**New Hyperspectral Imager for Light Weight UAVs – First test flight results**

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VTT Technical Research Centre of Finland has earlier developed hyperspectral push broom imaging technologies based on Prism-Grating-Prism components or on aberration corrected holographic gratings. In many applications however it would be beneficial to produce 2D spatial images with a single exposure at a few selected wavelength bands instead of 1D spatial and all spectral band images like in push broom instruments. Lately, VTT has developed a new concept based on the Piezo actuated Fabry-Perot Interferometer to enable recording of 2D spatial images at the selected wavelength bands simultaneously and to reduce the size of the hyperspectral spectrometer to be compatible with light weight UAV platforms. In our spectrometer the multiple orders of the Fabry-Perot Interferometer are used at the same time matched to the sensitivities of the image sensor channels. For example in a Bayer pattern RGB sensor or in a three CCD videocamera based on a wavelength separation prism there are different types of pixels for three wavelength channels. We have built prototypes of the new spectrograph fitting inside of a 30 mm cube and with a mass less than 50 g. The operational wavelength range of built prototypes can be tuned in the range 400 – 1100 nm and spectral resolution is in the range 5 – 10 nm @ FWHM. Presently the spatial resolution is 480 x 750 pixels but it can be increased simply by changing the image sensor. The hyperspectral imager records simultaneously a 2D image of the scenery at three narrow wavelength bands determined by the selected three orders of the Fabry-Perot Interferometer which depend on the air gap between the mirrors of the Fabry-Perot Cavity. The air gap value is determined using a capacitive measurement and changed under closed loop control with three Piezo actuators. The effective aperture the Fabry-Perot interferometer is 7 mm in diameter and the air gap can be controlled in the range 0.8 – 3.5 µm enabling the use of the wide range of interferometer orders. The new hyperspectral imager prototype will be used on UAV test flights in September 2009 in co-operation with the Mekrijärvi Research Station of University of Joensuu, Pieneering Oy and Flemish Institute for Technological Research (VITO). The results of these trials will be presented at the conference.

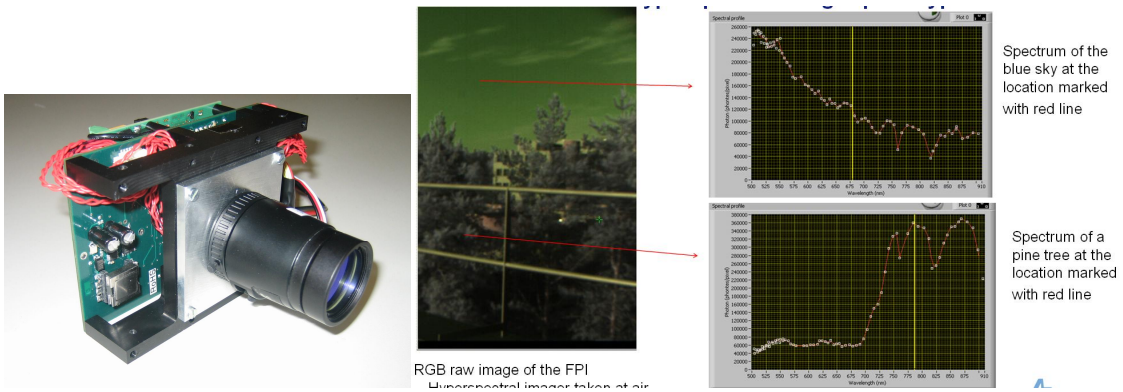


Figure 1. A photograph of the new UAV compatible Hyperspectral Imager prototype with a mass of 350 g. An example of a hyperspectral data cube recorded from laboratory window is shown on the right. The spectra of a blue sky and a pine tree are plotted.

[1] H. Saari, V. Aallos, A. Akujärvi, T. Antila, C. Holmlund, U. Kantojärvi, J. Mäkynen, J. Ollila, "Novel Miniaturized Hyperspectral Sensor for UAV and Space Applications", in Proc. of SPIE Europe Remote Sensing 2009 Conference 7474 "in Press".

[2] H. Saari H., "Spectrometer and interferometric method", Patent FI119830B, (2009).