Karlsruher Institut für Technologie

IMI Informationsmanagement im Ingenieurwesen

Prof. Dr. Dr.-Ing. Dr. h. c. Jivka Ovtcharova

Kaiserstraße 12 | Zirkel 2
76131 Karlsruhe | Geb. 20.20

Telefon: 0721 608- 46641
E-Mail: jorge.martinez@kit.edu
Web: http://www.imi.kit.edu

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Bachelor-/Master's Thesis

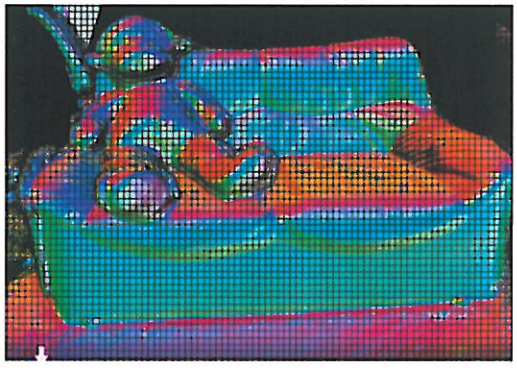
Development of a RGB-feature based tracking module for the "KinKon" 3D reconstruction system

KinKon is a real-time dense RGBD SLAM system for indoor environments, developed at the Institute for Information Management in Engineering. For achieving real-time performance, KinKon uses a GPU as its main processing unit together with a highly parallelized software architecture and data structures. The GPU implementation is currently done using the CUDA framework (NVIDIA).

Currently the system is able to scan both bounded volumes and extended scenes. For this purpose we rely on a depth based registration for estimating the current camera pose. In order to extend the functionality of the system and improve the tracking's robustness, a module for RGB based pose estimation module shall be developed.

This thesis includes the following aspects:

- Evaluation of the different types of RGB-features extraction algorithms and selection of the most suiting one.
- Development and evaluation of algorithms for matching and filtering features (e.g. using RANSAC, FLANN ...).
- Evaluation of the tracking accuracy using a given baseline system.
- Comparison of the developed tracking system against existing state of the art solutions.
- Calibration of the cameras e.g. using ROS, OpenCV or MATLAB.
- Development of a probabilistic sensor fusion algorithm for the integration of the results of the RGB- and depth-based tracking modules.
- Integration of the developed solution into the KinKon system.



Target group: Student of all fields, especially Computer Science and Mechanical Engineering.

Interests and skills:

- Basic knowledge in the field of Computer Vision.
- Medium/Advanced C++ programming skills.
- Proficiency in written and spoken English.
- Nice to have: Knowledge in GPU programming.

Begin: Immediate

Contact: Jorge Nieto (jorge.martinez@kit.edu), Simon Hummel (simon.hummel@kit.edu)

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