

Greenhouse Wireless Network Monitoring and Management Using IoT

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ABSTRACT: Indian agriculture is the major private sector enterprise in the country so India's economic security depends on agriculture sector as of now and in near future. Monitoring and control of greenhouse environment plays an important role in crop production and this may result in maximum photosynthetic activity. This project consists of design and implementation of a Wireless Sensor Network that can monitor the temperature, humidity, soil moisture in the greenhouse filed area by using raspberry pi 3, sensor devices, UNIX platform. So farmers can recognize the environmental conditions and implement various methods to increase the greenhouse crop production. The system is integrated with particular sensors. All monitored parameters that sensed by various sensors are transmitted through a wireless net link Internet of things(IOT) to PC Server which is acting coordinator node and designed to take corrective action once exceed the threshold parameters.

KEYWORDS. : Internet of Things (IOT); Embedded Computing System; Raspberry Pi 3; Sensor devices; UNIX platform.

I. INTRODUCTION

In the present scenario were people are moving around the world, there is an increased demand for connectivity with our properties wherever we are on the planet. Here comes the role connecting every device to the internet so that it is accessible wherever we have an internet access. This interesting fact throws upon us the need to implement a solution integrating our present resources. This is where internet of things comes into the picture. This report focuses on implementing a smart greenhouse that can monitored using IOT technology Automated greenhouse is the key of modern agriculture.

Agricultural service function growing now a days and informationization adds on the value in agricultural sustainable growth. Traditional agricultural development cant fulfilled the present requirements of agricultural sustainable growth. For changing the traditional mode of the agricultural automation this system introduces the application of internet of things in greenhouse automation which can reduce the manpower. So with the function of automated intelligent remote controlling of the greenhouse obtained real time and accurate crop environment information.

The system contains sensor network that includes various application specific sensors and computer network. This can satisfy the need of advanced automated agricultural production with the help of sensor node which collects environmental parameters, wireless module that transmits parameters.

The information gathered in database and threshold value automatic remote controlling take place. As Per Congcong. Li et al, Internet of things are widely used in China. In this article, automated agricultural model based on Internet of things designed and implemented with real time monitoring and management of greenhouse parameters.



Fig 1: Greenhouse environment

II. RELATED LITERATURE SURVEY

The proposed system for the greenhouse real time monitoring using Digital Signal Processor (DSP) has been implemented. The system was recorded the various environmental factors such as temperature, humidity, soil moisture contents. DSP based prototype systems are limited data storage capacity (32 bits, 1200 MHz speed), high power consumption, cost effective, no high flexibility and reusability, no easy upgrading (due to the usage of abstract hardware description language) but do provide only suboptimal processing speed due to the execution of software programs a wireless sensor network (WSN) consists of spatially distributed autonomous sensors to monitor physically or environmental conditions, such as temperature, sound, vibration, pressure, motion or pollutants and to cooperatively pass their data through the network to a main location. WSN can be used in some special situation for signal collection, processing and transmitting.

Wireless technologies have been rapidly developed during recent years. Its advantages include the liability, simplicity, and low cost in both installation and maintenance.

WSN can form a useful part of the automation system architecture in modern greenhouse. Wireless communication can be used to collect the measurement and to communicate between the centralized control and the actuators located in the different parts of the greenhouse. Compared to the cabled systems, the installation of WSN is fast, cheap and easy.

