TECHNISCHE UNIVERSITÄT MÜNCHEN
Human-centered Assistive Robotics
UNIV.-PROF. DR.-ING. DONGHEUI LEE

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M A S T E R ' S T H E S I S
for
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Recognition and Tracking of Dynamic Objects Using Static Sensors

Problem description:

Searching for a parking spot, even just on a parking lot can be time consuming, exhausting and uncomfortable for the driver. This can have different reasons, e.g., it's stressful to drive in a narrow and sometimes confusing layout. Therefore, the next step is autonomous valet parking. For every autonomous driving task, it is critical to have a precise localization. This can be challenging in complex structures, e.g., a parking garage. Also, current car models aren't equipped with the needed sensors to do this task on their own. One way to solve this problem, is to equip the parking garage with appropriate sensors, which provide a secure and affordable localization. André Ibisch et. al [1] showed that it's a promising approach to localize and track a vehicle based on environment-embedded LIDAR sensors. To achieve real-time, they process only a small subset of active points, to avoid reprocessing static objects, e.g., walls.
The main aim of this thesis is to develop and optimize a method to achieve a fast and precise localization of a vehicle and to identify and track other dynamic objects in the area. The input will be a fusioned pointcloud from several static multi-layered LIDARs. With these data, the vehicle will be controlled autonomously through a parking area. This method shall be optimized in respect to controllability of the vehicle, which is affected by the speed and the accuracy of the dynamic objects recognition. There is nearly always a tradeoff between speed and accuracy. Finally, the method will be evaluated with real data against human ground truth estimation.

Tasks:

- Literature research on LIDAR based dynamic objects recognition, tracking and optimization methods
- Development and integration of an optimization-based approach for recognition and tracking of dynamic objects
- Theoretical and experimental evaluation and tuning of the algorithm in regard to controllability of the vehilce

Bibliography:

[1] A. Ibisch, S. Stümper, H. Altinger, M. Neuhausen, M. Tschentscher, M. Schlipsing, J. Salinen, and A. Knoll. Towards autonomous driving in a parking garage: Vehicle localization and tracking using environment-embedded lidar sensors. In *2013 IEEE Intelligent Vehicles Symposium (IV)*, pages 829–834, June 2013.

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