

ABSTRACT

DESIGN AND TEST PERFORMANCE AUTOMATIC CONTROL ON DRIP IRRIGATION SYSTEM USING MICROCONTROLLER ARDUINO MEGA AND WIRELESS ZIGBee CONNECTION

By

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Drip irrigation has been applied to provide water and nutrient solution to plants. The application of drip irrigation system at this time is not precise yet generally because water is provided based on time schedule, not base on soil water content or plant requirement for water. This research aims to design and test the performance of an automatic device that control drip irrigation system automatically; using microcontroller Arduino Mega accomplished with *Zigbee* technology connection. The device works based on soil water content. Water pump will be turned on when the soil moisture is less than critical water content, and will be turned off when the soil water content is higher than field capacity. the device is also equipped with temperature and humidity sensors as detection of environmental parameters.

Sensor calibration and validation were performed by using three different soil textures: silt loam, loamy sand, and sandy loam. Each soil sample was mixed with compost by ratio of 5: 1. The testing of the device; however, was done by using sandy loam soil texture. Sensor calibration showed that relationship between voltage and soil water content was linear with $R^2=0,88; 0,95; 0,96$ respectively for silt loam, loamy sand, and sandy loam. While, validation showed that errors were 0,63%; 0,52%; 0,60% respectively for silt loam, loamy sand, and sandy loam. The results also indicated that linear regressions (correlation between voltage and soil water content) turned out to be applicable for specific *Soil Texture*. Therefore, this device may not be used for general soil textures. Validation of temperature and humidity showed an error that occurred in of $<2\text{ }^\circ\text{C}$ and $\pm 10\%$. The error value on humidity sensor is not as expected. The result of the test showed that the automatic device could work properly. Interval of data transmission was properly done per minute rather than per second.

Keywords: Drip Irrigation, Microcontroller, Automatic Control, Environmental Parameter.