



A new COmpact hyperSpectral Imaging system (COSI) for UAS

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This presentation gives an overview of the new COmpact hyperSpectral Imaging (COSI) system recently developed at the Flemish Institute for Technological Research (VITO, Belgium) and suitable for multirotor Remotely Piloted Aircraft Systems (RPAS) platforms. The camera is compact and lightweight, with a total mass of less than 500g including: an embedded computer, storage and power distribution unit. Such device miniaturization was possible thanks to the application of linear variable filters technology, in which image lines in the across flight direction correspond to different spectral bands as well as a different location on the ground (frame camera). The scanning motion is required to retrieve the complete spectrum for every point on the ground.

The COSI camera captures data in 72 narrow (FWHM: 5nm to 10 nm) bands in the spectral range of 600-900 nm. Such spectral information is highly favourable for vegetation studies, since the main chlorophyll absorption feature centred around 680 nm is measured, as well as, the red-edge region (680 nm to 730 nm) which is often linked to plant stress. The NIR region furthermore reflects the internal plant structure, and is often linked to leaf area index and plant biomass. Next to the high spectral resolution, the COSI imager also provides a very high spatial data resolution i.e. images captured with a 9mm lens at 40m altitude cover a swath of ~40m with a ~2cm ground sampling distance.

A dedicated data processing chain transforms the raw images into various information and action maps representing the status of the vegetation health and thus allowing for optimization of the management decisions within agricultural fields.

In a number of test flights, hyperspectral COSI imager data were acquired covering diverse environments, e.g.: strawberry fields, natural grassland or pear orchards. Next to the COSI system overview, examples of collected data will be presented together with the results of the spectral data analysis. Lessons learned and an outlook on further improvements will be also shared with the audience.