

Cloud-based Wireless Sensor and Actuator System for Smart Irrigation

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Abstract

The number of devices connected to the Internet is experiencing an exploring growth. This development leads to a world with endless possibilities offered by Machine to Machine communication, including the development of a smarter and greener planet through the use of information acquired around us. This information allows the creation of solutions aiming for better management of our natural resources. The interconnection of smart objects embedded with sensor enables this interaction with the environment according to the concept of IOT (Internet of Things), merging the physical and the logical worlds. These sensors communicate wirelessly forming a Wireless Sensor Network(WSN), which performs acquisition, collection and analysis of data such as temperature, windspeed and soil moisture. A WSN which also controls the environment is called a Wireless Sensor and Actuator Network(WSAN). The end-to-end system (Fig.1) aims to determine when, and how water, to apply at

each zone (A zone is a turf grass area that is watered simultaneously, controlled by valves). To minimize water waste, the system uses an improved adaptive irrigation algorithm that calculates the amount of water to apply in a certain zone depending on the maximum water volume that the soil can store. The almost infinite capabilities of storage and processing, the rapid elasticity and pay-per-use characteristics makes Cloud Computing an attractive solution to the large amount of data generated by the WSN. This dissertation proposes and evaluates a cloud based WSAN communication system to monitor and control a set of sensors and actuators to assess the plant water needs. This system can be applied in a variety of distinct situations such as in Agriculture fields, Greenhouse, Golf courses and therefore should be designed in order to be adapted to a variety of possible scenarios. The developed prototype was subject to experimental test in a real case scenario within a culture of peach trees.

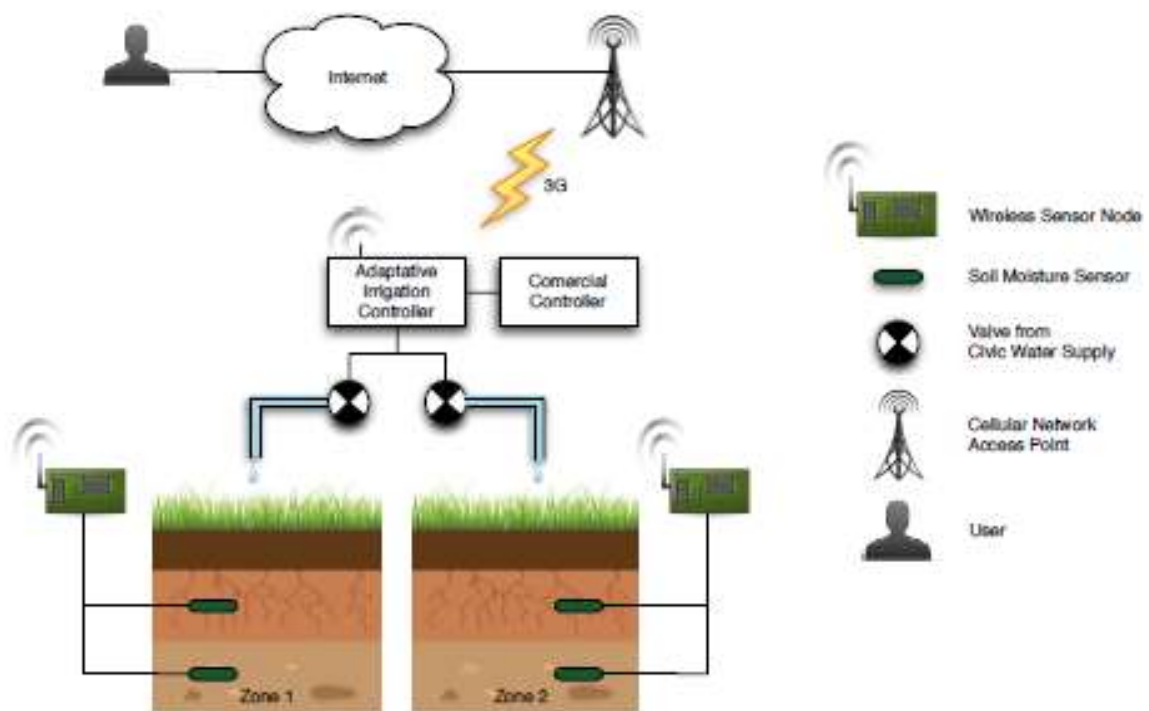


Fig.1: End-to-End System

Keywords: Wireless Sensor and Actuator Network(WSAN),End-to-End System, Internet of Things(IOT),Machine to Machine(M2M),Cloud Computing, Irrigation and optimization.