MONITOR AND CONTROL GREENHOUSE ENVIRONMENT

AMIZA BINTI ABU

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PERLIS.

AHMAD NIZAM BIN MOHD JAHARI @ JOHARI
Pensyarah
Fakulti Kejuruteraan Elektronik Dan Kejuruteraan Komputer
Universiti Teknikal Malaysia Melaka (UTeM)
Karung Berkunci No 1752
Pejabat Pos Durian Tunggal
76109 Durian Tunggal, Melaka

Tarikh: 28/04/2010

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Author : AMIZA BINTI ABU

Date : 28/04/2010

"I hereby declare that I have read this report and in my opinion this report is sufficient in terms of the scope and quality for the award of Bachelor of Electronic Engineering (Industrial Electronics) With Honours."

Signature : 

Supervisor's Name : AHMAD NIZAM BIN MOHD JAHARI @ JOHARI

Date : 28/04/2010.

Speacial dedication to my beloved parents, all my siblings, my kindhearted supervisor Mr. Ahmad Nizam bin Mohd Jahari@ Johari and speacial thank to my dearest friends.

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ABSTRACT

In greenhouse there were some measurement must to detect climate parameter in different parts so that make greenhouse operating by using automation system properly. Appropriate environment situation is necessary to optimum plant growth, crop products increase, and water consumption and other sources efficiency. Automatic method in data processing in soil conditions and various parameter climates which allowed information in plant growth collected on high frequency with minimum labor utilization. Objective of this project is to design a simple green house, easy to handle, microcontroller based circuit and to monitor and recorded temperature value, humidity, soil moisture and sunlight continuously and controlled, orderly to optimize and achieve good and maximum plant growth. The guard use is low power; cost efficient chip manufactured by ATMEL owns 8K byte in flash memory chip. It with regard to various modules in order to control light, drainage aeration and process efficiently in a greenhouse with in control by a cooler, fogger, dripper and explain respectively according to condition in must the crop. A liquid crystal display integrated (LCD) is used to display data reading and status achieved from various sensor. Apart from that, easy component use can reduce manufacturing and maintenance cost. Design would be flexible as the software can be changed at anytime. This making system proposed to reduce cost, portable and low maintenance to greenhouse applications, especially in rural areas and to small farming experts.

ABSTRAK

Di dalam rumah hijau terdapat beberapa pengukuran yang perlu bagi mengesan parameter iklim di beberapa bahagian yang berbeza supaya rumah hijau bersistem automatik dapat beroperasi dengan betul. Keadaan persekitaran yang sesuai perlu bagi pertumbuhan optimum sesebuah pokok, meningkatkan hasil tanaman, dan kecekapan penggunaan air dan sumber-sumber yang lain. Kaedah automatik di dalam pemprosesan data pada keadaan tanah dan pelbagai iklim parameter yang membenarkan maklumat pada pertumbuhan pokok dikumpulkan pada frekuensi yang tinggi dengan penggunaan buruh yang minimum. Objektif projek ini adalah merekabentuk rumah hijau yang sederhana, mudah dikendalikan, mikropengawal berpangkalan litar untuk memantau dan merekod nilai suhu, kelembapan udara, lembapan tanah dan cahaya matahari secara berterusan dan terkawal, teratur bagi mengoptimumkan pertumbuhan pokok yang baik. Pengawal itu menggunakan adalah meggunakan kuasa yang rendah, menjimatkan kos cip cekap dikilangkan oleh ATMEL mempunyai 8K byte pada cip ingatan kilat. Ia berhubung dengan pelbagai modul bertujuan mengawal cahaya, pengudaraan dan proses saliran dengan cekap dalam sebuah rumah hijau yang di kawal oleh sebuah pendingin dan pengabut. *Liquid Crystal Display* (LCD) juga digunakan untuk memaparkan data yang diperolehi daripada pelbagai pengesan dan status peranti itu. Selain itu, penggunaan komponen yang murah dapat mengurangkan kos pembuatan dan penyelenggaraan. Reka bentuk yang fleksibel boleh ditukarkan pada bila-bila masa. Ini menjadikan sistem yang dicadangkan dapat mengurangkan kos, mudah alih dan penyelenggaraan yang rendah untuk penguna yang menggunakan rumah hijau, terutamanya di kawasan luar bandar dan petani.

