SOLAR POWERED SMART GREENHOUSE ENVIRONMENT MONITORING BY USING IOT

Joshi Rahul[1], Waghmare madhumangal [2],Kaile Padmakar[3], Bansode rohit[4]

1 student, electrical engineering, trinity college of engineering and research, Maharashtra, India
2 student, electrical engineering, trinity college of engineering and research, Maharashtra, India
3 student, electrical engineering, trinity college of engineering and research, Maharashtra, India
4 student, electrical engineering, trinity college of engineering and research, Maharashtra, India

ABSTRACT

Greenhouses are climate-controlled system with walls and roof specially designed for offseason growing of plants. Most greenhouse systems use manual systems for monitoring the temperature and humidity which can cause discomfort to the worker as they are bound to visit the greenhouse every day and manually control them. Also, a lot of problems can occur as it affects the production rate because the temperature and humidity must be constantly monitored to ensure the good yield of the plants. Internet of Things is one of the latest advances in Information and Communication Technologies, providing global connectivity and management of sensors, devices, users with information. So, the combination of iot and embedded technology has helped in bringing solutions to many of the existing practical problems over the years. The sensors used here are soil moisture sensor and DHT11 (Temperature & Humidity sensor). From the data's received, Microcontroller automatically controls Moisture, Temperature, Humidity efficiently inside the greenhouse by actuating an irrigating pipe, cooling fan, and sliding windows respectively according to the required conditions of the crops to achieve maximum growth and yield. The recorded temperature and humidity are stored in a cloud database (Thing Speak), and the results are displayed in a webpage, from where the user can view them directly.

Keyword : - *Greenhouse, Sensors, Solar Power, wireless, Android application. thing speak*

I. INTRODUCTION

A greenhouse is mainly used to grow certain types of plants throughout the year or plants that require continuous monitoring to achieve high quality and quantity. At present most of the greenhouses are manually controlled and monitored. This method of greenhouse monitoring is labour intensive and time consuming. The Internet of Things concept can be used in greenhouse to increase the productivity by using various sensors to sense the environmental parameters. The Internet of Things is a network of devices that are connected via internet and together with web services communicate with each other. This paper proposes a system to monitor and automatically as well as manually control the system in greenhouse using temperature sensor, humidity sensor, light intensity sensor and soil moisture sensor. If the sensed data crosses a predefined threshold range an alarm will be triggered which will alert the user. A greenhouse can be defined as a closed structure which is used to protect the plants from external factors such as climatic conditions, pollution, etc. It offers a sustainable and efficient development of the plants throughout the year. Basic factors affecting plant growth are sunlight, water content in soil, temperature, humidity etc. Numerous researchers have worked with water sprinkling and irrigation system. They opted for different methods for determining the soil moisture condition. An article on the automated water supply system for urban residential Are as showed that their system can be used to effectively manage water resource. Required physical factors are manually for connection/ disconnection of supply. The customers and embedded system will be able to monitor the use of electrical power real time.

II. LITERATURE SURVEY

1) M. Danita et al. [1] propose the sensors used here are moisture sensor and DHT11 (Temperature &Humidity sensor). From the data's received, Raspberry PI3 automatically controls Moisture, Temperature, Humidity efficiently inside the greenhouse by actuating an irrigating pipe, cooling fan, and sliding windows respectively according to the required conditions of the crops to achieve maximum growth and yield.
2) Yan Liu et al. [2] propose the design of the system is based on ZigBee and the greenhouse environment is detected by a slave computer. The data collected will be transmitted to a host computer to do the specific operation. That is, by displaying and controlling greenhouse parameters in real time, the host computer can realize real-time monitoring and control of greenhouse temperature, humidity, light, air quality and other environmental parameters. The simulation results show that the system has good stability, low power consumption and good real-time monitoring effect. It can effectively improve the reliability and intelligence of the greenhouse environment monitoring, and reduce the monitoring cost.
3) Vimal P V. [3] stated that in order to achieve maximum plant growth, the continuous monitoring and controlling of environmental parameters are necessary for a greenhouse system. The main aim of this project is to design a simple, low cost, Arduino based system to monitor the values of environmental parameters and that are continuously updated and controlled in order to achieve optimum plant growth and yield. DHT11 sensor, Soil Moisture sensor, LDR sensor are the main sensors used in this project which give the exact value of temperature, humidity, water content, light intensity respectively. All environmental parameters are sent to android mobile phone via offline and online.

