Green Wall Automation System

Anita Devi
Electronics and communication engineering Department,
MVN University, Palwal, Haryana

Manju Kaushik
Ph. D Scholar
MVN University, Haryana, India

Dr. Rajeev Ratan
HOD (ECE)
MVN University, Haryana, India

Dr. S. K. Luthra
Vice Chancellor
MVN University, Haryana, India

Abstract- The main objective of this paper is to automatically irrigate plants grown vertically using special type of structures at particular angle that can be either free-standing or attached to walls, which can provide good appearance to a building, adding color and texture that won't go out of fashion. The system is controlled using 8253 micro controller. Soil moisture sensors are connected micro controller via comparator, when there is change in humidity of the soil, these sensors senses the change and gives signal to port of the micro-controller and thus pump is switched.

Keywords: Micro controller; soil moisture sensor

I. INTRODUCTION

System is dealing green wall irrigation control based on embedded system. The system presented here waters our plants regularly when we are out of vocation. The circuit comprises soil moisture sensor and analog to digital converter built using op-amp IC LM324. Op-amp's are configured here as a comparator. Two stiff copper wires are inserted in the soil to sense the whether the Soil is wet or dry. The Microcontroller 8051 family was used to control the whole system. It monitors the sensors and when more than two sensors sense the dry condition then the microcontroller will switch on the motor and it will switch off the motor when all the sensors are in wet condition. LCD shows dry and wet condition of moisture sensors.

A. Green wall-

Green infrastructure is the concept of using plants in urban and indoor areas in order to receive the benefits of their natural biological processes and improve the overall living environment. Living green walls are panels of plants, grown vertically using hydroponics, on structures that can be either free-standing or attached to walls. Living green walls are also referred to as vertical gardens, green walls. The idea for living green walls was first given by Stanley Hart White in 1938.

A well-designed, green wall can improve a building's appearance, adding color and texture that won't go out of fashion. Each wall is specifically designed, using different varieties of plants which can vary in color, growth and flower to create living art, inside and outside of building.

B. Irrigation system-

It is important to irrigate vertical green wall in order to provide moisture and keep plants growing. From an irrigation supply tank, I connected tube across the top of my green wall, with emitters to release water. Irrigation system is made to release water up to wet condition of sensor for three to four times daily, depending on weather condition of the area. Felt sheet is advisable to use attached to the frame to avoid rust.

Water is pumped from the tank to the green wall. Water is distributed to the plants in the wall. Gravity pulls excess water downward. Excess drainage water collects at the bottom of the wall and is fed back to the tank. This water is then used over and over (recirculates). Larger green walls have a direct irrigation system and smaller walls have a recirculating system, although this can vary. Each system has its advantages and disadvantages.

II. SOFTWARE AND HARDWARE PLATFORM USED

A. Hardware used-

Micro controller, ADC, Humidity sensor, Comparator, LCD, diodes, resistors and capacitors.

B. software used-

Micro c compiler

III. CONSTRUCTIONS AND WORKING

The input is 230V AC which is step down using the adapter (12V) .The 12V ac input is fed to the bridge diode to gives 12V pulsating DC. This DC voltage is filtered through the capacitor to remove the ripples. The filtered DC is fed to 7805 regulator to fetch +5v regulated output. This regulated voltage is given to all the components to function properly. In this project we have used moisture sensor having copper plates to measure the conductivity in the sand. When the sand is dry the conductivity is pretty low, and the conductivity increases as the humidity increases, and when the sand dries up the conductivity decreases. We have used this conductivity property to measure the humidity level of water. We have measured the voltage using the probes and property of conductivity, this voltage is analog type. We have converted this analog signal into digital by using Op-amp LM324. In the comaprator mode of operation the op-amp compares the input voltage of the system with a pre-defined threshold voltage and depending on the mode of operation of the op-amp(i.e. inverting and non-inverting mode of operation) generates the output in digital format. If the mode of operation is inverting in that case if the input is less than the threshold the output is high else low and vice versa is the case for non- inverting mode of operation i.e. if input is higher than the threshold voltage output is high else the output is low. Finally, it is interpreted that the op-amp in comparator mode is used for analog variation in two digital discrete levels of voltages.

