Automated Wireless Greenhouse Management System

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ABSTRACT

Increases in greenhouse sizes have forced the growers to increase measurement points for tracking changes in the environment, thus enabling energy saving and more accurate adjustments. However, increases in measurement points mean increases in installation and maintenance cost. Not to mention, once the measurement points have been built and installed, they can be tedious to relocate in the future. Therefore, the purpose of this Masters thesis is to present a novel project called "Automated Wireless Greenhouse Climate Management System" which is capable of intelligently monitoring and controlling the greenhouse climate conditions in a preprogrammed manner.

The proposed system consists of three stations: Sensor Station, Coordinator Station, and Central Station. To allow for better monitoring of the climate condition in the greenhouse, the sensor station is equipped with several sensor elements such as CO_2, Temperature, humidity, light, soil moisture and soil temperature. The communication between the sensor station and the coordinator station is achieved via ZigBee wireless modules and the communication between coordinator station and the central station is achieved via long range RF modems.

An important aspect of designing a wireless network is the reliability of data transmission. Therefore, it is important to ensure that the developed system will not lose packets during transmission. An experiment was carried out in one of the greenhouses at Plant and Food Research Ltd, New Zealand in order to determine the functionality and reliability of the designed wireless sensor network using ZigBee wireless technology. The Experiment result indicates that ZigBee modules can be used as one solution to lower the installation cost, increase flexibility and reliability and create a greenhouse management system that is only based on wireless nodes.

The overall system architecture shows advantages in cost, size, power, flexibility and distributed intelligent. It is believed that the outcomes of the project will provide the opportunity for further research and development of a low cost automated wireless greenhouse management system for commercial use.

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