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IOT GREENHOUSE MONITORING SYSTEM

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ABSTRACT

A green house is where plants such as flowers and vegetables are grown. Greenhouses warm-up during the day when sun-rays penetrate through it, which heats the plant, soil and structure. Green houses help to protect crops from many diseases, particularly those that are soil borne and splash onto plants in the rain. Greenhouse effect is a natural phenomenon and beneficial to human being. Numerous farmers fail to get good profits from the greenhouse crops for the reason that they can't manage two essential factors, which determines plant growth as well as productivity. Green house temperature should not go below a certain degree; High humidity can result to crop transpiration, condensation of water vapour on various greenhouse surfaces, and water evaporation from the humid soil. To overcome such challenges, this greenhouse monitoring and control system comes to rescue. This project demonstrates the design and implementation of a various sensors for greenhouse environment monitoring and controlling. This greenhouse control system is powered by Atmega328 microcontroller it consists of temperature sensor, light sensor, soil moisture sensor, LDR sensor, LCD display module, 12v DC fan, Bulb and pump. Temperature sensor senses the level of temperature. If it goes high DC fans gets on and when the temperature goes low the fan gets off. Soil moisture sensor, senses the water level as the level decreases the pumps gets on. In the absence of light, the LDR sensor senses and the bulb start glowing. By this way it will become easy to monitor and control the system. All the sensor parameters data will update into IOT sever automatically and we can monitor that data anywhere in the world.

1. INTRODUCTION

Greenhouse monitoring and Control System is the approach in which the rural areas farmers will be benefitted by this Greenhouse environment. This project focuses on the Generic architecture and it can also be applied for much other automation-based application. Direct supervision of human will be replaced. By referring the different papers, we have proposed the system based on the limitations which is present in the monitoring and control system. Greenhouse is where the plants are grown with the controlled manner. Nowadays, Greenhouse construction is in greater demand due to the lack of land availability and urbanization. Growing crops will be reserved mainly by this proposed Greenhouse project. From the location wireless, Greenhouse using IoT can be used to monitor and control many Greenhouse buildings. A Greenhouse, which is an exceptionally outlined homestead structure.

This gives a more controllable environment to a better crop security, transplantation, harvest generation and product seeding. As a part of this present-day period, for developing yields, following to more space of area which has vigorously utilized for commercial ventures and housing the area space is accessible. The cost-effective farming such as new blossoms, organic products and vegetables generation is the utilization of Greenhouse development in many tropical nations. The conformity of ideal atmosphere development conditions which is to attain to the high return at great quality, low natural burden and low cost is the effectiveness of plant creation inside Greenhouse which depends fundamentally. Parameters like light, humidity, temperature, soil moisture must be controlled ideally where the given certain criteria through water creation, warming, ventilation and lighting are used to attain certain objectives. By persistent checking and controlling of these ecological parameters which gives a significant data that is related to the individual impacts of the elements differently towards acquiring the most extreme creation of harvest. The present remarkable difficulties of Greenhouse are to control. Temperature changes quickly, In Greenhouse as a result, fluctuations relying upon sun powered radiation level, moisture levels and outside temperatures. Poor natural product set and quality frequently bought by the high stickiness and poor light intensity. Expanding the efficiency of laborers by empowering them for the more important assignments, electrical expenses and heating fuel, empowering producers and directors to settle on better administration choices and to invest more on the energy dealing with procedures can be decreased by practicing exact control over the system. In this thesis, we have proposed a system which can read the parameters data from the environment which is identified within the Greenhouse and will be controlled manually or by Android app which we have developed. In the cloud data will be stored for future use. If any climate values fluctuate the precautionary measures will be taken by the user. The relationship between reference estimations and sensor flags, breaking down the developments, the natural variables which are uncovered and advancement of yields is explorated by strictly observing climate changing conditions. Greenhouse is a closed environment that provides optimal conditions for plant growth and promotes plant growth by controlling indoor and outdoor environments. A complete greenhouse remote monitoring system first detects indoor environmental elements through various sensors and then uploads the measurement signals to the control platform through wired or wireless methods, and the control platform remotely controls various terminal valves in the room (such as water valves, heating, Dropper, sprinkler irrigation, and other equipment) work to ensure that plants can grow in the best state. The greenhouse remote monitoring system mainly measures indoor carbon dioxide, temperature, humidity, light, soil moisture. Outdoors need to measure basic parameters such as wind speed, wind direction, and rainfall. These factors directly affect the growth of greenhouse plants. The sensor is a key component of the greenhouse remote monitoring system. Each sensor continuously measures a certain environmental factor at a specific location and reports these measurement results to the monitoring system. After the system detects the value deviation, it

outputs a signal to the controller of the specific sensor to control the corresponding valve switch and make adjustments in time. The greenhouse remote monitoring system of the Internet of Things can be widely used in agriculture, horticulture, animal husbandry, and other fields. It can implement monitoring and management in places that require special environmental requirements and provide timely measures for realizing the healthy growth of ecological crops and timely adjustment of cultivation and management. Scientific basis, while realizing supervision automation.