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LIST OF ABBREVIATION

PC	–	Personal Computer
LDR	–	Light Dependent Resistor
ADC	–	Analog to Digital Converter
LCD	–	Liquid Crystal Display
SIP	–	Single In-line Package
DIP	–	Dual Inline Package
QFP	–	Quad Flat Package
IDE	–	Integrated Development Environment
asm	–	Assembly Language

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CHAPTER I

INTRODUCTION

1.1 Introduction

We live in a world where everything can be controlled and operated automatically, but there are still a few important sectors in our country where automation has not been adopted or not been put to a full-fledged use, perhaps because of several reasons one such reason is cost. One such field is that of agriculture.

Agriculture has been one of the primary occupations of man since early civilizations and even today manual interventions in farming are inevitable. Greenhouses form an important part of the agriculture and horticulture sectors in our country as they can be used to grow plants under controlled climatic conditions for optimum produce.

Automating a greenhouse envisages monitoring and controlling of the climatic parameters which directly or indirectly govern the plant growth and hence their produce. Automation is process control of industrial machinery and processes, thereby replacing human operators.

1.2 Objectives

The objectives of Monitor And Control Greenhouse Environment project are as below:

a) to improve the crop productivity with the use of greenhouse as a planting site.
b) to design a simple green house, easy to handle, microcontroller based circuit
c) to monitor and recorded temperature value, humidity, soil moisture and sunlight continuously and controlled, orderly to optimize and achieve good and maximum plant growth.

1.3 Problem Statement

A number of problems associated with the above mentioned systems are enumerated as below:

a) Complexity involved in monitoring climatic parameters like humidity, soil moisture, illumination, soil pH, temperature, etc which directly or indirectly govern the plant growth.

b) Investment in the automation process are high, as today's greenhouse control systems are designed for only one parameter monitoring (as per GKVK research center); to control more than one parameter simultaneously there will be a need to buy more than one system.

c) High maintenance and need for skilled technical labor. The modern proposed systems use the mobile technology as the communication schemes and wireless data acquisition systems, providing global access to the information about one's farms. But it suffers from various limitations like design complexity, inconvenient repairing and high price. Also the reliability of the system is relatively low, and when there are malfunctions in local devices, all local and tele data will be lost and hence the whole system collapses. Moreover farmers in Malaysia do not work under such sophisticated

environment and find no necessity of such an advanced system, and cannot afford the same.

Keeping these issues in view, a microcontroller based monitoring and control system is designed to find implementation in the near future that will help farmers.

1.4 Scope of Works

The main scope of Monitor And Control Greenhouse Environment project is to monitor and control of the microclimatic parameters of a greenhouse on a regular basis round the clock for cultivation of crops or specific plant species which could maximize their production over the whole crop growth season and to eliminate the difficulties involved in the system by reducing human intervention to the best possible extent.

The system comprises of sensors, Analog to Digital Converter, microcontroller and actuators. When any of the above mentioned climatic parameters cross a safety threshold which has to be maintained to protect the crops, the sensors sense the change and the microcontroller reads this from the data at its input ports after being converted to a digital form by the ADC. The microcontroller then performs the needed actions by employing relays until the strayed-out parameter has been brought back to its optimum level. Since a microcontroller is used as the heart of the system, it makes the set-up low-cost and effective nevertheless.

As the system also employs an LCD display for continuously alerting the user about the condition inside the greenhouse, the entire set-up becomes user friendly. Thus, this system eliminates the drawbacks of the existing set-ups and is designed as an easy to maintain, flexible and low cost solution.

1.5 Report Structure

This final year project report consists of five chapters. First part of this paper discusses the basic features of a typical to monitor and control greenhouse environment, the factor that initiate the greenhouse to be developed and its objectives.

The second part describes literature review and background study of Monitor and Control Greenhouse Environment project.

The third part which is Chapter III covers the design and development of a Monitor and Control Greenhouse Environment project.

The fourth part which is Chapter IV consists of the results and application of Monitor and Control Greenhouse Environment project. It includes the result analysis and software development.

Finally, the last part concludes the overall development process and the system as well.

CHAPTER II

LITERATURE REVIEW

Much research on the environment in greenhouse has focused attention on the scope for sophistication in the control strategy. The internal environment is closely controlled, so that the conditions that maximizes the potential performance of the crop, if it can be investment to achieve more precise control that gives a better commercial return. The greenhouse systems have for long been controlled by computers, increasing the likelihood of acceptance of computer-based advances in control strategies.

