

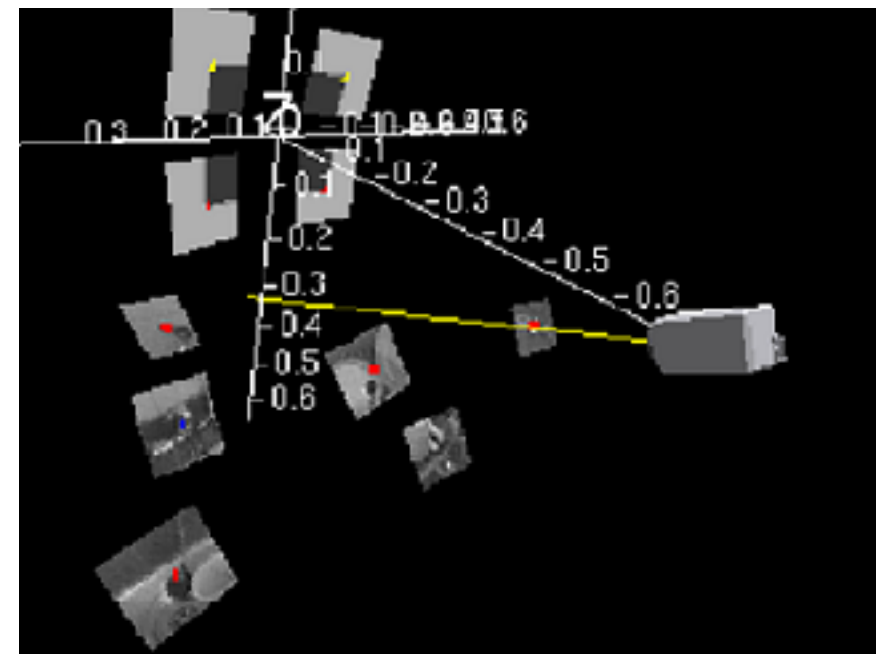
SURF-SLAM

Team 4 Final project presentation
4/9/18

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Motivation

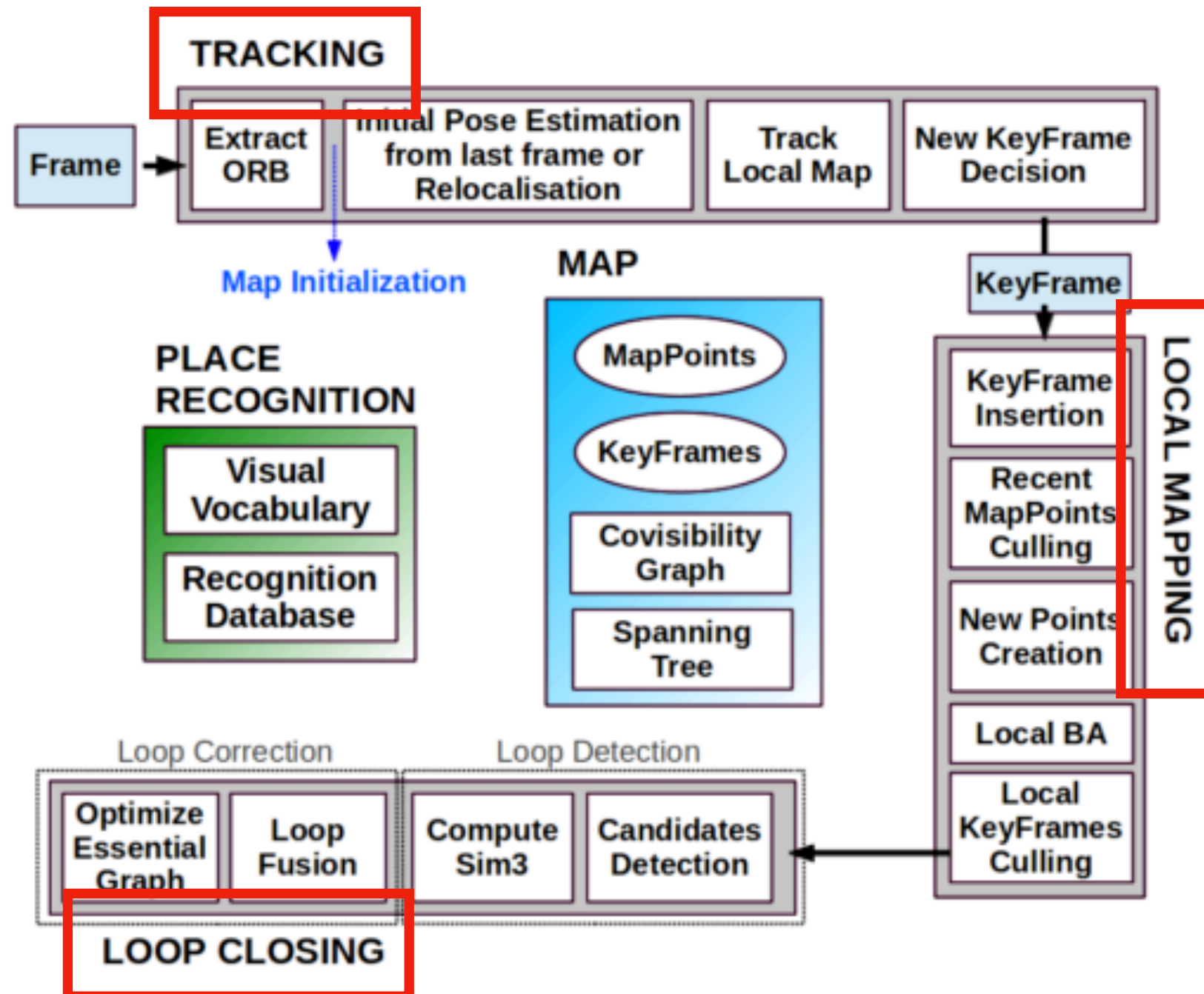
- SLAM is a fundamental problem in autonomous navigation
- Cameras are cheap and ubiquitous
- MonoSLAM is for room-sized domains



