Robust Sampling Consensus
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Motivation
- Image stitching, 3D reconstruction, tracking,...
- Many algorithms of computer vision use two-view geometries: homography and epipolar geometry
- Need for robust and accurate estimators

RANSAC algorithm
- RANdom SAmple Consensus
- Robust sampling estimator
- Different cost functions used: thresholding, truncating, log-likelihood,...
- LO-RANSAC: Local Optimisation refines promising samples – stabilises the results, decreases number of samples needed

Major Contributions
LO-RANSAC analysed and tested
- Created automatic testing framework
- Several unexpected aspects discovered

Local Optimisation sped up
- LO decreases number of samples needed, however it has an overhead
- Faster variants developed

Cost functions analysed
- Smooth ones more robust to inlier/outlier error threshold selection
- Proposed best: truncated quadratic, as a fast approximation of MLE

Properties of the Improved Algorithm
- High speed (milliseconds for most problems)
- High stability (almost non-random in nature)
- High precision in a road range of conditions
- Low sensitivity to the choice of inlier/outlier threshold
- Offers significantly better starting point for further optimisation

Conclusions
- New experimental framework created
- Speed problem in Local Optimisation discovered, speed-ups proposed
- Cost functions analysed, the best one found
- Result: robustified to number of points and error threshold selection
- Implementation and used datasets made publicly available (GPL)

Links
http://cmp.felk.cvut.cz/software/LO-RANSAC/
http://lebeda.sk/DP/