2. LITERATURE SURVEY

A greenhouse (also called a glasshouse or a hothouse) is a building or complex in which plants are grown. These structures range in size from small sheds to industrial-sized buildings. A greenhouse is a structural building 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 sunshine is absorbed inside the structure. Air warmed by the heat from warmed interior surfaces is retained in the building by the roof and wall; the air that is warmed near the ground is prevented from rising indefinitely and flowing away. In domestic greenhouses the glass used is typically 3mm (or 1/8") 'horticultural glass' grade, which is not generally as clear or free from imperfections as that used in a residential or office building[6]. Plastics mostly used are polyethylene film and multiwall sheets of polycarbonate material, or PMMA acrylic glass [4]. Commercial glass greenhouses are often high-tech production facilities for vegetables or flowers. The glass greenhouses are filled with equipment such as screening installations, heating, cooling and lighting, and may be automatically controlled by a computer [5]. Climate Control Systems is sought after internationally for greenhouse automation technology [10]. During last decades, Wireless Sensor Networks (WSN) are used in many environmental monitoring applications, such as methane leak detection, Radioactive radiation leakage[1] Failure detection and industrial environment control[2], and in different applications such as Automated irrigation system[3]. This work proposed a wireless sensor network system for greenhouse monitoring and control. The network composed of sensor node with different sensors to measure and transmits the sensed data to a remote station via wireless communication. The control achieved by Arduino technology, and UGI is designed using Lab View software in the gateway to show the received acquisition data [11], [12]. The system is build with a single node but it can be extended to many others as much as needed, also the system measures some common parameters which can be increased as much as the node can carry. The ecosystem plays a crucial role in plant development the amount of moisture inside the greenhouse cannot be adequately understood by farmers in the greenhouse. The condition in the green building they just understand manually, and they experience it on their own [13]. Experience plays a significant part in their regular activities at the end of the day. The plants would have water if the soil has minimum water content, but if it is too moist, in the greenhouse the roof will be opened during day time. Efficiency in greenhouse plant production must be achieved to achieve effective growth increases, so that

high production rates can be achieved at lower cost, higher quality and low environmental burdens. The greenhouse can be controlled by IOT which involves refrigeration, ventilation, immersion of the soil, etc. This System can be managed by concentrating on environmental criterion such as temperature and humidity. An individual can automatically monitor the environmental parameters of the greenhouse [14]. The need for ON/OFF switchgear functions eliminates automation plays an important role in performing things automatically. Automation does not eradicate or suppress human error entirely, but it minimizes it at certain stages. It is the need of the world of today for anything to be practical or controlled remotely. Here, assuming that the greenhouse owner will regulate and monitor the greenhouse from anywhere. The owner doesn't have to go over any of them and monitor the circumstances at all times. The owner must remain in one position and constantly track and manage the number of greenhouses at the same time. WiFi Module ESP8266 plays an important role in transmitting data to the network, removing the need for cable or wired links that automatically minimize costs. So, given all the evidence in our heads, we are developing an IOT based greenhouse system. The greenhouse system comprises the monitoring area and the control area. A DHT11 sensor, an LDR sensor, a moisture sensor on the floor and a flame sensor track environmental parameters are included in the control portion.ESP8266 is used to submit IOT cloud systems with environmental parameters [15]. A fan, water pump and artificial light are in the control area. The heart of the machine is the Arduino microcontroller. In this effort, The Arduino is the standard controller used to connect all sensors to each other. To detect the temperature inside the greenhouse the temperature sensor is used. The microcontroller receives the sensor readings. All of these relays are connected to the Buzzer. If the temperature exceeds the threshold level, the microcontroller transmits signals to activate the fan. LDR sensor for detecting the intensity of sunlight in the greenhouse. The microcontroller sends signals using artificial light to increase the strength of light if the amplitude is below the threshold value. The microcontroller can transmit signals using artificial light to increase the light intensity when the amplitude is below the threshold value [16]. The moisture sensor is used to detect moisture and the soil moisture sensor is used to detect moisture from the soil. If the sensor's measured humidity value is above the threshold value, using a water pump, water is transferred. If soil moisture is limited, the buzzer will be turned on by the microcontroller to decrease moisture and open the water outlet to increase soil moisture. Data on these parameters would be sent to the IOT module at the same time (ESP8266). Regardless of any threshold mismatch observed, the details sent to the IOT will be forwarded periodically. The ESP8266 is a microcontroller link chip for linking TCP/IP links and transmitting the data into Wi-Fi.The information that these sensors detect is then sent to the IOT. And then send it to your laptop and Smartphone.

