



HYPERSPECTRAL DRONE CAMERA SYSTEM FOR APPLICATION DEVELOPMENT

Imec introduces the first embedded computing platform fully dedicated to multi-sensor hyperspectral imaging. This new system platform allows to simultaneously mount one VIS / NIR or one VIS / SWIR based hyperspectral imaging camera, enabling acquisition and processing of hyperspectral imaging data in real-time, all in a very compact form factor, and matching latest commercial drone technologies like the DJI Matrice 600.

THE MOST ADVANCED SNAPSHOT HYPERSPECTRAL IMAGING PLATFORM FOR UAV APPLICATION DEVELOPMENT

In applications such as precision agriculture, forestry management, security & surveillance, the ability to mount several hyperspectral imaging sensors on unmanned aerial vehicles (UAVs) is of crucial importance. imec UAV platform is supported by a powerful embedded computing platform featuring NVIDIA Jetson GPU, integrated storage, wireless and wired controls connectivity via standard drone gimbal interfaces like (but not limited to) the DJI Matrice 600. This UAV system solution has been designed with the mindset of enabling end-users with real-time acquisition, processing and down-streaming of the application data at video-rate from drone-based systems.

KEY BENEFITS

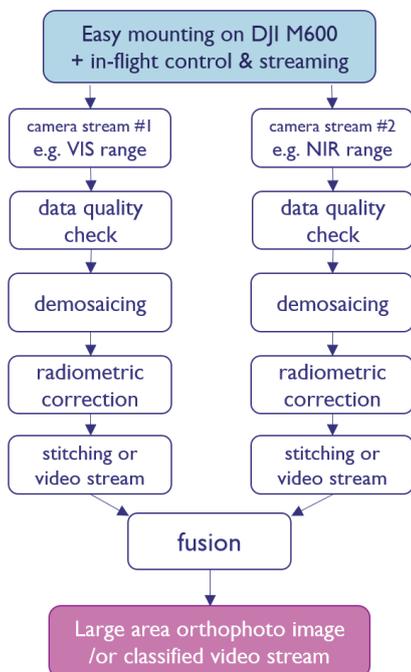
- VIS / NIR / SWIR range hyperspectral imaging all combined in one compact and low weight platform for aerial mapping, inspection and surveys
- **Real-time, video-rate snapshot acquisition** of hyperspectral imaging data with direct image classification on-board
- **Full software image processing pipeline:** from acquisition to fully stitched orthophoto images or hyperspectral imaging classified image video stream”



Orthophoto hyperspectral aerial images of large test field of soybean cultures in Brazil: the color image is augmented with spectral features information recolored images to show where specific variations within crop cultures (e.g. disease pattern) are being observed to support precision agriculture decisions – Courtesy of GAMAYA.

UAV PLATFORM CONFIGURATION POSSIBILITIES

Spatial resolution	2,048 x 1,088 px (VIS, RedNIR, NIR sensors) with 5.5 um pixel pitch 640 x 480 px (SWIR sensor) with 15 um pixel pitch
Spectral resolution & range	30+ bands in 450 – 875 nm range (VIS + RedNIR configuration) 40+ bands in 470 – 970 nm range (VIS + NIR configuration) 40+ bands in 675 – 1650 nm range (NIR + SWIR configuration) custom configurations possible – please contact us for more info
FWHM	~ 10 – 15 nm
Acquisition speed	90 FPS max for single sensor, 40 FPS max for dual-sensor camera
SW acquisition & processing pipeline	On-board (Linux based) processing capabilities : - RAW frames acquisition to local storage at video-rate - Saturation detection - Focus & elevation stability detection - De-mosaicing & radiometric corrections - Real-time classification with built-in classifiers On-computer (PC, window based) processing pipeline : - Stitching for orthophoto images - Fusion of two camera orthophoto images Output format = ENVI compatible file
Embedded HW	nVidia Jetson GPU, 2TB local storage, geo-tagging of each spectral image with access from GPS/RTK & IMU data from DJI Matrice 600 drone. Remote control connectivity fully integrated with DJI Matrice 600 HW & SW environment
Dynamic range	8 / 10 bit (VIS to NIR range sensors) and 13 bit (SWIR range sensors)
Optics	9 / 12 / 16 / 24 / 35 / 50 mm lenses – F2.0 – C-mount
Mechanical	Fully compatible with Gremsy Pixy U and MavLink industry standards
Dimensions (LxWxH)	10 x 7 x 6.5 cm
Weight	450 g (without optics)



Software processing pipeline (high level overview) starting with RAW frame acquisitions from two hyperspectral imaging sensors (e.g. VIS + NIR) to fully stitched orthophoto images.



VIS / VNIR range
HSI camera

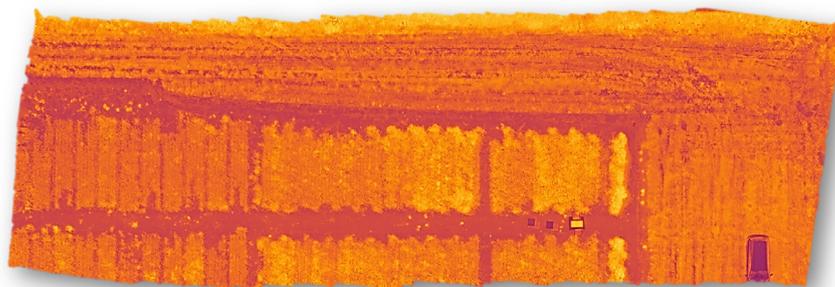


imec

UAV purpose multi-camera hyperspectral Imaging system carrying two hyperspectral imaging cameras (VIS to SWIR range) with embedded computing platform and Skyport connectivity for seamless acquisition and processing of hyperspectral imaging data in real-time.

APPLICATIONS

- Precision agriculture
- Forestry management
- Security & surveillance
- Industrial inspection of pipes, roads, solar panels, windmills
- General hyperspectral imaging R&D 'out of the lab' in outdoor environments



NDVI (vegetation vigor index) orthophoto stitched images acquired from several test flights data by imec team in Belgium. The full HW & SW pipeline platform has been early on validated in order to ease the integration and deployment of this unique technology in low altitude drone projects.

CONTACT US

hsi.sales@imec.be

DISCLAIMER - This information is provided 'AS IS', without any representation or warranty. Imec is a registered trademark for the activities of IMEC International (a legal entity set up under Belgian law as a "stichting van openbaar nut"), imec Belgium (IMEC vzw supported by the Flemish Government), imec the Netherlands (Stichting IMEC Nederland, part of Holst Centre which is supported by the Dutch Government), imec Taiwan (IMEC Taiwan Co.) and imec China (IMEC Microelectronics (Shanghai) Co. Ltd.) and imec India (Imec India Private Limited), imec Florida (IMEC USA nanoelectronics design center).