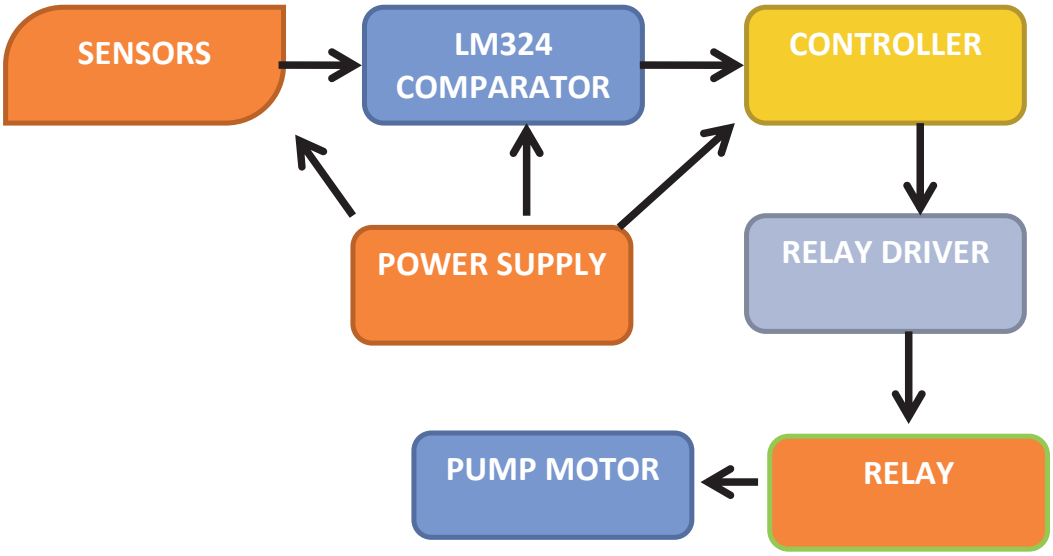

Fig 1 Block diagram of green wall automation system

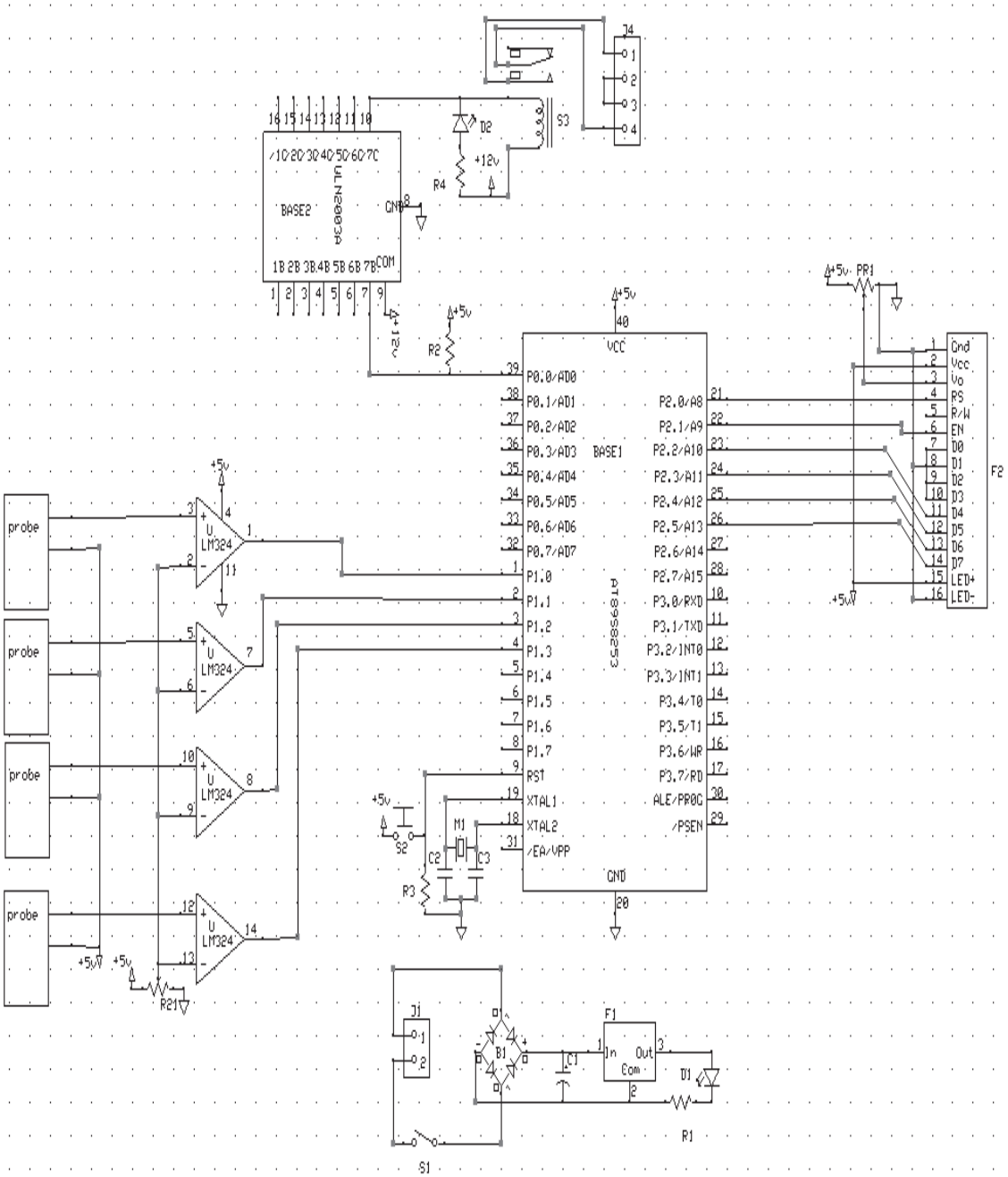

Fig 2. Ckt diagram

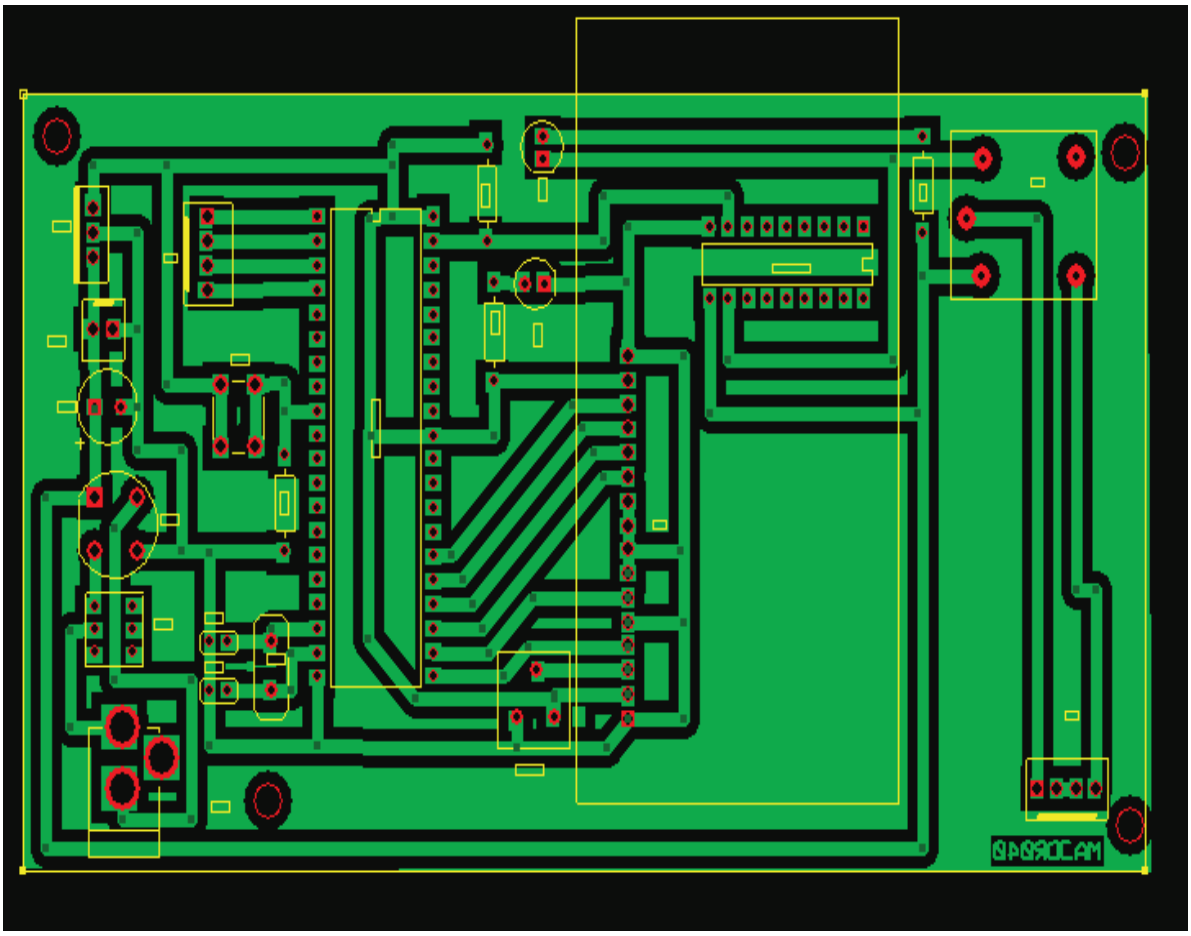

Fig 3 Layout

The Microcontroller was used to control the whole system it receives digital signal from comparator, monitors the sensors and when more than two sensors sense the dry condition then the microcontroller will switch on the motor and it will switch off the motor when all the sensors are in wet condition. These are used to switch on and off motor as per controller output. LCD displays dry or wet condition of sensor using alphabet'd' for dry and 'W' for wet as shown in project image. The microcontroller does the above job it receives the signals from the sensors, and this signals operated under the control of software which is stored in ROM. Motor or pump operates according dryness of soil and Current flows through designed relay card using relay driver (ULN2802). In relay the control coil, which is wrapped around an iron core? The iron core intensifies the magnetic field attracts the upper arm and pulls it down, closing the contacts and allowing power source to go to the load. The major advantage of using this IC (ULN2803) is that it can fulfil the need for high voltage and high current also. This is enabled through a low voltage and low current source to give high voltage and high current output. LED indicates the operation of relay. When LEDs are on, that means relays are operated to switch on motor pump. If it is off