ORB-SLAM

- Real-time Visual SLAM for large environments
 - Keyframe-based graph method
 - ORB Features
 - Oriented, multi-scale, FAST corners with a 256 bits descriptor
 - View-point invariant
 - About 10x faster than SIFT

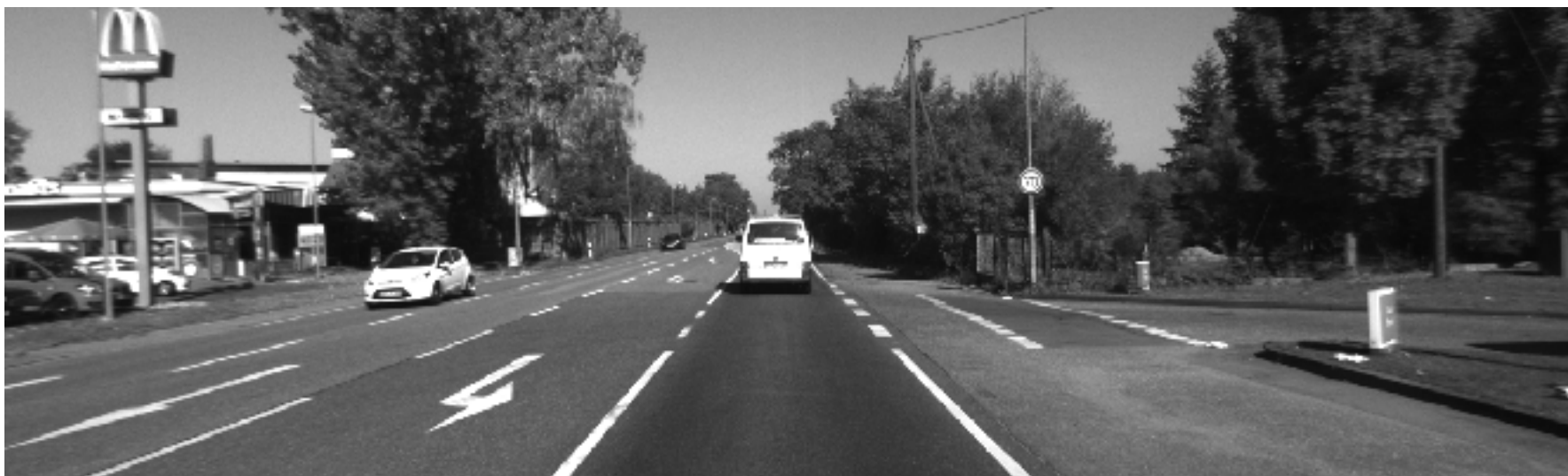
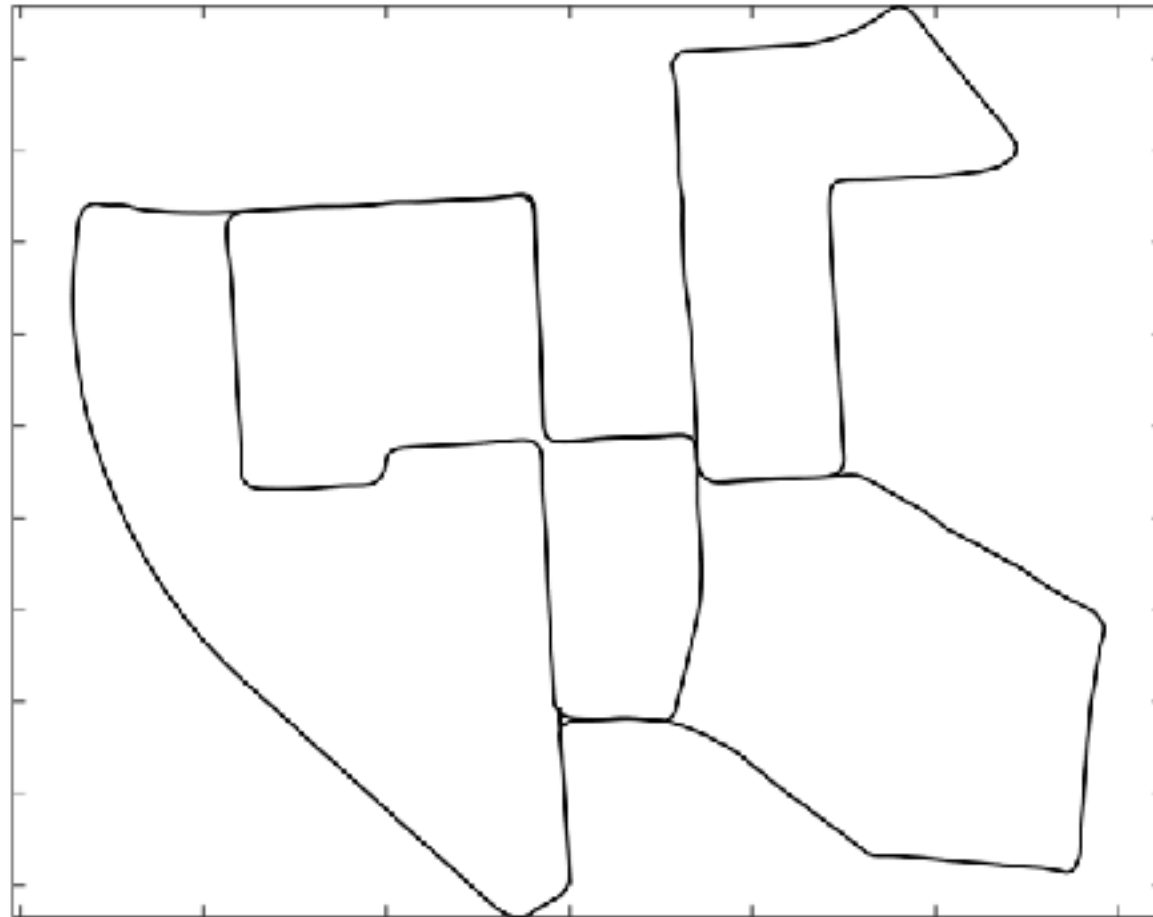
ORB-SLAM Algorithm



