Institut für Photogrammetrie
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Digital Terrain Model generation from Unmanned Aerial Vehicle imaging

Proposal for a Bachelor thesis topic (EN)

Currently, flights to capture thermal aerial images are typically carried out using airplanes or helicopters. Thermal flights by airplane, in particular for small areas of interest are not economically feasible. In this context, the use of an Unmanned Aerial Vehicle (UAV) to capture thermal images is a promising solution. An UAV platform is characterized by high flexibility and low costs compared to thermal flights by a manned aircraft and delivers measurements with high temporal and spatial resolution. District heating networks distribute heat through underground pipes carrying hot water or steam from a central power plant. Heat or water leakages due to bad insulation or cracks are common problems. Loss of media (water/steam) or energy is expensive and has negative impact on the environment. It is therefore of great interest to the network owners to find methods to detect and localize the leakages.

Defects or leakages in district heating network are defined as hot spots in the orthophoto that is produced from thermal images captured by a UAV. Despite that hotspot search area is limited to pipe location provided as Geographic Information System (GIS), high amount of false detection is detected. The sources for such false detections are street lights, cars, trees and etc. Such the examples are categorized by having height above the ground. In contrast to a Digital Surface Model (DSM), a Digital Terrain Model (DTM) represents the bare ground surface without any objects like plants and buildings. Due the fact that a heating network is installed underground, such objects could be filtered by DTM generation.

The main goal of this thesis is to compare different approaches for automatic DTM or ground level extraction from the data captured from UAV images. The classical approach is morphological filtering to generate DTM. Segmentation is another approach that can be used to detect ground level from a DSM. The student will be provided datasets containing thermal and optical images captured by UAV as well as photogrammetric results such as point cloud and DSM.

This thesis will be supervised by Artuom Sledz, M.Sc.

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