SMART WATER MANAGEMENT

Introduction:

A wireless sensor network is a network composed of a set of nodes integrating the functions of acquiring, processing, communicating. Once deployed, the nodes cooperate with each other autonomously to collect and transmit data to a base station in order to monitor and / or control a phenomenon. Nowadays, the use of WSN knows a great boom in areas as diverse as the military, medicine, the environment and precision agriculture

Precision agriculture can be defined as the art and science of using technology to improve crop production. This is achieved by providing information pertinent to agriculture properly related to metrological factors (temperature, humidity, sunshine, wind. In this context, implementing smart irrigation techniques that improve the efficiency of water use will help farmers to make their activities more profitable while at the same time enhancing the sustainability of agriculture in its together. Experimental results have shown that the reliability and the increase of crop growth1,2,3. Nowadays several IOT cloud platforms have been put on the web. These latest user interface offers friendly-uses to anyone who wants to monitor at a lower cost connected objects. Despite their use in automotive and smart city applications, the integration of these in precision agriculture applications is not very widespread. In this project we are interested in setting up and testing a system based on the network of wireless sensors and the Internet of objects and IOT cloud platforms in the context of precision agriculture. In this paper we propose to describe a prototype system based on a network of sensors and an IOT cloud that alerts the farmer when the crops need to be irrigated.

Related work:

IoT frameworks and platforms are still immature for agriculture, but there is a trend now to apply IOT in the agricultural sector. In 12 Duan Yan-e et al proposed an IOT application that provides agricultural information and crop information to farmers on the basis of collected wireless sensor network data. This information is used to ensure that the rate of Fertilizer application and within the recommended limit. In 13 Xiangyu HU et al. Developed an IOT application for remote monitoring and control of agricultural fields, which is based on the analysis of data collected by the wireless sensor network, which has enabled farmers to minimize the cost of hand And the efficient use of water resources. In 14 Andreas Kamilaris et al. Have proposed an application called Agri-IOT allowing the analysis and the processing of data coming from a network of sensors (WSN) while exploiting the semantic aspects. This will make it possible to associate an easy publication of data on the semantic web.

Background:

Precision agriculture

Precision agriculture is a principle of management of agricultural parcels appeared in the United States in the 1980s. Already in 1985, researchers from the University of Minnesota vary the intake of calcium amendments on agricultural plots. We then try to modulate the insertion of certain inputs (nitrogen, phosphorus, potassium) in certain high-energy-intensive crops and inputs (maize, sugar beet for example), in the context of race to progress agricultural yields. Mainly precision farming aims at optimizing yields and investments4,5,6, seeking to better account for the variability of environments and improving conditions between different plots. It has influenced tillage, seeding, fertilization, irrigation and pesticide spraying. In practice The aim is to optimize the management of a plot from a triple point of view: • Agronomic: The agronomic precision aims at improving the efficiency of inputs / yields, including the choice of strains and varieties more adapted to the edaphic or phytosanitary context • Environmental: It also involves reducing certain risks to human health and the environment (in particular by reducing the environmental release of nitrates, phosphates and pesticides). • Economic: Increase yields, while reducing energy consumption and chemical inputs

WSN:

Networks of autonomous wireless sensors is promising technology which is making its place to complement these existing solutions and compensate their shortcomings: Implemented in plots, they can continuously monitor different parameters. "This is a new generation of embedded systems coupled with wireless communication technologies. Thanks to these devices, it is possible to acquire, store, process and transmit data.

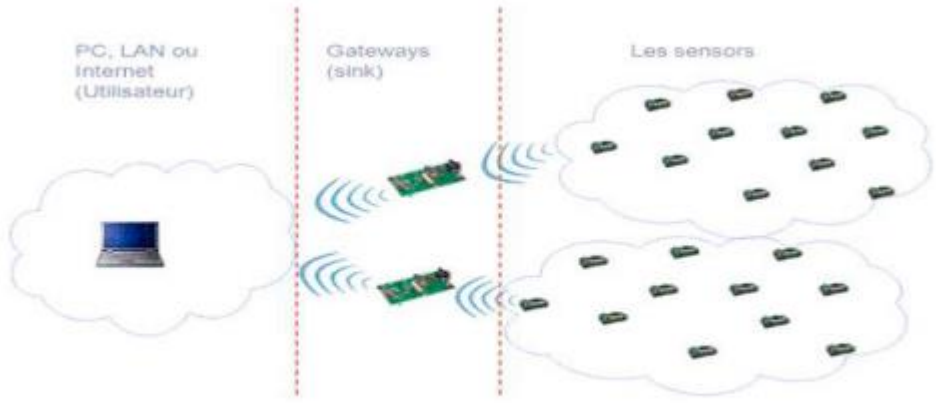


Fig. 1 WSN architecture.

