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PRACTICAL RESULTS ON HARDWARE IMPLEMENTATION OF MONITORING AND CONTROLLING SYSTEM FOR THE OPERATION OF GREENHOUSE ENVIRONMENT

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ABSTRACT

This paper is introducing the novel concept and designed system for automation in Monitoring and Controlling of Greenhouse Enviorrnent. All the necessary requirements in completion of the design like component details, PCB layout, schematic diagram along with the software requirement are mentioned in detailed in this paper. The designed system presented along with the practical results, concluding that the proposed system can be the better option to change the current scene of agriculture and greenhouse to the complete automation. This will fulfill our expectations and lead to increase in the low cost production.

KEYWORDS: Greenhouse, Agriculture, Automation, Era, Novel.

INTRODUCTION

This paper is highlighting on the designing and implementation of the Automated Monitoring and Controlling System for the Operation of Greenhouse Enviornment. The concept was introduced to overcome the problems and deficiencies faced while operating with the manual operations or human labour working operations. This was the scenario in the past years of agriculture. But, this scene is going to be replaced by the newly designed automated systems in the agriculture as well as greenhouse. The paper is sequencing hardware design requirements followed by designed system with its all the technical details along with the practical results.

The suggested system in the paper will convert the manual or human labour operations to complete automatic operations in the agriculture or greenhouse.

SYSTEM DESIGN REQUIREMENTS

Hardware Requirements

1) **Microntroller Unit**

Microcontroller is the soul part of the whole system which is used to control all other remaining components on the hardware. System is having Atmega16 microcontroller.

Fig. 1 Microcontroller Atmega16

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2) **Soil Moisture Sensor**

Soil moisture sensors measure the water content in soil. A soil moisture probe is made up of multiple soil moisture sensors. Since, analytical measurement of free soil moisture requires removing a sample and drying it to extract moisture. Soil moisture sensors measure some other property, such as electrical resistance, dielectric constant,etc.

Fig. 2 Soil Moisture Sensor

The relation between the measured property and soil moisture must be calibrated and may vary depending on soil type. Reflected microwave radiation is affected by the soil moisture and is used for remote sensing in hydrology and agriculture. Portable probe instruments are generally used by farmers or gardeners.

3) **Humidity Sensor**

The humidity sensor HIH4000, manufactured by Honeywell is used for sensing the humidity. It delivers instrumentation quality RH (Relative Humidity) sensing performance in a low cost, the relative humidity is a measured. Percentage of the vapour in the air is compared to the total amount of vapour that could be held in the air at a given temperature.

Fig. 3 Humidity Sensor

4) **Temperature Sensor**

National Semiconductor's LM35 IC has been used for sensing the temperature. It is an integrated circuit sensor that can be used to measure temperature with an electrical output proportional to the temperature in oC. The temperature can be measured more accurately with it than using a thermistor. The sensor circuitry is sealed and not subject to oxidation, etc.

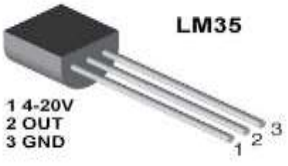

Fig. 4 Temperature Sensor

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5) **LDR (Light Dependent Register)**

Light Dependent Resistor (LDR) also known as photoconductor or photocell, is a device which has a resistance which varies according to the amount of light falling on its surface. Since LDR is extremely sensitive in visible light range, it is well suited for the proposed application.

Fig. 5 Light Dependent Register

6) **GSM Module**

This GSM Module can accept any GSM network operator SIM card and act just like a mobile phone with its own unique phone number. It can be used to send and receive SMS or make/receive voice calls. It can also be used in GPRS mode to connect to internet and do many applications for data logging and control. This GSM modem is a highly flexible plug and play **SIM900A** GSM module for direct and easy integration.

Fig. 6 GSM Module

7) **Relays**

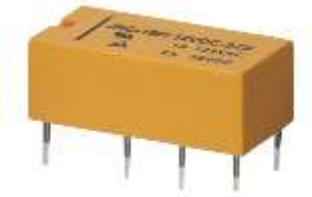

Fig. 7 Relay

A relay is an electrically operated switch. Many relays use an electromagnet to mechanically operate a switch, but other operating principles are also used, such as solid-state relays. Relays are used where it is necessary to control a circuit by a low-power signal with complete electrical isolation between control and controlled circuits, or where several circuits must be controlled by one signal.

Software Requirements

1) Eagle 2) Atmel Studio 3) Flash Magic

The above three softwares plays an important role the complete designing process of the system. Eagle is the software used for the designing of PCB. Then further PCB is generated with some process of fabrication. Atmel

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Studio is used to run and execute the code or programme of system hardware. After the successful execution of a program, the Hex file of the code is generated to the same location. And that Hex file is then dumped in to the microcontroller or the microcontroller is burned with the help of ISP programmer and Flash Magic software.

