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SMART GREENHOUSE AUTOMATION USING SOLAR POWER

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Abstract: The 21st century is striving hard for cultivation of plants in a controlled manner, But because of lacking of land availability and scarcity of water. In traditional farming, farmer has to visit the farming land regularly to measure the various environmental parameters such as temperature, humidity, light intensity and soil moisture to cultivate the right crops at right time in right soil. Even though this traditional farming system have been used for years, the system is hectic and fail to prove high productivity rate as farmer usually unable to measure all the parameter accurately. Therefore there is need to optimize the system in a way that is affordable and efficiently conserves water. Manually controlling the water is a tedious process and inefficient due to requirement of a person to control. Working in such a manner sometimes it leads to damage of plant in the absence of that person. The main problem is it depends on weather conditions, sometimes which leads to complete damage of plants. Therefore, there is a need to come up with a system which overcomes the problems of manual systems. A system which reduces manual control and would efficiently worked in a control manner.

This is done by using Automatic greenhouse monitoring and controlling. It replaces the direct supervision of the human. In this paper the different papers have been reviewed and developed the proposed system based on the limitation in the present monitoring system. Greenhouse is a building where plants are grown in a controlled manner. We created a total model of smart greenhouse for implementing our system. It consists of simple but efficient algorithm, which happens to manage all the aspects.

Keywords— Arduino ATmega328, Atmospheric sensors, DC motor controlled sprinkler system. Solar panel.

I. INTRODUCTION

The Outline of this project had been aimed at data acquisition in greenhouse from multiple sensors, Greenhouse main task is to offer a protective environment for the crop production. So that to use it for processing to achieve the better upgrade of growth in greenhouse plants. Additionally, this data shows effect on the climate of greenhouse. Operation of arduino as software and Global system for Mobile Communications (GSM) module and sensors as hardware. By using Arduino mega board provides multiple inputs analogs and process based upon the input according to the threshold values provided in the program and makes the corresponding components to work along. All this setup is supplied with solar power. Typically greenhouse control system monitored mainly the environment elements such the temperature and humidity inside the greenhouse. The control of greenhouse climate in order to improve the development of a specific cultivation and to minimize the production cost becoming increasingly important for the growers. However, to be able to monitor a details crop grow status requires more accurate and various data than temperature and humidity only. Accordingly, monitor crop itself I as important as monitoring indoor environment. The human man power to maintain the facilities without proper control system. Manpower is prone to error. To run the plant efficiently, a control system has to be apply that can simultaneously reduce the cost of operation, without having too much on the manpower. It also can improve the production of the plant, hence increase the profit of the organization. The crop to grow in perfect condition, and increase the productivity without having to depend on the weather and environment conditions naturally.

II. THEORY

A. Arduino UNO

The Arduino Uno is an open-source microcontroller board based on the Microchip Atmega328P Microcontroller and developed by Arduino.The board is equipped with sets of digital and analog input/output pins, It has 14 digital input/output pins, 6 analog input, a 16 MHZ crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button..”UNO” means one in Italian and is named to mark the upcoming release of arduino 1.0.

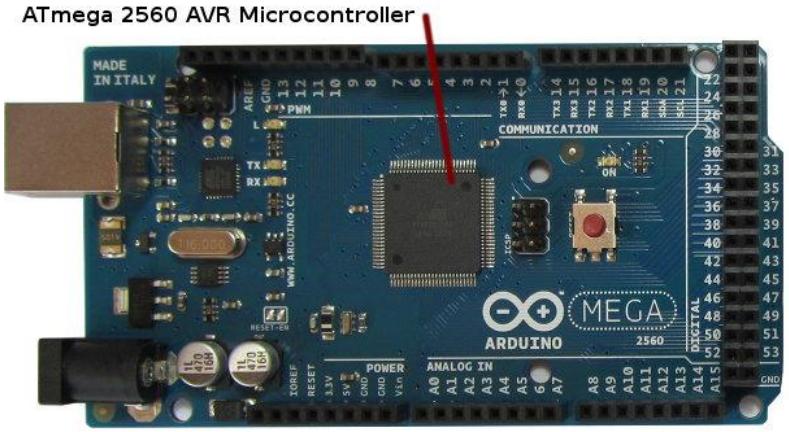


Fig: Arduino Uno

The Uno is the latest in a series of USB Arduino boards and reference model for Arduino platform. The Arduino Uno can power via the USB connection or with external power supply. External power can come either from an AC to DC.

The Arduino are programmed using a dialect of feature from programming language C and C++. In addition to using traditional compiler tool chains, the Arduino provide integrated development environment (IDE) based on processing language project.