Our Implementation

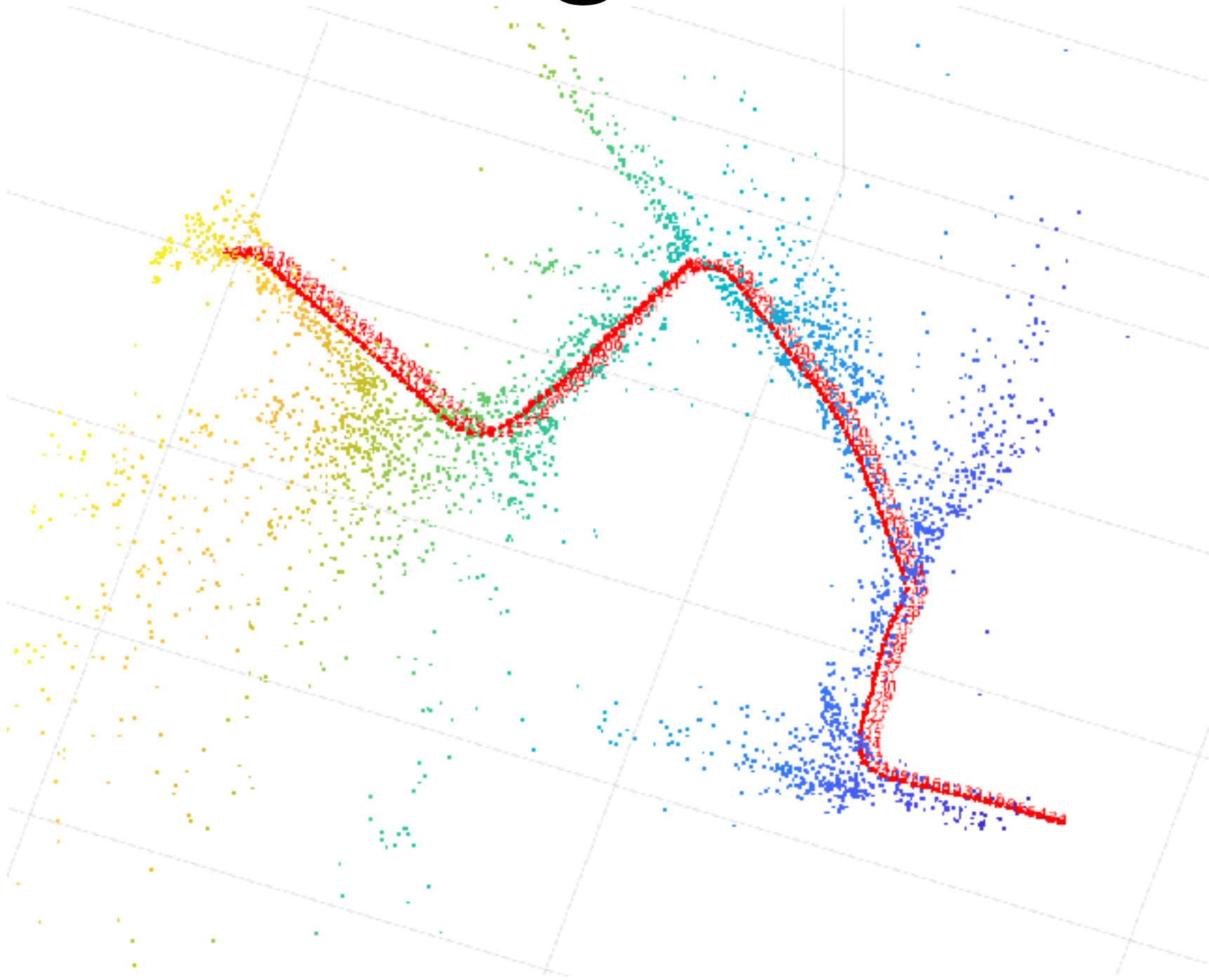
- **Feature extraction:** SURF instead of ORB features
- **Tracking:** Visual odometry using *Structure From Motion*
- **Loop Closure Detection:** Bag-of-Words
- **Optimization:** Bundle Adjustment (e.g., loop closing)

