Evaluating Local Features for Day-Night Matching

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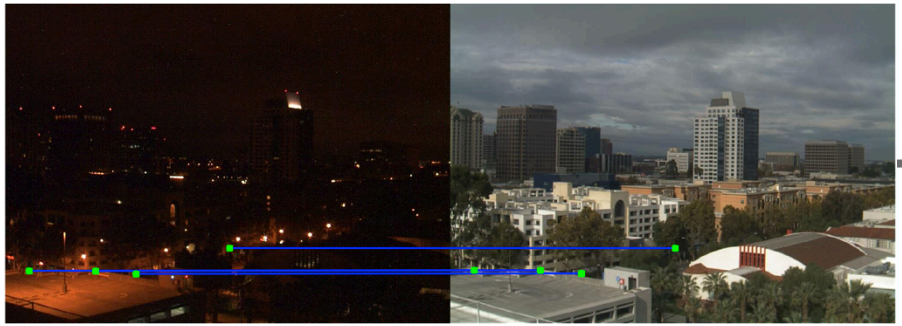
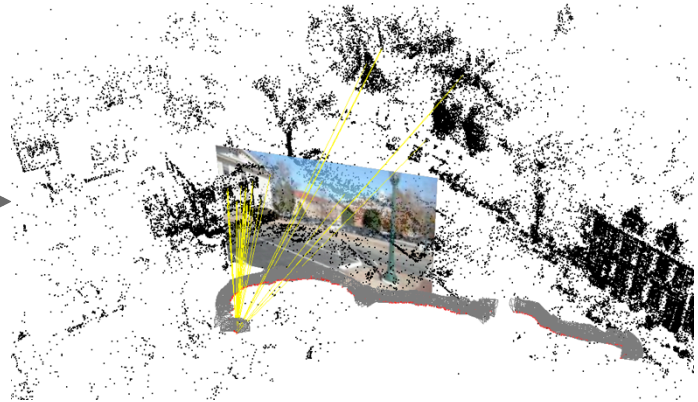
Motivation

Day-Night Matching





Try to answer

1. How seriously are detectors affected by illumination?

2. Is finding repeatable feature detectors the main challenge?

3. Is there potential to improve matching performance?

Dataset

Selected a subset from AMOS dataset
Only contain illumination changes
Available at: http://www.umiacs.umd.edu/~hzhou/dnim

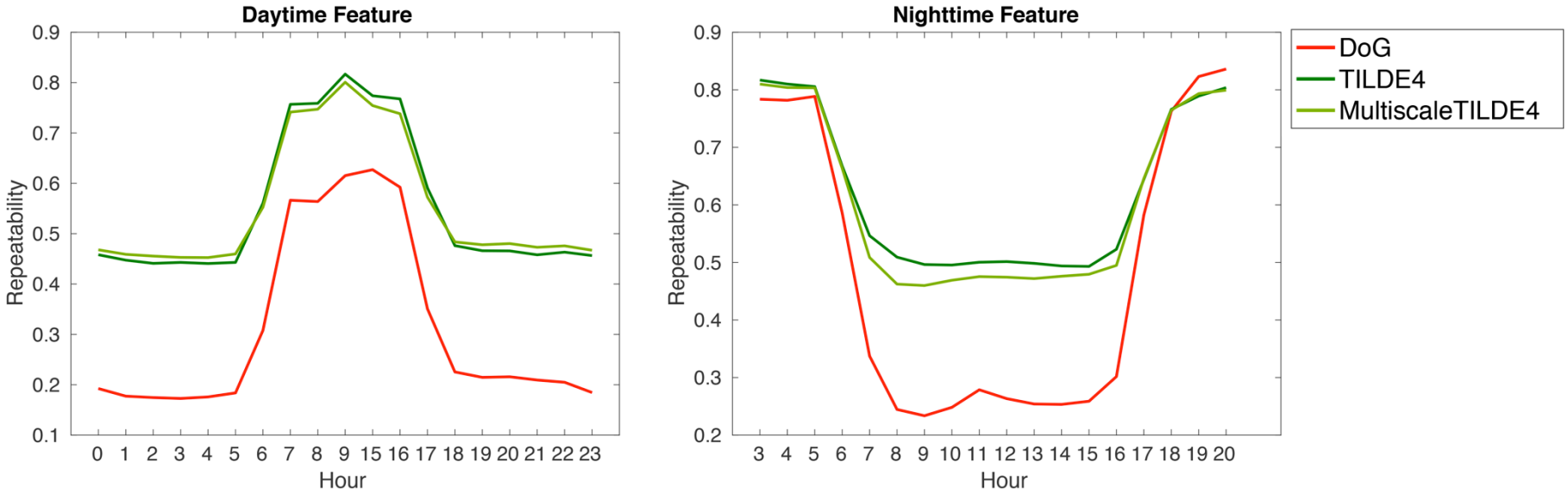
N. Jacobs, N. Roman and R. Pless. Consistent temporal variations in many outdoor scenes. (CVPR ’07)

