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Investigation of the modelling of dynamic tie points in a bundle adjustment

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, dynamic tie points must also be modelled to represent this environment.

The goal of this work is to investigate a suitable modelling for dynamic tie points in a bundle block adjustment. Different movement models are to be tested and compared. Data recorded in the context of the GRK i.c.sens mapathon in road traffic serve as the data basis. A sequence of images was recorded in which a vehicle equipped with a stereo camera and a GNSS sensor drives behind a vehicle with a mobile mapping system as well as visible markers. This sequence will be used to evaluate the accuracy of the methodology. Figure 1 shows schematically such a scenario in which a camera moves through an environment with static parts as well as dynamic objects. Static tie points are extracted from the static parts and the points on the dynamic objects are used as dynamic tie points.

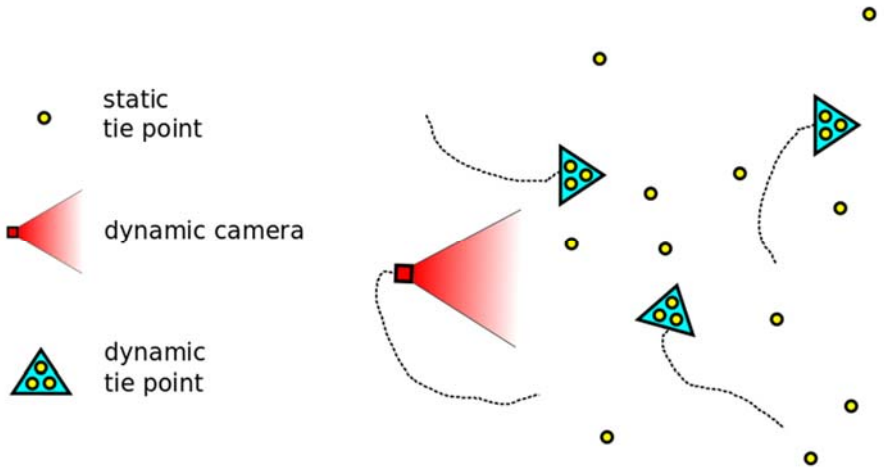

Figure 1 Scenario in which a dynamic camera moves in a static environment (static tie points yellow) with individual dynamic objects (dynamic tie points cyan).

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

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