DESIGN AND DEVELOPMENT OF A SYSTEM CONTROLLER FOR HIGH-CAPACITY TISSUE CULTURE GROWTH CHAMBER

Undergraduate Design Project
Submitted to the Faculty of the
College of Engineering and Information Technology
Cavite State University
Indang, Cavite

In partial fulfillment
of the requirements for the degree
Bachelor of Science in Computer Engineering

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December 2018

ABSTRACT

FLORES, FAYE A. and **OLIVAREZ, ERIKHA SHAIRA C., Design and Development of a System Controller for High-Capacity Tissue Culture Growth Chamber**. Undergraduate Thesis. Bachelor of Science in Computer Engineering. Cavite State University, Indang, Cavite. December, 2018. Adviser: Prof. Andy A. Dizon.

The study was conducted to control the environmental parameters inside a growth chamber such as temperature, humidity, and photoperiod. The general objective of the study is to design and develop a system controller for a tissue culture growth chamber. Specifically it aimed to: design and construct a circuit for the system that will control the operation of the tissue culture growth chamber; develop a graphical user interface (GUI) for the whole system; create a data logging system for the results and readings of the operation of the whole system; test and evaluate the performance of the system controller in terms of: accuracy of the system output, effectiveness of the system controller to the growth chamber, responsiveness of the GUI, user acceptability on the whole system based on the perception of the evaluators and determine the total cost computation of the system.

It was constructed through four main methods: The construction of the circuit followed by the development of the GUI, the data logging and the integration of the system. The design project was composed of Arduino 2560 microcontroller, a Raspberry Pi 3 microcomputer, A 7" touch screen display, SPDT and Solid state relay modules, dht22 temperature and humidity sensor, led tube lights, fan blowers and exhaust, heater, and a Pi Camera.

The microcontroller used acted as the main control of the whole system, the microcomputer served as the control for the input from the user and the data logging

system. A graphical user interface (GUI) is also included to the study where the user will choose what crop was desired to cultivate. The choices include different type of crops such as banana, *makapuno*, coffee and rice, wherein each of this crop has already set of parameters required; and a manual input where the user can input the desired environmental parameter, if it differs from the parameters of the crops in the choices. A photoperiod option is also present in the GUI application which includes choices as 10 min, 8/16 h, and 12/12 h and 24 h.

The evaluation of the system controller resulted to matched the performance in terms of its accuracy through the GUI display and the thermometer hygrometer, its effectiveness in controlling the components required by the user and in tabulating a graph to objectively observed its technical variations and the GUI was found responsively from the starting of its application through each of its buttons. The user acceptability in terms of functionality, reliability, usability and user-friendliness resulted and rated as excellent by the evaluators. Thus, overall user evaluation of the system controller fully meets and far exceeds the most expectations.

The total cost of the design project was P15093.00.

TABLE OF CONTENTS