B. Solar Panel

A solar panel is a collection of solar cells. The solar panel converts the solar energy into electrical energy. Output of the solar panel is its power which is measured in terms of Watts or Kilo watts. Solar power uses multiple reflectors to collect more sun's thermal energy. Thermal energy collected through the day to perform different operations. Performance of the solar panel depends on a number of factors like climate, conditions of the sky, orientation of the panel, intensity and duration of sunlight and its wiring connections.

Fig:Solar Panel

C. Atmospheric Sensor's

1. Soil Moisture Sensor

- It consist of two probes which are used to measure the volumetric content of water.
- Two probes allow the current to pass through the soil.
- Then it gets the resistance value to measure the moisture value.
- It connected in two modes analogue and digital mode.

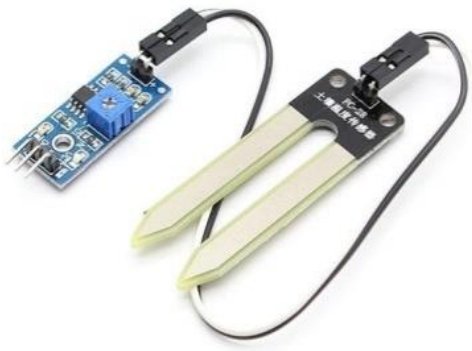


Fig 2: Soil Moisture Sensor

D. LDR Sensor

Light dependent resistor is used to detect change in light intensity or as alight sensor. LDR is basically a variable resistor. LDR resistance changes with the change in intensity of light. If intensity of light falling on LDR is high, LDR will have low resistance.

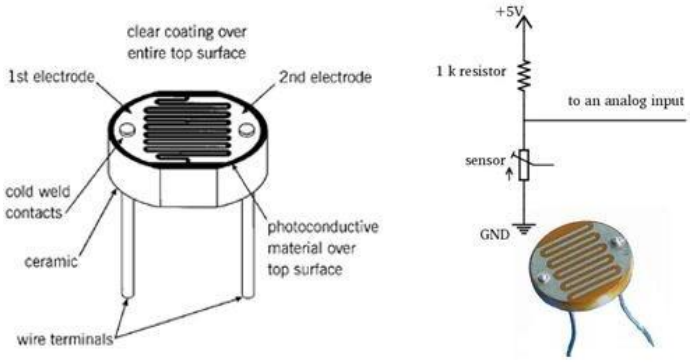


Fig: LDR Sensor

When intensity of light increases, LDR offers high resistance. Hence there is a inverse relationship between intensity of light and resistance of LDR. LDR is a resistor and its resistance vary according to the amount of light falling on its surface.

E. Temperature and Humidity Sensor (DHT11)

- DHT11 sensor is used to measure both Temperature and Humidity.
- It has high reliability, high efficiency and long-time stability.

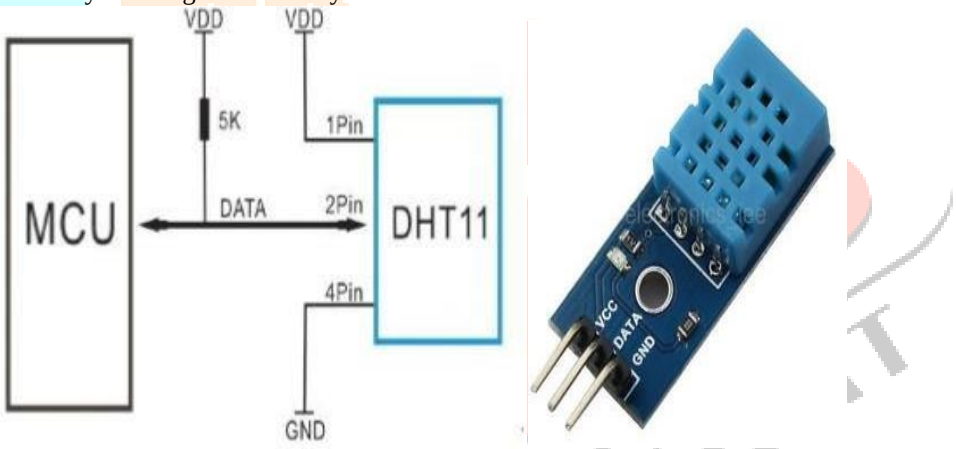


Fig 4: DHT11 Sensor

- It has a thermistor for measuring the temperature.
- Humidity measuring component for measuring humidity.
- GSM Modue

Fig: GSM Module

GSM stands for Global System for mobile communication. Here in this project by using GSM module we can keep information about the effects of climate on plants. It sends the information about Temperature, Humidity, Light Intensity, soil moisture and status of appliances that are connected with circuit for controlling Green house parameters. Its operating voltage is 3.3V to 5V. It can transmit voice, SMS, and data information.