there is no need of water and motor and relays are in off position. Water pump supplies water to the plants from tank. A tube is connected across the green wall, with three emitters to release water in to three primary plant containers. Other plant containers may be connected in parallel to these primary containers using plastic pipe as shown in green wall image with project. Using this method, we can supply water to nine no. of plant containers and beautiful small size green wall irrigation is controlled.

Fig 4 Image of green wall automation system.

IV. RESULTS

Project automatically controls the irrigation of green wall successfully. Microcontroller AT8253 controls the motor according to condition of soil moisture sensor. When sensors are in wet condition, it switches off the water pump and switches on the water pump when more than one sensor is in dry condition. Dry and wet condition of sensor can be easily seen from LCD. Studies show that by controlled irrigation 30-50% of water is saved than conventional method. Less amounts of water is supplied in controlled manner according dryness condition of sensors which improves growing conditions. Drip irrigation increases watering times to plants, prevents soil erosion and saves nutrient. Also, because the water flow is no of times, water goes deeply into the sand that goes into the root zone. Water is supplied only when it's needed as sensors are added to the system for automatic watering. It is very easy to modify drip irrigation system to adjust it to the needs of the garden or lawn.

Table-1 Experiment Result

SENSOR POSITION	LCD READING	MOTOR
All in wet soil	**W W W**	**Off**
Two in wet soil And one is dry	**W W D**	**Off**
Two are dry & One is in wet soil	**D D W**	**On**
All are dry	**D D D**	**On**

V. CONCLUSIONS

The system has no. of benefits and can be operated with less manpower. This system supplies water only when moisture in the soil decreases below the reference value. Due to the direct supply of water to the roots less water is used and it helps to maintain the humidity to soil ratio at the roots constant up to large extend. Thus the system is compatible and efficient to change the environment.

VI. FUTURE SCOPES

The system which is discussed above is made on the board and the results are shown. But this system performance can be improved with present technology in the area of wireless communication and GSM technology using Short Message Service with the help of embedded technology. The future bright for green walls, they are in mind of city developers and could be an important tool to solve future energy, space, and water and food problems. They can ensure low transportation fresh food in a limited foot print and produce with a minimum amount of water. In future, green walls will control the environmental pollution. As they will be developed, they will generate new jobs.

REFERENCES

[1] Purna Prakash Dondapati, “An Automated Multi Sensored Green House Management" International Journal of Technological Exploration and Learning (IJTEL) Volume 1 Issue 1 (August 2012) –Page no: 21-24.

