Monitoring and Controlling of Environmental Parameters in a Polyhouse

[1]PREETI V. HAZARE, [2]APURVA V. THAKARE, [3]POONAM R. SELUKAR, [4]SHIWANI KUMARE, [5]SWAPNIL NIKHATE

Assistant Professor in Electrical Engineering
Datta Meghe College of engineering and technology,
Sawangi Meghe, Wardha.

ABSTRACT: **Farming is a fast emerge and highly competitive industry. With the continuous introduction of new cultivators and new plants, cultural techniques are changing and consequently new products are developing. Ornamental crop culture technology is enhancing with the availability of equipment and there is a sea change in the trend of consumers. Modern technology is employed with new generation of growers for maximizing production and offer quality produce for consumer acceptability, thus fetching a better price. It has emerged as a lucrativeprofession with the much higher potential for returns compared to other Agri-horticultural crops.**

***Keywords*: AC Power Supply, Motors, Sensors, Microcontroller, Relays.**

I. INTRODUCTION

Earlierfarmer uses old and traditional methods of crop cultivation which require a massive amount of hard work and attention. Also the results of crops were obtained with poor accuracy and less fertility. This causes barrier in implementing traditional cultivation techniques as old methods need a lot of hard work and also they were time adaptable. The poly houses provide automatic and effective controlling techniques for betterment in crop growth over old growing methods. This will make less human efforts which required for growing crops in open field. Poly houses are framed or inflated structures covered with transparent or translucent material large sufficient to grow crops under partial or full controlled environmental conditions to get optimum growth and abundance. At present, the data transfer between the poly houses and the control system is mainly provided by suitable wired communication system, such as a field bus. It is well known that, about 95% of crops, either crop cash crops are grown inopen field where the climatic conditions are extremely injurious resulting poor growth of crops. Hence poly houses are peculiarly needed to grow plants under natural environmental conditions. Different atmospheric factors are responsible for development of plant growth. In some case various factors like light, temperature, humidity, CO2 gas are composedby environment which, poor or weak environment can damage plants by providing disease. Hence for better apprehension of climatic factors is necessary that may affect the development of the plants and appropriate actions can be drawn to prevent these difficulties. The imbalance of parameters causes various diseases for crops growth. To overcome these diseases, environmental parameters are needed to be control. Hence the system is made based on wireless communication which is stable and suitable for data acquisition and device control in different kind's agricultural sites. The necessary hardware used in this project is microcontroller (At-mega2560) as central processing unit, sensors for sensing the physical parameters, relays for controlling output devices and LCD for displaying the parameters under control. The software used is Micro C pro for AVR and protocol for communication is TCP/IP. The sensors, constitute the data acquisition system, sense the change in parameters and provide information to the microcontroller.

II. LITERATURE SURVEY

Jaypal Baviskar and Afshan Mullagives the Greenhouse facility which precise monitoring and controlling of various parameters, so as to cultivate quality conscience crops without slaying resources. The cabling laid for the sensors, deployed inside the Greenhouse is not feasible. Hence the need for an automated system employing wireless communication and remote sensing is imperative. This paper proposes a Wireless Sensor Network (WSN) based embedded system and deals with the implementation of ZigBee network for remote controlling of the Greenhouse parameters. The detailed information regarding establishment of ZigBee network in Star topology as well as in Mesh Topology, inside the Greenhouse is illustrated. It also demonstrates the real time monitoring of parameters such as temperature, humidity, as well as the total power consumption of the system, with the help of a PC based GUI application developed on Java platform [1].

S.R.Boselin Prabhu propose that a sensor is miniture compontent which measure physical parameters from the environment.sensors measure the physical parametar and transimit them either by wired or wireless medium [2]

.P.J.Gurao propose that environmental parametrs like light intensity,concentraion of gases is monitor andmoisure in a air temprature and factors like growth of plants can be affected by varition in these parametar ,so if one these parameter is changes,it can be monitored by internally automatically contral envirnmetal designed in prosed system [3].

Hemraj and Sukesha proposed that a modal which uses the AODTPC protocol of real time power consumption managing capability in which the environmental parameters like temperature and relative humidity are monitored and controlled to maintain the intended range inside the green house. [4].

