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MASTER'S THESIS
for
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Efficient Optimization for Robust Bundle Adjustment

Problem description:

Bundle adjustment [3] is a fundamental building block for visual odometry and SLAM, which typically leads to large-scale non-linear least-squares problems. The state-of-the-art solver for such problem class is the Gauss-Newton algorithm coupled with Schur complement [1]. We shall investigate various modifications for this algorithm, and extend it to robust estimators for the sake of pruning outliers from feature-matching stage. We shall validate our development through experiments on synthetic and real datasets.

Tasks:

- Literature research on bundle adjustment [3] and nonlinear optimization [2].
- Implementation of the Gauss-Newton algorithm [1].
- Algorithmic improvement and extension to robust BA.
- Experimental comparisons on synthetic and real datasets.

Bibliography:

- [1] S. Agarwal, N. Snavely, S. M. Seitz, and R. Szeliski. Bundle adjustment in the large. In *European Conference on Computer Vision (ECCV)*, pages 29–42, 2010.
- [2] J. Nocedal and S. Wright. *Numerical Optimization*. Springer, New York, 2nd edition, 2006.
- [3] B. Triggs, P. McLauchlan, R. Hartley, and A. Fitzgibbon. Bundle adjustment — a modern synthesis. In *International Workshop on Vision Algorithms*, pages 298–372, 1999.

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