Design and Implementation of Rain Water, Humidity and Temperature Detector Alarm Unit for Green House Irrigation System

Jyothi Prakash[#1], Bimbika R Patel[#2], Birendra Kumar Bhagat[#3],NikhilBhaskar[#4],Manjula.B.G[#5]
[#1, #2 ,#3, #4] *Student, Electrical & Electronics Engineering, K.S.S.E.M, Bengaluru, Karnataka State, India,*
[#4]*Associate Professor, Electrical & Electronics Engineering, K.S.S.E.M, Bengaluru, Karnataka state, India*

Abstract

The most important factor of quality, productivity of plant growth varies as temperature, humidity and the level of the carbon dioxide. Continuous monitor of these environmental variables provides information regarding factors which affect the growth of plant grown inside green house and method to manage productiveness. The optimal greenhouse adjustment can enable us improve productivity and to achieve remarkable energy savings. Our design is able to obtain greenhouse irrigation control by using the developed Rain water, Humidity and Temperature Detector- Alarm Unit.

The designed alarm unit was simulated in Proteus 8 Professional Suite. The circuit consisting microcontroller, LCD, transformer and relay is built on a wooden board. The glass Green house is built for green house irrigation purpose .The required supply is provided to all components used in the circuit. Different sensors are used to control the different parameters in the green house and to create a suitable environment for the Green house irrigation.

Keywords: *Proteus 8, Microcontroller, LED, Rain sensor, Humidity sensor, LM35.*

I. INTRODUCTION

A green house is a structure with walls and roof made chiefly of transparent material, such as glass, in which plants requiring regulated climatic conditions are grown. These structures range in size from small sheds to industrial-sized buildings. The interior of a greenhouse exposed to sunlight becomes significantly warmer than the external ambient temperature, protecting its contents in cold weather. Greenhouse protects crops from too much heat or cold, shield plants from dust storms and blizzards, and help to keep out pests. The greenhouse allows certain crops to be grown throughout the year, green houses are increasingly important in the food supply of high latitude countries. Pests and diseases, and extremes of the heat and humidity, have to be controlled, and irrigation is necessary to provide water. Significant inputs of the heat and light may be required, particularly in the winter season for the production of warm weather vegetables. Because the temperature and humidity of greenhouses must be constantly monitored to ensure optimal conditions, a WSN can be used to gather data remotely. The data are transmitted to a central location and used to control heating, cooling, and irrigation systems.

The system itself was usually simple without opportunities to control locally heating, lights, ventilation or some other activity, which was affecting the greenhouse interior climate. This all has changed in the modern greenhouses. The typical size of the greenhouse itself is much bigger what it was before, and the greenhouse facilities provide several options to make local adjustments to the lights, ventilation, heating and other greenhouse support systems. However, more measurement data is also needed to make this kind of automation system work effectively. Increased number of measurement points should not dramatically increase the automation system cost. It should also be possible to easily change the location of the measurement points according to the particular needs, which depend on the specific plant, on the possible changes in the external weather or greenhouse structure and on the plant placement in the greenhouse.

II. LITERATURE REVIEW

Rainwater harvesting is a simple technique of collecting and reserving rain water. Either, one can store it in tanks or can use it to recharge ground water depending upon the situation. It is ideal for areas where there is inadequate ground water supply or surface resources. The system helps in utilizing the primary source of water and prevents the run off from going into sewer or storm drains, thereby reducing the load on treatment plants. Rainwater harvesting systems used in housing schemes can provide water for portable and non-portable uses [8]-[11].

The rain detection system used to detect rainfall and activate automatic closing of glass. Also it allows wiper to be controlled automatically. The system contains a microcontroller that takes in the input signals from the sensors and controls the operation of the glass based on these input signals. The proposed model automatically turns up the glass upwards when rainfall is detected and the glass goes down when no rain is detected. This system can further be used to detect the percentage efficiency of the rain which is falling on the windscreen. An automatic wiper controller, based on resistive rain sensor which is cost effective, efficient and has a wide range of output. An equivalent electrical and mathematical model of the sensor is developed, simulated and practically verified. The rain sensor has a predetermined geometry. Hence the rain water forms film on the sensor surfacecausing its resistance to change non-linearly. To increase the overall efficiency of system, it is necessary to linearize the sensor response. It is achieved using electrical equivalent model of the sensor and with appropriate linearization circuit. Further, a customized embedded system is developed using PIC micro-controller to achieve motor speed variation based on sensor output. The system uses a combination of impedance, piezo-electric sensors to detect rain and its intensity. The system contains a microcontroller that takes in the input signals from the sensors and controls the operation of the windshield wipers based on those input signals [5]-[12].