Qui Zengshuai proposed that the high-precision mechanism model of the greenhouse and the problem of the nonlinear strong coupling between temperature and humidity, also the method of accurate linearization in the nonlinear system [5]

The environmental conditions are mostly responsible for the development of a plant or crop. Due to climate factors in the environment consists of many different factors including light, ambient temperature, soil temperature, humidity, soil moisture, and CO2 which can directly or indirectly forces the natural growth of plants.Theseplay a relevant role in the quality and productivity of plant growth. In some cases, poor environmental conditions can either damage a plant directly or indirectly. An Embedded systems approach to monitor poly house have become quite important now a days, particularly for monitoring and control of polyhouse systems. A good understanding of these climate factors allows the raiser to be more aware of any potential problems that may affect the development of the plants and appropriate actions can be drawn to prevent these problems from happening. At the same time, if the value of these parameters is continuously changing then it also causes the disease on crops. in case of Sarpagandha, high humidity of 80-85% and temperature range of 10-40 degreeC cause development of the powdery mildew disease because of which small darken areas appears on the leaves of Sarpagandha which later become white powdery spot. Hence there is need for controlling of environmental parameters as per the requirement of proper and disease free plants.

POLYHOUSE AUTOMATION

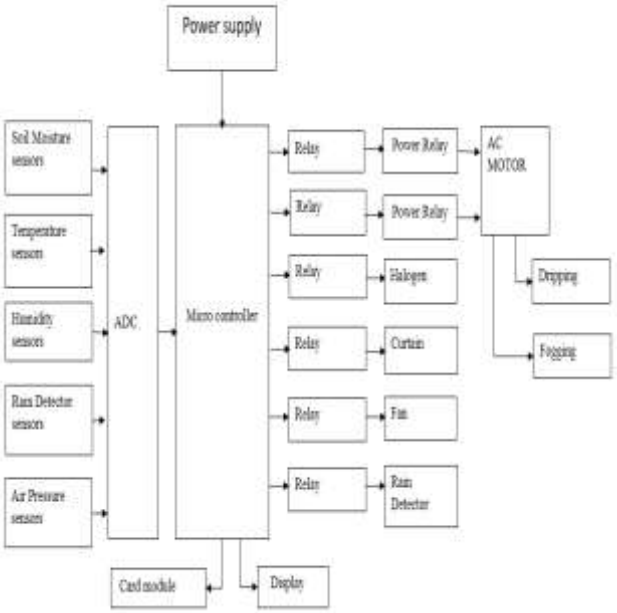
Poly house isa system which protectsthe agricultural crops and plants of farmers from sudden change in climate and regulates the environment inside the Poly house according to the requirement. Because of this the farmers can grow their crops without any external obstruction. Thus, monitoring and controlling forms the core element of a Poly house development. Control of internal environment is achieved by managing several elements like air movement, sliding louvers, exhaust fans, heaters, air conditioning systems, sunroof, etc. In our project the complete Poly house automation control system will be done through a network of sensors and controllers/actuators, which in turn will detect the environmental changes of the Poly house and take necessary action against predefined set of normal values. Factors such as economics, size, and ambient environment shall determine the level of complexity of a poly house control system. In this section we briefly review the various existing and upcoming technologies which can be incorporated for achieving Poly house automation monitoring and control. The farmer or a service provider can set different sensors datum control parameters. When the sensor sense, the network detects a value that is higher or lower than the predefined datum, then the required sensors will turn on automatically. Sensors are installed both inside and outside of the Poly house. The outside sensors collect the data about the ambient weather conditions such as rain detector sensor, on the other hand the insides sensors detect the Poly house response such as temperature, humidity etc. In case of multiple control system, a logical advancement from single point static control, a single access point can control multiple devices or elements. For example, exhaust fan followed by switching on light and sliding louvers can be simultaneously activated based on single input parameter. For large-scale applications such control strategies can be implemented on an integrated control platform, e.g. microcontrollers or Programmable Logic Controllers (PLC). Individual microcontrollers can be networked in a modular fashion with a master controller, which manages multitasking. Sensor networking can be achieved through a wired network (WLAN) or alternatively a Poly house wireless sensor networks (WSN). A field server is essentially a computer that should be durable, compact and economical enough to be installed universally in the fields throughout the year. With deep penetration of internet services to remote countryside, it is possible to convert a field server into a web server. In such cases, a field server will have its own Internet Protocol address. Such a system greatly increases the versatility of the monitoring and control strategy. The need for continuous in-situ monitoring by personnel is eliminated to a large extent, as farmers and stakeholders can be remotely connected to the poly house environment through a simple internet connection. The field server (Web server) collects all the sensor data and publishes it on the World Wide Web (WWW) in the form of HTTP; this is done in real-time and all the clients having authenticated access to the web server will get this data through the internet. Such a system can also be easily extended so that the control and monitoring of specified parameters can not only be done through the internet, but farmers can also use their mobile telephones to accomplish the same task. Benefit of using the mobile phone is that there is no limit to the distance as well as there is no need for proximity of the client to an internet connection. In this paper, we demonstrate an internet based process monitoring and control system for a Poly house. The developed system, as noted earlier, has the possibility of integration with GSM communication platform