KITTI Dataset



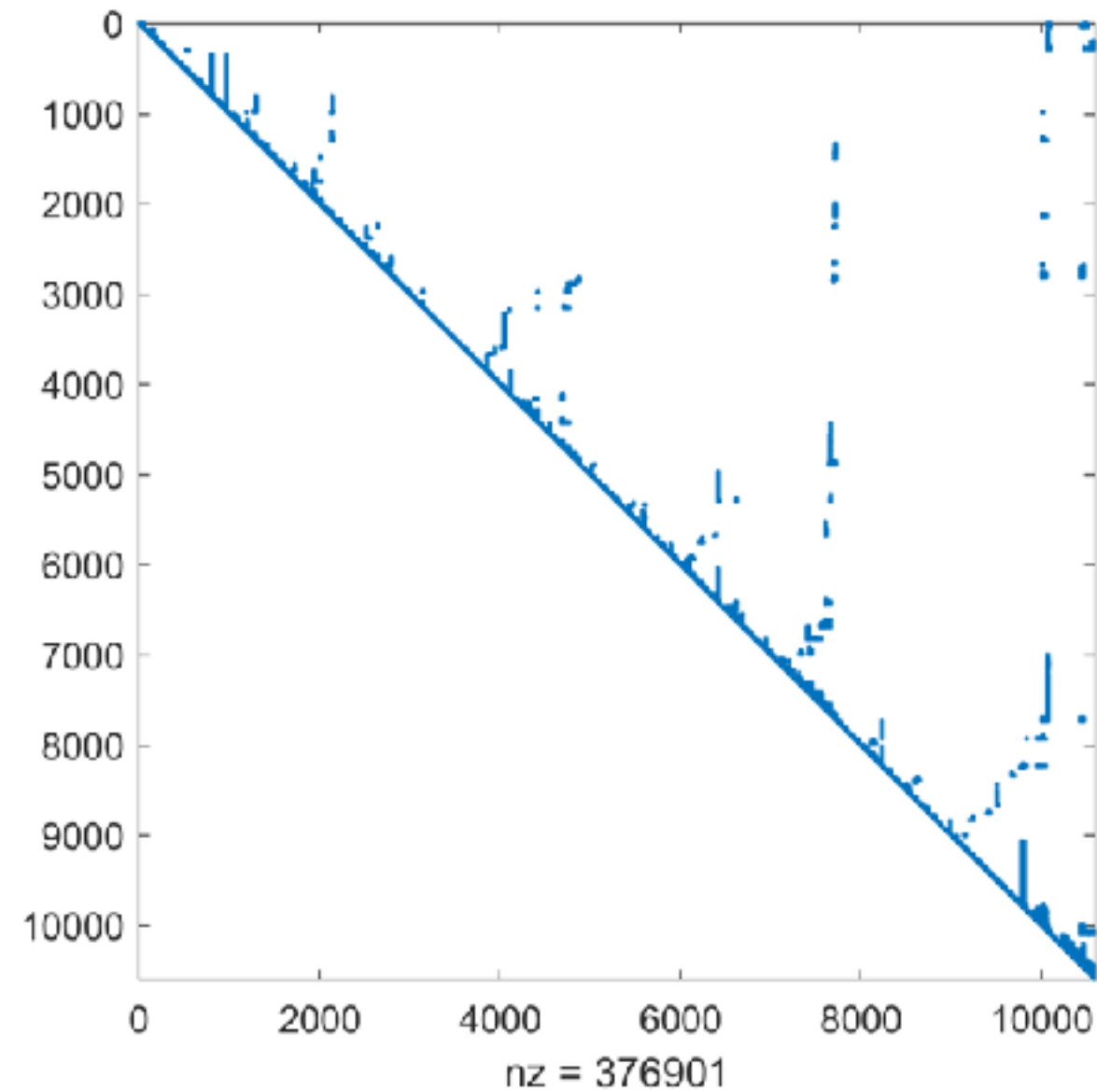
- Andreas Geiger, Philip Lenz, and Raquel Urtasun. "Are we ready for autonomous driving? The kitti vision benchmark suite." *In Conference on Computer Vision and Pattern Recognition (CVPR)*, 2012.