III. RELATED WORK

This system describes the design of a greenhouse monitoring & controlling system by using Arduino. Some of the previous systems used android phone to monitor the green house but lacked to control it using android from remote locations. One of them was based on Global System for Mobile Communications (GSM) in which notifications are sent via SMS. The biggest disadvantage of these systems was that one person always had to be present in the green house or in the vicinity of the green house. The first problem which is overcome in our system is that a person need not always be present in the greenhouse. Plants in green house are grown under controlled environment. The temperature differences can cause harm to plants. Sometimes the farmers cannot predict which action needs to be taken so to control the environment and may take wrong decisions thus causing more harm to the plants in the green house. Our system will allow him to take proper decisions by providing the status of the sensors to the farmer with accurate information through the IOT web server. Thus this system helps farmer to control green house from remote locations.

IV. SIGNIFICANCE AND SCOPE

This system helps in monitoring and controlling the climatic conditions that are favorable for the cultivation of a particular plant. By using this system, crops growth can be improved along with maximized yield, irrespective of the weather conditions. Automatically control environmental conditions within greenhouse allowing any type of plants to be grown all year round. Eliminates risk of greenhouse not being maintained at specific environmental conditions due to human error.

Minimize labour costs involved in maintaining a greenhouse. This project describes the design of a greenhouse monitoring & controlling system based on IOT using Arduino. 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 the way we live our daily lives & what information is stored about us.

The computing is free to use anytime from the cloud and anywhere as long as the computer is connected with the internet. This monitoring & controlling system precepts different parameters inside the greenhouse using sensors, GSM & IOT to provide the updates.

V. Proposed Project:

The present Proposed project is developed by reviewing different papers based upon the limitation of extinction of conventional energy sources like coal, oil etc. For the modification in the previous paper power source is replaced by Solar or wind energy. Solar or wind power is a renewable energy source and whenever the project is out of energy, then this solar cell or wind mill implemented here works as a backup as it is stored in a battery, that means a continuous cost effective power supply.

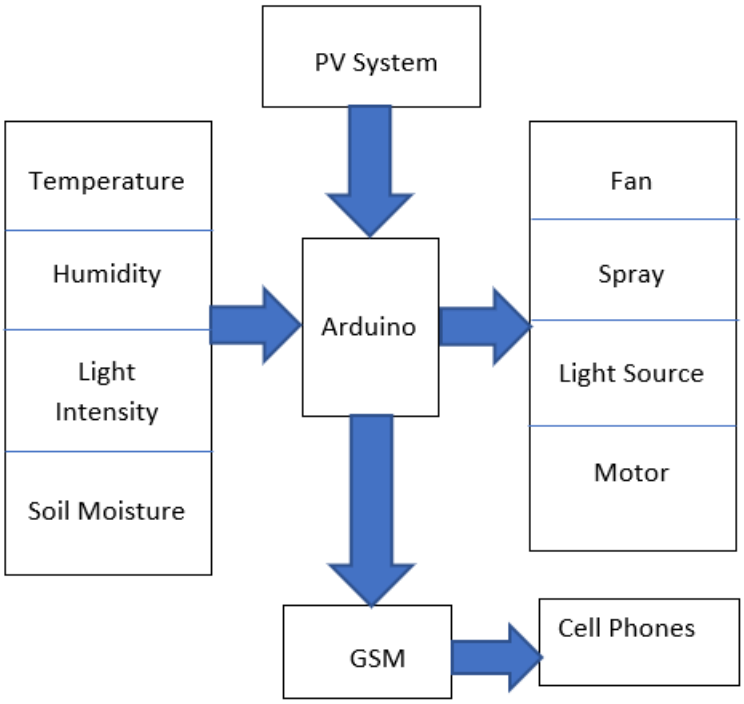
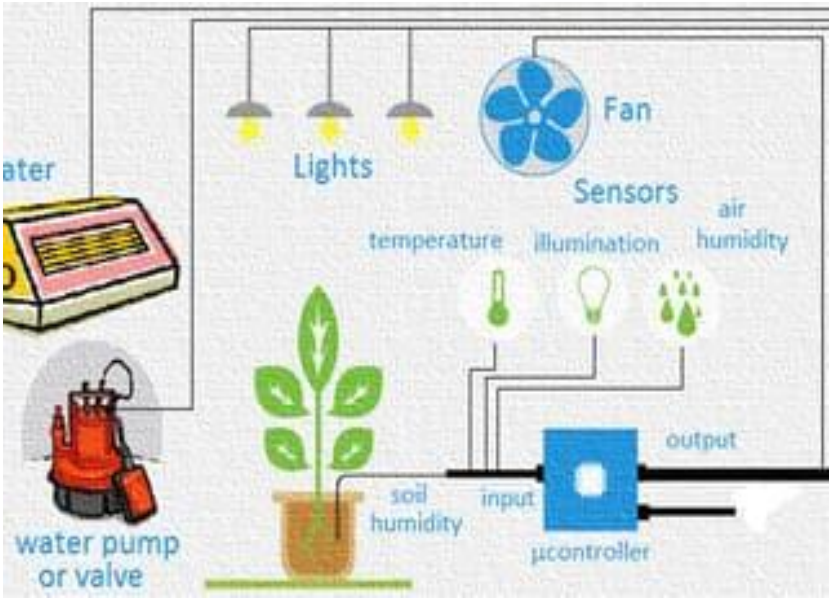


