
Effectiveness of XR-based Proprioception Intervention on Knee Joint Position Reproduction Accuracy: A Pilot Study

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Abstract:

Water scarcity represents one of the most pressing environmental challenges in arid regions such as the United Arab Emirates (UAE). Efficient water management is essential for sustaining agriculture under extreme desert conditions. This study presents Green Desert, an Internet of Things (IoT)-based smart irrigation monitoring system designed to optimize water use in desert agriculture. The system integrates ultrasonic sensors, ESP32/ESP8266 microcontrollers, and cloud-based monitoring platforms to provide real-time water level tracking in irrigation reservoirs. A wick-based passive irrigation mechanism ensures efficient water delivery directly to plant roots while minimizing evaporation losses.

A pilot prototype developed by undergraduate computing students was deployed in a simulated desert environment. Experimental validation showed high measurement accuracy (average error ≈ 0.15 cm), low latency in monitoring updates (1–2 seconds), and reliable operation under environmental constraints. The results demonstrate that the proposed system provides a low-cost and scalable approach for sustainable agriculture in arid regions. The Green Desert project highlights the potential of IoT technologies to improve water management and support food security in desert environments.

Keywords:

Internet of Things (IoT), Smart Irrigation, Water Monitoring, Desert Agriculture, Sustainable Farming.