Low-cost orchard monitoring systems for Precision Agriculture based on photonic sensors (DIGIFRUIT)

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This project aims to take a step forward in the adoption of **Precision Agriculture and digital agriculture technologies in fruit growing**. It fits within the thematic areas of a) Agriculture and Agrofood Sciences (CAA), subarea Agriculture and Forestry (AYF), and b) Industrial Production, Civil Engineering and Engineering for Society (PIN), subarea Electrical, Electronic and Automatic Engineering (IEA). The contribution of the project to the thematic areas can suppose an inflection point in the real adoption of Precision Agriculture technologies in fruit production. This would be motivated by the **incorporation of lowcost photonic sensors, algorithms for information extraction and operation protocols for orchard characterization and monitoring**. Furthermore, the results of the project may contribute to the **robotisation of fructiculture** as an alternative to the lack of qualified manpower.

Under the hypothesis that a low-cost orchard monitoring system will favour the digital transition of fructiculture, **the main objective of the present project is to advance in the applicability of RGB-Depth cameras and low-cost LiDAR sensors for orchard monitoring in the framework of Precision Agriculture**.

Specific objectives:

- **Objective 1**: to **develop a low-cost monitoring system** for fruit tree orchards. Different photonic sensors (RGB-D, low-cost LiDAR) and other devices (GNSS receiver, embedded computers, etc.) will be evaluated, selected and integrated to constitute a low-cost system for the monitoring of fruit orchards. In addition, the necessary algorithms will be developed for the generation of 3D reconstructions and extraction of the canopy geometric parameters from the measurements carried out with the monitoring system. After the development of the monitoring system.
- **Objective 2**: **carry out a proof of concep**t for a Precision Agriculture application. For that, the system will be implemented in different mobile platforms to characterize fruit orchards at different moments along the campaign. The goal will be to assess canopy growing and yield estimation in orchards subjected to variable-rate site-specific fertilizer management.