Progress



Example of our visual odometry

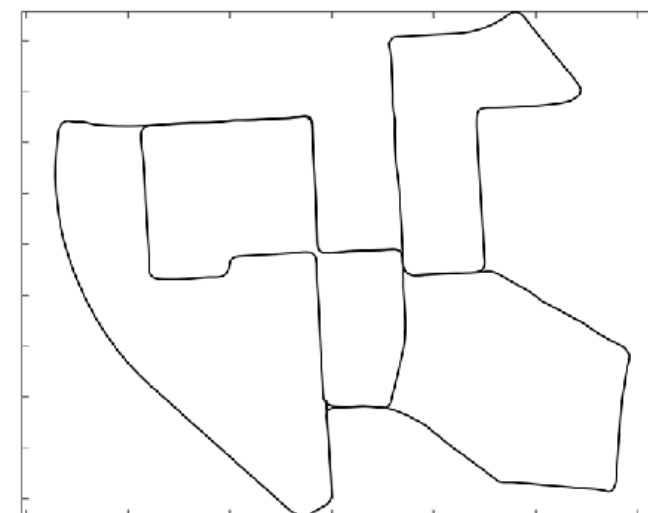
Progress



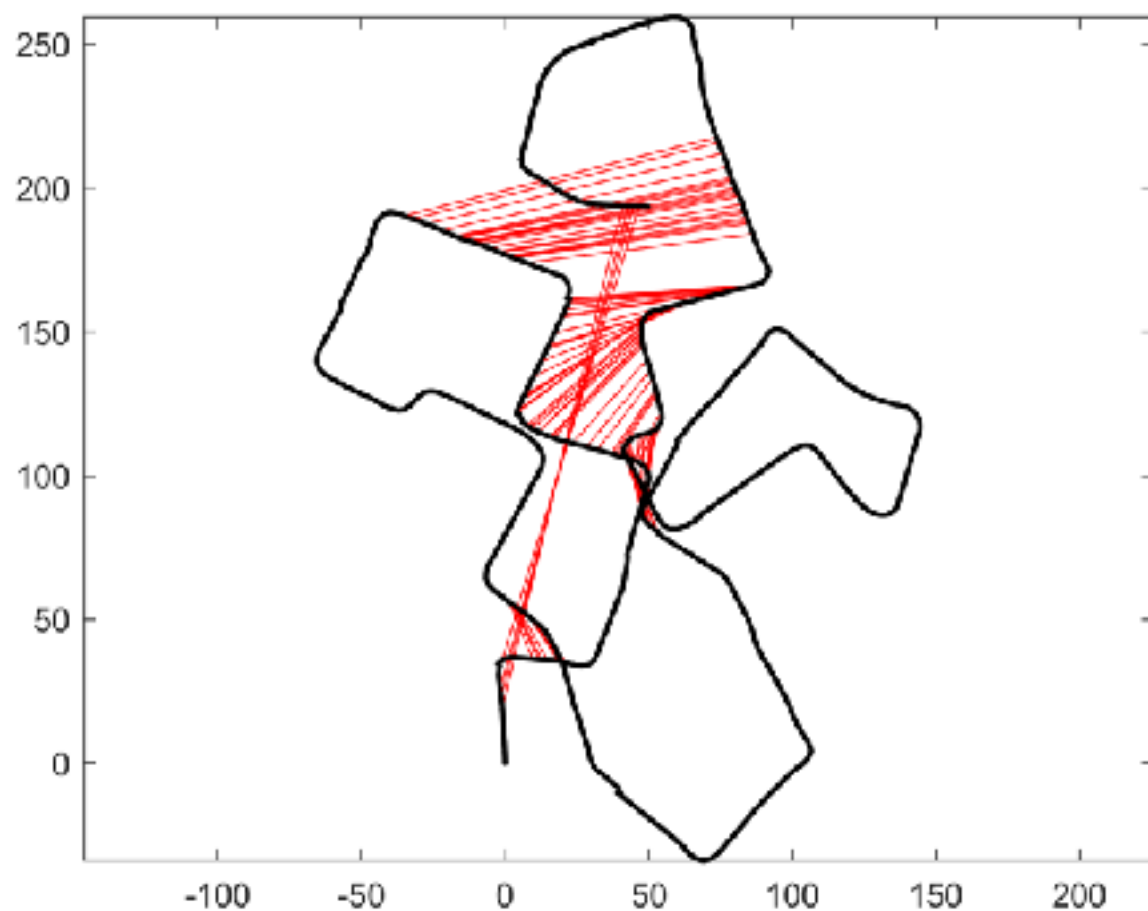
Cholesky Decomposition of Information Matrix

