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DESIGN AND DEVELOPMENT OF ROBOTICS FOR GREENHOUSE USING IOT

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ABSTRACT

This paper put forward a method to realize the communication between wireless sensors network and the internet. The IOT (Internet of things) gateway is used as part of the greenhouse monitoring system. The IOT gateway uses ARM7 (LPC-2148) as the MCU. The application demonstrates the gateway is reliable, compatible and extensible. It provides the real-time detection, control and also the ability of intelligent greenhouse monitoring.Here we use robotics which moves towards the plant to do the desired action requested by the user.

Keywords:*Internet of things(IOT), ARM7(LPC2148), Robotics, Sensors, Wi-fi Module..*

1. INTRODUCTION

We live in a world where everything can be controlled and operated automatically, but there still a few important sectors in our country where automation has not been adopted or not been put to a full-fledged use, perhaps because of several reasons one such reason is cost. One such field is that of agriculture. Agriculture has been one of the primary occupations of man since early civilizations and even today manual interventions in farming are inevitable. Greenhouses form an important part of the agriculture and horticulture sectors in our country as they can be used to grow plants under controlled climatic conditions for optimum produce. This enables the production of crops which otherwise could not be produced at that specific location. Automating a greenhouse envisages monitoring and controlling of the climatic parameters which directly or indirectly govern the plant growth and hence their produce.

The most important factors for the quality and productivity of plant growth are temperature, humidity and light. Continuous monitoring of these environmental variables provides valuable information to the grower to better understand, how each factor affects growth and how to maximize crop productiveness. A greenhouse is a building in which plants are grown for commercial or research purposes. These structures range in size from small sheds to very large buildings, with different types of covering materials, such as a glass or plastic roof and frequently glass or plastic walls; it heats up because incoming visible solar radiation (for which the glass is transparent) from the sun is absorbed by plants, soil, and other things inside the building. Air warmed by the heat from hot interior surfaces is retained in the building by the roof and wall. In addition, the warmed structures and plants inside the greenhouse re-radiate some of their thermal energy in the infrared spectrum, to which glass

is partly opaque, so some of this energy is also trapped inside the glasshouse. The proposed system is an embedded system which will monitor and control the microclimatic parameters of a greenhouse on a regular basis round the clock for cultivation of crops or specific plant species which could maximize their production over the whole crop growth season and to eliminate the difficulties involved in the system by reducing human intervention to the best possible extent using sensors, Analog to Digital Converter, microcontroller and actuators .When any of the above mentioned climatic parameters cross a safety threshold which has to be maintained to protect the crops, the sensors sense the change and the microcontroller reads this from the data at its input ports after being converted to a digital form by the ADC . Since a microcontroller is used as the heart of the system, it makes the set-up low-cost and effective nevertheless. As the system also employs an LCD display for continuously alerting the user about the condition inside the greenhouse, the entire set-up becomes user friendly. Thus, this system eliminates the drawbacks of the existing set-ups and is designed as an easy to maintain, Automated, flexible and low cost solution.

1.1 LITERATURE SURVEY

The demand for the food crops is more in the present scenario. Now a day the cultivation of the crops in the greenhouse under specified conditions which is suitable for the crops is increased.

The authors in [1] discussed an embedded systems approach to monitor green house. They are used an embedded system approach to monitor and control the greenhouse parameters. They are measuring humidity, temperature, pH of the water, soil wetness and light intensity by sensors. The message will be sent to the owner through GSM. The authors in [2] have proposed Wireless sensing and control for precision greenhouse management they used a CPU for monitoring ZigBee with PIC microcontroller to establish a wireless communication between two distant locations. The range of the ZigBee is limited. Their main purpose is to monitor and control only the temperature and humidity. The authors in [3] have discussed green house monitoring and controlling using android mobile application .The new system developed to test the indoor humidity. Complete system is designed to monitor and control the humidity inside the greenhouse. The software used is an android phone, connected using WIFI to a central server which connected via serial communication to microcontroller and humidity sensor. PC.M.K. The authors in [4] have discussed providing smart agricultural solutions to farmers for better yielding using IOT. They explained about the IOT concept. The issues related to the farmers are hampering the cause of our evolution. One of the solutions for these problems is to help farmers using modernization techniques. This paper explains combining the advantages of the major characteristics of emerging technologies such as IOT and web service. The authors in [5] have presented IOT based green house monitoring system the monitoring of the vital parameters of greenhouse namely temperature and soil moisture through IOT is explained .irrespective of our place where we are, we can control the parameters.

2. PROPOSED WORK

Basing on the development of society, maintaining traditional way of agriculture can’t satisfy people’s requirements. To overcome this problem traditional way greenhouse is monitored and maintained to great extent

using a technology called IOT. Most physical variables relevant in a greenhouse can be measured by automatic sensors. This holds for temperature, light, soil moisture, and relative humidity. Precipitation can also be detected, although it is somewhat less common. All the mentioned physical variables are sampled and stored electronically at regular intervals when something is changing. Overall, the measurements provide quite a good input-output picture of the physical part of the greenhouse crop system. .We propose a contribution to the development of greenhouse monitoring. This paper presents the design and development of an electronic system based on a microcontroller that integrates remote sensing functions rooted to cloud computing using Internet of Things (IOT). The system allows the acquisition of different climatic parameters in an agricultural greenhouse and in addition, this electronic system achieves the remote monitoring of greenhouse solutions, by cloud computing solutions (Internet of Things) and robotics.

