ISSN (Online) 2394-6849

International Journal of Engineering Research in Electronics and Communication Engineering (IJERECE)
Vol 3, Issue 8, August 2016

Design and Implementation of Greenhouse Parameters Monitoring and Controlling System

[1] N. Gayathri, [2] G. Tirumala vasu, [3] Dr. V. Rajesh
[1]PG Student, Department of ECE, Siddharth Institute of Engineering & Technology, A.P, India
[2]Associate Professor, Department of ECE, Siddharth Institute of Engineering & Technology, A.P, India
[3] Principal, Usha Rama College of Engineering & technology, Krishna district, A.P, India

Abstract: **-- This paper proposes a new approach towards the monitoring and controlling of Greenhouse environment which is based on GSM technology. Microcontroller reads the value of sensor periodically and transmits the sensed data from monitoring node to sink node via GSM module. This proposed system is implemented using ARM7, Sensors (Humidity sensor, temperature sensor, gas sensor), GSM modem. If any of the Greenhouse parameters exceeds the threshold value set by the user, necessary control action will takes place automatically. Also alert will be provided to the user through GSM module. The controlling action will takes place with the help of fan, motor. If the Greenhouse parameter falls below the threshold value, the controllers will be turned off automatically.**

***Keywords*—GSM, ARM7, Temperature, Humidity, Gas**

I. INTRODUCTION

A greenhouse is a structure in which plants are grown. These structures range in size from small sheds to industrial-sized buildings. The greenhouse production has become way of rich. The miniature greenhouse is known as a cold frame greenhouses allow for great control over the growing plants. The growth of the crop in greenhouse depends on temperature, humidity co2 and other parameters in greenhouse. Greenhouse is an advanced facility available in which we can monitor the climate to increase plant growth and avoid the effects of season changes on the plant. The purpose of greenhouse environmental monitor is to get the best climatic condition for crop growth, crop yield and improve quality of crops. Innovations and environmental control options can aid the home gardener or horticulturists by automatically adjust the temperature, humidity and other parameters in greenhouse.

Greenhouse system still uses the labor-intensive system in monitoring temperature, humidity and gas. A lot of problems can occur not for worker but also affected the production rate because of the temperature, gas and humidity of the greenhouse must be constantly monitored to ensure optimal conditions. With the continued expansion of production scale, the disadvantages of conventional wire monitoring system or more and more prominent, such as complicated wiring and difficult maintenance. The wireless sensor networks can be used to gather the data from environmental parameters in greenhouse to make greenhouse monitoring and controlling system work properly. Greenhouse monitoring system based on wireless communication technology does not require any cables, add or reduce configuration at simple system construction. So it is very useful for in our greenhouse system application requirement.

II OVERVIEW

The Fig 1 shows the block diagram of greenhouse monitoring and control system architecture. It contains two modules, namely monitoring unit and controlling unit.

A. Monitoring Module

The monitoring module will be placed at the greenhouse. This module will consist of a microcontroller (LPC2148) which is designed on ARM7 architecture. This microcontroller is a 32 bit and is chosen because of its low power consumption. The sensor array will have three sensors namely temperature sensor, gas sensor, humidity sensor. the microcontroller monitors the sensors; these sensors will give an analog output i.e. variable output. To read this information the microcontroller needs to convert this analog values to digital form. this is done with the help of ADC. LCD is used for displaying the parameter values.

ISSN (Online) 2394-6849
International Journal of Engineering Research in Electronics and Communication Engineering (IJERECE)
Vol 3, Issue 8, August 2016

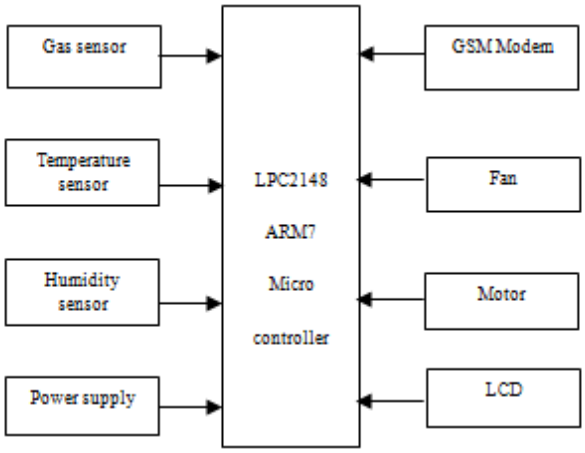

Fig.1 Greenhouse monitoring and controlling system

B. Controlling module

The controlling devices are used to control the environmental parameters. Here in this project fan is used to control the gas. If gas exceeds the specified range the fan will on automatically. Similarly if the temperature exceeds the threshold value, the motor will be on automatically. In this way we can control the two parameters. This is only for demo purpose this structure can be changed based on the plant.

