Use of static and dynamic tie points in image sequences acquired with moving sensors

Proposal for a Master thesis topic (DE/EN)

Positioning is one of the main tasks in navigation. Due to the developments in autonomous driving, a constant and reliable position becomes more and more important. To solve this task usually GNSS and IMUs, and sometimes also laser scanners are used. But this task can also be accomplished by cameras. Cameras have advantages in cost and weight compared to laser scanners and they can work in GPS denied areas, e.g. deep canyons, as long as there is enough light. A frequently used method to position oneself with the help of camera images is the bundle block adjustment. Here the classical approach assumes a static environment. However, the typical environment in road traffic is dynamic. Therefore, static and dynamic pixels have to be distinguished first, so that both groups can be considered separately in the positioning.

The goal of this thesis is to develop a method that can distinguish dynamic from static pixels in a given image sequence. For this purpose, an overview of existing methods shall be given first. Subsequently, different methods will be applied to a data set and evaluated. Possible approaches include optical flow or geometric conditions from image triplets. Subsequently, the image pixels shall be marked with the corresponding property (dynamic or static) and used for positioning. As input data an image sequence from a single camera shall be used, which was acquired in the course of the GRK i.c.sens mapathon (figure 1). These are images of traffic typical situations. The camera is mounted on a multi-sensor platform, which allows to use further sensor data like GNSS or a second camera for evaluation.

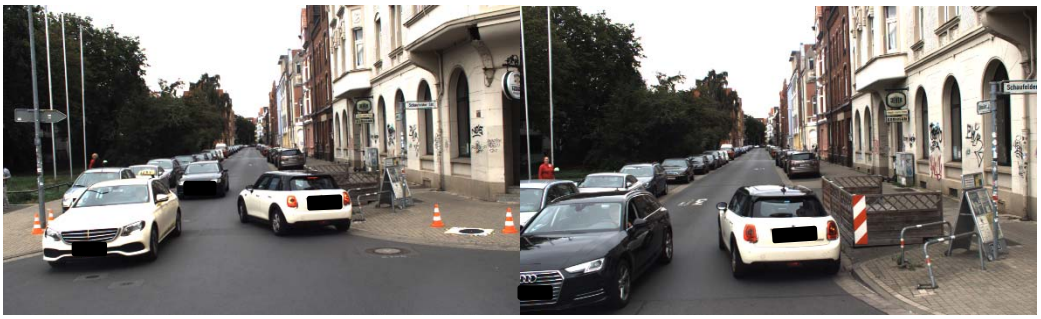

Figure 1: Images of a typical traffic situation taken during the Mapathon by one of the moving multi-sensor platforms with a time difference of 2 seconds.

This thesis will be supervised by Philipp Trusheim M.Sc.