3. EXISTING SYSTEM

In the existing system of greenhouse monitoring model we can detect the weather sensor parameters like temperature, humidity, soil moisture, pressure, rain status. This information

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is monitor on LCD alert to user using global system for mobile technology. But there is no automatic control system as per parameters change. In this proposed system we integrated automated control of irrigation pump if there is no water to plant. DC exist fan automatically turn on if the temperature or humidity increases high to protect plant. Light automatically on when there is light intensity is low. All the sensors information we posted into IOT server so that we can monitor greenhouse data from anywhere in the world.

4. PROPOSED SYSTEM

Here mainly we have five modules. The first one is Regulated Power Supply. It is connected to the circuit. The regulated power supply is given a 230Volts AC power supply and later it is converted into 12 Volts DC power supply. There are two capacitors; the first capacitor reduces the noise in the 12V DC power supply. Then the voltage regulator (7805) converts 12V DC into 5V DC power Supply. The Second capacitor also reduces the noise present in 5V DC and overall the 5V DC power supply is flowing into the total circuit system. The inputs are sensors, they are Temperature & Humidity sensor that will sense the amount of temperature and humidity levels and gives the reading to the Arduino microcontroller. If the temperature & humidity levels are beyond the threshold value then the Ignition fan gets ON otherwise stays OFF. Light sensor LDR senses the amount of sunlight if there is sufficient light bulb is OFF, if not bulb gets ON. The soil moisture sensor senses the dryness and wetness, if it is dried the water is required so the water pump gets ON. If the moisture sensor senses it aswet the pump won't release water. All this data received will be stored in a server creating a website by using a wifi Hotspot. In this way, greenhouse monitoring is done and the plant's growth will be good and can be benefitted from good yield.

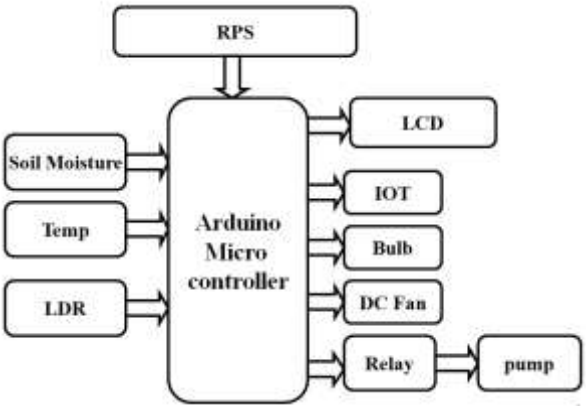

Fig.1. Proposed block diagram

WORKING MODEL:

The temperature and humidity sensor can be connected to an external controller. When direct sunlight causes the indoor temperature or humidity to be too high, the temperature and humidity sensor uploads the current value to the general platform, and the general platform sends a signal to the fan controller of the greenhouse to control its work suction or vent. Proper greenhouse lighting can maximize plant growth and development while minimizing energy consumption. Light measurement helps optimize growth and can be used to automate supplemental light levels in greenhouses and guide light positioning in indoor growth facilities. Light sensors are a good tool for assessing the exposure of plants to light. Soil water content is the driving force for plant growth. When the water content in the soil is relatively high, the water in the plant will enter the body of the plant through the membrane of the root system, accompanied by a large number

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of inorganic nutrients in the soil. However, when the water content in the soil is insufficient, the concentration in the root system of the plant is lower than the growth environment of the outside world. This makes the main activity of the root system leading to the soil environment more, and the elements in the soil enter the plant body. If it is too small, it will have an impact on the growing needs of plants. Monitoring the soil moisture content in the greenhouse can help increase yields.

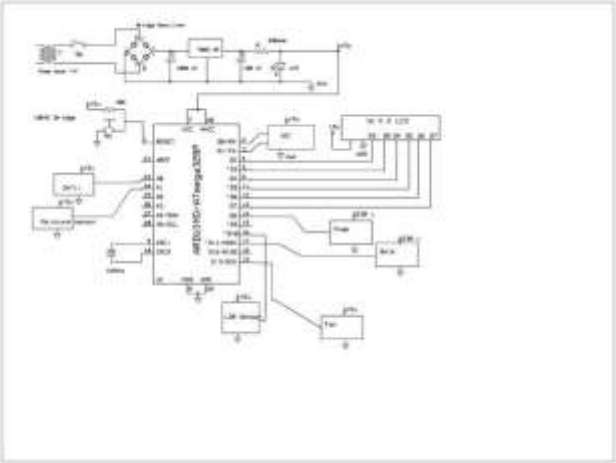
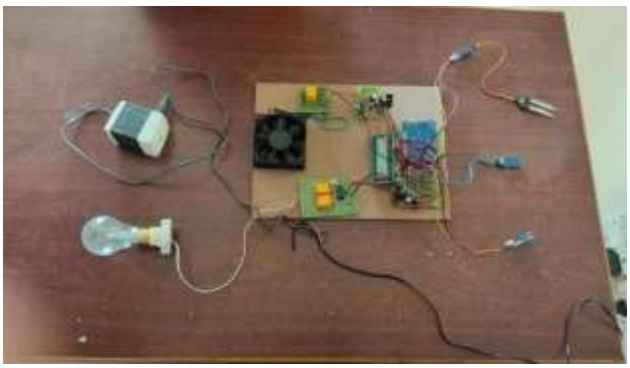


