Time-Domain Reflectometry Applied to Irrigation Control

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This paper consists in an irrigation control system that aims to rationalize the use of water in crops, reaching the area of biggest water demand in the world, the agriculture. To this end, we developed a new method of soil moisture measurement using the principle of time-domain reflectometry (TDR) due to its low sensibility to variations in the soil composition. The proposed method, which consists of a sensor and an electronic circuit, was tested in practical experiments with different soil types and the data passed through a statistical analysis of variance, which has proven the data validity, independent of the soil composition. The complete system is composed by a soil moisture sensor and a measurer circuit, both in the field and powered by solar panels, and also by a central unit which receives the measured data through radiofrequency. The central unit is a Raspberry Pi board, which has a database, user interface and irrigation control. In the database, the parameters to control each crop type and the moisture measurement are stored. This information is available in the form of charts and tables of a desired period in a web environment. To calculate the average resented, a C algorithm performs an error elimination based on Chauvenet's Criterion, displaying only valid values. Through the measurements obtained by the sensor and the crop type, the system determines the time that the irrigation process becomes necessary and automatically activates it, eliminating the need of replacement of the manual control device already installed in field.

Awards Won:

Third Award of $1,000

SPIE, the international society for optics and photonics: Second Award of $1,500