DESIGNED HARDWARE

This part of the system consists of various sensors, named as soil moisture sensor, humidity sensor, temperature and light detection sensors, etc. These sensors sense various parameters such as temperature, humidity, soil moisture and light intensity in the changing environment. Now, depending on the unnecessary changes in the environment, respective actions will be taken to activate output devices like water pump, sprayer, cooler, artificial lights, etc. These actions are taken on the basis of predefined database values for the sensors.

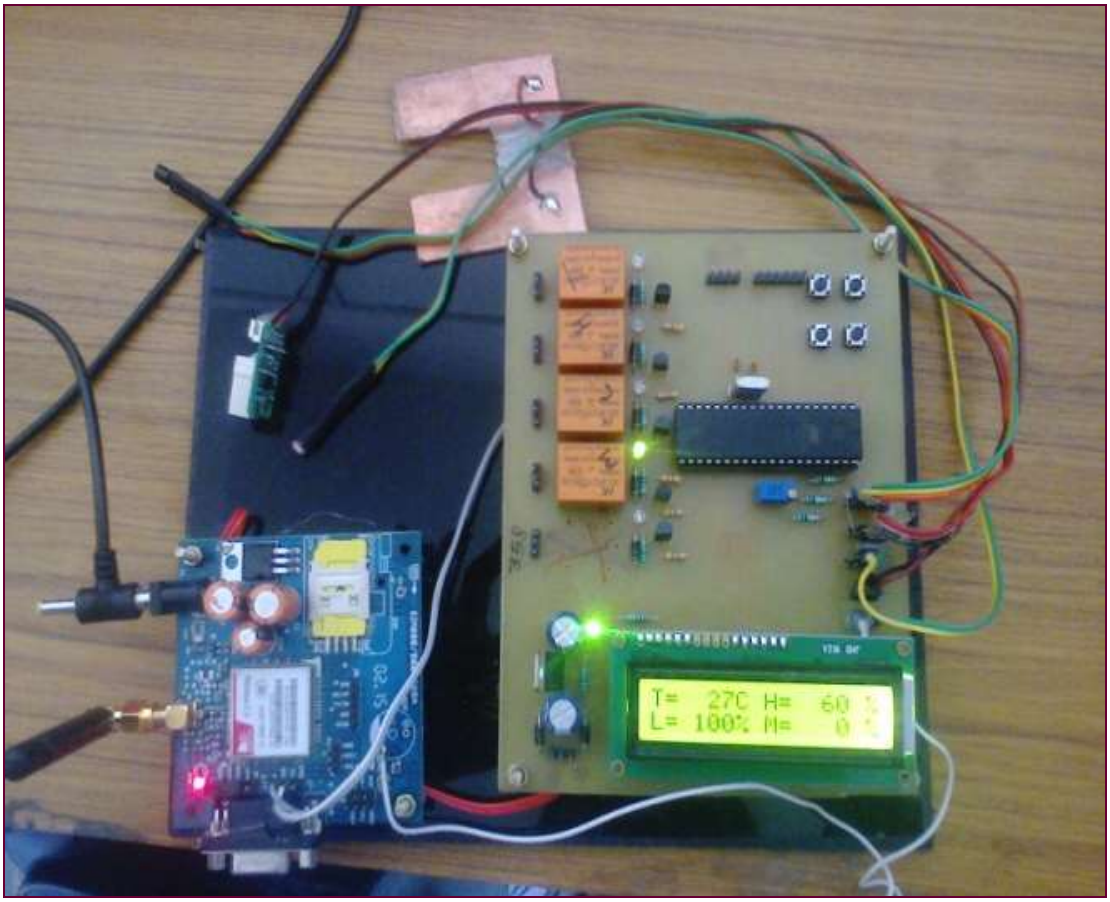

Fig. 8 Designed System Hardware

The complete operation of the system is performed on the basis of microcontroller base platform. LCD display is placed on the device to display the various data or paremeters of the working system, buzzer is also provided to the device for catching the attention of the operator or worker at the place where the system is placed. GSM module is provided to send all the updates to the owner of farm or greenhouse. So that, the owner will be able to take necessary decisions/actions for changes in the environmental conditions. So with the implementation of this system will make the agricultural and greenhouse sector completely automated. Infact all the manual working operations in the farm or greenhouse will change to complete automated working operations.

