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Evaluation of topographic information from drone images and SfM for hydraulic modelling

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Topography is an important baseline information in many scientific research fields, particularly in hydrodynamic modelling, yet to obtain up-to-date wet and dry topography data is one of the most difficult tasks in hydrodynamic modelling. Up-to-date data helps us simulate and understand better the behaviour of a river, for instance fluvial or pluvial floods.

Conventionally, the information can be collected by field surveying with total stations or differential GPS and aerial photography. This traditional approach usually requires intense labour work, long time, and huge budgets. Time efficiency and spatial coverage increase if the information is collected by remote surveying e.g. laser scanning techniques (Light Detection and Ranging, Terrestrial Laser Scanner), but their great expense is a drawback. Thus these approaches may not be ideal to frequently update topographic data.

The combination of Structure-from-Motion–Multi-View-Stereo (SfM–MVS) algorithm and drone images has recently been a comparable and low-cost alternative to those "traditional" approach. Firstly, drone is flown over an area to take a collection of highly overlapping images using a standard digital camera/sensor mounted on it. Secondly, the SfM–MVS searches for and matches features on those photos and compute camera parameters, allows to reconstruct 3D surface in the form of point clouds. These point clouds are then further analysed to extract terrestrial information, not only detailed digital terrain model (DTM) but also land cover.

In this study, the photogrammetry using drones and SfM–MVS is applied in two case studies of the H2020 EU SCENT project: Sontea-Fortuna (in the Danube Delta, Romania) and Kifissos Catchment (near Athens, Greece). Collected photos are fed into SfM–MVS-based softwares (Agisoft PhotoScan and Pix4D) for generating point clouds which are then processed to obtain terrain information.

We present here a comparative assessment of the outputs of this data collection and analyses with a focus on two aspects: (1) comparison between "drone & SfM" derived topographies with other sources like Lidar, and; (2)performance of built hydrodynamic models enriched with newly obtained information.