III HARDWARE SYSTEM DESIGN

A. ARM7 Microcontroller

This microcontroller is a 32 bit and is chosen because of its low power consumption, inbuilt 10 bit ADC, and UART based serial communication and is suited for application requirement. ARM7 is based on enhanced RISC (Reduced instruction set computing). It has on-chip flash memory32KB to 512KB, on-chip static RAM 8KB to 40KB. 60 MHZ maximum CPU clock available from programmable on-chip PLL with settling time of 100s.

B. GSM

The advantage of GSM is, its international roaming capability in over 100 countries, improved battery life, efficient network design for less expensive system expansion, efficient use of spectrum, advanced features such as short messaging and caller ID, a wide variety of handsets and accessories, high stability mobile fax, Easy to use over air activation, and all account information is held in a smart card, which can be moved from handset to handset. The baud rate is configurable from 9600 to 115200Kbps. The GSM module used in this project is SIM900 which offers all features mentioned above and serves as a medium between sink node and the user. Its operating voltage ranges from 4.2V to 12V.

C. Relay Driver

A relay is an electromechanical switch, which perform ON and OFF operations without any human interaction. Generally, the relay consists a inductor coil, a spring Swing terminal, and two high power contacts named as normally closed (NC) and normally opened (NO). When there is no power applied to the inductor coil (Relay is OFF), the spring holds the swing terminal is attached to NC contact. Whenever required power is applied to the inductor coil, the current flowing through the coil generates a magnetic field which is helpful to move the swing terminal and attached it to the normally open (NO) contact. Again when power is OFF, the spring restores the swing terminal position to NC.

D. Sensors

There are three types of sensors used in this project namely temperature sensor, gas sensor, humidity sensor. These are used to sense the environmental parameter values. The outputs of these sensors are analog output. It transmittes their output to ARM microcontroller. LCD displays temperature, gas, humidity values. The detail description of those sensors described as follows.

1) Temperature Sensor

The temperature sensor used in this project is LM35. LM35 is a precision IC temperature sensor with its output proportional to the temperature (in **o** C). The sensor circuitry is sealed and therefore it is not subjected to oxidation and other processes. With LM35, temperature can be measured more accurately than with a thermistor. It also possesses low self -heating and does not cause more than 0.1**o**C temperature rise in still air. The operating temperature range is from -55°C to 150°C. The output voltage varies by 10mV in response to every **o** C rise/fall in ambient temperature, *i.e.*, its scale factor is 0.01V/**o** C.

2) Gas Sensor

MQ5 Gas sensor is used in this project. The sensing element of gas sensor is a tin dioxide (sno2) semiconductor which has low conductivity in clean air. In the presence of a detectable gas, the sensor's conductivity increases depending on the gas concentration in the air. A simple electrical circuit can convert the change in conductivity to as output signal

ISSN (Online) 2394-6849
International Journal of Engineering Research in Electronics and Communication Engineering (IJERECE)
Vol 3, Issue 8, August 2016

which to the gas concentration. It has high sensitivity to methane, propane, and butane, making it ideal for natural gas and LPG monitoring. The sensor can detect a wide range of gases, making it an excellent, low cost sensor for a wide variety of applications. Also, available with a ceramic based highly resistant to severe environments up to 200 ^{0}C.

3) Humidity Sensor

The humidity sensor used in this project is DHT11. This sensor senses the humidity in the surrounding environment based on the water content in the atmosphere. The dielectric value is directly proportional to the humidity in the surroundings based on which the humidity value is calculated. It ensures high reliability and excellent long-term stability. This sensor includes a resistive-type humidity measurement component and an NTC temperature measurement component, and connects to a high-performance 8-bit microcontroller, offering excellent quality, fast response, anti-interference ability and cost-effectiveness. Each DHT11 element is strictly calibrated in the laboratory that is extremely accurate on humidity calibration.

IV SOFTWARE SYSTEM DESIGN

A. KEIL Micro vision4

KEIL µ vision tool IDE (integrated Development Environment) is a windows base front for the C-compiler and assembler. KEIL µ vision tool is used for writing embedded C-programs. Embedded C is a high level language, which includes many aspects of the ANSI (American National Standard institute) C-programming language. Standard libraries are altered or enhanced to peculiarities of an embedded target processor. CX51 is a cross compiler to compile C programs for your target environment and provides and several extension to ANSI standard C to support elements of the microcontroller architecture. These C Programs are referred as embedded C programs. in .c form. and hex file can be automatically created. This file can be dumped in microcontroller using flash magic.

