the quality** on the same level.

Initial image



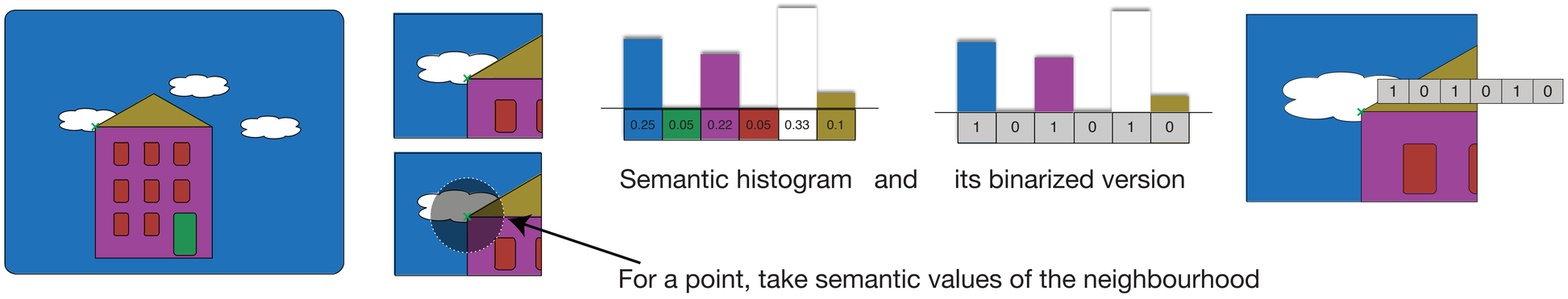
Ground truth segmentation



Automatic segmentation [3]

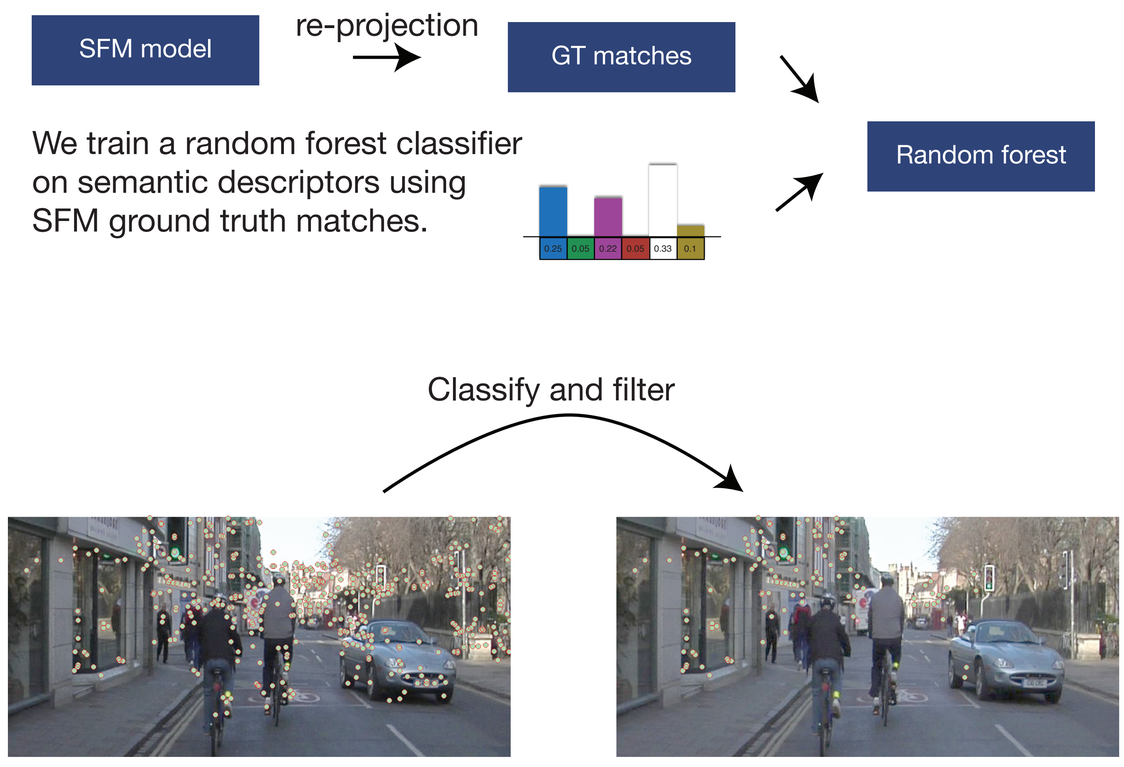
Method

Our semantic descriptor on top of SURF features [1] for every point is designed to be discriminative and robust to noise.



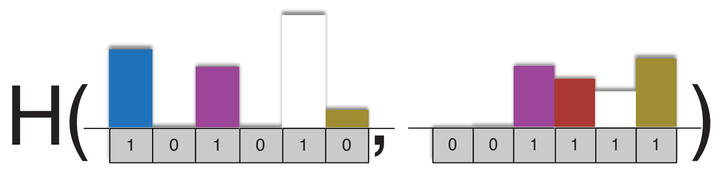
Predicting which features are matchable

- Much time is spent on matching the points that do not have a correct match (e.g., are on the sky or a moving object).
- We predict the ones that are not likely to match correctly and leave them out before matching.

