Distributed Sensing Network using Ultra Low-power LoRa Nodes: A Case Study in Intensive Almond Groves

Antonino Candeias[1] and Rogério Dionísio (✉)[1,2]
[1]Instituto Politécnico de Castelo Branco, Castelo Branco, Portugal
[2]DiSAC - R&D Unit in Digital Services, Applications and Content
rdionisio@ipcb.pt

Abstract— The digitization of various agricultural processes is a growing reality in Portugal and in the world. Some of the application areas use sensor networks to monitor several parameters, including monitoring plant growth, atmospheric conditions or optimizing the irrigation process. However, in the agricultural environment where energy sources may be scarce, the implementation of an autonomous sensor network must consider the limitations imposed by the energy consumption of sensor nodes, powered by batteries. Moreover, spatial distribution models must be tested to optimize the number of sensors and their placement in the field.

This paper presents an ongoing work, being developed in partnership with a company, owner of an extensive almond grove in the region of Idanha-a-Nova and Fundão, Portugal. The objective is to implement a sensor network, making use of a LoRa technology and battery-powered nodes, and collect information on various parameters associated with intensive almond trees groves.

The proposed sensor network is part of an IoT middleware framework that captures multiple data from different sources. Through smart farming, precision agriculture, real time monitoring and business intelligence solutions, the expected results are productivity increase and optimization of the use of resources in the almond cultivation process and a significative reduction of the environmental impact.

Keywords— Sensor Network, Power consumption, MQTT, Embedded Systems, Node-RED, The Things Network