III. METHODOLOGY

In poly house, relevant conditions influence the crop condition and growth. Internal environmental parameter can be monitored and controlled by different mechanism. The cultivation of crops in the poly house is very complex issue and this issue can be simplified by checking level of water, temperature, etc. A Poly House is a Structure made up of polyethylene, usually, 3 shapes known as Barrel Shaped, Ridges and Furrow and Saw Tooth Shaped are used. The interior structure of the poly house heats up due to incoming solar radiation from the sun and warms plants, soil, and other things inside building faster than the heat can escape the structure. Air warmed by the heat from hot interior surfaces is retained in the building by the roof and wall. Temperature, humidity and ventilation can be controlled by equipment fixed in the Poly House. Poly house is the process in which the plants are being monitored and survived for their future growth. We are also measuring the various parameters like temperature, light, humidity, soil moisture and will be displayed on the LCD. We are also giving the security to the playhouse.

Temperature and light is sensed by respective sensors and sensor output is amplified and given to ADC. Microcontroller controls these parameters and keeps them at some predefined levels using relay interface. These relays can be connected to all control devices. And the values of temperature and light to a computer through serial port.

BLOCK DIAGRAM



1.Sensors : we are going to use soil moisture sensors, humidity sensors, rain detectors sensors temperature sensor and lair pressure sensor to sense soil moisture ,humidity rain detect, temperature and air pressure respectively. These sensors sense the parameters and gives corresponding voltage output

2. ADC: The main part of our project is microcontroller which reads only digital input. (0V & 5V) But the output of Amplifier is in analog form, so it has to be converted into digital format, for this purpose we are going to use ADC to convert analog output from amplifier into the digital output to be given to microcontroller.

3. Microcontroller: This is the CPU (central processing unit) of our project. We are going to use microcontroller of 8051 family. The various functions of microcontroller are like:

I. Reading the digital input from ADC which is derived from Temperature and soil moisture sensor, humidity sensors, rain detectors and air pressure.

II. Sending this data to LCD so that the person operating this project should read the values of temperature and soil moisture sensor, humidity sensors, rain detectors and air pressure

III. Controlling the parameters like Temperature, soil moisture sensor, humidity sensors, rain detectors and air pressure turning On/Off the respective relays

IV. Sending the values of temperature and l soil moisture sensor, humidity sensors, rain detectors and air pressure to the computer using serial port

4. Relay: We have used 6 relays in our project. First one will be turned on when the temperature falls below the desired value. And the second relay will be turned on when temperature reaches above the desired value. (e.g. if the desired value is 20 degree C, then Relay 1 will be turned on when temperature is 19 or below and Relay 2 will be turned on when temperature is 21 or above)

5.Ac motor: we have use to use 1 ac motor in our project soil moisture sensors sense the moisture of the soil ,if soil is dry then ac motor is automatically start and after at desired moisture of the soil motor automatically turn off. Also ac motor used for fogging system through the humidity sensors

IV. ENVIRONMENTAL PARAMETERS AFFECTING CROP GROWTH AND CONTROL

.

