

Visual SLAM in a group of collaborative cameras

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. Because of these reasons, this thesis is to investigate an application using cameras.

Multiple independent cameras are to be used to improve the positioning by collaboration between these sensors. This idea is supported by the development of Car2X research in the past years. The connection between these topics is the collaborative visual SLAM.

The specific task in this thesis is to investigate how the observations of multiple cameras can be merged to improve the result of the SLAM. The cameras are moving while they observe the environment. So the external orientation of the different cameras is depending on time. While moving in the scenery the cameras will observe each other. These observations should be used to connect the cameras.

The influence of the different observations and the geometry of the camera network should be evaluated in the end.

A possible scenario of tie points and dynamic cameras is shown in figure 1.

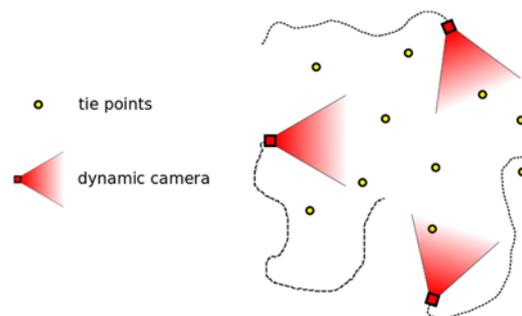


Figure 1: Different cameras moving in a set of tie points

Existing implementations for a bundle adjustment and a simulation to create the scenery should be used as part of the implementation of the visual SLAM approach.

The results of the investigation have to give a perception of the usability of a collaborative visual SLAM approach where the observed counterparts used for positioning, concerning correctness and precision. The results have to be discussed and evaluated.