

**General Sir John Kotelawala Defence University**

Faculty of Computing

Department of Information Technology

**Virtual Environment control system through Sensor network**

**For greenhouse**

Proposal of the Final year Project undertaken in partial fulfillment of the requirements for the Bachelor of Information Technology Degree program

By

GHMDD Lakshan(IT/13/241)

Under the Supervision of

Mr. B. Hettige

&

Mr. D Maithri Ranga Kulasekara

# PLAGIARISM DECLARATION

I declare that this material, which I now submit for project proposal is entirely my own work and has not been taken from the work of others , save and to the extent that such work has been cited and acknowledged within the text of my work. I understand that plagiarism, collusion, and copying are grave and serious offenses in the academic level and accept the penalties that would be imposed should I engage in plagiarism, collusion, and copying. I have read and understood the rules and regulations. I have identified and included the source of all facts, ideas, and opinions in the assignment references and bibliography.

# ACKNOWLEDGEMENT

I acknowledge Professor Mr. B. Hettige and Mr. D Maithri Ranga Kulasekara for encouraging me to write this paper, and also the lecturers who inspire me to write this. The author bears all the responsibility for any misunderstandings and/or errors therein.

**Table of content**

[1.0 Introduction 2](#_Toc443245817)

[2.0 Problem 2](#_Toc443245818)

[3.0 Solution 2](#_Toc443245819)

[4.0 Aim and Objectives 2](#_Toc443245820)

[4.1 Aim 2](#_Toc443245821)

[4.2 Objectives 2](#_Toc443245822)

[5.0 Description about proposed solution 2](#_Toc443245823)

[5.1 input 2](#_Toc443245824)

[5.2 Process 2](#_Toc443245825)

[5.3Output 2](#_Toc443245826)

[6.0 Technology, Gadget and Software 2](#_Toc443245827)

[6.1 Technology 2](#_Toc443245828)

[6.2 Gadget 2](#_Toc443245829)

[6.3 software 2](#_Toc443245830)

[7.0 Timeline 2](#_Toc443245831)

[8.0 Reference 2](#_Toc443245833)

# 1.0 Introduction

Greenhouse is a building or place where plants are grown. Greenhouses form an important part of the agriculture and horticulture sectors of a country. Greenhouses are used for Grow flowers, vegetables, fruits, and tobacco plant. It create the best condition for the plant growth and eliminate the impact on plant growth due to some outside environment behaviors changes .Basic factors that affect for plant growth are sunlight, humidity temperature etc. The most important factors for the quality and productivity of plant growth are temperature, humidity, light. The optimal greenhouse environment adjustment can enable us to improve productivity and to enhance the cultivation when environment parameters change rapidly. This system is used to monitor and control the essential greenhouse parameters, such as, Temperature, humidity and light intensity. Automated greenhouse involves the automatic monitoring and controlling of climatic parameters which directly or indirectly govern the plant growth and their production. In order to control the climate factors and environment autonomously, it is required a computer/software equipment. The system has advantages of low power consumption, low cost, good robustness, and extended flexibility.

# 2.0 Problem

Environment factors like temperature, humidity and light are hard to control manually inside a Greenhouse and there is a need for automated system to do that task. When Environment behaviors change rapidly, immediately response must be activated. It can’t be done by the manual system. As well as manual system’s price is very expensive and maintenance isn’t convenient.

# 3.0 Solution

Build a virtual environment control system through sensor network to control the environment parameters that rapidly change. This automated system involve the controlling of climatic parameters which directly or indirectly govern the plant growth and their production. For greenhouse, environment control system increase crop yield, improve quality, regulate the growth period and improve the economic efficiency, and the optimum condition of crop growth by changing greenhouse environment factors such as temperature, humidity, light etc.

# 4.0 Aim and Objectives

## 4.1 Aim

The aim of this project is to build efficient and effective automated system to control the environment parameters that change rapidly.

## 4.2 Objectives

Build miniature greenhouse which is equipped with automatic monitoring and controlling system

Minimizes labor costs involved in maintaining a greenhouse

Detect and maintain temperatures

Detect and maintain humidity levels

Detect sunlight and artificial light.