Evaluation

1. Detector: DoG, Hessian, HessianLaplace, MultiscaleHessian, HarrisLaplace, MultiscaleHarris, TILDE and TILDE’s extension.
2. Descriptor: RootSIFT

How seriously is detector affected by illumination?

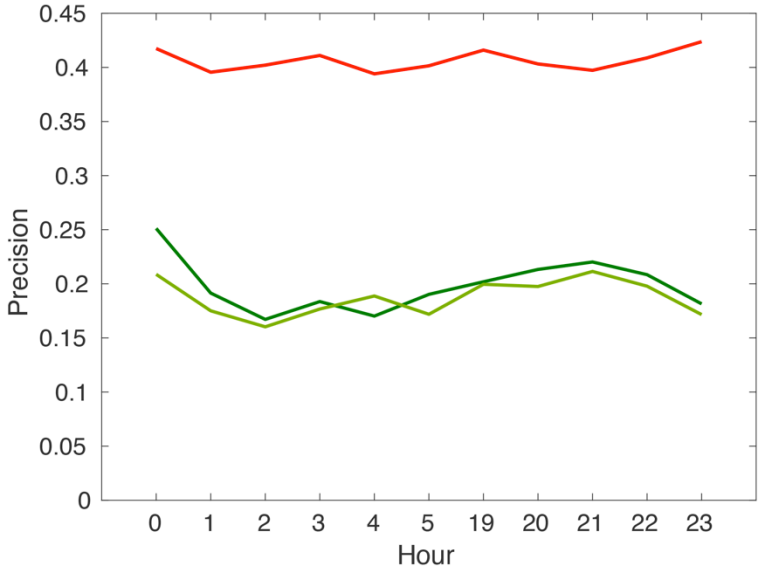
Method: Evaluate repeatability of detectors

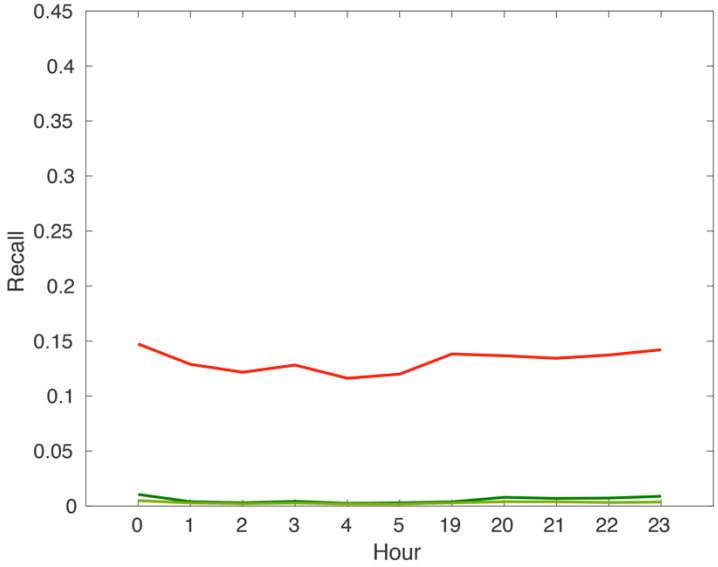


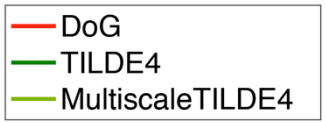
Conclusion: Detectors are affected to a large extent

Is finding repeatable detectors the main challenge?

