Green automation and monitoring over MATLAB

Pooja D. Tekale [1], Mr. P. R. Thorat [2]

[1]PG student: Dept. of Electronics,

Savitribai Phule Women's Engineering College, Aurangabad, India

[2]Assistant Professor, dept. of Electronics

Savitribai Phule Women's Engineering College, Aurangabad, India

---***---

Abstract - *In this system the advanced controlling and monitoring of the farm is done. This is handling by the MATLAB software and we are using arduino for the purposed of the interfacing of MATLAB. We can see the graph of the difference parameters read in the agriculture, like the temperature, soil moisture, light and PH sensor also which help for the development of the tree. In the sense it will helps to monitor the environment of the earth perfectly. The advantage of this system is that we can accumulate this graph as per time and date also.*

In this system we are using the AVR microcontroller to interface with the sensor so we can control the parameter read and also be in charge of in the agriculture field. Here microcontroller will take data serially from the PC. We are using controlling part as LDR for the purpose of artificial light and water pump for the supply of water.

Key Words: **LDR (Light Dependent Resistor), RISC (Reduced instruction set computing), WSN (Wireless Sensor Network), GSM (Global System for Mobile Communications), ADC (Analog to digital converter)**

1. INTRODUCTION

Automation is process of controlling the industrial machinery and process there by replacing human operators. Climatologically condition monitoring is one of the very important aspects in agricultural production that has a direct effect on the productivity and maintenance of crop. A major loss occurs every year due to damage of crops by various diseases caused by improper climatic conditions.

Now a day's automation is used in all over and everything can be operated automatically, but there are still a few important sectors in our country where automation has not been adopted or not been put to a fully use, it may be possible because of a number of reasons. One of them is cost and one such field is agriculture. Agriculture has been one of the main occupations of man in our country, as we know since early civilizations and even today manual interventions in farming are expected. Greenhouse is the modern facility available in which we can control the climate to raise plant growth and keep away from the effect of season changes on the plants. Greenhouse is playing an important role in the production of out-of- seasonable fruits, vegetables and flowers as well as high value and sensitive plants like capsicum. The aim of greenhouse environmental check to get the best climatic conditions (controlled temperature, moisture, light and PH level and other important parameter responsible for the production) for crop development, increased crop yields, improved quality of crops, and regulated growth cycle of crops. Greenhouses are generally used for growing flowers, vegetables, fruits, and tobacco plants. Most of the Greenhouse systems still use the physical system in monitoring the temperature and moisture. A lot of difficulties can occur at the time of production not for worker but it also affects production rate because the temperature and moisture of the greenhouse must be continuously monitored to ensure optimal conditions.

Fig.1 Greenhouse

Greenhouses help to monitor important part of the agriculture and horticulture sectors. In our country, as they can be used to grow plants under controlled climatic parameters which directly or indirectly the plant growth and hence they produce good quality of product. In this project the advanced automation and monitoring of the area of the farm is done and this will totally monitored by the MATLAB software. It will show the graph of the different parameters read in the agriculture like the temperature, soil moisture,

PH level and light which are responsible for the growth of the tree.

In this project it will be the advanced automation and monitoring of the farm. This will totally monitored by the MATLAB software by showing the graph of the difference parameters study in the agriculture, like the temperature, soil moisture, PH level and light which affect on the growth of the tree. In the sense, it will help to monitor the environment of the earth exactly. We can store this graph as per time and date also in this project. Another thing is that the MATLAB software having the image processing capability so that we can also check the food quality as per its size and color but we are not using digital image processing part here, The main part is the monitoring over MATLAB and for the interfacing of arduino with the PC we have to use arduino microcontroller because it is fast upcoming microcontroller as compare to other.

Now, the project will also compare and contrast all the systems and look at their various features and disadvantages. A wide range of options are available for the green automation systems. All of these will be examined at length.

2. Related work

About 95% of plants, food and cash crops are grown in open field by cultural method. Man has learnt how to grow plants under natural environmental situation. In some temperate regions climatic conditions are extremely bad and no crops can be grown-up. Automation is the only way for growing plants all around year by protecting plants from extreme cold and temperature. Chemical application of nutrients and pesticide is one of the most important processes in agricultural production. About 30-35% of production looses can be saved while harmful insects and diseases are eliminated by pesticide spraying. Greenhouse automation system controls the temperature, moisture, PH level and light intensity using different control devices and transfers the data to the PC. An autonomous robot enables the greenhouse automation process for spraying the pesticide and helpful the diseased plants. This system failed to care for diseased plants and updating of remote monitoring. The autonomous robot for pest spraying leads to high cost for construction of greenhouse automation.

