Energy and Operations Optimization for Effective Greenhouse Management

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Abstract

IoT technology-based process automation that can be applied to a greenhouse leads condition manage- ment and status monitoring more robust while saving energy and resources. The proposed system which is based on IoT technology and MQTT protocol can set optimal growth conditions for plant and seed growth within the greenhouse. The sensor-based inputs are to be transformed into the processed values based on the defined logic and the standard benchmarks gathered from the local agricultural authorities. The key areas of condition monitoring to be done via temperature, humidity, soil moisture, and lighting. It can ultimately yield an increased harvest having supported both the plant and seeds-based implementations for multiple types of plants. One of the most important factors to consider is that the farmers can have energy savings through the proposed solution by controlling the actuators in an optimal manner and reducing manual intervention by a considerable amount. The excess usage of electricity by lights and cooling fan usage in the greenhouse can be controlled with real-time data tracking and better analytics. The use of water can be properly maintained for the plants by putting only the required amount. It will make the soil wet and spraying the required amount to air will make better humidity control. Thus the real-time condition based controlling of the actuators leads to making the greenhouse operations more optimal and better utilization of resources and energy which ultimately results in financial benefits for the greenhouse owner. Based on the evaluated power consumption of the greenhouse power usage before and after the system was installed, the newly introduced system is capable of saving energy by having optimal control of actuators by performing algorithmic calculations to meet only the required level of weather conditions. This is to be proven experimentally by implementing the proposed system for a defined period of time under the monitoring of energy usage.

Keywords

Energy, Greenhouse, Efficiency, Accuracy, Power Consumption