Progress

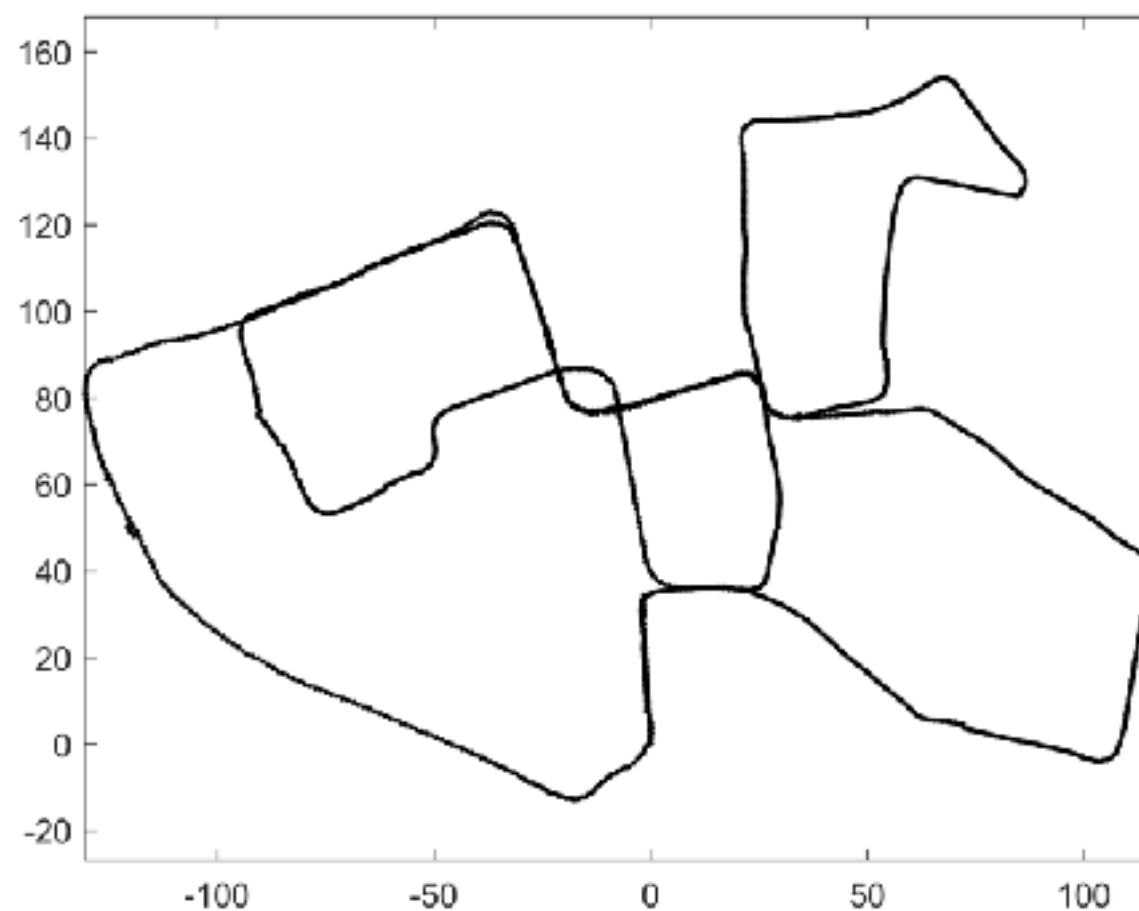
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Ground truth



**Visual odometry &
Loop closure proposals**



Example of a loop closure

TODO

- Remove redundant keyframes
- Evaluate performance

Questions?