Integration of multispectral camera on low-cost UAVs for precision agriculture

Hernández, E.,[1] Rodríguez, A.,[1]* Pérez-García, A.,[1]** López, J.F.[1]

[1]*Institute for Applied Microelectronics, University of Las Palmas de Gran Canaria, Spain*

Corresponding author: * poster: armolina@iuma.ulpgc.es, ** oral presentation: apgarcia@iuma.ulpgc.es

In the last decades, the integration of multi and hyperspectral cameras with unmanned aerial vehicles (UAVs) has resulted in a tool that allows acquiring relevant information for many different fields of study with an unprecedented flexibility. For agriculture, the use of these devices is an advantage in terms of saving time and resources, as well as being beneficial for sustainability and environmental preservation. Spectral technology is crucial in the new revolution called precision agriculture, providing information related to the internal structure of the leaves which is highly related to its reflection of light at different wavelengths. The use of UAVs equipped with the appropriate sensors enables periodic monitoring of crops during cultivation, preventing diseases, pests and other plant needs.

In this work, framed in the Interreg-MAC project called APOGEO, the development of a low-cost UAV that can incorporate different sensors, such as inertial measurement unit (IMU) or multispectral cameras, is presented. A low-cost multispectral camera is also being developed that can be incorporated into the UAV for precision agriculture studies. In addition, an embedded board with advanced processing capabilities has been mounted on the UAV to control its trajectory, manage data acquisition, and enable on-board processing such as the evaluation of different spectral vegetation indices. The system has been experimentally validated using a commercial multispectral camera to calculate vegetation indices in vineyard areas. Specifically, the Normalized Difference Vegetation Index (NDVI) results facilitate the differentiation of canopy cover from other types of surfaces and indicate the general state of health of the vegetation.

References

1. Horstrand, P.; Guerra, R.; Rodríguez A.; Diaz, M.; López, S.; López, J.F. A UAV Platform Based on a Hyperspectral Sensor for Image Capturing and On-Board Processing. *IEEE Access*, **2019**, *7*, 66919-66938. DOI: 10.1109/ACCESS.2019.2913957.

2. Morales, A.; Guerra, R.; Horstrand, P.; Diaz, M.; Jiménez, A.; Melian, J.; López, S.; López, J.F. A Multispectral Camera Development: From the Prototype Assembly until Its Use in a UAV System. *Sensors* **2020**, *20*, 6129. https://doi.org/10.3390/s20216129