Autonomous Racing – Fusion of Camera and virtual depth sensor for 3D object detection

In the context of the project Roborace, software for an autonomous racing vehicle is developed at the Chair of Automotive Technology. This software manages the whole process of autonomous driving: Starting at data acquisition by the sensors, perception, planning and finally controlling the vehicle safely under racing conditions.

Modern vehicles sensors offer a wide range for environment perception such as Cameras, LIDAR and Radar sensors. An image-based object detection and depth estimation is developed at the Chair with Deep Learning techniques. In this IDP, the current object detection pipeline will be augmented towards a 3D pose detection.

The first step of this project consists of a literature search for current developments in the field of machine learning for environmental perception on images. In the second step, the current pipeline is augmented to predict the orientation and size of the detected objects. The pipeline should stay modular to change easily between different detection and estimation modules. The current monocular learning based approach shall be evaluated against a stereo-based deep learning approach. Finally, the detection result shall be evaluated on the nuScenes dataset and simulation data.

Work packages

- Literature search about object detection for camera data with machine learning algorithms
- Augmentation of the current algorithm to a 3D pose estimation
- Analysis of the depth network architecture
- Evaluation of the implemented approach on simulator data and the nuScenes dataset.

Requirements

- Practical knowledge in the field of neural networks
- Ideally programming experience in Python
- Involved working attitude

Should you be interested in this project or in another project in the context of the Roborace project, send a short motivation letter, transcript and CV to:

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