EBERHARD KARLS UNIVERSITÄT TÜBINGEN

Mathematisch-Naturwissenschaftliche Fakultät
Fachbereich Informatik
Kognitive Systeme (Prof. A. Zell)

Masterarbeit

Monte Carlo Localization based on OpenStreetMaps

In known indoor environments, mobile robots are able to localize themselves using particle filters. For outdoor navigation, most solutions use SLAM systems or GPS, but SLAM methods usually require high amounts of memory in large environments, suffer from drifts, and do not provide a geo-referenced position. GPS, on the other hand, is not always available.

The goal of this work is to develop a solution using publicly available OpenStreetMap data. The localization system should use the 3D sensors available on our outdoor robots, most likely the Velodyne VLP-16. GPS may be used if available, but approximate localization should be achieved without it. Therefore, a suitable map representation for OSM maps and a sensor model for the Velodyne 3D LiDAR need to be designed.

This work should most likely be evaluated on the KITTI odometry benchmark, using any existing and available Visual Odometry (VO) method for particle propagation. Further, a qualitative evaluation should be done with one of our Summit XL outdoor robots in the near surroundings of the Sand building.

The approach shall be implemented in C++ under Linux with ROS and integrated into an existing Monte Carlo Localization framework. Prior knowledge, e.g. by visiting the Mobile Robots practical course, is beneficial.

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