The Wireless Sensor Network can be used to gather the data from point to point to trace down the local climate parameters in different parts of the big greenhouse to make the greenhouse automation system work properly. In this contest with the evolution in wireless sensor technologies and miniaturized sensor devices, it is possible to uses them for automatic environment monitoring and controlling the parameters of greenhouse, for Precision Agriculture application. This paper proposes and analyses the use of Programmable System on Chip Technology as a part of Wireless Sensor Networks to monitor and control various parameter of green house.

III. OBJECTIVES AND METHODOLOGY

A. *Objectives*

The objectives of project are given below:

1) To study the existing circuit that can sense changes in Rain water, Humidity and Temperature.

2) To arrive at design specifications for Rain water, humidity and Temperature detector-alarm unit.

3) To develop the Rain water, Humidity and Temperature Detector-Alarm unit

4) Test the Rain water, Humidity and Temperature Detector-Alarm unit to meet the design specifications.

B. *Methodology Adopted:*

Methodology for Objective-1:

- Literature Survey will be made to understand the designs and developments made in Rain water, Humidity and Temperature sensors-alarm unit.

Methodology for Objective-2:

- Pre-requisite data for the design specifications of Rain water, Humidity and Temperature Detector-Alarm unit is extracted from the available reference journal publications meeting the desired specifications.
- The designed Detector-Alarm unit will be simulated in Proteus and circuit component values are obtained.
- The design will be refined to get the suitable Detector-Alarm unit circuit component values and retested using Proteus.

Methodology for Objective-3:

- The Rain water, Humidity and Temperature Detector units will be developed with discrete components on printed circuit board after choosing the appropriate components to match the obtained design as closely as possible.

Methodology for Objective-4:

- The interfacing of microcontroller with the hardware Detector – Alarm unit is done for processing of signals.
- The alarm system is implemented with Rain water, Humidity and Temperature Detector units and its functioning is observed and recorded.
- The advantages of new design of Rain water, Humidity and Temperature Detector – Alarm unit will be validated against the performance of existing Detector – Alarm unit.
- Conclusions will be drawn based upon the validation studies.

IV. EXPERIMENTAL WORK

Microcontroller Atmega32 controls all the analog and digital sensors and displays data in LCD. When the output of Rain sensor is below 4000 mV beeper is initiated. A 60 W bulb is used for increasing the surrounding temperature. When soil humidity falls below 60% from the determined value, the pump drives automatically. Rain Water Detector unit senses the wetness of each Rain drop above 30%.
The LED glows once the Rain Water Detector senses the rain drop.The working model ofRain water, Humidity and Temperature detector Alarm unit is as shown in Figure 1.

Figure 2 represents the Block diagram of rain water, humidity and Temperature detector Alarm Unit build to control parameters of Green house. It contains all the individual components required for controlling humidity, temperature and rain water for Green house. The microcontroller used in the circuit monitors the different parameters inside the green house. The circuit is designed to control all the specific parameters of Green house like temperature, humidity of soil, rain water and water pump for auto-irrigation in green house. The beeper and LED in the circuit are used to indicate the proper set value of different sensors. Operating conditions of Rain water, Humidity and Temperature detector Alarm unit is as shown in Table 1.

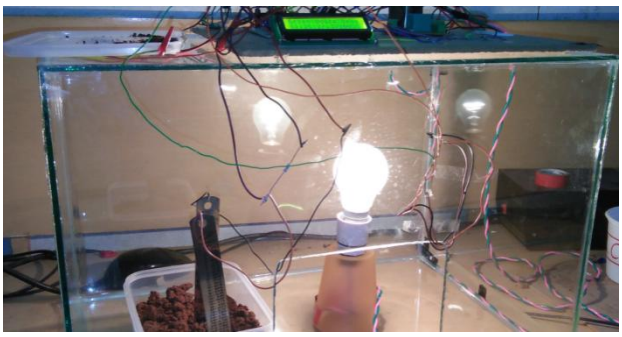

Figure 1: Working Modelof Rain water, Humidity and Temperature Detector Alarm Unit