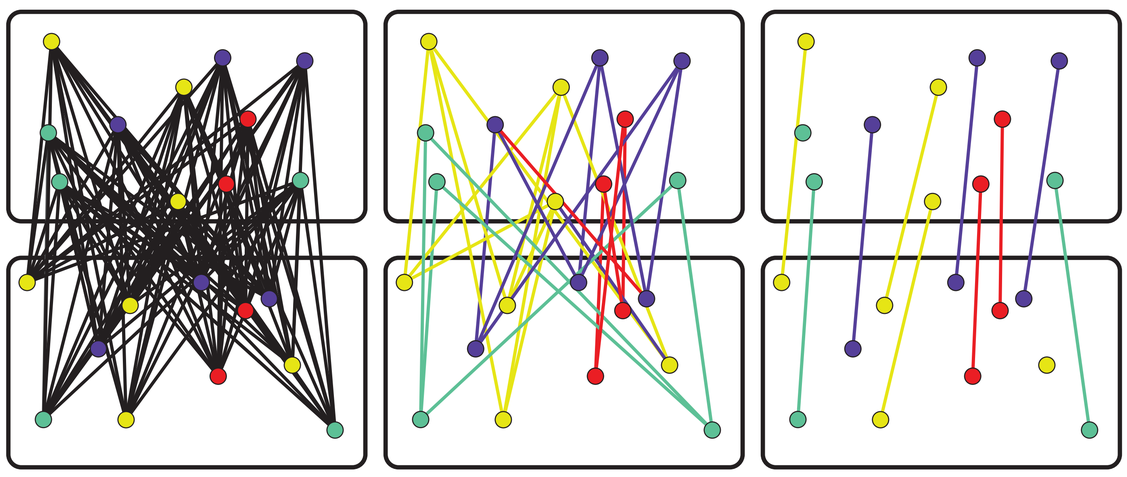


Matching semantically close features

- For every pair of features, compute the Hamming distance between their binary diagrams and match only the ones with a low distance.

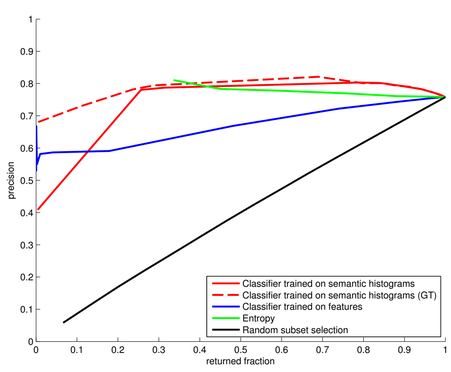


- The number of binary histogrsams is low
- We can split the features into small groups
- Grouping can be done efficiently by pre-matching the histograms

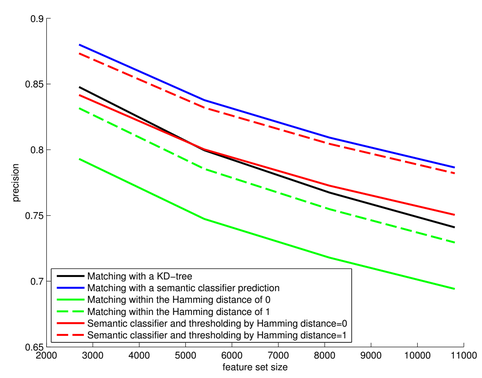


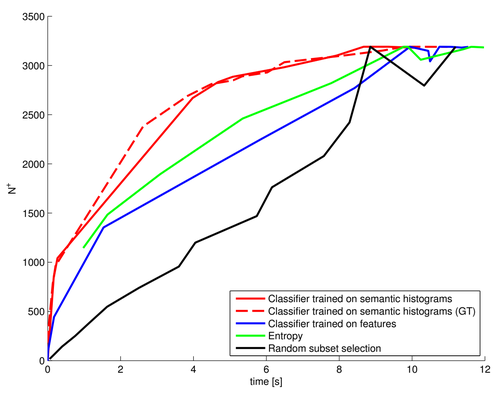
Results

- 2x faster with better precision
- 8x faster with 16% precision loss

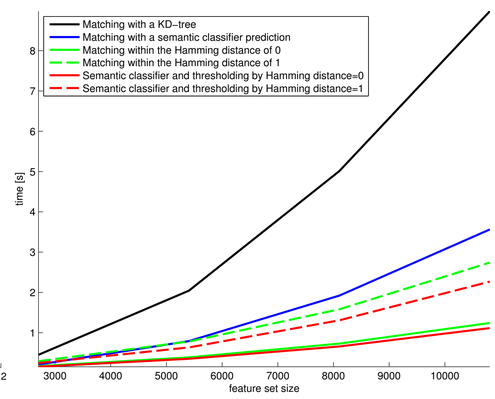


Prediction is more precise (better than [2]).

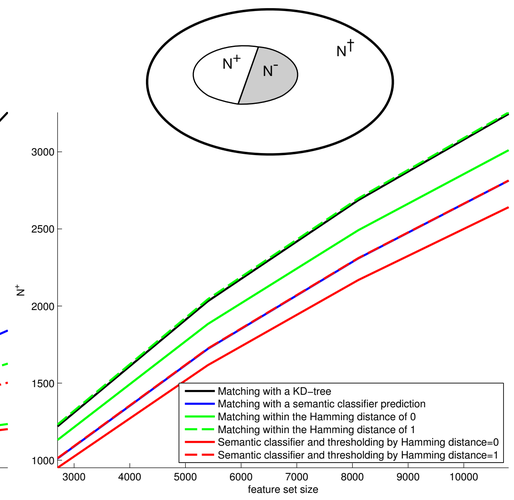




Prediction is faster…



…even faster with a combo



…keeping the #matches high

[1] H. Bay, T. Tuytelaars, and L. Van Gool. SURF: Speeded up robust features. ECCV, 2006
[2] W. Hartmann, M. Havlena, and K. Schindler. Predicting Matchability. CVPR, 2014
[3] H. Riemenschneider, A. Bodis-Szomoru, J. Weissenberg, and L. Van Gool. Learning Where To Classify In Multi-View Semantic Segmentation. ECCV, 2014

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