OT-27

CICLOPE | Airborne hyperspectral platform

ULPGC Universidad de Las Palmas de Gran Canaria | Fundación Parque Científico Tecnológico
OTRI Oficina de Transferencia de Resultados de Investigación

TYPE OF RESULT

New technology
New product
New service
New knowledge or skill

COMMERCIAL MATURITY LEVEL

Conceptual idea
Proof of concept (design)
Validated in a controlled environment
Validated in a real environment
Successfully implanted

PROTECTION LEVEL

Non- applicable
Patent
Software
Know - how
Utility model

Description of the solution. Problem solved

CICLOPE is the result of bringing together two technologies in a product aimed at multiple applications for processes requiring detection and/or identification of objects, or define their properties remotely. On one side, we find hyperspectral technology, and on the other side we have the use of unmanned aerial vehicles (UAV). Hyperspectral technology allows to collect data invisible to human eye, which has only three colour receptors (red, green and blue). Hyperspectral sensors both in the visible spectrum (400-700nm) and in near infrared (700-2500nm) collect information in hundreds of bands, providing a large amount of data about identification, features and properties of the observed object. This way a spectral signature from each material is generated, contributing to the decision making of many productive processes. It is foreseen that this technology will experience a great development in future years as it is showed on figure 1.

Figure 1. Evolution of hyperspectral technology market by regions (in $ US)

Concerning to the UAVs use, it is undeniable that this kind of platforms provide access to information from a perspective different from the one got at ground level and it allows to access to distant places making easier inspection tasks, especially those ones that a repetitive and can be automated. It is expected that in Spain drone industry prospective achieve great progress in the next three decades (Figure 2).

2035		
Flota drones uso profesional	Volumen de negocio anual (M€)	Puestos de trabajo (ud)
51.400	1.220	11.000
2050		
Flota drones uso profesional	Volumen de negocio anual (M€)	Puestos de trabajo (ud)
53.500	1.520	11.500

Figure 2. Drone market in Spain (2035 and 2050)

CICLOPE is a completely automated and autonomous airborne platform which has a payload of an hyperspectral sensor on the range VNIR (400-1000 nm) or in SWIR range (1000 - 1700 nm). Besides, it is able to support a thermal sensor that supplements hyperspectral sensors. To this end, a Matrice 600 structure (from Dji company) has been modified by adding an embedded mini-PC that is in charge of controlling and getting images as well as doing some level of processing. For those cases of complex processing, data are compressed and sent to ground. Hyperspectral cameras used are FX series made by the Finnish company Specim (FX10 and FX17), initially developed for industrial applications but our Institute (IUMA) has adapted all their features to be used in drones.

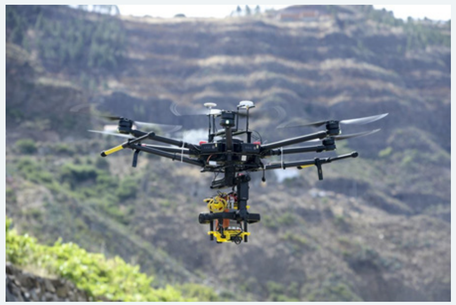

Figure 3. CICLOPE Platform

This way, a specific mission can be automated obtaining high detail. The platform is in charge of collecting data, and landing on the same spot where the process started.

As an example of the uses of this device, currently, we are working on applying it to precision agriculture (by monitoring crops in order to check their progress and quality). It is one of the projects led by the IUMA and it is denominated APOGEO (Precision Agriculture for the Improvement of Wine Production in the Macaronesia), financed by funds through the Interreg-MAC Programme 2014 -2020. CICLOPE has also been tested on environmental area, more precisely for detecting plastics and other pollutants in the marine area.

Fields of commercial application

This platform may result of great interest for the following sectors:

- Precision agriculture: CICLOPE allows to generate a colour map of a specific land, representing different vegetation indexes related to the strength to the crops to the crops, proportion of nutrients or existence of pests in early stages.
- Environmental monitoring: CICLOPE allows to identify different components in nature as certain plastics and hydrocarbons in the sea or in terrains that are not easily accessible, where physical samples cannot be taken.
- Maintenance and monitoring: using CICLOPE, access to certain urban areas can be achieved in order to analyse the level of damage or corrosion of materials hard to access.
- Security: CICLOPE is a technology that can detect objects that are camouflaged or components that can be dangerous for safety and integrity of people.

Market opportunity

A possible market for this airborne hyperspectral platform can be found in any of those processes that need being monitored periodically, especially those located on large locations or that are difficult to access. This turns the agricultural industry into the potential client, as well as public administrations or security forces.

Competitive advantage

Although there are similar products on the market, these are limited because the use of multispectral sensors that provide lesser information and because they are closed solutions that do not allow to make changes. CICLOPE is a completely open and modular solution that can be easily adapted to include new sensors or processing elements.

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