Universität Stuttgart
Institut für Flugmechanik und Flugregelung

Deep learning in Dynamic Environments

HiWi – Stelle

Student Assistant Position

Background:

Most SLAM (Simultaneous Localization and Mapping) methods make the assumption of a static environment. However, the world we live in is highly dynamic. One of the issues in developing SLAM methods for dynamic environments is the lack of reliable and benchmarked datasets. Real world datasets are almost impossible to capture since ground-truth information is usually not available. On the other hand, simulated or synthetic worlds need to resemble the real ones to be useful, with realistic textures and dynamic objects, while also providing robot-centric information (e.g., state estimate and IMU readings). Currently, there exists no dataset that combines all these elements.

Problem definition:

Assuming that a dynamic environment generation pipeline to produce/record such synthetic data exists, to be usable the data generated by it needs to be processed and benchmarked. The results will also be used for setting a baseline for future work, with the potential of having a great impact in both the robotics and computer vision communities. Furthermore, based on a combination of different techniques (e.g. segmentation, optical flow, geometric clues, object-environment interaction), we will also segment all dynamic entities, like humans, in the scene.

Task:

- Post processing of the generated synthetic data.
- Testing of data with state of the art SLAM (ORBSLAM)/V[I]O (RoVIO)
- Finetuning and testing (C/R)NN networks for various tasks using this data, e.g. semantic segmentation (MaskRNN), detection (YOLO) and optical flow.
- Testing a human-specific segmentation network.

Requirements:

- Basic Working knowledge of ROS
- Experience Python desired (especially *numpy, pytorch/tensorflow*)
- Knowledge of ML concepts (overfitting, training, finetuning)

If interested, please contact:

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