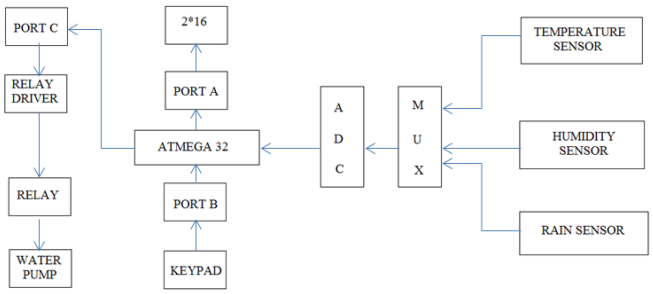

Figure 2: Block Diagram of Rain water, Humidity and Temperature Detector Alarm Unit

SL.NO	SENSOR	RANGE	INDICATOR
1.	RAIN SENSOR	BELOW 5000mv	LED ON
2.	RAIN SENSOR	ABOVE 5000mv	LED OFF
3.	SOIL HUMIDITY SENSOR	0mv-1000mv	LED ON
4.	SOIL HUMIDITY SENSOR	1000mv-5000mv	LED OFF
5.	TEMPERATURE SENSOR	BELOW 35◦C	LED ON
6.	TEMPERATURE SENSOR	ABOVE 45◦C	LED OFF

Table 1: Operating Conditions of Rain water, Humidity and Temperature Detector Alarm Unit

V. CONCLUSION

In green house technology, more number of the parameters are to be controlled because, large varieties of the crops can be grown. In this situation, different sensors with additional hardware and software is an efficient solution for green house control. The system allows to monitor the condition of temperature and humidity which the temperature and humidity sensor successfully collected data in the greenhouse and send the data to the microcontroller.LCD screen displays the collected data showing both sensor, temperature and humidity ON/OFF control. C Compiler and Proteus software are used for the programming and interfacing process. The system is modified interms of number of sensors and PID control which in turn increases the reliability.

REFERENCES

[1] S. S.Rao, Switchgear and Protection, 13th ed., Khanna, 2008

[2] D. Kothari and I.J.Nagarath, Electrical Machines, 4th ed., TMH, 2010.

[3] M. A. Mazidi, J. G. Mazidi and R. D.Mckinlay, The 8051 Microcontroller and Embedded Systems-using Assembly and C, PHI, 2006.

[4] D. M. M. K. S. B.Madankar, “Intelligent Rain Sensing using Automatic Wiper System,”International Journal of Computer Applications, 2011.

[5] N. Dharmadhikari, “Automatic Wiper System," International

Journal of Computer Technology and Electronics Engineering, vol. 4, no. 2, April 2014.

[6] D.D.Chaudhary, S.P.Nayse and L.M.Waghmare, "Application of Wireless Sensor Networks for Greenhouse Parameter Control in Precision Agriculture," International Journal of Wireless & Mobile Networks, vol. 3, no. 1, July 2013.

[7] A.Salleh, M.K.Ismail, N.R.Mohamad, M. A. Aziz, M.A.Othman and M.H.Misran, "Development of Greenhouse Monitoring using Wireless Sensor Network through ZigBee Technology," International Journal of Engineering Science Invention, vol. 2, no. 7, pp. 06-12, July 2013.

[8] K. G. I. A. Khan, "Design of rain Detection System for Power Windows,"International Journal of Advanced Researh in Computer Science and Sofware Engineering, vol. 5, no. 4, pp. 1523-1527, April 2015.

[9] J. J.Woyotowitz, "Adjustment,Irrigation System With Soil Moisture Based Seasonal Watering". Patent US 20100094472 A1, 15 April 2010.

[10] I.G.Alexanian, "Irrigation Controller Water Management with Temperature Budgeting". Patent US 8401705 B2, March 203.

[11] M. K. Kumar, "Design of rain water harvesting system at Shipa hostel in JNTUA College of Engineering Ananthapuram: a case from Southern India,"International Journal of Engineering Research and Development, vol. 11, no. 12, pp. 19-29, 2015.

[12] K. J. D. S. M. Joshi, "A novel and cost Effective Resistie Rain Sensor for Automatic Wiper Control,"Circuit Modelling and Implementation, 2013.