A. Flowchart

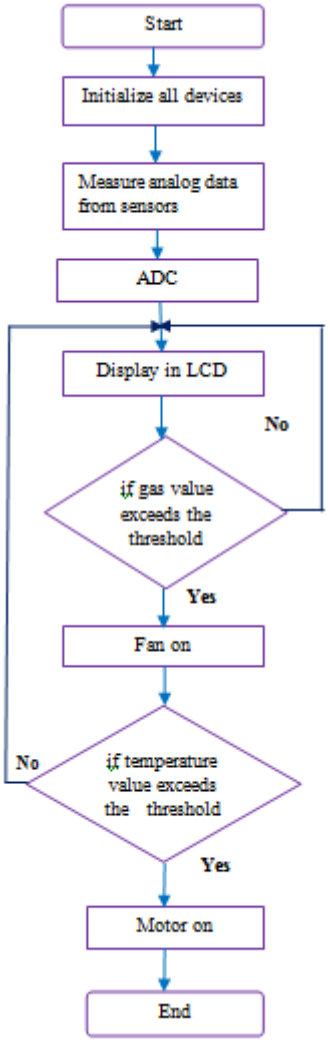

Fig2: Flow chart for greenhouse monitoring

C. PROTEUS

ISIS provides the development environment for PROTEUS VSM, our revolutionary interactive system level simulator. This product combines mixed mode circuit simulation, micro-processor models and interactive component models to allow the simulation of complete micro-controller based designs. ISIS provides the means to enter the design in the first place, the architecture for real time interactive simulation and a system for managing the source and object code associated with each project. In addition, a number of graph objects can be placed on the

ISSN (Online) 2394-6849
International Journal of Engineering Research in Electronics and Communication Engineering (IJERECE)
Vol 3, Issue 8, August 2016

schematic to enable conventional time, frequency and swept variable simulation to be performed. Library files can be set to Read Only. This prevents users from messing with symbols or devices that may be used by others. It Support for both interactive and graph based simulation.

