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MASTER'S THESIS

for

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Visual SLAM from RGB-D video

Problem description:

SLAM (Simultaneous Localization and Mapping) with RGB-D video is one of the most active research topic in recent years [2][4]. Despite the good performance of recent visual odometry approaches, accumulated drift error is inevitable, which results in inconsistent map. With loop closure detection and map graph optimization [3], the accumulated drift error can be corrected [2].

During SLAM process, a world model is simultaneously reconstructed. Some previous methods [2][4] simply add raw sensor data to obtain world model. However, the raw sensor data contains noise in both depth and rgb images. To obtain a high quality reconstruction, combining sequential raw sensor data is required.

In this thesis, the student will add loop closure detection/map graph optimization part on one previous approach [4], and develop keyframe refinement method.

Tasks:

- Literature research and get familiar with previous visual odometry approaches.
- Develop keyframe refinement method to reduce noise of raw sensor data.
- Add map graph optimization [3] to existing visual odometry method [4].
- Test developed system with online available dataset [1].

Bibliography:

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- [2] Christian Kerl, Jurgen Sturm, and Daniel Cremers. Dense visual slam for rgb-d cameras. In *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, pages 2100–2106, 2013.
- [3] Rainer Kümmerle, Giorgio Grisetti, Hauke Strasdat, Kurt Konolige, and Wolfram Burgard. g 2 o: A general framework for graph optimization. In *2011 International Conference on Robotics and Automation*, pages 3607–3613. IEEE, 2011.
- [4] Shile Li and Dongheui Lee. Fast visual odometry using intensity assisted iterative closest point. *IEEE Robotics and Automation Letters (RA-L)*, 2016.

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