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DESIGN AND REAL-TIME DEVELOPMENT OF SOLAR POWERED SMART IRRIGATION SCHEDULING SYSTEM IN AN AGRICULTURAL ENVIRONMENT USING NI LABVIEW

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Abstract

Conventional agriculture faces significant challenges related to inefficient water usage, suboptimal nutrient management, and the high cost of manual monitoring, often impacting crop yield and sustainability. This paper presents a smart agriculture system's design, implementation, and testing to optimize irrigation and provide data-driven fertilizer recommendations. The system integrates an array of sensors (NPK, soil moisture, temperature, humidity, water level) interfaced with an Arduino UNO microcontroller and a NodeMCU (ESP8266) module for IoT-based communication. System control, real-time data acquisition, processing, and visualization are managed through a Graphical User Interface(GUI) developed in NI LabVIEW. A key feature is the incorporation of a Support Vector Machine (SVM) classifier, trained to analyze NPK sensor data and classify soil nutrient levels, achieving 95% accuracy during validation. The system automates irrigation cycles based on real-time soil moisture and water tank levels, controlling a water pump and solenoid valve. Energy sustainability is addressed through integration with a solar power system and battery storage. Remote monitoring is facilitated via the Blynk cloud platform and is accessible through web and mobile dashboards. The developed system demonstrates a viable solution for enhancing resource efficiency, reducing manual intervention, and promoting sustainable agricultural practices through automation and intelligent data analysis.

Key words: internet of things (IoT), LabVIEW, machine learning, smart irrigation, support vector machine (SVM)

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