Crop cultivation has been around for a long time. It plays a central role in the continuous development of human civilization. Custom crop cultivation requires a tremendous amount of more work and attention and there are some disadvantages in implementation traditional cultivation techniques:

- ➢ Weather dependent factors: plants growth and development are primarily governed by the weather condition.
- ➢ Pests and disease: plants growing under traditional cultivation technique are significantly affected by pests and disease

It was discovered that there are indication that already many thousands years ago civilization in countries such as China, Egypt and India employed means of projection against cold, wind and excessive solar radiation

This method of protection was employed only to provide a short term protection for plants against harsh climate conditions. However no further development occurred until the late 15th century and early 16th century, when European explorers brought back plants acquired in the course of their travels mint were tropical plants that could not endure the cold European climates. The result was the creation of greenhouse and this early greenhouse was originally referred to as "giardini botanic" as known as "botanical gardens". As a plant grows, it undergoes many developmental changes, including formation of tissues and organs such as leaves, stem, flower and roots. The main source of nutrients used to aid this development process is found in its surroundings. In other words, the development of a plant is solely dependent on the conditions of the environment in which plants are grown. The environment consists of many different factors including light, ambient temperature, soil temperature, humidity, soil moisture and CO2. This climate factors play an important role in the quality and productivity of the plant growth.

Either directly or indirectly, most plant problems are caused by environmental stress in some cases poor environment stress could weaken the plant and strip off its immunity and protection against diseases and harsh weather condition. A good understanding of these climate factor allows the grower to be more aware of any potential problems that may affect the development of the plant and appropriate action can be drawn to prevent these problem form happening.

Green manufacturing plays a key role to provide cleaner energy source, reduce atmospheric emissions, degrade the impact of greenhouse gasses, save natural resources and energy, maximize yield and minimize waste, etc. It would not only be important to the rapidly growing renewable energy and clean technology sector, but also be substantially beneficial to society and economy. It is estimated that green energy can save EU3trillion 2050. The "green" jobs are growing faster than overall job growth in the U.S. Thus, going "green" or "sustainable" is not an option, but a necessity. It is noticeably becoming major component of the missions for manufacturers to stay globally competitive. Green manufacturing covers a broad spectrum of manufacturing, from development of green technology products, implementation of advanced manufacturing and production

technologies, and introduction of energy efficient and environmentally friendly manufacturing processes and systems, from the plant to the enterprise level, and the whole supply chain. Here, we interpret green manufacturing

Some of the previous systems used android phone to monitor the green house but lacked to control it using android from remote locations. One of them was based on Global System for Mobile Communications (GSM) in which notifications are sent via SMS, but disadvantage of this

system was every time user had to type commands which was time consuming and costly. The biggest disadvantage of these systems was that one person always had to be present in the green house or in the vicinity of the green house. Plants in green house are grown under controlled environment. The temperature differences can cause harm to plants. Sometimes the farmers cannot predict which action needs to be taken to control the environment and may take wrong decisions thus causing more harm to the plants in the green house.

3. Propose system

AVR microcontroller (Atmega328) is used for the purpose of high performance and we know it having reduced instruction set computing (RISC) based. We are using sensor for the sensing of the parameter like soil moisture, temperature, PH sensor and other as per requirement which are connected to controller of the system i.e. AVR and controlling part is also added here. LCD is used for the purposed of the getting display of sense parameter of green house and for the power supply we have to use adapter in this system. Arduino is the latest upcoming fastest microcontroller which is used in project for the interfacing with the PC and we are using GSM for getting parameter reading when we want.

Fig.2 propose system

MATLAB is the main part in the project in which we get parameter reading in the form of graph that is easy to study. Following table shows the specification of the sensor

Table-1: Specification of the sensor

Type of sensor	Name of sensor	Range of sensor	Unit
Temperature sensor	LM35 (national semi.)	-55 to 150 degree Celsius	Kelvin
Soil moisture sensor	PH meter	0 to 100 m	Meter cube of water per meter cube of soil
Light sensor	LDR(light dependent resister)	30 to 60 nm.	Wavelength(lambda)
PH sensor	PH meter	0 to 100m	Meter cube of water per meter cube of soil

4. Performance analysis

In this section we are discussing about the working of the system and result of the system.