Fig.2. Proposed Circuit diagram

PIN DESCRIPTION

- In this system, Arduino is the heart of the whole system which takes control of the process. When sensors sense any change in the environment or soil, Arduino comes into action and processes the required operation.
- When the soil moisture sensor does not sense moisture in the soil then Arduino turns on the water pump and sends a message to the owner of the status that the motor is turned on if LDR senses low light then Arduino takes control and turns on the artificial lights.
- In this system, a 16x2 LCD is used for displaying the status for all operations Motor turned-on or off, temperature, humidity, and light status. The LCD's data pins are connected in 4-bit mode (data pin d4, d5, d6, and d7 pin of LCD is directly connected with pin no. 4, 5, 6, and 7 of Arduino, and commanding of LCD's Rs and En is connected with pin no. 2, 3 of Arduino). LDR is used for sensing light intensity and its output is connected to Analogy pin 10 of Arduinowhile the artificial light is connected using a relay. The relay is operated by using ULN2003 and controlled using PIN17 of Arduino. Humidity and temperature sensors are used for sensing humidity and temperature that are connected directly with Analogy pin A0 of Arduino. The fan is directly connected with pin 19 of Arduino and CFL light is connected with pin 11 of Arduino by using Relay. The water pump is also connected by using a relay and is controlled by Adriano's PIN 14 and the sensor for measuring the soil moisture, PIN24 is used.

5. RESULTS



This is set up of our Green House Monitoring andControllingSystem

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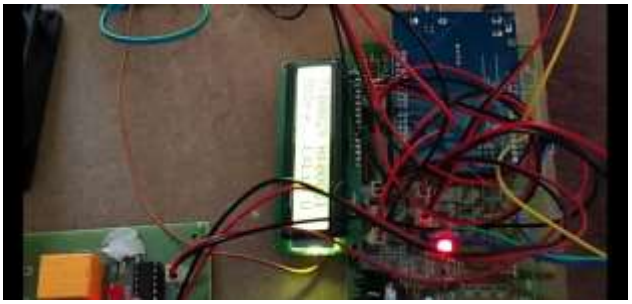
when the system is in on condition it displays the title of the project on the LCD

While connecting to the IoT server it displays **CONNECTING** on LCD

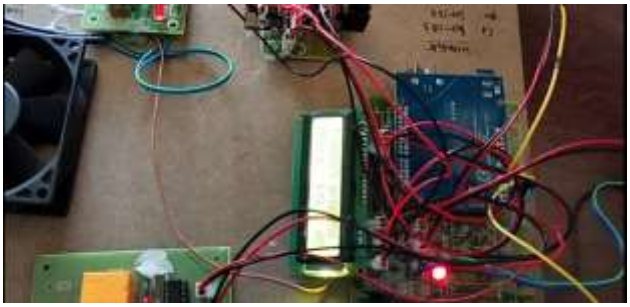


Here the Data is displayed on the LCD module, **T** for temperature value, **H** for Humidity value, **M** for moisture in the soil, **L** for light intensity, and at the bottom is displaying means the data is uploading to the server.

Here Ignition fan is turned ON when the temperature exceeds 33 degrees

Here, The Bulb will be on when there is an absence of light

Here, The Motor Pump will be on when there is dry in the soil content.



Here **U** will display means uploading the data into the server and Timer will run for 10 seconds during this time the system is in the hang position.

Table.1 Results comparison Table

Parameter	Existing Model	Proposed Model
Microcontroller	8051	Arduino
Speed	Low	High
Complexity	High	Low
Efficiency	LOW	HIGH

6. CONCLUSION

We designed and implemented greenhouse monitoring system successfully. In this system, Arduino is the heart of the whole system which takes control of the process. When sensors sense any change in the environment or soil, Arduino comes into action and processes the required operation. When the soil moisture sensor does not sense moisture in the soil then Arduino turns on the water pump and sends a message to the owner of the status that the motor is turned on if LDR senses low light then Arduino takes control and turns on the artificial lights. We executed required results successfully.

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