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PCB LAYOUT

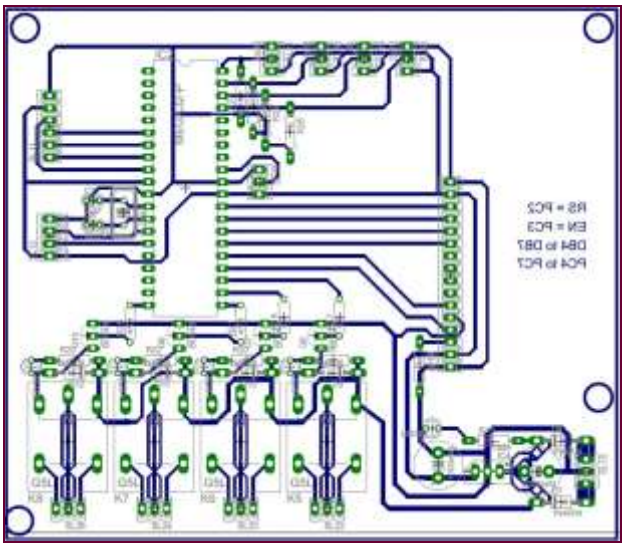

Fig. 9 PCB Layout

SCHEMATIC DIAGRAM

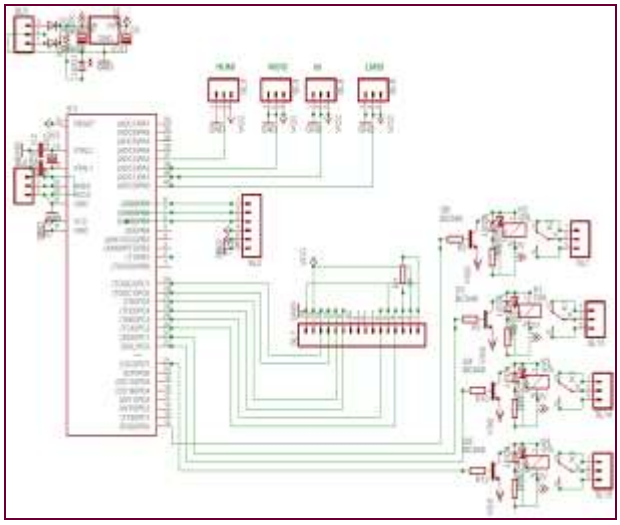

Fig. 10 Schematic Diagram

PRACTICAL RESULTS

The following snapshots of LCD display in the Fig. 11 are showing the practical results of the system. When the system was tested practically in the greenhouse environment, the following different results are observed with variations in the different environmental parameters as below.

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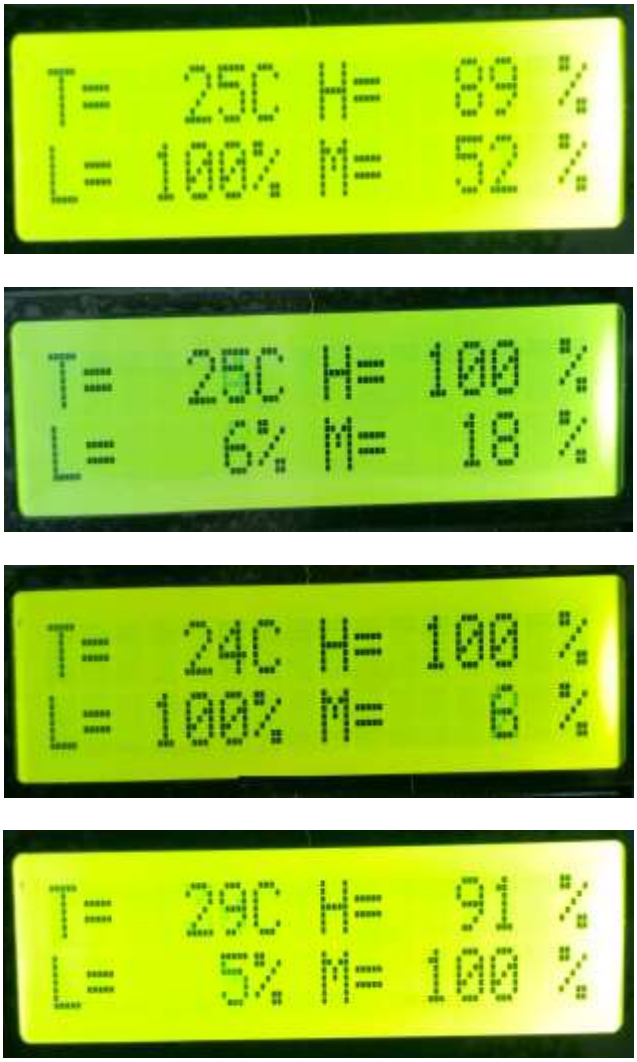

Fig. 11 Results on LCD Display

Above LCD snapshots are representing the different changes in the environment of greenhouse, which are observed on the system as the practical working results. These readings have been taken at different times, when the changes are observed in the environment with different parameters like temperature, humidity, moisture, light intensity, etc.