IOT Cloud

IoT (Internet of Things) is a scenario in which objects, animals and people are assigned as unique identifiers, IOT makes it possible as the ability to transfer data over a

network without requiring any human interaction To-human or human-to-machine. The architecture of the Internet of the objects Fig2 relies mainly on 4 processes allowing to collect, to store, to transmit and to treat data from the physical world. The role of the different processes presented in Fig 2 is described as follows: • collect data: refers to the action of transforming an analog physical magnitude into a digital signal. • Interconnect: allows you to interface a specialized object network with a standard IP network (e.g. WiFi) or consumer devices. • Store: qualifies the aggregation of raw data, produced in real time, meta tagged, arriving in an unpredictable way. • Finally, presenting indicates the ability to restore information in a way that is understandable to humans, while offering a means of acting and / or interacting.

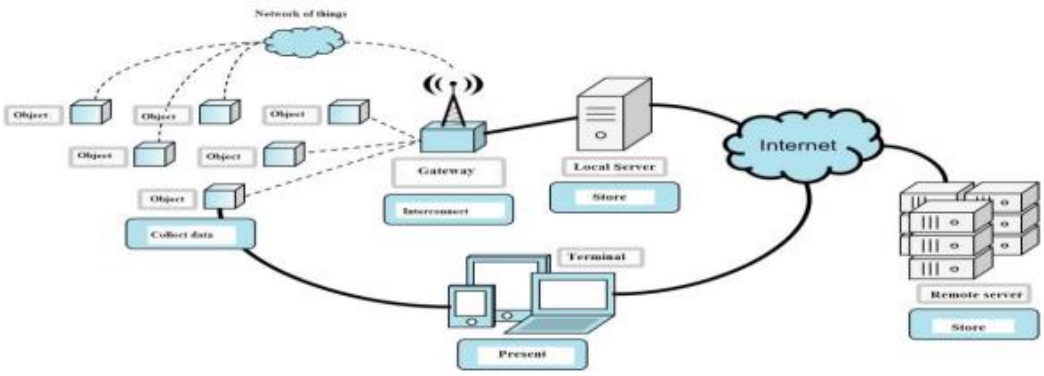


Fig. 2. IOT architecture.

Architecture system design

The general architecture Fig 3 of our supervisory system can be described in a three-third application. A third party connected to the sensor network deployed in the plots, a third party connected to the gateway intended to transmit the data via the Internet, and a third based on the web application of objects via the platform ubidots

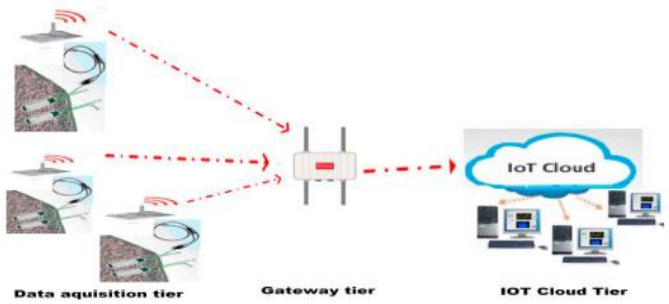


Fig. 3. Architecture system design.

Tier of sensor Network

In this part we will use sensor nodes of type waspmote 01. These are manufactured by the Libelium company based on the Arduino hardware open source technology. Each sensor node is equipped primarily with an Atmega 128 microcontroller. An IEEE 802.15.4 ZigBee Transceiver, an energy management module and a flash memory management system on an SDRAM card. The various modules of the card are connected by buses of type uart, spi and i2c. Each wasmpote node is equipped with a soil moisture sensor. The latter is equipped with two electrodes incorporated in a gain above gypsum slice. It is buried in the ground to measure the soil water pressure which reflects the moisture state of the soil. The higher the voltage, the more dry the ground.

Deployment:

