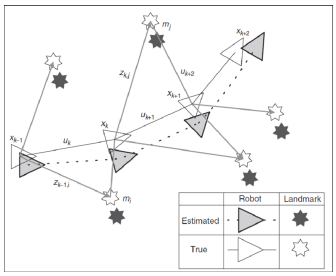
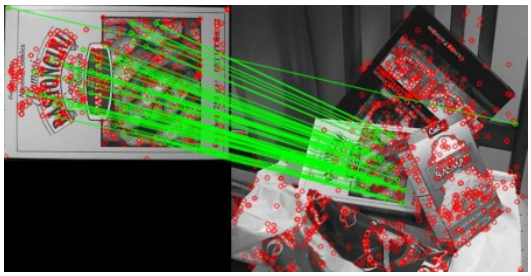
Karlsruhe Institute of Technology

Bachelor Thesis / Master Thesis

Sparse SLAM error simulation





SLAM (left), Image features (right, *OpenCV*)

Convetional SLAM approaches use feature detectors and descriptors to build residuals and formulate the SLAM problem. A subset of the sensor data is used in the end, making the problem *sparse*. Newer approaches use photometric errors without explicit keypoint detection, but still in the sparse domain. The sources for errors in those approaches are not well researched.
Task of this thesis is to investigate different error sources for SLAM approaches such as calibration, feature detection and optimization. For this, existing simulation should be extended and state-of-the-Art approaches tested.

Literature (Excerpt):

- Jakob Engel, Vladlen Koltun, Daniel Cremers (2015): *Direct Sparse Odometry*
- Raúl Mur-Artal, and Juan D. Tardós (2016): *ORB-SLAM2 for Monocular, Stereo and RGB-D Cameras*

The proposed thesis consists of the following parts:

+ Literature research
+ Modelling and Simulation of SLAM errors
+ Evaluation on Simulated Data and comparison to real data

I am happy to answer any questions you might have. Feel free to ask for an appointment or directly ask at my office!

Institute of Measurement and Control Systems (MRT)
Prof. Dr.-Ing. Christoph Stiller

Advisor:
Johannes Janosovits, M.Sc.

Programming language(s)[1]**:**

C++	basic
Python / MATLAB	advanced

System, Framework(s):
Linux, Ceres-Optimizer

Required skills:
- Optimization Fundamentals
- Work on your own

Language(s):
German, English

For more information please contact:

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Or directly send in your application including your current grades as well as our questionnaire!

[1] **skill levels:**

beginner	< 500 lines of code (LOC)
advanced	500 – 5000 LOC
proficient	> 5000 LOC