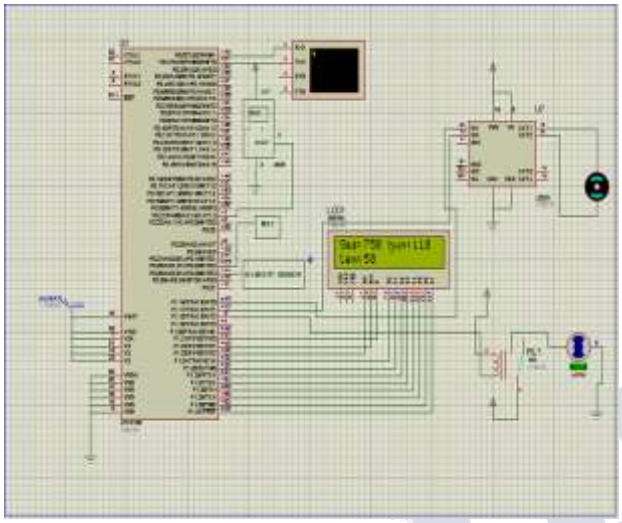

Fig 3: Simulation design

V RESULTS

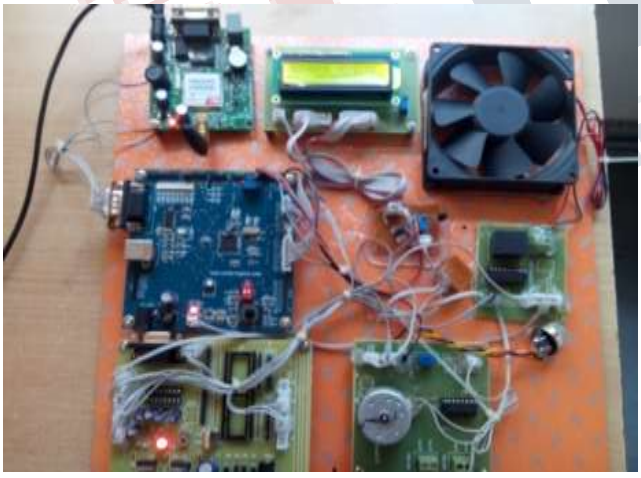

Fig 4: greenhouse monitoring and controlling kit

Fig5: LCD display

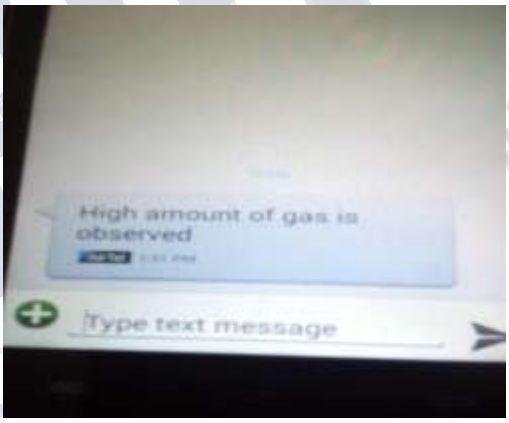

Fig 6: Message sent to user

V CONCLUSION

This project implementation primarily focuses on monitoring and controlling of Greenhouse parameters automatically. The implementation of this automatic monitoring and control of Greenhouse parameter using microcontroller and GSM technology had successfully been done, which leads to reliable and cost effective system. The roposed system utilizes the sensor for detecting the Greenhouse parameters, as well as GSM technology to send alert notification message to the user. By testing we obtain the expected performance and reliability. In this project for controlling Temperature and Humidity, GSM module is used.

ISSN (Online) 2394-6849
International Journal of Engineering Research in Electronics and Communication Engineering (IJERECE)
Vol 3, Issue 8, August 2016

FUTURE SCOPE

In future we can also add of more sensors to monitor other environmental parameters such as Soil PH Sensor, and oxygen Sensor while allowing the replacing of current sensors if a wider range of measurements is desired. And also Integration of additional monitoring devices such as a Wi-Fi camera to monitor growth of agricultural product. And also the data can be uploaded to web server continuously.

ACKNOWLEDGEMENT

We would like to thank our mentor and guide Associate Prof. G. Tirumala Vasu for guidance and help throughout our project. We are also thank full to our institute Siddharth institute of engineering & technology, puttur, India for providing all the facilities needed for our project.

REFERENCE

[1] Zhang Xin, Du Bo, Fend Lei, Liu Wen-Zhou, "Development of the wireless Environmental monitoring system", International Conference on Computer Application and System Modeling (ICCASM), 2010.

[2] Ma Yuquan, Han Shufen, Zhang Lihong, "A Control System of Environment Parameters of Greenhouse Group Based on Double CAN Bus", International Conference on Computer and Communication Technologies in Agriculture Engineering, 2010.

[3] Yang Shulian, Zhang Yu, "Wireless Measurement and Control System for Environmental Parameters in Greenhouse", International Conference on Measuring Technology and Mechatronics Automation, 2010.

[4] D. D Chaudhary, S. P Nayse, L. M Waghmare, "Application of Wireless Sensor Networks for greenhouse Parameter Control in Precision Agriculture", International Journal of Wireless & Mobile Networks (UWMN) Vol. 3, No. I, February 2011.

[5] Sammons, P. J Furukawa T &Bulgin A, "Autonomous Pesticide Spraying Robot foruse in a Greenhouse". Australasian Conference on Robotics and Automation. Sydney, Australia, pp. 1-9, 2005.

[6] Kittas, C. T Boulard and G. Papadakis, Natural ventilation of a greenhouse with ridge and side openings: sensitivity to temperature and wind effects. Transactions of ASAE, 40(2): 415-425, 1997.

[7] Dr. K.V. K. K Prasad, "Embedded Real Time Systems", Dream tech Press Publication, 2nd Edition, 2005.

[8] Daniel W Lewis, "Fundamentals of Embedded Software where C and Assembly meet", Publisher Prentice Hall Inc, ISBN 0-13-06 1589-7, 2002.

ABOUT AUTHORS

N. Gayathri received Bachelor of Engineering degree in Electronics and Communication Engineering from Sri Venkatesa Perumal College of Engineering and technology, Puttur, India in 2014. She is persuing her M.tech. degree in Embedded Systems from Siddharth Institute of Engineering and technology, J.N.T.University, Anantapur.

G.Tirumala Vasu received the B.Tech degree in Electronics and Communication Engineering in 2007 from the SV University, Tirupati and M.Tech degree in DECS in 2009 from JNTUA, Anantapur. Presently he is working as Associate Professor in Siddharth Institute of Engineering And Technology, Puttur. His areas of interest include Digital image processing,Digital Signal Processing, Embedded Systems,Antennas and Wave Propagation.