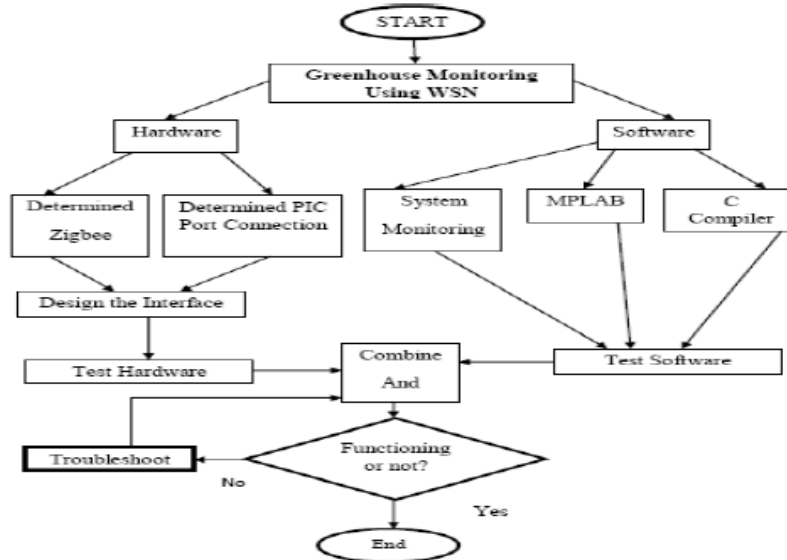


Fig 2 : Block diagram of literature survey

III. EXISTING SYSTEM MODEL

The requirements in real-time, reliability and sustainability should be met for crop-growth for this intelligent system is designed. In this system, a wireless sensor network with software was designed and implemented for the Greenhouse wireless sensor network monitoring and Management in order to achieve intelligent controlling of greenhouse crops growing environment. It can sense important environmental parameters like Temperature, Humidity, Soil moisture, Light intensity for plants in real time with the help of sensors and microcontroller. It transmits sensors information wirelessly with the help of RF link i.e. XBee to central location for further analysis.

The environmental parameters like Sunlight, Temperature, Humidity and soil moisture are controlled by the whole system. The sensing network runs by AVR microcontroller ATmega328P which is based on Arduino UNO Module. For communication purpose, a RF link 2.4GHz ISM band Transmitter-Receiver installed to transmit or receive these information to PC which is located at central location as well as to GPRS module for internet accessibility and to cloud for further analysis.

To design hardware for green house monitoring various sensors are used to control the environment. The parameters like greenhouse temperature, humidity, light intensity for green house and soil wetness for crop growth. The green House monitoring system consists of sensor circuits, AVR microcontroller, Signal conditioning circuit, receiver and transmitter Module, and a required power supply unit.