Method: Evaluate precision and recall of detector + RootSIFT

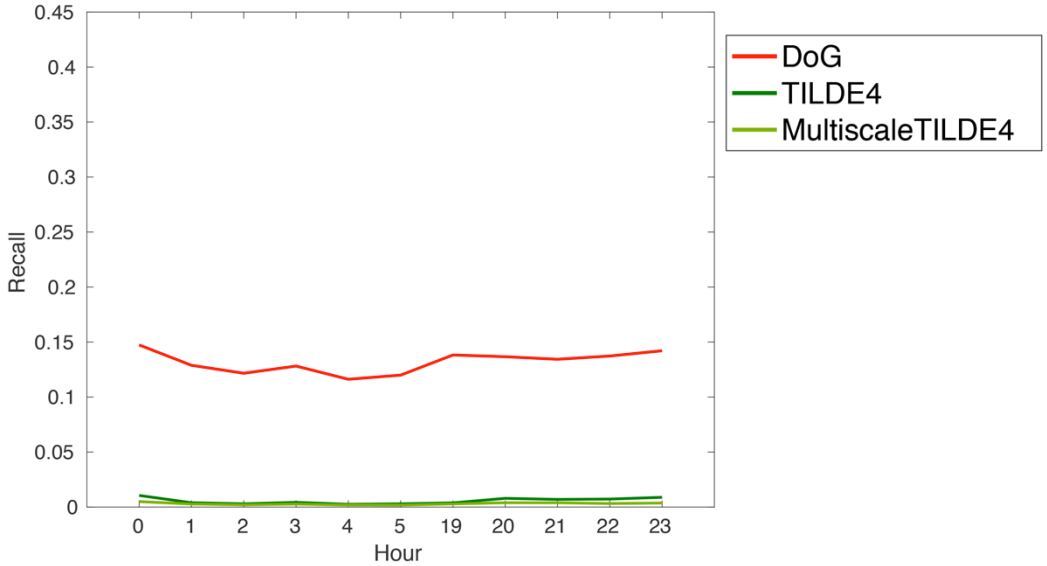






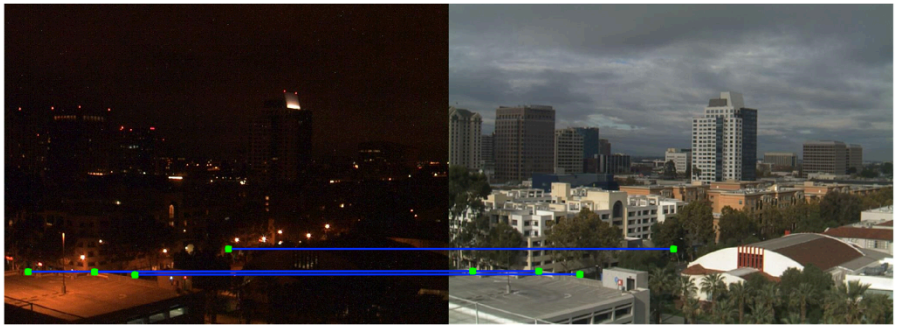
Conclusion: High repeatability $\neq$ overall high performance

Potential to improve descriptors

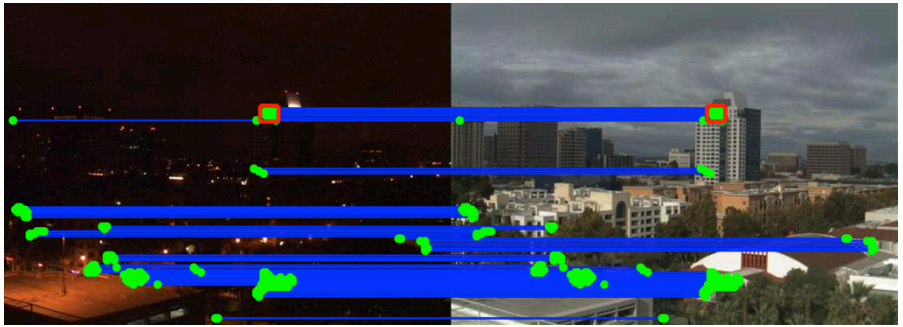


Low recall: Detected features cannot be matched

Potential to improve detectors



DoG + RootSFIT



Dense RootSIFT

Dense RootSIFT can find much more correct matches

Conclusions

Day-Night matching is hard even without view point changes

1. How seriously is detector affected by illumination?

   To a large extent

2. Is finding repeatable feature detectors the main challenge of matching?

   High repeatability $\neq$ overall high performance

3. Is there potential to improve matching performance?

   Yes, both for detectors and descriptors