A. Temperature Control

Temperature influences most plant development process including photosynthesis, transpiration, absorption, respiration and flowering. In general, growth is promoted when the temperature rise and inhibited when temperature falls. The growth rate of a plant will not continue to increase with the increasing of temperature. Each species of plant has a different temperature range in which they can grow. Below this range, processes necessary for life stop, ice forms within the tissue, tying up water necessary for life processes. Above this range, enzymes become inactive and again process essential for life stop. For example, in case of chilies Damping Off disease occurs due to temperature of 20_C, hence seedlings killed before emergence as shown in. Therefore there is need to control temperature. Chilies infected by damping off

B. Humidity Control

Humidity is important to plants because it partly controls the moisture loss from the plant. The leaves of plants have tiny pores, CO2 enters the plants through these pores, and oxygen and water leave through them. Transpiration rates decrease proportionally to the amount of humidity in the air.
This is because water diffuses from areas of higher concentration to areas of lower concentration [4]. As there is no one level of humidity that is good for all crops, the preferred humidity level is needed to be established of crops in green house for best growing condition. During summer season, air is too dry which makes humidity level low and hence plants will transpire more rapidly, this will also lose a large amount of moisture which is not suitable for growth of plants. In order to prevent such unbalance conditions, humid atmosphere had been created in green house by using humidification technique like misters, fogging and roof sprinklers. For plants that require very high humidity, automatic spray system can be used to control humidity levels. In small green house spray can be missed by hands. The humidity control is also provides disease free vegetables. For example, Leaf Mold is common and destructive disease on tomatoes under humid conditions. This disease is most destructive in green house when humidity is very high hence there is need to control humidity to overcome this disease.

C. Light Control

Light plays most important role in photosynthesis process as all living organism get energy from light. The rate of photosynthesis process is reduced in absence of light.
Without light, a plant would not be able to produce the energy it needs to grow. The clear effect can be seen between plant grown in normal light and same plant grown in total darkness that is without light. The chlorophyll content of plant grown in the dark is very low which causes pale yellow leaves. Also growth of plant gets terminated. Hence there is need to control light in proper proportion for development of plant growth. So in this project we are using LDR sensor from which temperature gets reduced below the predefined value then the sensor sense and give instruction to the Microcontroller and light gets on.

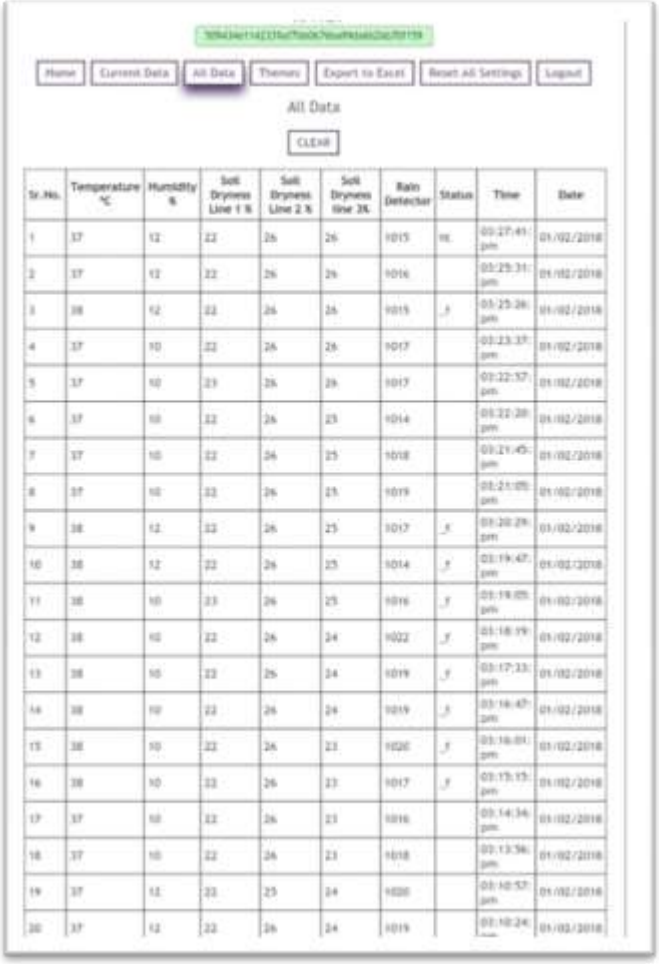
D. Moisture Sensor

The Moisture Sensor detects the moisture of the soil around the sensor, which is ideal for monitoring the plants or the soil moisture. This sensor uses the two probes to pass current through the soil, and then it reads that resistance to get the moisture level. Excess water makes the soil conduct electricity better; while dry soil conducts electricity poor.

