

# REMOTE MONITORING & CONTROL SYSTEM FOR ENVIRONMENTAL PARAMETERS IN GREENHOUSE BASED ON ARM

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**Abstract :** *In this embedded system application design for to check the Environmental parameter like temperature, humidity, Carbon Dioxide concentration and light intensity in Greenhouse. Remote monitoring and controlling of these parameters implemented with the help of sensors and wireless technology. Wireless technology is used to overcome complication of wiring and distance. In this embedded system application Raspberry pi microcontroller, Real Time Operating System, sensors, GSM modem or other wireless technology too. By this application continuously check and monitor manually and automatically environmental parameters in greenhouse. With the help of push button switch or remotely via Wireless networking will set the level of threshold level. This embedded system application is implemented and tested for correct functionality. Developing System is realized on hardware and software discussed in detail. This application is more useful for farmer. Developed monitoring system has some features like simple structure, high reliability, flexible and good extensibility.*

**Index Terms -** Sensors, relay board, Raspberry Pi, AVR board, GSM module.

## I. INTRODUCTION

In old day farmer require more hard work and attention for cultivation of crop. So the obtained crop quality is poor also productivity is less. Old cultivation techniques need a lot of hard work and it requires more time. So old techniques are required more time.

Greenhouse means an area, room or building which cover with glass in which temperature is maintain as per requirements and limits. This glass is translucent material. Under the greenhouse all environmental parameters are needed to grow plant are controlled as per plant requirement. So All environmental condition has been fulfilled then gets good growth and productivity. Most of plants or crops are grown in open field. So climatic condition are more affect to crop so poor growth of crops.

Plants need natural condition to grow. So greenhouse provide that type of environment. Environmental parameters are affect to development of plant growth. Environmental parameters are light, temperature, humidity, CO<sub>2</sub> gas. All environmental parameters are directly or indirectly plays important role in growth of plants. In some cases, poor or weak environment can damage plants So plants suffer from diseases.

The environmental parameters are responsible for the growth of a plant or crop. The environment consists of many different parameters including light, ambient temperature, soil temperature, humidity, soil moisture, and CO<sub>2</sub> which can directly or indirectly affect the natural growth of plants. Here in this system we approach a control system which provides natural condition which required to plant growth. Now a days in research area of embedded System, it become quite important to monitor and control.

## II. EASE OF USE

A greenhouse is use for hood plant and crop growth under natural condition. Greenhouse can be made in small area to large area. There is no any limitation. For rural distract, the greenhouse vegetation has become very good.

The productivity of crop in greenhouse depends on CO<sub>2</sub> concentration, water content, light intensity, temperature and other variables in greenhouse. Greenhouse variable properly measure and timely adjust. Tradition wired monitoring system is more complex, arrangement is not complicated and difficult to understand.

## III. BACK GROUND

For development of agriculture science greenhouse climate is very good for good quality of crop and productivity. Under greenhouse environment many environmental parameters are controlled. By using microcontroller, we can control parameter but farmer will not get information about greenhouse. Wireless technology improves to monitor and control parameter.

There are various technologies, used for wireless networking. Wireless network like Zigbee network, infrared, Bluetooth and RF technology. But it is not fully applicable because there are so many problems with technology. Addition Hardware and software use sensor network provide good control on Greenhouse. More variable increase then wireless network bandwidth will increase. CAN Bus requires wired system to control environment parameters of green-house.