Node programming and configuration

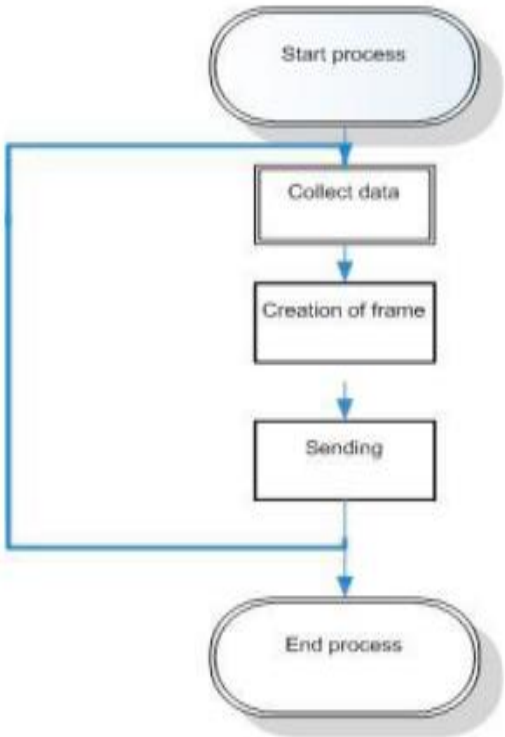
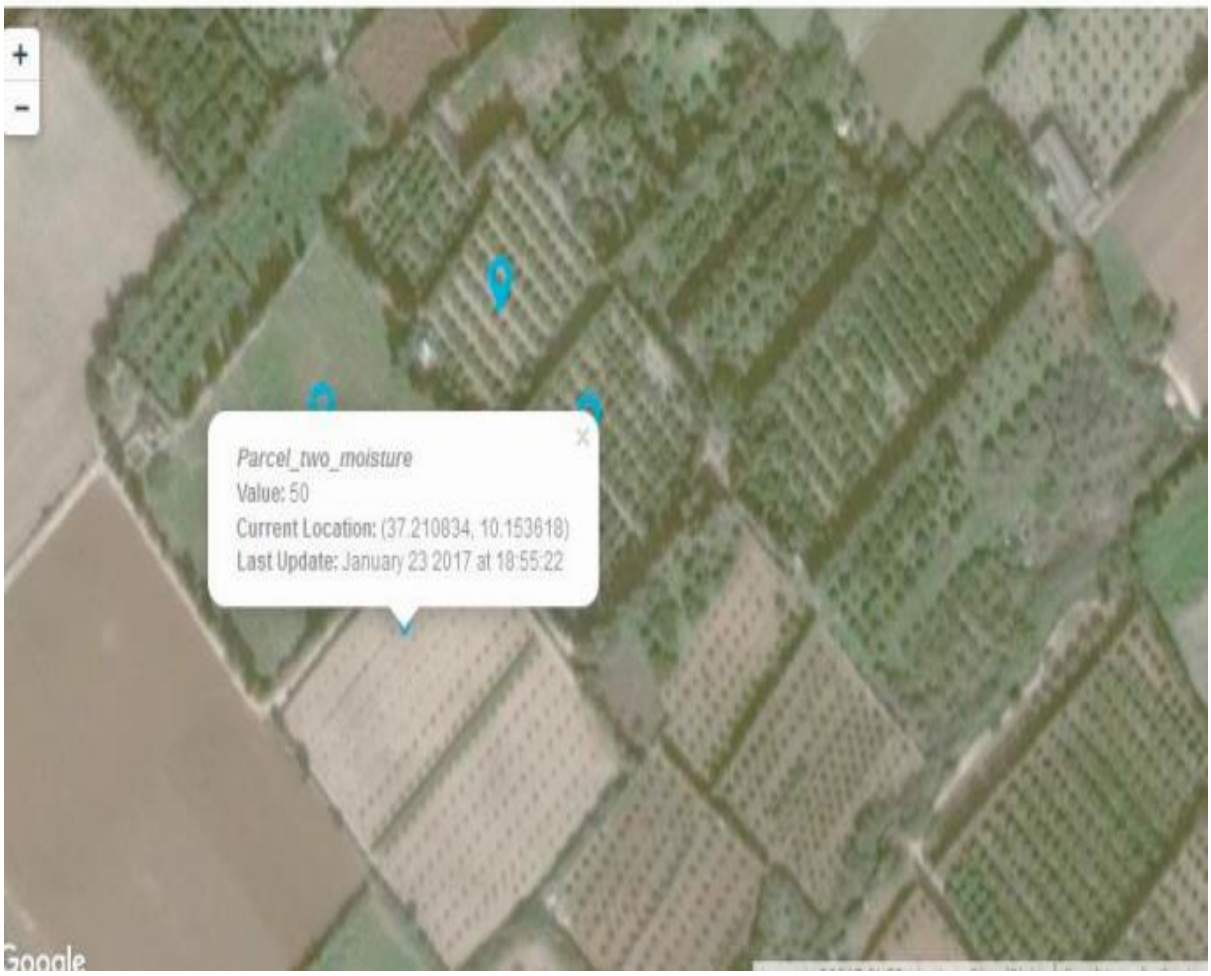