E. Microcontroller

The Arduino Mega 2560 is a microcontroller board based on the ATmega2560 (datasheet). It has 54 digital input/output pins (of which 14 can be used as PWM outputs), 16 analog inputs, 4 UARTs (hardware serial ports), a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with an AC-to-DC adapter or battery to get started. The Mega is compatible with most shields designed for the Arduino Duemilanove or Diecimila.

RESULT



All Data

CLEAR

Sr.No.	Temperature °C	Humidity %	Soil Dryness Line 1 %	Soil Dryness Line 2 %	Soil Dryness line 3%	Rain Detector	Status	Time	Date
1	37	12	22	26	26	1015	H	03:27:41 pm	01/02/2018
2	37	12	22	26	26	1016		03:25:31 pm	01/02/2018
3	38	12	22	26	26	1015	_L	03:25:26 pm	01/02/2018
4	37	10	22	26	26	1017		03:23:37 pm	01/02/2018
5	37	10	23	26	26	1017		03:22:57 pm	01/02/2018
6	37	10	22	26	25	1014		03:22:20 pm	01/02/2018
7	37	10	22	26	25	1018		03:21:45 pm	01/02/2018
8	37	10	22	26	25	1019		03:21:05 pm	01/02/2018
9	38	12	22	26	25	1017	_L	03:20:29 pm	01/02/2018
10	38	12	22	26	25	1014	_L	03:19:47 pm	01/02/2018
11	38	10	23	26	25	1016	_L	03:19:05 pm	01/02/2018
12	38	10	22	26	24	1022	_L	03:18:19 pm	01/02/2018
13	38	10	22	26	24	1019	_L	03:17:33 pm	01/02/2018
14	38	10	22	26	24	1019	_L	03:16:47 pm	01/02/2018
15	38	10	22	26	23	1020	_L	03:16:01 pm	01/02/2018
16	38	10	22	26	23	1017	_L	03:15:15 pm	01/02/2018
17	37	10	22	26	23	1016		03:14:34 pm	01/02/2018
18	37	10	22	26	23	1018		03:13:56 pm	01/02/2018
19	37	12	23	25	24	1020		03:10:57 pm	01/02/2018
20	37	12	22	26	24	1019		03:10:24	01/02/2018

REFERENCES

[1] JaypalBaviskar*,AfshanMulla†, AmolBaviskar‡, ShwetaAshtekar§ and AmrutaChintawar, "Real time Monitoring and Control System for Green House Based On 802.15.4 Wireless Sensor Network", IEEE 2014

[2] S.R.Boselin Prabhu, "Environmental Monitoring And Polyhouse Controlled By Distributed Sensor Network", *2014.*

[3] *Priyanka Jayram Gurao,* "Auto Monitoring And Control Of Environmental Parameters For Polyhouse System",march 2016.

[4] Hemraj, "Power Estimation And Automation Of Polyhouse Using Wireless Swnsor Network",2014.

[5] Qui zengshuai, "enviromental parameter control of the greenhose",2012

[6] K.Lokesh Krishna, J.Madhuri, Dr.K.Anuradha, "A ZigBee based Energy Efficient Environmental Monitoring Alerting and Controlling System", ICICES2016.

[7] P. S. Asolkar, Prof.Dr. U. S. Bhadade, "An Effective Method of Controlling the Greenhouse and Crop Monitoring UsingGSM" , IEEE 2015

[8] Yogesh R. Sonawanea , Sameer Khandekar a , Bipin Kumar Mishra a , K. K. SoundraPandian b, "Environment Monitoring and Control of a Polyhouse Farm through Internet" , 2008.