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Monitoring system using web of things in precision agriculture

Foughali Karim*[a],Fathalah Karim[b],Ali frihida[b]

[a] *Communication System Laboratory Sys'Com, National Engineering School Of Tunis, University Tunis El Manar, Tunisia*
[b] *Cognition and Ontology of GeoSpatial Systems,National Engineering School of Tunis, University Tunis El Manar,Tunisia*

Abstract

As water supplies become scarce because of climatically change, there is an urgent need to irrigate more efficiently in order to optimize water use. In this context, farmers' use of a decision-support system is unavoidable. Indeed, the real-time supervision of microclimatic conditions are the only way to know the water needs of a culture. Wireless sensor networks are playing an important role with the advent of the Internet of things and the generalization of the use of web in the community of the farmers. It will be judicious to make supervision possible via web services. The IOT cloud represents platforms that allow to create web services suitable for the objects integrated on the Internet. In this paper we propose an application prototype for precision farming using a wireless sensor network with an IOT cloud.

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Keywords: wireless sensor networks; Web of things; monotoring; precision agriculture

1. 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.

*Corresponding author. Tel.: +21696488622; fax: +0-000-000-0000 .

E-mail address: foughali.karim@gmail.com

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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 growth[1,2,3].

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.

2. 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.

3. Background

3.1. 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 investments[4,5,6], 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.