TECHNISCHE UNIVERSITÄT MÜNCHEN
Human-centered Assistive Robotics
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M A S T E R ' S T H E S I S
for
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Active Learning a Lidar Object Detector in a New Driving Environment Using Deep Learning

Problem description:

When driving in the wild, an autonomous vehicle will encounter previously unseen scenarios. In such cases, it would be beneficial to adapt the object detection system with a training dataset collected from the new environment. For example, imagine a scenario where a driverless car with its deep-learning based object detector trained on highways is tasked to detect vehicles in urban areas. Since the urban environment is more complex, with a lot objects and poses of vehicles being different from highways, it is necessary to adapt the object detector with these unseen, hard samples.

However, collecting training samples with labels in a new driving scenario is tedious and time-consuming, especially for an object detector that takes lidar point clouds as input. Moreover, the informativeness of each sample is different: some are informative and can help the autonomous car to improve its detection performance significantly, while some others are less helpful. Therefore, it is highly desirable that the autonomous car can efficiently adapt its detection model to a new environment by actively querying training sample labels (active learning).

Tasks:

This master thesis aims at developing a deep learning-based 3D object detection via Lidar point clouds. The vehicle detector can efficiently adapt to new driving scenarios different from the ones where it was trained.

- Literature review for active learning and 3D object detection.
- Analyze the dataset, which is to be determined.
- Develop an active learning framework to enable the Lidar 3D object detector to efficiently annotate training samples. Using the proposed active learning strategy, the network can achieve the same vehicle detection performance with fewer training samples compared with baseline methods.

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