

UAV-Based 3D Data Collection and Processing

Recent developments in UAV (Unmanned Aerial Vehicle) technology and SfM (Structure from Motion) techniques caused UAVs to become standard platforms for 3D data collection. Because of their capability to provide high resolution and very accuracy data, drones are viewed as a low-cost alternative to traditional aerial platforms. They offer advantages in numerous geospatial domains requiring large-scale mappings of relatively small areas.



Figure 1. Leica Aibotix X6V2 used for image acquisition.

Because of their flexible utilization and their ability to reach inaccessible urban regions, drones appear as an optimal solution for urban applications. They can be efficiently employed to provide essential information for smart city monitoring and management. Together with SfM techniques and reconstruction workflows, images collected with UAVs enables to generate 3D point clouds at various levels of density (c.f. Fig. 2).



Figure 2. Dense 3D point cloud generated by SfM from images collected by UAV.

While UAV-based 3D data can be made readily available, their further interpretation to extract the required object information is still an open problem. For scene interpretation and assignment of semantic labels to the 3D points, the first step is often to segment the 3D data. Point cloud segmentation can then support classification and further feature extraction. As a result, the unstructured data is partitioned into meaningful connected subsets sharing similar attributes and belonging to the same object class (c.f. Fig. 3). Since segmentation and classification of 3D urban data is a complex task with diverse challenges, it often requires the combination of several techniques to obtain the desired results for different applications.

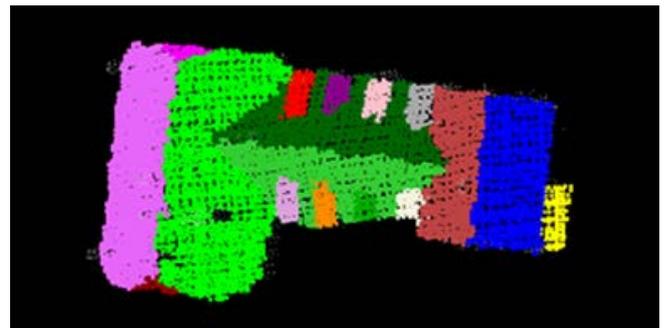


Figure 3. 3D point cloud of a building segmented into planar patches.

Exemplary topics for master thesis:

- For more details about exemplary topics, please refer to the display case of the chair "Methods of Geoinformation Science" at room H5121 (main building of Technische Universität Berlin).

Recommended skills:

- Spatial analysis, geometric computations, pattern recognition, programming (C++).