Evaluation on the Performance of Greenhouse Temperature Measures and Environmental Control System [1]

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ABSTRACT

In order to assess whether the efficiency of greenhouse environment control equipments meets user's expectation or not, the study focused on developing a simple, fast, and accurate verification method to measure temperature distribution of crops growth layers inside a greenhouse. Through wireless sensor network sensor module, the method measures temperature data of crops growth layers inside a greenhouse and sends the data to back-end processor for further analysis. To analyze the data, we applied Response Surface Methodology (RSM) of statistic mode to mark the relation between crops growth layers and temperature changes, and then show the temperature distribution status by using continuous 3-D images which allow system manager learn immediately how temperature distributes dynamically inside a greenhouse so he could assess and improve the efficiency of greenhouse environment control.

Take the greenhouse used in this research for example, when the environment control equipment was activated to cool down the greenhouse, the distribution of crops growth layers is an increasing convex curve. The temperature of central axle area is $1.2℃$ lower than the west side and $3℃$ lower than the east side. This distribution shows that in the central area of the greenhouse's north-to-south axle, wind is stronger than west and east sides, and the west side is stranger than the east side; therefore, the fans need to be relocated to enhance both sides' wind.

Key words: WSN, RSM, greenhouse environment control.