Fig :Block Diagram

A. Mechanism



- An arduino based Greenhouse Automation is designed.
- The arduino can be programmed with arduino software (IDE).
- Internet Of Things concept is used for showing the sensed data on web portal page.
- Power supply is given by the solar to Arduino.

B. Software Implementation

The software part programming through Arduino Uno software (IDE). It is easy to write code and upload it to the board. C and C++ language are used for programming.

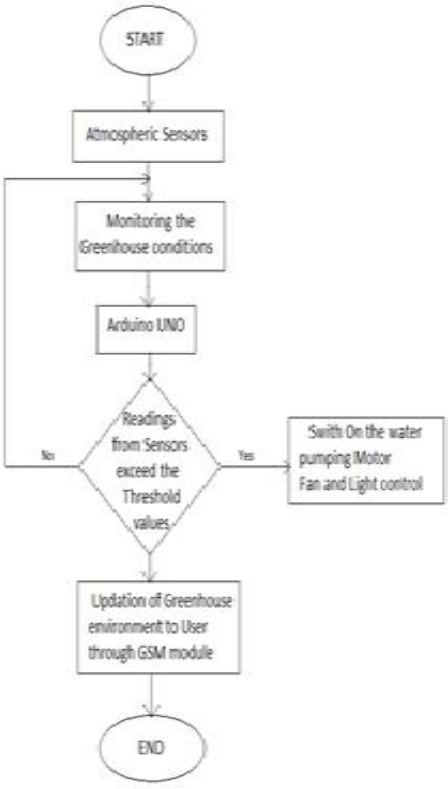
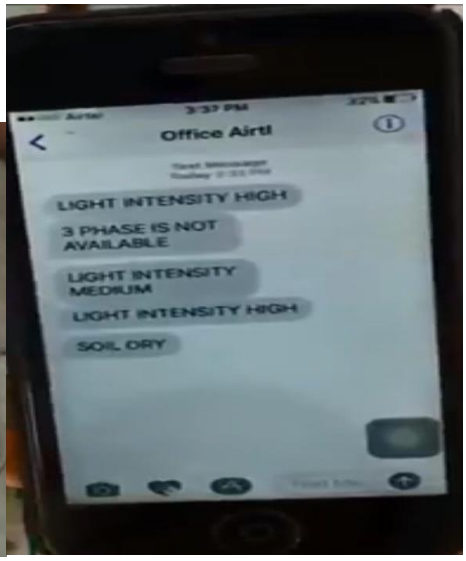


Figure 8. Typical Screenshot during Program Development

VI. EXPERIMENTAL RESULTS

In this proposed system we have used atmospheric sensor's, which is LDR light sensor,, DHT11 humidity sensor. For these sensor's we have denoted some specific conditions or the threshold values .



As per their climate the value will be change and the controlling action will be taken by relays which is connected to the output side. And the changed data of atmospheric sensor's we can observed for analyzing on the screen of serial monitoring using the arduino uno kit and their IDE software.The hardware of proposed system and status of the sensor's.

A. Advantages

- Any plant can be planted outside the farming season.
- Protect plants against rainy seasons, storms, wind and frost.
- Control pests and diseases.
- Total automation of greenhouses / nurseries / bio tech parks.
- Can be used domestically.
- Reducing fertilizers waste.
- Suitable for Tissue culture plants.
- Easy to use, install, operate troubleshoot.
- Useful for small scale farmers &green house owners. Low cost setup.
- Higher yields with space optimization, for instance planting vertically.

B. Conclusion

Here, proposed design is implemented with Arduino platform for greenhouse monitoring , controlling temperature and soil moisture by using solar power as a supply.

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