4.1 Monitoring part of the system

Firstly we have to place this system at green house or open field and palace all sensor After switching the power supply we get the initialization of the system with the help of LCD which is place on the PCB and connect to the system part when the PCB start conducting and all sensor get started we get output at the LCD display first is the PH sensor reading, second is the liquid that is soil moisture sensor reading.
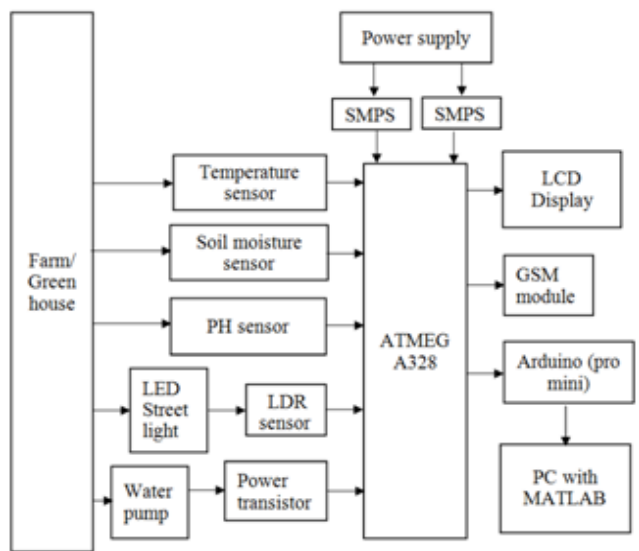

Fig.3 monitoring part of the system

Third is the temperature sensor reading, and last is light sensor reading after this data is transfer to the arduino nano via connecting wire to the port of the arduino which is interface with the PC to get graph

Fig.4 placing of the sensors

4.2. Controlling part of the system

Now the second part of the system is the controlling which is very important without any human operator we can control this system by using water pump and Street light. When the water level of the soil is goes less than set point at that time pump get started by using power transistor and when darkness is occur due to change in atmosphere at that time street LED is on in this way we can control level of the water in soil and the light of the green house.

When the water level is less than 74-75 then at that time power transistor is start motor pump at the second controlling part when LDR (light dependent resistor) detect darkness that is efficiency of light at that time street light glow.

Fig.5 controlling part of the system

4.3 Interfacing with MATLAB

Here we are using arduino nano for the purpose of the interfacing of the system and PC to get output of the system in the form of graph at the MATLAB. Following figure shows the interfacing of the MATLAB and the system.

Fig.6 Interfacing with MATLAB

At the MATLAB window we get the graph of parameter as shown in folling figure this is real time system so we get the graph as per time and date.
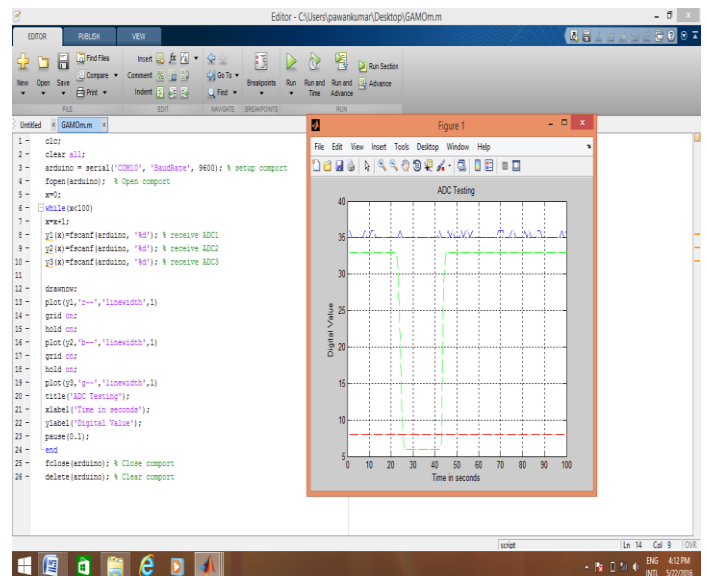