2.1 Greenhouse Temperature and Humidity Control System

2.1.1 Introduction

Commercial glass greenhouses are high tech production facilities for growing vegetables or flowers, filled with equipment like screening installations, heating, cooling, and lighting. In many cases these systems are automatically controlled by a computer to regulate and maintain proper plant growth. One of our customers aimed to develop a PC-based control system for automatically monitoring the temperature of their greenhouse.

2.1.2 System Requirements

Due to the fragile nature of growing plants within a greenhouse, this customer had strict requirements for the implementation of their automated system, which included the following:

- The temperature and humidity of the greenhouse should be recorded and allow automatic adjustments
- The system should allow remote monitoring and control through the Internet
- Any failure of the air-conditioner needs to be immediately reported to the administrator
- Surges from outside should be avoided in order to prevent the controller from malfunctioning
- The greenhouse was far from the control station, requiring highly reliable product

2.1.3 Project Implementation

This system can remotely monitor and manage the temperature and humidity within the greenhouse through the Internet, providing a more accurate, efficient and reliable system than constant physical monitoring[1].

ADAM-4017	8-ch Analog Input Module
ADAM-4051	16-ch Isolated Digital Input Module
ADAM-4056	12-channel Sink Type Isolated Digital Output Module
ADAM-4052	8-ch Isolated Digital Input Module
ADAM-4571L	1-port RS-232/422/485 Serial Device Server
ADAM-4068	8-ch Relay Output Module with Modbus
Software	ADAMview, GeniDAQ

Table 2.1: Project Implementation of Greenhouse Temperature and Humidity Control System

2.1.4 System Diagram

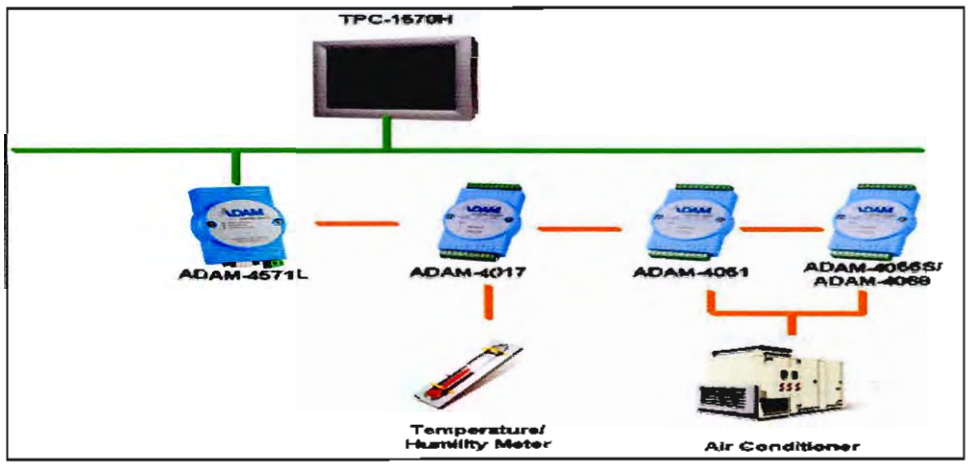

Figure 2.1: System Diagram of Greenhouse Temperature and Humidity Control System

All temperature and humidity data is sent to the ADAM-4017, while the signals monitoring the air-conditioner are sent to ADAM-4501. The temperature of air-conditioner is adjusted and controlled by ADAM-4068 and ADAM-4056S. Communications are supported by RS-485. If the PC does not support Ethernet, then the conversion could be supported by ADAM-4520. The program can be implemented manually or automatically, and any alarm event record can be searched and viewed on the PC screen[2]. The temperature and humidity can be configured and adjusted on a timer according to season, weather, etc[3]. The variation of temperature and humidity is shown and analyzed by the curve chart. The entire system can be remotely controlled through the Internet.

2.2 Design of an Embedded System for Monitoring and Controlling Temperature and Light

2.2.1 Introduction

In later stage of development it has been found that microcontrollers (integration of microprocessors and certain peripherals including memory on single chip) are more reliable as well as efficient[4]. Use of microcontrollers in embedded