Analisis of the Possibility of Automating the Photogrammetric Mission Planning for Unmanned Aerial Vehicle, Based on Data from Airborne Laser Scanning

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SUMMARY

The industry for UAV (Unmanned Aircraft Vehicles) photogrammetric flights continues to evolve. Usage for this technology includes multiple fields such as forestry, civil engineering, ecology and more. Automation of photogrammetric mission planning and execution is one of the key aspects for UAV flights for the reason of saving time of the operator and ensuring safety of the mission. Another problem that is mentioned in the paper is acquiring data that is useful for such a task. This paper presents own implementation as well as overview of UAV photogrammetric mission planning workflow for mapping buildings based on ALS (Aerial Laser Scanning) datasets, and a way for its automation. For each step, existing industry-tested commercial solutions are presented along with their advantages and problems. There are also overviews of common data formats for all elements of the workflow. Data used for the experiments comes from polish national repository of ALS datasets, that covers the whole area of Poland. In the created application, after selecting a feature (building) by coordinates, relevant by proximity LIDAR (Light Detection and Ranging) data packets are downloaded. Afterwards comes modelling of terrain features using methods such as Poisson Surface Modelling or Ball Rolling Algorithm. Experiments prove superiority of the former method. A 3D model of the building is then either automatically extracted from the MESH model, based on LIDAR classification data or by user input. Finally, the plan for a photogrammetric mission, suitable for autonomous flight is generated and uploaded to a controller (smartphone). While this paper is focused on missions with the goal of collecting data for buildings, the code is adaptable, so it can easily be modified to facilitate planning flights for tree outcroppings and other features. Conclusions present how different algorithms and factors (i.e., height, age, and neighbourhood) of the selected building influence the validity of the created mission plan. In some cases, the mission plan is flight ready after the initial selection of a feature, while sometimes creating a plan is impossible or requires additional user input or even another UAV mission with a LIDAR sensor to collect more accurate or up to date data.
