Karlsruher Institut für Technologie

IMI Informationsmanagement im Ingenieurwesen

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Master's Thesis

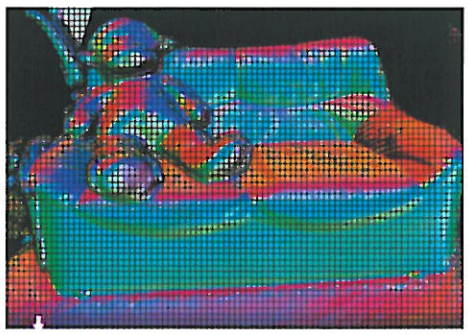
Design and development of a high-definition coloring system for low and medium resolution volumetric models

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 only stores the geometric information of the reconstructed scene. Current state of the art solutions store the RGB values in the same way as they store the geometric information, that means using a dense volumetric representation. When high-definition coloring is required, this approach becomes prohibitive due to hardware constraints regarding memory and processing time. The goal of the thesis is to develop a coloring system based on the high-definition texturing of low resolution volumetric models. Because of KinKon's software architecture, a new data structure for the real-time storage and retrieval of high-definition color information has to be developed.

This thesis includes the following aspects:

- Design and development of a real-time capable data structure for the storage and retrieval of high-definition textures.
- Development of a probabilistic blending algorithm for fusing redundant color information.
- Development of algorithms for indicating the system when to capture a color frame and which part of it to store.
- Qualitative evaluation of the colored model.
- Calibration of the cameras e.g. using ROS, OpenCV or MATLAB.
- 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

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