

Unmanned Aerial Vehicles in Municipality Level 3D Topographic Data Production in Urban Areas

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SUMMARY

The National Land Survey of Finland (NLS) is currently working towards a new joint National Topographic Database (NTDB). The NTDB will provide basic information about physical environment including objects such as buildings, roads, waters, elevation, land cover and names. The data will be based on the current NLS Finland Topographic Database, orthoimages, laser scanning data, digital elevation models and on large scale planning data from municipalities.

As large scale data from municipalities will have a great role in the forthcoming NTDB, a project has been started to investigate the current and future topographic data production methods in Finnish municipalities in urban areas. The project investigates what are the current topographic data production processes and could new mapping methods, such as using unmanned aerial vehicles (UAV) or terrestrial mobile mapping technologies, reduce manual labor in the field and provide more cost-efficient map updating in urban areas. The project investigates the usability of these methods and prepares a preliminary process model and guidelines for using these methods in municipality level 3D topographic data production. Furthermore, the project includes several case studies in producing 3D topographic data in different municipalities using different UAVs.

This paper focuses on describing the UAV part of the project. General properties and characteristics of different types of UAVs, such as multirotors and fixed-wings will be described and a typical UAV system for mapping application including its payload will be presented. Usability of UAVs in mapping objects for municipality level topographic database in urban areas and applicability of UAV-based mapping in different situations will be considered.

Operating UAVs in populated urban areas requires proper planning and work guidelines in order to produce accurate and reliable data and simultaneously operating safely and taking into account the

local legislation regarding unmanned aviation.

The preliminary process flow for a UAV-based mapping which takes into account these issues will be presented. The process starts from the measurement planning and end ups to 3D vectorized topographic data. The process is divided to three phases which are the planning phase, measurement phase and data processing phase. The sub-tasks in each phase are:

- □ Planning phase: General planning and measurement method decision based on the mapped area and required accuracies; Legislative preparations; Risk management; and Flight planning.
- □ Measurement phase: Ground Control generation; and Aerial imaging.

Data processing phase: Aerial image processing to orthomosaics and 3D point cloud data; Accuracy evaluation; and Vectorization of 3D data to topographic data format.

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