Fig.7 Output of the system at MATLAB

If there is change in the environment then we can see the sudden change in the value of the parameter.
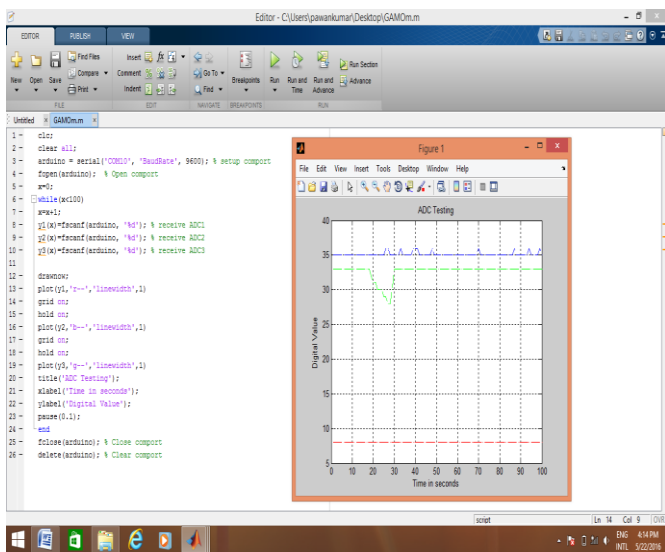
Fig.8 Output of the system variation at MATLAB

4.4 GSM working of the system

After completion of green automation and monitoring over MATLAB part of the system we are added GSM module which is used to get the parameter reading when we want for that we have to send #message to that SIM card number (xxxxxxxxxx) which is place in side of program then it send parameter value to that number, which is save in program.

In this we get reading of the parameter when we are away from the farm or green house. As shown in following figure.
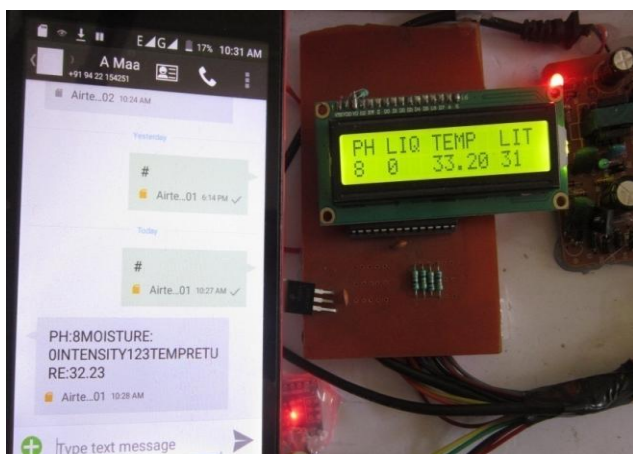

Fig.9 Output of the system by using GSM module

4.5 field work results

The following figure shows the visited green house where I get all results

Fig.10 Visited green house

Table-2: field work results of system

Name of crop/vegetable /plants	PH	Liquid	Temp.	Light
Wheat	5.5-6.5	7-50	31.76	36
Eggplant	4.5-5.3	12-46	37.60	39
Onion(red onion)	5.30-5.80	10-80	30.01	32
Onion(white onion)	5.37-5.88	10-80	30.01	32
cabbage	4	10-80	33.60	41
Drumstick	8	5-60	31.25	31
Rose(all type)	5	5-20	36.00	45

5. CONCLUSIONS

This method will help in automatic control and monitoring of different parameters inside the greenhouse which are required for smooth maintenance using MATLAB without human interference. This project can be implemented in automation of a hi-tech greenhouse. If this project is implemented in a large scale it can be used in automation of plantations, etc.

The system design here user friendly, low cost, easily implement & stable, it should be more efficient. In this paper greenhouse management approach to monitor and control the environment is demonstrated.

ACKNOWLEDGEMENT

REFERENCES

[1] Nilima mayee Shamal and Umesh Chandra Patil-"Multi-channel data acquisition and data logging for greenhouse application", IEEE Students' Conference on Electrical, Electronics and Computer Science, 2014.

[2] Hemaj, Sukesha-"Power estimation and automation of greenhouse using wireless sensor network", 5th international conference confluence the next generation information technology summit 2014.

[3] GuoXiaogian, Liu Rong –"Greenhouse demand fore casting model based on Markov chains", international conference on intelligent computation technology and automation, 2013.

[4] Hangoro A., Reynaldo R., Putra M., Sari R., "Green House Monitoring and Controlling using Android Mobile Application", IEEE Conference Publication, 2013.

[5] Sushama Arjun kolhe, S. A. Annadate, "Implementation of greenhouse automation using ARM7 controller", International journal of computer application June 2012.

[6] Anujkumar, "Prototype Greenhouse Environment Monitoring System", 'Proceeding of International Multi conference of Engineers and Computer Scientists', 2012

BIOGRAPHIES

PG student: dept. of Electronics Savitribai Phule Women's Engineering College, Aurangabad,431007 India Pooja.tekale92@gmail.com