[2] Uday A. Waykole , “Greenhouse Automation System” 1st International Conference on Recent Trends in Engineering & Technology, Mar-2012, Special Issue of International Journal of electronics, Communication & Soft Computing Science & Engineering, ISSN: 2277-9477-Page no:161-166.

[3] Sumit A. Khandelwal, "Automated Green House Management Using GMS Modem" , International Journal of Computer Science and Information Technologies, Vol. 3 (1) , 2012, 3099 – 3102

[4] Indu Gautam, “Innovative Gsm Bluetooth based Remote Controlled Embedded System for Irrigation” International Journal of Computer Applications (0975 – 888) Volume 47– No.13, June 2012, Page no: 1-7.

[5] K. Rangan, Indian Institute of Technology Madras, Chennai, India, T. Vigneswaran, SRM University, Chennai, India " An Embedded Systems Approach to Monitor Green House" 978-1-4244- 9182-7/10/$26.00 ©2010 IEEE, Page-61-65.

[6] Kiran Sahu, Mrs. Susmita Ghosh Mazumdar " Digitally Greenhouse Monitoring and Controlling of System based on Embedded System " International Journal of Scientific & Engineering Research, Volume 3, Issue 1, January-2012 1 ISSN 2229-5518.

[7] Rajeev G Vishwakarma, Vijay Choudhary Department of Computer Science, SVITS Indore, India " Wireless Solution for Irrigation in Agriculture" Proceedings of 2011 International Conference on Signal Processing, Communication, Computing and Networking Technologies (ICSCCN 2011).

[8] Vandana Pandya, Deepali Shukla , Asst.Professor, Medicaps Institute of Technology & Management, Indore (M.P.), India " GSM Modem Based Data Acquisition System " International Journal Of Computational Engineering Research (ijceronline.com) Vol. 2 Issue.5.

[9] G.K. Banerjee, Rahul Singhal, Electrical engineering dept., College of Technology G B Pant University Pantnagar, India " Microcontroller based Polyhouse Automation Controller" 2010 International Symposium on Electronic System Design.

[10] B.Chiranjeevini Kumari, K.Rajasekar, BVCEC, India "Implementation of SMS based Heartbeat monitoring system using PSoC Microcontroller" IJECT Vol. 2, SP-1, Dec . 2011 ISSN : 2230- 7109(Online) | ISSN : 2230-9543(Print).

[11] Andersson, K., Bakke, J. V., Bjorseth, O., Bornehag, C.-G., Clausen, G., Hongslo, J. K., et al. (1997). TVOC and Health in Non-industrial Indoor Environments. Denmark: Munksgaard.

[12] Baugman, A., & Arens, E. (1996). Indoor humidity and human health - Part I: literature review of human health effects of humidity-influenced indoor pollutants. Indoor environmental quality, 102, 193-211.

[13] Green over Grey. (2012). Gallery - green wall projects and living wall images. Retrieved January 2013, 28, from Green over Grey living walls and design: http://greenovergrey.com/photo-gallery/photogallery.php

[14] Norback, D., Michel, I., & Widstrom, J. (1990). Indoor air quality and personal factors related to sick building syndrome. Scandinavian Journal of Work, Environment & Health, Vol. 16 , 121-128.

[15] Rossenfeld, C. (2004, August 1). Budding business. Commercial Property News, 18(14). Available at ebscohost.com.

[16] Monroe, L. K., Madsen, J. J., Garris, L. B., Suttell, R., Geneser, E. A., & Easton, S. (2004). Green: Your questions answered. Buildings, 98(5), 28-44.

[17] Ries, R. and Bilec, M. M. (2006). The economic benefits of green buildings: A comprehensive case study. The Engineering Economist, 51(3), 259-295.

[18] M.A. Mazidi & J G mazidi, the 8051 micro controller and embedded systems, Pearson education asia, (2002).

[19] Scott MAC. Kenzie, The 8051 micro controller, second edition, pretice hall Inc., USA, (1995).

[20] John B Peatmen, Design with micro controllers, Mc- Graw Hill, USA,

[21] Michael Predko, Hand- Book of micro controllers, Mc-Graw Hill, New-york, (1999).

[22] Jonathan W Valvano Embedded micro processor systems, Thimson asia pvt. Ltd, Singapore, (2000).

[23] Takashi kenjo and Akira sugwara, Stepping motors and their micro-Processor control, Oxford science Publications, Clarendon press, Oxford, (1994).