#### IV. BLOCK DIAGRAM

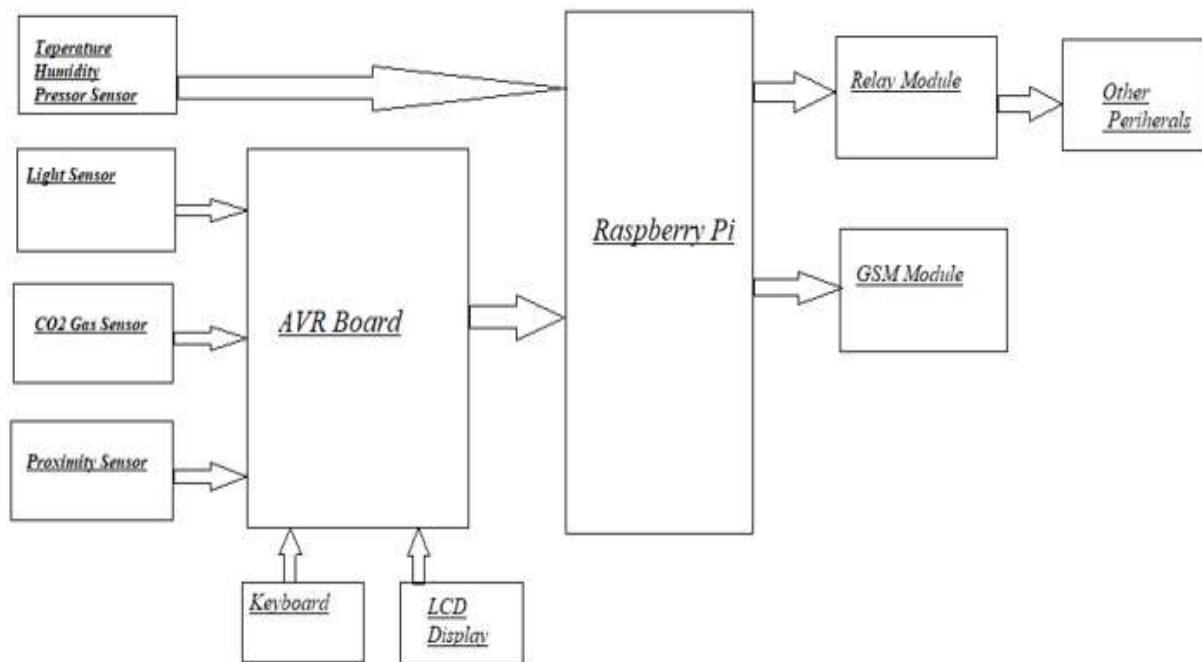


Fig.1 Block Diagram of the System

#### V. THEORITICAL IMPLEMANTATION

Raspberry Pi is used because doing more complicated and multiple task. Raspberry Pi have ARMv8 controller which is 32 bit controller. Raspberry Pi takes only digital value. Raspberry Pi have not on chip Analog to Digital converter so the sensor data can be given to directly on Raspberry Pi. Firstly calculate the sensor data then it given to ADC. It converts in to digital then checks by raspberry pi and send message to the relay board and manage the data. Atmega 16 is standard AVR board. This board is helping us to quick start with the application and run application. We can apply both AC and DC supply because this board is powered with both power supplies. On this board LCD interface easily.

BME280 sensor used to measure Humidity, Temperature and pressure. This sensor directly interfaces with Raspberry Pi. LDR sensor interfaces with AVR Board. Data captor by AVR board which is convert into Digital value and give to Raspberry Pi with I2C communication. I2C communication is fast. It is double side communication. We can give data and take data both. Raspberry Pi connects with laptop by LAN wire or Wi-Fi. Command given by Raspberry Pi that I want data LDR sensor data then AVR board display the data of LDR sensor. According Light value relay turn on/off. As per relay trigger and we get the information though GSM what is crop need and what the condition of all parameter.

The proper irrigation and fertilization is varies by crop. It varies about by crop type, age, phase and climate. More parameters are also affects to crop life cycle. Growth of plant depends on light. Due to photosynthesis process, plant use light and CO<sub>2</sub> they make their food and produce glucose.

Humidity is most significant variable to affects crop. High humidity may increase the probability of diseases and decrease transpiration. Lower humidity cause the photosynthesis process lower down. The humidity control is more complex because vary the temperature. CO<sub>2</sub> is main parameter for plant growth. During photosynthesis phenomenon the plants take away CO<sub>2</sub> from the atmosphere for procedure. During the photosynthesis, the plant uses carbon and radiation to produce glucose. That function is to permit the plant growth.

#### VI. RESULT AND ANALYSIS

VARIABLE	LIMIT= δ 3%	LIMIT= δ 5%
Temperature	0.50	.58
Moisture	3.5	5.5
Light Intensity	28.5	34.5
Humidity	1.3	2.0
Pressure	10.5	17.5

#### VII. CONCLUSION

Though mobile communication environmental parameter in greenhouse remote monitoring and control system is developed and initially experimented. The experimental results indicate that the system has some features as follows: 1) It provide evolution at agriculture science. Overcome human efforts required for tradition and old crop cultivation. 2) It can watch crop at any real time and any distance. Farmer can see their crop growth and productivity at any distance. 3) It has the advantages of GSM technology, wired are not required so complexity is overcome. Power can save, low cost, good robustness, flexible extension, convenient installing over the traditional measurement and control system.

### VIII. FUTURE ENHANCEMENT

1. Adopt touch screen based Human Machine to interface with monitor and control.
2. Using Solar panel and battery we can save the electricity.
3. Make an analysis of all plant life cycle.
4. Adding camera interface we can watch all plant health and growth.
5. We can make IOT base project. Through IOT we can give information time by time.

### IX. ACKNOWLEDGMENT

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