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IoT based Automation in Green House

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***Abstract*: This proposed work is primarily about the improvement of current agricultural practices by using modern technologies for better yield. This work provides a model of a smart greenhouse, which helps the farmers to carry out the work in a farm automatically without the use of much manual inspection. Greenhouse, being a closed structure protects the plants from extreme weather conditions namely: wind, hailstorm, ultraviolet radiations, and insect and pest attacks. The irrigation of agriculture field is carried out using automatic drip irrigation, which operates according to the soil moisture threshold set accordingly so as optimal amount of water is applied to the plants by using soil moisture sensor. Automated greenhouse is to ease people when they wish to grow plants. It helps to monitor the situation, when they are at home. The main aim of this system is to minimize the human care needed for the plant by automating the green house and monitor its environment status. A single unit of the greenhouse structure prototype has been constructed and integrated with the sensors. The control system is designed with Arduino Uno microcontroller. Servo motors have been used to push the roof when there is rain detected. A 12 volt fan is also installed and turns ON when the temperature is too high. The prototype developed is simulated under five different places and the results are analyzed. Further, the readings collected from storage containers are sending via text message and mail to farmer or owner of green house.**

***Keywords*: controller, Greenhouse, Humidity, IOT, Moisture, Node MCU Uno Microcontroller, Sensors, Temperature.**

1. Introduction

Now a day's in our surrounding everything can be controlled and operated automatically. But there are some sectors where automation has not been adopted. One such field is that is agriculture. Green house form an important part of the agriculture. Mainly greenhouse is used to grow plants under controlled climatic conditions. Greenhouse controlling and monitoring of many parameter like temperature, humidity, soil moisture, light intensity and soil pH are important for better plant growth. For controlling these all parameters and also growth of plants without human expectation we can design automated greenhouse. Automation is process control of industrial machinery and process, there by replacing human operators.

Presently for developing such kind of fully automated setup mode the best supporting technology is IOT. Now a days IOT is not only theoretical concept but also practical in reality. Currently the operation of the IOT is in such a way that machine communicates with devices through embedded sensors. IOT is Internet of Things a technology which created a drastic change in this technical world. IOT link up with Greenhouse monitoring will result a great benefit because in our present Scenario monitoring or taking care of our plant error IOT is the best solution. So in this IOT based system Arduino microcontroller used Arduino receive input from different sensors like DHT11 sensor used for measuring temperature and humidity, soil moisture sensor used for measuring water content and pH of soil, LDR sensor used for measuring light intensity and Water level sensor used for detecting the level of water in well.

2. Literature survey

Table 1
Literature survey

Sr. No	Year	Author	Paper Name	Remark
1.	2018	A.A. Alkandari, S.Moien	Implimentation of Monitoring System for Air quality using RaspberryPi.	This paper was focused on few dangerous gases such as CO , NO2 and other gases.
2.	2017	M.Krishna Mohan, Jakkula Likhitha, Tejaswy Yamarthi, Kagitha Sravani.	GreenHouse Monitoring System Using IOT.	In this system IOT gateway is used as a part of greenhouse monitoring system which is reliable, compatible & extendible & it provide real-time detection.
3.	2017	Vibha Wali, Yogesh Dalvi, Vishnu Subhash, Hemantkumar Sharma, Varun Nair.	Automated GreenHouse	Introducing this system can help in increasing the cultivation in a controlled environment.
4.	2016	Ullas S.Patel, Saiprasad Shravankumar, Veerabhdra K.J.	GreenHouse Monitoring and Controlling using Android Mobile App.	The Objectives of this project is to design a simple, easy to install, user friendly to monitor & record the values of temperature, humidity, soil moisture and sunlight of the environment.
5.	2015	Abdullah Tanveer, Abhishek Choudhary, Divya Pal, Rajani Gupta, Farooq Husain.	Automated Farming Using Microcontroller and Sensors.	This paper here is all about automated control features with latest electronic technology using microcontroller & GSM phone line.

Wi-Fi module which is part of Node MCU is used to send environmental parameters to database. The SMS is sent to the user when the sensor value exceeds a defined level. The Owner of Greenhouse will have notification of their Greenhouses status from any place at time.

3. Objective of system

The main objective of this system is to automate the working

of Greenhouse. This system helps to reduce the cost of electricity bills and also provides access to electronic devices remotely to control them

4. System overview

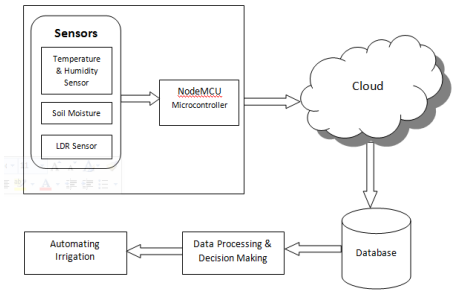

Fig. 1. Block diagram of green house automation system

The System architecture of the proposed system is shown in figure. In this work low cost soil moisture sensors, temperature and humidity sensors, are used. They continuously monitor the field and send it to the web server using Node MCU transmitter and receiver and Ethernet connection at receiver ends. The sensor data are stored in database. The web application is designed in such a way to analyze the data received and to check with the threshold values of moisture, humidity and temperature. The decision making is done at server to automate irrigation. If soil moisture is less than the threshold value, the motor is switched ON and if the soil moisture exceeds the threshold value the motor is switched Off same as if the temperature is exceeding or less than at fixed temperature then fan is ON or OFF. This method can also be used in green houses where in addition light intensity control can also be controlled and automated.

A. DHT11 Sensor

DHT11 sensor is used to measure both temperature and humidity. It is a low cost temperature and humidity sensor. It has high reliability, high efficiency and long-time stability. It has a thermistor for measuring the temperature and a humidity measuring component for measuring humidity. Fig.2 shows DHT11 sensor.