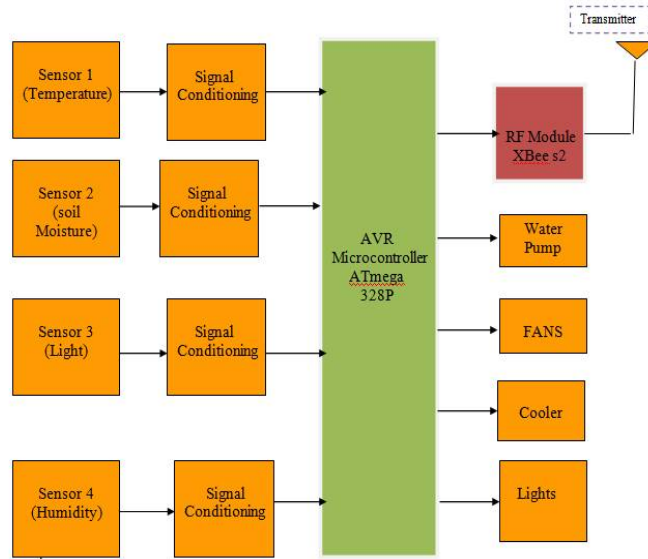


Figure 3: Block diagram of existing method

IV. PROPOSED METHOD

Conventional Greenhouse controlling technique or farming techniques does not have concept of IoT. This project consists of temperature, humidity monitoring & controlling and light monitoring. The section consists of, Raspberry pi module, Temperature sensor, Soil Moisture sensor, Humidity sensor, power supply, and raspberry pi. To attain our proposed system need to use Raspberry pi 3 to monitor the agricultural field. In moisture sensor, humidity sensor, Temperature sensor is used to monitor the field of environment. Monitor the data in HTML web page using IoT store the data in server. The Temperature sensor is a transducer, which converts the temperature into linear current. By using the signal conditioning circuit the current converting in to Voltage (I2V) via Operational Amplifier Circuit and given in Analog to digital converter (ADC PFC8591). The ADC is Interface with ARM (Raspberry pi) processor; The ADC produces the digital value as per the temperature value. When the temperature value is exceeded as threshold value the relay is energized via Raspberry pi module then the device is disconnected from input 230 V AC Source, As well as When the temperature is below the threshold value the relay is de-energized via Raspberry pi module then the device is connected with input 230 V AC Supply. The Temperature value is monitored in HTML Web Page as well as Controlled. The firmware for this project is written in embedded 'C' language.

Raspbian wheezy OS is used to run the program. MobaXterm software is used to write, edit and load the program in Raspberry pi 3 module. With the help of I2C all the sensors are read by Raspberry pi module and the output is displayed on the web page. I2C is a communication protocol which is used to establish communication between two devices. With this automatic operation sensors takes place in effective manner.

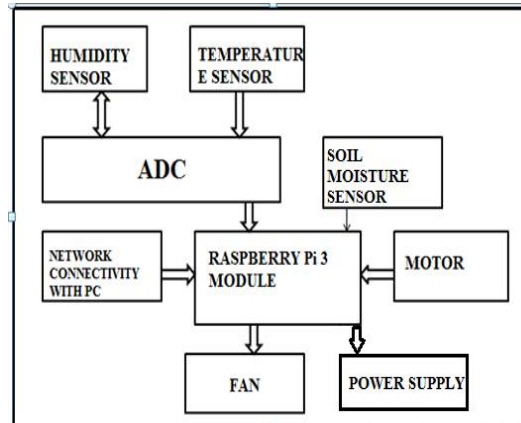


Figure 4: Block diagram of proposed method

To display the collected data to the user who are in need of it a webpage has been created. By browsing the web address one can monitor the greenhouse parameters at one single click.

In this tier sensed data will be processed, stored in the cloud i.e.in to the Google spread sheets and also it will show a trend of the sensed parameters with respect to the specified values. The end users can browse the data using mobile phones, PCs etc. With the help of IOT the environmental conditions inside the greenhouse can be viewed using the URL address as per the user constrain based on web based processing.

A server is an instance of a computer program that accepts and responds to requests made by another program; known as a client. Less formally, any device that runs server software could be considered a server as well. Servers are used to manage network resources. The service or information in the server are provided through the Internet that are connected through LAN and made available for users via smart phones, web browser or other web browser devices to make the system more intelligent, adaptable and efficient.

V. IMPLEMENTATION

This project is implemented in green house to monitor soil moisture, humidity, temperature. The sensors have huge amount of implementations. This project can be used for any type of irrigation fields, in nursery, botanical gardens. This project can be implemented in any closed area which located remote places which need to be monitored without human presence, like research centre located in very high altitude. The humidity sensor will sense the humidity of the value of the humidity. If the value is higher than the predefined value it will send a message to the owner that the humidity is high. The temperature sensor will sense the value of the temperature and if the temperature is high the sensor will display it in the monitor. The soil moisture sensor will sense the water content in the soil and if the water content is less the user will be indicated. Measuring soil moisture is important for agricultural applications to help farmers manage their irrigation systems more efficiently. Knowing the exact soil moisture conditions on their fields, not only are farmers able to generally use less water to grow a crop, they are also able to increase yields and the quality of the crop by improved management of soil moisture during critical plant growth stages.



