TECHNISCHE UNIVERSITÄT MÜNCHEN
LEHRSTUHL FÜR STEUERUNGS- UND REGELUNGSTECHNIK
ORDINARIUS: UNIV.-PROF. DR.-ING./UNIV. TOKIO MARTIN BUSS

March 16, 2016

M A S T E R ' S T H E S I S
for
Bing Liu
Student ID 03645960, Degree EI

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:

[1] Ankish Handa, Thomas Whelan, John McDonald, and Andrew J Davison. A benchmark for rgb-d visual odometry, 3d reconstruction and slam. In *2014 international conference on Robotics and automation*, pages 1524–1531. IEEE, 2014.
[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.

Supervisor:	Shile Li
Start:	xx.02.2016
Intermediate Report:	xx.05.2016
Delivery:	xx.08.2016

(D. Lee)
Univ.-Professor