The DHT11 temperature and Humidity sensor is used. The total amount of water vapor in air is defined as a measure of humidity. Relative humidity is calculated because when there is a change in temperature, relative humidity also changed. The temperature and humidity changes occur before and after irrigation. The amount of water droplets in air is increased after irrigation. This causes decrease in temperature which in turn increases the relative humidity of the surroundings. The temperature and humidity reading are often notified to the user so that the user can be able to know the field conditions from anywhere. The temperature and humidity sensor can also be used in green houses.

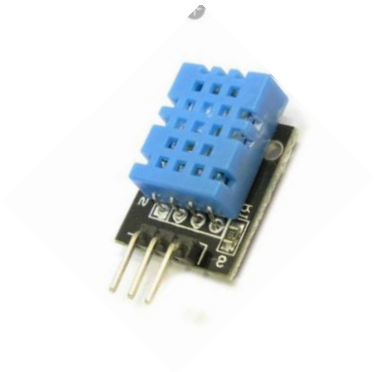

Fig. 2. DHT11 Sensor

B. Soil moisture sensor

Soil moisture sensor measures the moisture content in soil. This soil moisture sensor consists of two metal rods held apart at a fixed distance by some insulating material shows soil u sensor. Fig.3 shows Soil Moisture sensor. The soil moisture sensor has two probes which is inserted into the soil. The probes are used to pass current through the soil. The moisture soil has less resistance and hence passes more current through the soil whereas the dry soils has high resistance and pass less current through the soil. The resistance value help detecting the soil moisture. If the water is more, resistance is low and if the water is less, resistance is high. It also consists of a potentiometer to vary the sensitiveness of the sensor. Features are low power consumption, high sensitivity, Arduino compatible interface and the operating voltage is 5V.

Fig. 3. Soil moisture sensor

C. LDR sensor module

LDR (Light Dependent Resistor) sensor module is used to measure light intensity. It has both analog output pin and digital output pin. The sensor has a potentiometer knob that can be used to adjust the sensitivity of LDR towards light. Fig. 4 shows LDR sensor module. Light sensor is used to detect light intensity of the environment. Light is the major source for crops which is responsible for photosynthesis. Light Dependent Resistor (LDR) is used in which the resistivity decreases with increase in light intensity and vice versa. The voltage divider circuit is designed to measure resistance due to light intensity variations. The voltage level increases with increase in light intensity. The analog reading is taken from the board. It can be used in green houses where artificial lighting is done using any of the incandescent lamps, fluorescent lamps instead of sunlight.

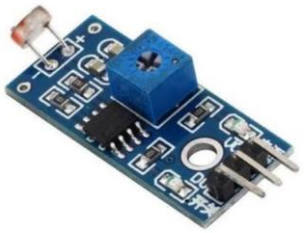

Fig. 4. LDR Sensor

D. Node MCU Microcontroller

Node MCU Uno Microcontroller is open source IOT platform. It includes firmware which runs on the ESP8266 Wi-Fi SoC from Espreessif Systems, and hardware which is based on the ESP-12 Module. ESP8266 is a low-cost, Wi-Fi Module chip that can be configured to connect to the Internet of Things (IOT). The term "Node MCU" by default refers to the firmware rather than the development kits. The firmware uses the Lua scripting language. Fig. 5 shows Node MCU Uno Microcontroller.

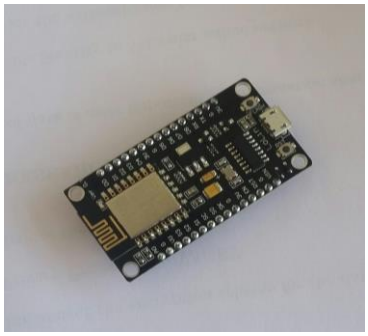

Fig. 5. NodeMCU Uno Microcontroller

5. Result

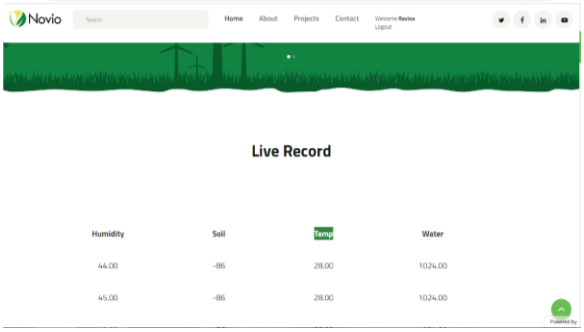

Fig. 6. Experimental result

Above fig. 6 shows result of the different sensors value which is display on our website. Different sensors like temperature and humidity, soil moisture sensors, LDR sensor and water level sensor are used for monitor the Greenhouse. These sensors sense the various temperature and humidity, soil moisture, light intensity and also detect water level in well. After that this value is sent to NodeMCU. The NodeMCU constantly monitors the digitized parameters of the various sensors and verifies them with the predefined value and checks if any corrective action is to be taken for the conditions at that instant of time. In such situation arises, it actives the activators to perform a controlled operations. The values of the parameters are updated to a webpage created on HTML code. It get refreshed after every five seconds.

6. Conclusion

Internet of Things has enables the agriculture crop monitoring easy and efficient to enhance the productivity of the crop and hence profits for the farmer. Wireless sensor network and sensors of different types are used to collect the information of crop conditions and environmental changes and this information is transmitted through network to the farmer/devices that initiates corrective actions. Farmers are connected and aware of the conditions of the agricultural field at anytime and anywhere in the world. Some disadvantages in communication must be overcome by advancing the technology to consume less energy and also by making user interface ease of use.

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