Figure 5: Raspberry Pi 3 module

The advantages of this project is automatically control environmental conditions within greenhouse allowing any type of plants to be grown all year around. When the manual control happens there may be a chance of error occurrence. This system eliminates risk of greenhouse not being maintained at specific environmental conditions due to human error. Minimizes labor costs involved in maintaining a greenhouse. Customers are able to define specific greenhouse conditions. This is a “Plug-and play” product. the applications are this system can be used in green houses to control the vital parameters of environment for the proper growth of plants, which is our main application. With slight changes this project can be used in Mechanical companies to measure various parameters of operating machines like temperature and light. Temperature monitoring and controlling action can be used in home or various halls like conference room, seminar hall to control the temperature of room.

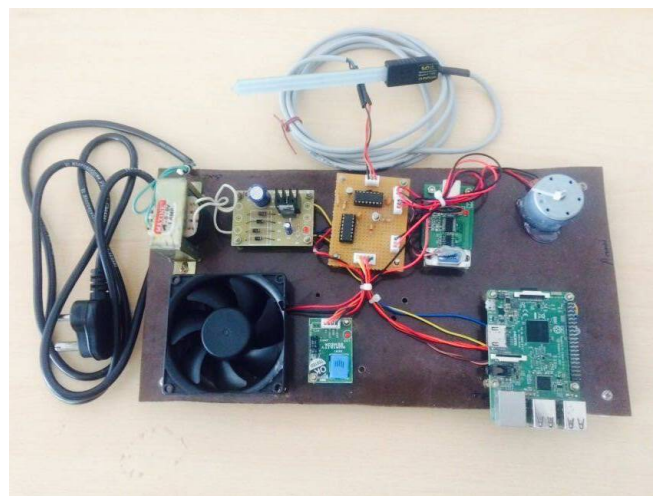


Figure 6:Proposed Greenhouse wireless and monitoring system

VI. RESULT

We designed this project to monitor and control the environmental parameters. We got result based on effective management of greenhouse environment by both automatic manner and human involvement manner. Automatic controlling process is fully done based on coding. During this process if any of sensor modules does not work properly no inputs will be given to microcontroller or wrong result will be obtained. So at that time human involvement will be very useful for greenhouse environment. The sensors are connected to the microcontroller. In this the humidity sensor and the soil moisture sensor are connected through the ADC because they are analog sensors. The sensors will sense the different parameters.

VII CONCLUSION

This paper describes the design of a greenhouse monitoring system based on IOT. Agriculture projects even in urban areas are on a rise in recent times, in unique forms. Technological progress makes the agricultural sector grow high, which here is made by the IOT. The IOT will dramatically change way we live our daily lives and what information is stored about us. This monitoring system percepts different parameters inside the greenhouse using sensors. The developed system can be proved profitable as it will optimize the resources in the greenhouse. The complete module is of low cost, low power operation hence, easily available to everyone. This paper is a basic idea of the research regarding greenhouse but still there is a lot more to be explored technologically.

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REFERENCES

- [1]. Rodrigo Castaeda-Miranda, Eusebio Ventura-Ramos Jr, Rebeca del Rocio Peniche-Vera, et al. "Fuzzy greenhouse climate control system based on a field programmable gate array", Biosystems Engineering, 2006, vol. 94, pp. 165~177.
- [2]. N. Bennis, J. Duplaix, G. Enea et al. "Greenhouse climate modeling and robust control", Computers and electronics in agriculture, 2008, vol. 61, pp. 96-107
- [3]. Gu Jinan, Mao Hanping. "A mathematical model on intelligent control of greenhouse environment", Transactions of the Chinese Society for Agricultural Machinery, 2001, vol. 32, pp. 63~66.
- [4]. Wang, N., Zhang, N., & Wang, M.. Wireless sensors in agriculture and food industry—recent development and future perspective. Computer and Electronics in Agriculture, 2006, vol. 50, pp. 1-14.
- [5]. Serôdio, C., Cunha, J. B., Morais, R., Couto, C., & Monteiro, J.. A networked platform for agricultural management systems. Computers and Electronics in Agriculture, 2001, vol. 31, pp. 75-90