3D hyperspectral reflectance signatures by light-weight UAVs for the monitoring and measuring the environment

Eija Honkavaara[(1)], Teemu Hakala[(1)] , Lauri Markelin[(1)]

[(1)]Finnish Geodetic Institute
Geodeetinrinne 2, 02430 Masala Finland

Light-weight UAV imaging techniques have developed rapidly. Currently, the UAV based methods are efficient in measurement projects covering small areas, typically less than 1 km^2. There are many potential applications for this novel data due to the increasing need of accurate environmental information.

One of the challenging parts of the UAV image data utilization is to process the data so that reliable information of the object geometry and radiometry is obtained. The FGI has been developing processing methods for UAV imagery to provide accurate 3D hyperspectral information [1,2]. The steps in the rigorous processing include radiometric and geometric sensor calibration, controlled flight campaign, georeferencing by self-calibrating bundle block adjustment technology, point cloud generation using novel dense matching technologies and finally a radiometric adjustment and reflectance transformation. This processing provides 3D hyperspectral reflectance point clouds, digital surface models and hyperspectral image mosaics, with a high geometric and radiometric accuracy, and high spatial resolution. These can be utilized in various environmental remote sensing applications, such as precision agriculture, water monitoring, forest damage detection and environmental impact assessment.

The approach has been demonstrated by using low-cost consumer cameras as well as with the novel Fabry-Perot hyperspectral imager (FPI) developed by the VTT Technical Research Center [3]. The FPI technology provides a new concept for environmental measurement, by providing hyperspectral data cubes in a frame image format. Frame images are suitable for providing 3D object information and for stereoscopic interpretation.

In the presentation we will present our approach and results concerning accurate environmental measurements by the novel UAV technology.

More details about our recent activities are given in the Internet:

http://www.fgi.fi/fgi/research/researchgroups/spectrophotogrammetry

References

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