2.1 METHODOLOGY

The main purpose of this paper is to monitor the conditioning of the plants in any circumstances. As we consider the parameters of the plants as the input , the information of the plant will be in the form of analog ,to convert this the ARM7 board consists of in-build analog to digital converter (ADC) here the data will be converted and it will be displayed on the LCD screen at any instant of time . And if the sensing value crosses the threshold level then the driver circuit will automatically switches the related automation control. This complete process will be done in the plant premises. We can check and monitor plant condition from any place at any instant of time.

2.1.1 BLOCK DIAGRAM

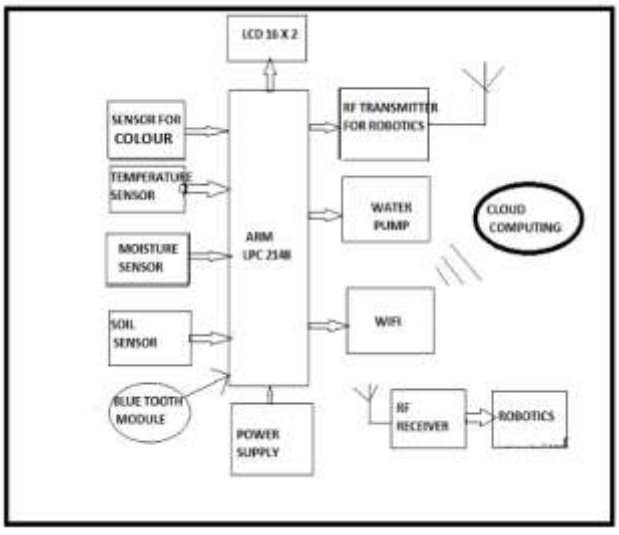

Fig1: Block diagram of greenhouse Monitoring system.

As shown in fig1: the hardware design of the proposed method consists of 4 input sensor (i.e. temperature, soil moisture, humidity, color sensor) and ARM7 (LPC-2148) acts as the heart controller of the design and WiFi for the internet purpose. The final results will be display and checked in IOT app.

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Sl.no	Components	Features and Description
1.	Arm7(Lpc2148)	8-40kb chip static RAM, 60MHz high speed operation, programming of 256 bytes in 1ms, timers 32bit with PWM and watchdog unit.
2.	LCD 16x2	Display the level of the sensors.
3.	Wi-Fi ESP2866(Thing speak)	ESP2866 firmware communicate at different baud rates and commands.
4.	RF Module	RF transmitter and Receiver, frequency 434Mhz, Transmission Rate 1Kbps-10Kbps
5.	Sensors	Soil and Moisture Sensor, Humidity Sensor, Color Sensor, Temperature Sensor(LM35)

4. RESULTS

We are monitoring the weather condition in the green house and make the information visible anywhere in the world. The technology behind this is Internet of Things (IOT), which is an advanced and efficient solution for connecting the things to the internet and to connect entire world of things in a network. The operation of the designed network platform, in terms application data about the conditions in the greenhouse (soil moisture and temperature) as a function and time and date presented in the graphs.

Fig 1a. Shows the output of greenhouse temperature variance.

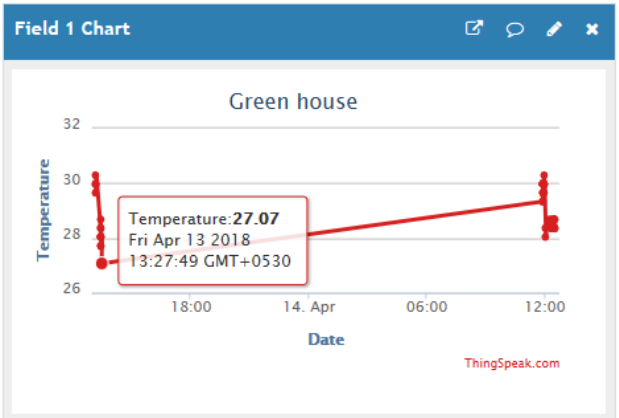
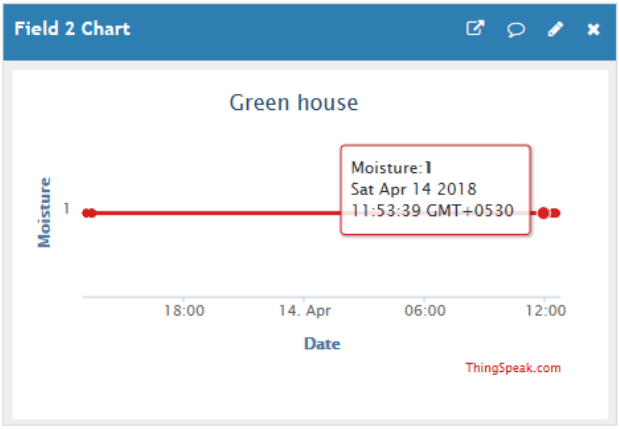


Fig 1b. shows the greenhouse moisture variance.



5. CONCLUSION

This paper gives a step-by-step approach in designing the microcontroller based system for measurement and control of the four essential parameters for plant growth, i.e. temperature, humidity, soil moisture, and color has shown that the system performance is quite reliable and accurate. This will reduce the time of using the manual way of watering. Fewer workers are needed to maintain the plants or crops. The sensors such as temperature sensor (Thermistor) and soil moisture probe are used to control the temperature and watering in the greenhouse. The system has successfully overcome quite a few shortcomings of the existing systems by reducing the power consumption, maintenance and complexity, at a reduced cost and at the same time providing a flexible and precise form of maintaining the environment. . Here we use robotics which provides the comfort of automation.

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