Also, the same observed results can be received further on the cellphone or mobile phone as shown in Fig. 12. These all the changes in the greenhouse can be observed on the personal cellphone by giving missed call on the number provided with GSM module in the system. This is one of the agenda used particularly in this system. Otherwise GSM module can be operated in another way also.

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Fig. 12 Results on Cellphone

SCOPE FOR FURTHER DEVELOPMENT

1) Instead of using buzzer, direct human voice alarm for respective action can be designed.
2) The number of sensors can be increased to add more fetures depend on the requirements which is possible by using various versions of microcontrollers.
3) Modification in the system can be done with the use of a datalogger and a graphical LCD panel showing the measured sensor data over a cyclic period of time.
4) Multiple controller system can be developed that will have master and slave units to operate with number of places or number of greenhouses simultaneously from the single master unit.

CONCLUSION

The system has successfully achieved the target of making the greenhouse automated. Monitoring and controlling operations of the greenhouse can be performed with this system at reduced cost and extremely low power consumption. Also, this system with low maintenance and less complexity provides more flexible and user friendly environment.

So, such a system can be a better option for the reliable working of greenhouse which will results in increased quantity as well as quality production.

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(I2OR), Publication Impact Factor: 3.785
(ISRA), Impact Factor: 2.114

REFERENCES

[1] Ramesh S. Gaonkar, "Microprocessor Architecture, Programming & Applications".
[2] Gonzalez, R.A., Struve, D.K. and L.C. Brown. 1992. "A computer-controlled drip irrigation system for container plant production", HortTechnology, pp.402-407.
[3] Fangmeier, D.D., Garrot, D.J., Mancino,C.F. and S.H. Husman. 1990. "Automated Irrigation Systems Using Plant and Soil Sensors". In: Visions of the Future. ASAE Publication 04-90. American Society of Agricultural Engineers, St. Joseph, Michigan, pp. 533-537.
[4] "Sensors and wireless sensor networks for irrigation management under deceit conditions", International Conference on Agricultural Engineering (AgEng2008), 2008.
[5] Pranit P. Kathale, Dr. A. M. Agarkar, "Hardware Implementation of Automated Pantry Order System using ZIGBEE", International Journal of Engineering Sciences & Research Technology, ISSN: 2277-9655, Vol.3, Issue 2, pp 630-633, February 2014.
[6] Neelam R. Prakash, Tejender Sheoran, Dilip Kumar, "Microcontroller Based Closed Loop Automatic Irrigation System", International Journal of Innovative Technology and Exploring Engineering (IJITEE) ISSN: 2278-3075, Volume-1, Issue-1, June 2012.
[7] R.suresh, S.Gopinath, K.Govindaraju, T.Devika, and N.SuthanthiraVanitha5, "GSM based Automated Irrigation Control using Raingun Irrigation System", International Journal of Engineering Research and Development e-ISSN: 2278-067X, p-ISSN : 2278-800X, Volume 4, Issue 11, PP. 51-54 51, November 2012.
[8] Pranit P. Kathale, Dr. A. M. Agarkar, "Review on Automated Pantry Order System using ZIGBEE", International Journal of Engineering Research & Technology (IJERT), ISSN: 2278-0181, Vol.3, Issue 1, pp. 474-478, January 2014.
[9] Muhammad Ali Mazidi, Janice Gillispie Mazidi, Rolin D, Mc. Kinlay, "The 8051 Microcontroller & Embedded Systems", Pearson Education Inc. 2nd Edition, 2008.
[10] "Arduino Based Automatic Plant Watering System", International Journal of Advanced Research in Computer Science and Software Engineering, Volume 4, Issue 10, ISSN: 2277 128X, October 2014 .
[11] "Intelligent Humidity Sensor for - Wireless Sensor Network Agricultural Application", International Journal of Wireless & Mobile Networks Vol. 3, No. 1, February 2011.
[12] Prof. Pranit P. Kathale, Jyoti Mankari, Payal Shire, "A Review on Monitoring and Controlling System for the Operation of Greenhouse Environment", International Journal of Advance Research in Computer Science and Software Engineering (IJARCSSE), ISSN: 2277-128X, Vol.5, Issue 4, pp. 366-369, April 2015.
[13] www.google.com.
[14] http://nrlp.iwmi.org/PDocs/DReports/Phase_01/12WateSavingsTechnologies-Narayanmoorthy.pdf
[15] https://www.nabard.org/pdf/OC 45.pdf.
[16] http://www.iimahd.ernet.in/users/webrequest/files/cmareports/15Analysis_Resource_Final.pdf.
[17] Ministry of agriculture, http://agricoop.nic.in.
[18] http://www.cicr.org.in/pdf/low_cost_drip.pdf.
[19] http://en.wikipedia.org.
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[22] http://www.atmel.com/images/doc2466.pdf.
[23] www.alldatasheet.com