LABORATORY: CNR ISPC - AIRLAB

NAME OF THE INSTRUMENT

VNIR + IRT multisensor platform on drone

GENERAL DESCRIPTION

It is a multisensor platform conveyed by a quadcopter drone and consists of a multispectral camera that acquires 4 bands of the visible spectrum up to the near infrared (VNIR), a thermal camera (IRT) and an RGB camera. remotely managed with a single remote control, it is designed for applications in the field of archaeological prospecting. Through the integration and fusion of data acquired with the VNIR and IRT cameras, it is possible to identify, georeference and insert proxy indicators into the map, such as changes in humidity (damp-marks), variations in vegetation growth (crop-marks) and presence of organic materials on the surface, referable to the presence of underground structures and transformations at the scale of the site and landscape of cultural interest. The digital models that can be obtained by processing the images acquired with the RGB camera with structure from motion algorithms will allow the creation of detailed maps and orthophotos and, through post processing based on visualization techniques, identify microtopographic variations of archaeological interest.

The system is suitable for documenting and detecting archaeological contexts, excavation phases and architectural surfaces. Regarding the latter, the possibility of acquiring thermographic images at close range with the drone can be exploited, in addition to thermographic images acquired from the ground, for the detection of degradation pathologies and forms of alteration such as plaster detachment, patinas, deposits, and the presence of constructive modifications of the wall structures behind it.

An optimal use of the system is to integrate it with other remote sensing data on an aerial and satellite platform for multi-scale and multi-sensor applications.

TECHNICAL DETAILS

The multisensor system consists of a quadcopter drone equipped with a removable radiometric 30Hz thermal imaging camera with quick coupling and release with integrated optical camera that can be installed on the drone, a VIS-NIR multispectral camera, an RGB digital camera. The acquisition can take place with a flexible configuration, one or two chambers together or, only RGB chamber, RGB chamber with multispectral, RGB chamber with thermal chamber.
Below are the technical specifications of the drone and the cameras.

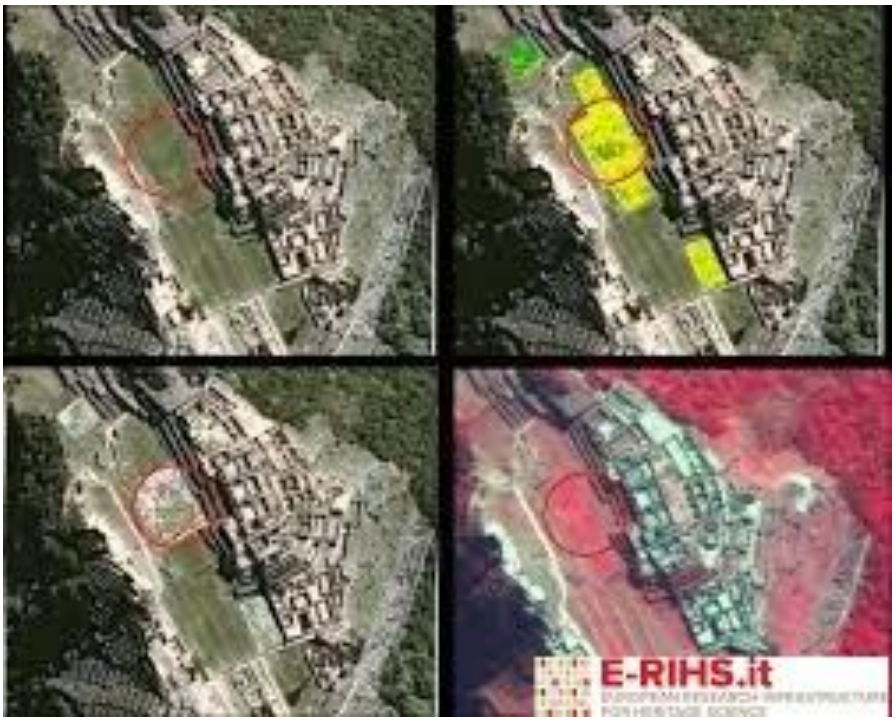
1_Drone quadcopter.
Maximum operating distance not less than 50 meters
Payload not less than: 1.30 kg
Minimum flight time: 34 minutes without payload and 24 minutes with maximum payload

2_Multispectral chamber
Acquisition spectral bands: Blue (446nm), Green (548nm), Red (650nm), Red Edge (720nm), NIR (840nm)
Sensor configuration: 12.3MP BSI CMOS
Field of view: 60 ° HFOV (4K Stills / Video) 1080p ranges 30 ° - 60 ° HFOV
Maximum weight of 400gr, global shutter with acquisition speed up to 0.1mmillisec
3-axis brushless gimbal support: Tilt: 0 ° to -90 °, Pan 0 °; Roll 0 ° Mechanical Range: Tilt: + 25 ° to -115 °, Pan 0 °; Roll + 40 ° Max Controllable Speed: 50 ”/ S

3_Thermic camera
Frequency 30Hz
Resolution 640 x 512 pixels

Optics (13mm)
3-axis brushless gimbal support

4_Micro four thirds digital camera
20.8 Mp, 15mm / 1.7 ASPH MFT lens including 4K video recording, 3-axis brushless gimbal support



FURTHER INFORMATION

N. Masini, R. Lasaponara (2020). Satellite and close range analysis for the surveillance and knowledge improvement of the Nasca geoglyphs. *Remote sensing of environment*. Volume 236, January 2020, 111447

Masini N., Marzo C., Manzari P., Belmonte A., Sabia C., Lasaponara R. (2018). On the characterization of temporal and spatial patterns of archaeological crop-marks. Journal of Cultural Heritage, doi: 10.1016/j.culher.2017.12.009

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