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Mobile photogrammetric raster clouds to apply classification of time series data

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Vehicle-mounted, wide-angle cameras combined with deep learning algorithms are proving to be a powerful mapping tool (e.g. Google Street View). Such tasks include facilitating adaptation to the increasingly common extreme rainfall events attributed to climate change. Repeatable rapid surveys of agricultural parcels have the potential to combine ground and satellite information over large areas, enabling cost-effective planning of cultivation tasks such as more efficient nutrient supplementation, pest management, irrigation water use. In this paper we describe our experience with a photogrammetric data acquisition system (FODAR).

The vehicle mounted Geometer device takes images every two metres along the routes travelled, which can be evaluated on its cloud-based geographic information platform. The geospatial data can then be displayed and evaluated interactively. On-the-move survey control is also provided. A powerful on-board computer can be used to monitor the recording during fieldwork. After the survey, the software automatically converts the recording metadata for cloud-based processing. It is also possible to determine the geographic position of point objects and measure distances and areas. The artificial intelligence used by the system uses deep learning algorithms to recognize and pinpoint with high accuracy on the map various objects on the surveyed road sections, such as traffic signs, but also fire hydrants, sewer covers, stormwater drains and other objects related to urban hydrology.

The use of such equipment in precision agriculture is not yet widespread, despite the fact that due to its vehicle mountability also can be used for mapping of ploughs or orchards and for effective assessment of crop growth. Our aim in using the tool was to build a prototype workflow to evaluate the data set that is expected to become available in the near future.

Patterns in the data, such as vegetation health, that are present in the data and have not been investigated so far, could lead to an increase in the profitability of management decisions by including the near-infrared band in photogrammetric analyses. In contrast to teaching deep learning algorithms, the object detection and image classification itself can be done with relatively little hardware effort, but future trends must be taken into account. For processing a large number of images submitted by cloud-connected vehicles, it may be worth considering a dynamically scalable hardware infrastructure. In addition, objects of agricultural interest identified by the technology could also serve as calibration data for aerial or even spaceborne imagery.

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