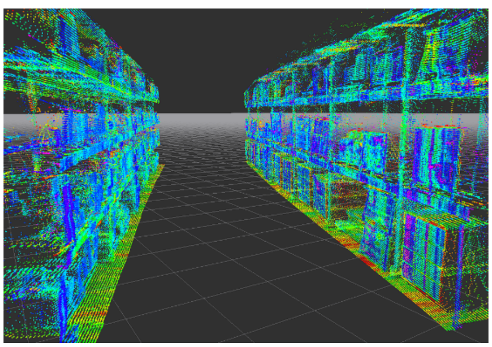
Adapting SLAM Algorithms to Time-of-Flight sensor data

Background

Autonomous Mobile Robotics and Vehicles is a rapidly growing in fields as logistics, healthcare and professional cleaning. These robots need several sensors and cameras for navigating and avoiding obstacles. Indoor navigation is most commonly based on laser scanners (LiDaR) that sense distance in a plane in front of the robot. A drawback with this approach is that it loses details above and below this two-dimensional plane.

Time-of-Flight cameras sense distance by illuminating the scene with modulated infrared light and measuring the phase shifted delay of the returned illumination. This results in a complete 3D interpretation of the scene. Using Time-of-Flight cameras in navigation would then drastically increase the detail of the sensed environments.



However, Time-of-Flight come with some artifacts as Multipath Interference and flying pixels. These artifacts need to be mitigated to some extent to be able to fully utilize the 3D data.

The aim for this thesis is to adapt algorithms for Simultaneous Localization and Mapping, SLAM, to Time-of-Flight sensor data by mitigating the effects of Multipath Interference and Flying pixels.

Scope

- Theoretical study of SLAM algorithms and Time-of-Flight
- Implementation of one or several algorithms
- Experimental measurements with an *ifm electronic* Time-of-Flight camera
- Evaluation of the implemented algorithms
- Own ideas can be accommodated.

Requirements

The thesis is on advanced (M. Sc.) level with an expected timeframe of 20 weeks.
The student should have extensive knowledge in signal processing, mathematics and programming.

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