Constantly monitor and control environmental conditions in greenhouse to ensure it remains at preset temperature, light, moisture and humidity levels

# 5.0 Description about proposed solution

5.1 input

In this project, a wireless sensor network will be developed for greenhouse monitoring by integrating a sensor node. There are three sensors capable to measure four climate variables. They are temperature sensor, humidity sensor and light sensor

5.2 Process

Sensor node capture the environment variables. There are 3 sensors at input side and it has 3 devices at the output side to control the respective parameter. There is a web base application develop with asp.net .That web base application input the values that must be have in the greenhouse. Sensor node capture the environment variable like temperature, humidity and light. If environment variable captured by sensor network greater than value that enter by web application, devices will be automatically activated (Fan, Light and Exhaust Fan) at the output side and send SMS notification to the User. All output devices will be connected wirelessly to the gateway. They can communicate wirelessly.

## 5.3 Output

Based on input values, devices will be switched OFF/ON automatically.

* If the temperature exceeds beyond the limit set then a fan will be automatically switched ON as a coolant to reduce the temperature
* Humidity sensor is used to check the humidity of the air in the greenhouse. If the humidity exceeds the limit set then an exhaust fan will be switched ON to maintain the suitable environment for the plants
* Light sensor sense the light and set an optimum light in the greenhouse for the plants. An artificial light will be switched ON automatically by the light sensor if there is insufficient light for the plants in the greenhouse .And the light is switched OFF automatically when the plants get sufficient light from the sun
* Alarm will be sent to his mobile phone by SMS, if some measurement variable changes rapidly.

**Devices**

Exhaust Fan

Fan

Light Bulb



**If values captured by sensors > Input values by the app**

Temperature Sensor



**Microcontroller**

Light Sensor

Send **SMS**

Humidity Sensor





Web base application

Figure 1: System Overview Rich Picture

# 6.0 Technology, Gadget and Software

## 6.1 Technology

Sensor network

Wireless sensor networks (WSNs) are able to efficiently sense various parameters with high accuracy and low power consumption. The development of sensors and networks based on sensor nodes has impacted and changed our everyday life. Wireless sensor network (WSN) can form a useful part of the automation system architecture in modern greenhouses .A wireless sensor network (WSN) is a system consisting of a collection of nodes and a base station. Wireless communication can be used to collect the measurements and to communicate between the centralized control and the actuators located to the different parts of the greenhouse.

## 6.2 Gadget

Temperature sensor

Humidity Sensor

Light Sensor

Fan

Light Bulb

Exhaust fan

Microcontroller (Arduino Board)

The microcontroller is the heart of the proposed embedded system. It constantly monitors the digitized parameters of the various sensors and verifies them with the predefined values and checks if any corrective action is to be taken for the condition at that instant of time. In case such a situation arises, it activates the actuators to perform a controlled operation.

## 6.3 software

ASP.NET

Arduino IDE

# 7.0 Timeline

# 

# 8.0 Reference

[1] I. F. Akyildiz, W. Su, Y. Sankarasubramaniam, and E. Cayirci, “Wireless sensor networks: a survey,” *Comput. Netw.*, vol. 38, no. 4, pp. 393–422, 2002.

[2] Y. Song, C. Gong, Y. Feng, J. Ma, and X. Zhang, “Design of greenhouse control system based on wireless sensor networks and AVR microcontroller,” *J. Netw.*, vol. 6, no. 12, pp. 1668–1674, 2011.

[3] R. H. Hussain, A. F. Marhoon, and M. T. Rashid, “Wireless Monitor and Control System for Greenhouse,” *Int. J. Comput. Sci. Mob. Comput.*, vol. 2, no. 12, pp. 69–87, 2013.

[4] T. Ahonen, R. Virrankoski, and M. Elmusrati, “Greenhouse monitoring with wireless sensor network,” in *Mechtronic and Embedded Systems and Applications, 2008. MESA 2008. IEEE/ASME International Conference on*, 2008, pp. 403–408.

[5] C. Yawut and S. Kilaso, “A wireless sensor network for weather and disaster alarm systems,” in *Proc. International Conference on Information and Electronics Engineering, IPCSIT*, 2011, vol. 6.

[6] M. A. Perillo and W. B. Heinzelman, “Wireless sensor network protocols,” *Algorithms Protoc. Wirel. Mob. Netw. Eds Boukerche Al CRC Hall Publ.*, 2004.

[7] M. Nakamura, A. Sakurai, and J. Nakamura, “Distributed Environment Control Using Wireless Sensor/Actuator Networks for Lighting Applications,” *Sensors*, vol. 9, no. 11, pp. 8593–8609, Oct. 2009.