

Conception and Evaluation of Irrigation System Based on Internet of Things

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Abstract

This study investigates the precision and efficacy of irrigation water distribution equipped with Raspberry Pi technology compared to manual irrigation water distribution. For that 5 scenarios (A,B,C,D,E) were investigated and analyzed respectively. Scenarios A was the irrigation water distributed manually, and B,C,D,E were those managed with raspberry Pi4. The analysis focused on various aspects including performance, minimal deviation, monitoring and the system water distribution capability. The results showed low standard deviations in most groups, pinpointing Group B with a minimum of 1.84; indicating a high degree of consistency in the quantity of water supplied. Group E stands out with the highest maximum standard deviation of 18.34, an indication of higher variability in the water distributed. This standard deviation is obtained in this scenario because of the way the irrigation is planned as an alternance of 90% and 110% of Group Applied water. The maximum difference percentage between targeted values (traditional manual irrigation methods) and means of obtained from Raspberry Pi4 values is generally low (e.g., 2.60% in Group A). This indicates that the irrigation system closely aligns with the targeted values, signifying good accuracy. Additionally, time series analysis highlights the system's ability to maintain uniform water distribution over time. The system's optimization for maintaining consistent water levels contributes to uniform plant or crop growth, emphasizing the potential of IoT-based precision agriculture. These findings underscore the benefits of using Raspberry Pi technology in modern irrigation systems and its potential to revolutionize agricultural practices.

Keywords: Irrigation systems, Internet of Things, Irrigation water management, Raspberry Pi