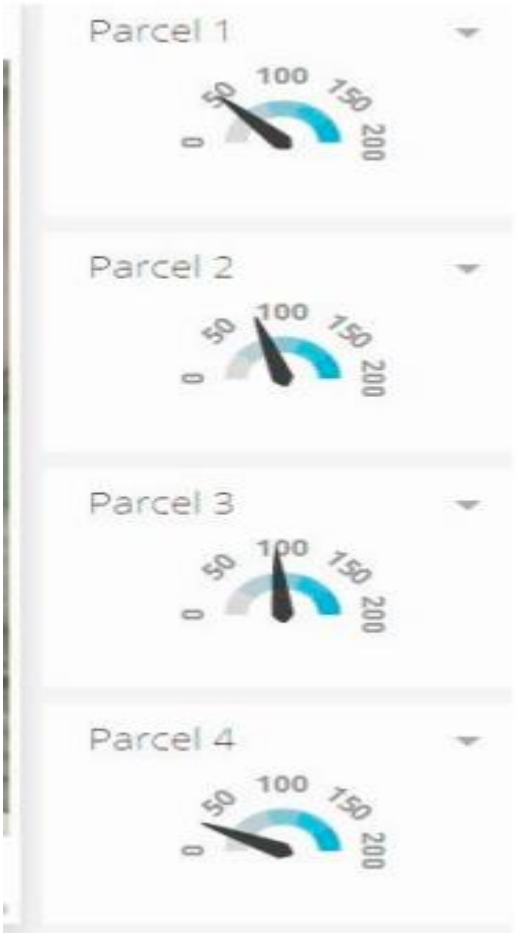
Fig. 4. Wasmpote node operation

Gateway programming and configuration

Mainly is based on a process that allows to recover the frames received on the IEE 802.15.4 module and to fragment the data then to integrate it in a Json code compatible to the format of ubidots and to transmit it via internet by the module GPRS below An overview of the Json stream format. Curl –X POST -H "Content-Type:application/json"-d '{"Parcel_one_moisture":{"value":3,"context":{"lat":37.233123,"lng":10.082181}}, "Parcel_two_moisture":{"value":11.21,"context":{"lat":37.232809,"lng":10.081591}}, "Parcel_three_moisture":{"value":156,"context":{"lat":37.233429,"lng":10.081096}}, "Parcel_four_moisture":{"value":156,"context":{"lat":37.233429,"lng":10.081096}}}' http://things.ubidots.com/api/v1.6/datasources/585c560276254273e49eb616?token=V3gD 0TEYtGfJWXvZ8j5k9dh 0fXLeW7

Monitoring interface





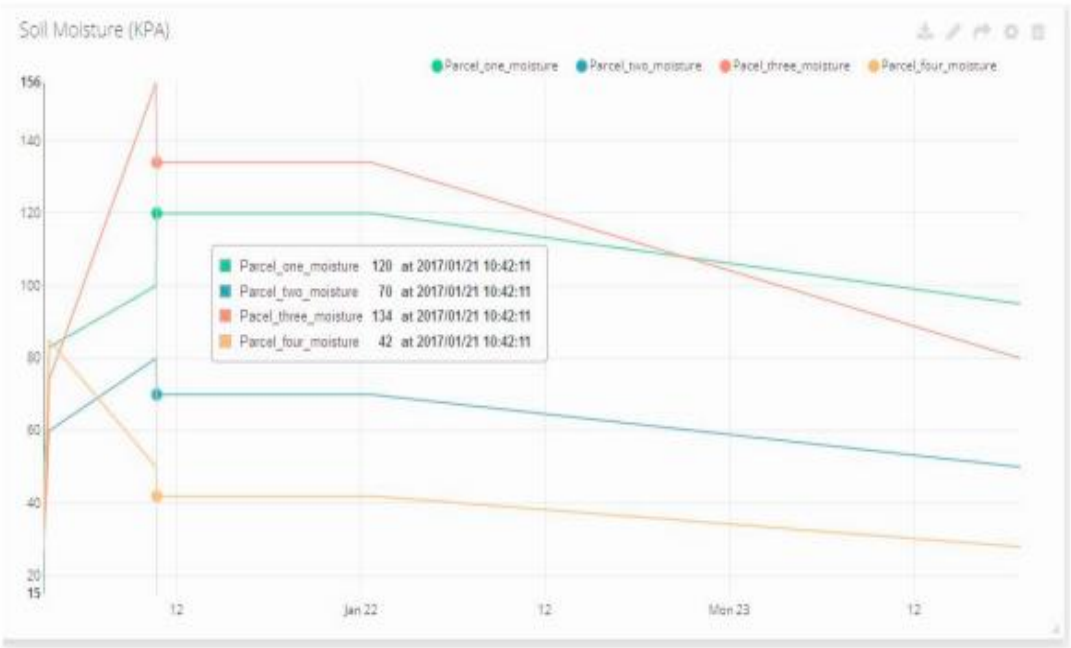


Fig. 6. Measurement of soil moisture with for nodes in flied.

Fig. 7. Alert interface