IV. BLOCK DIAGRAM

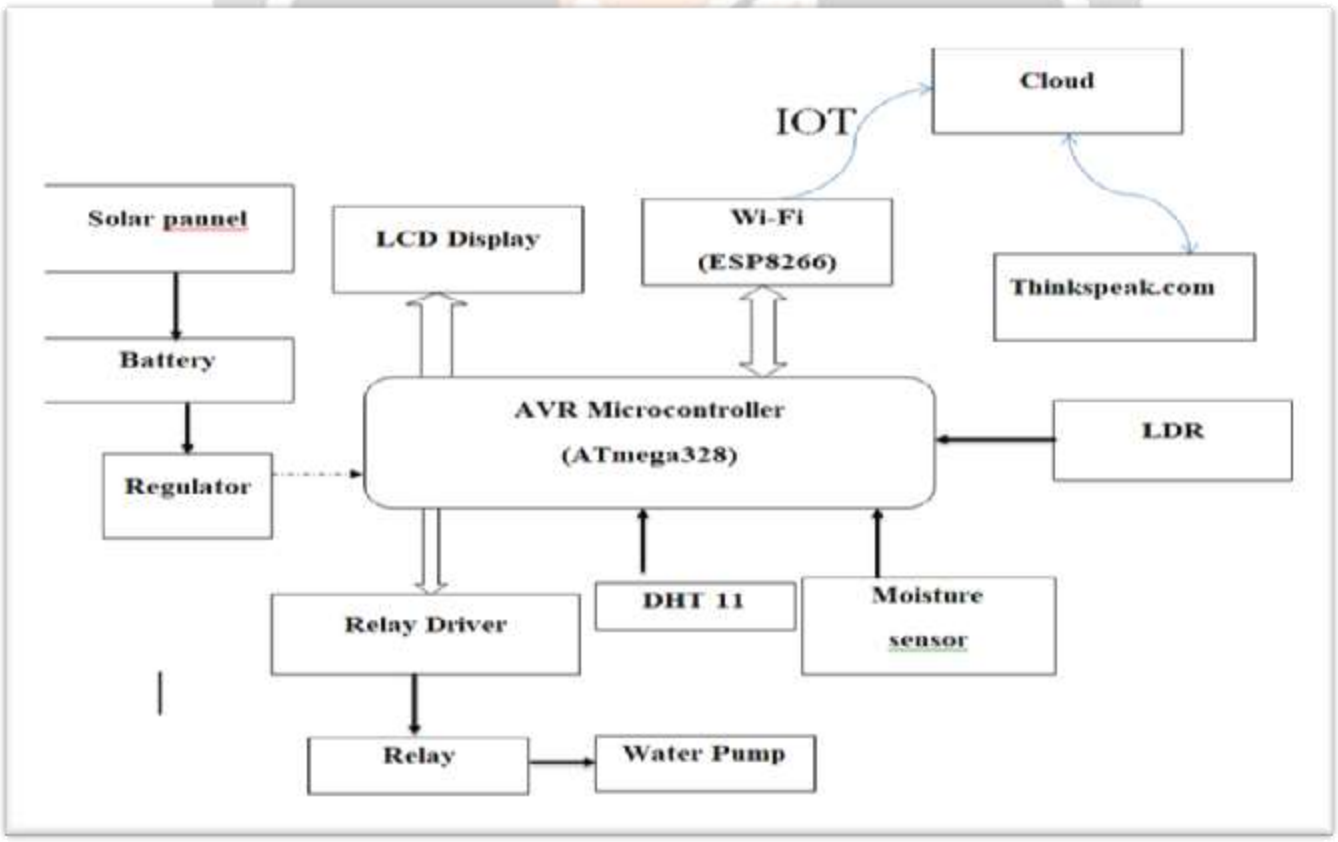
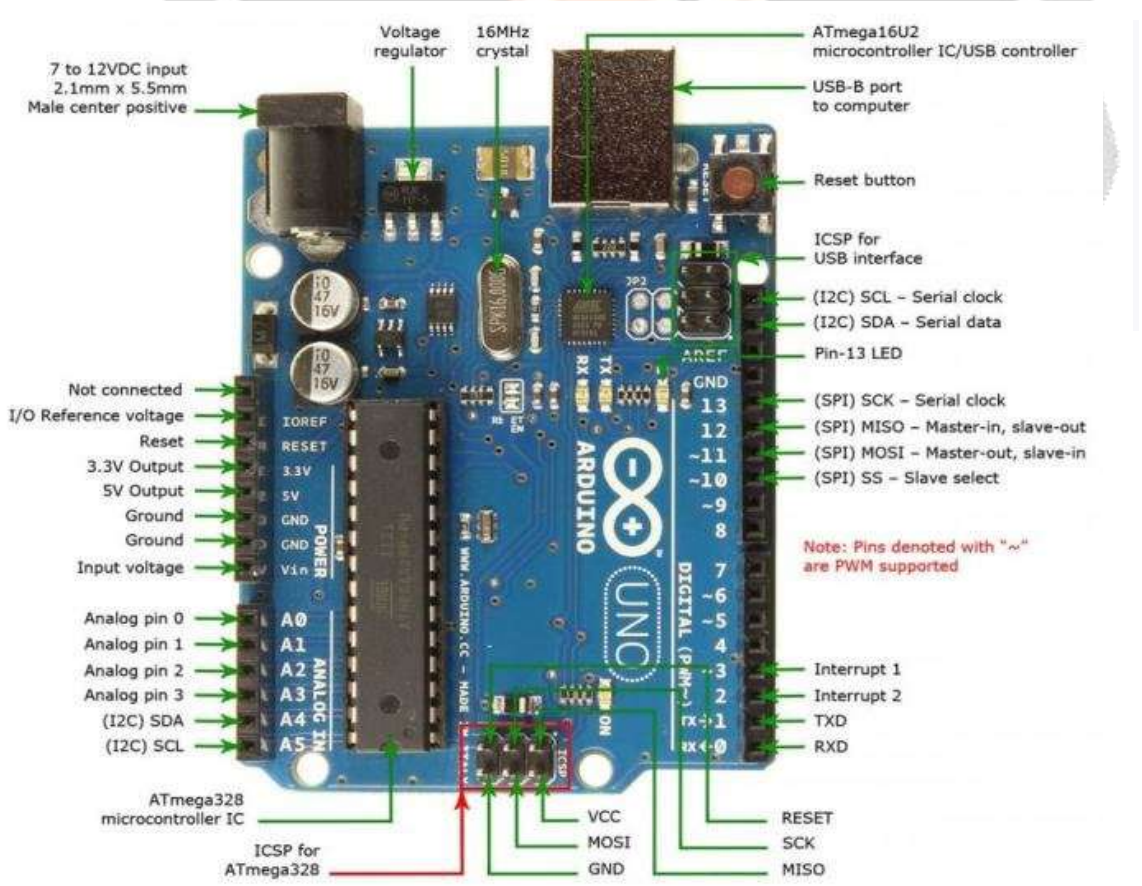


Fig -1.block diagram of smart health monitoring system

Solar panel is mounted at roof of the green house and it connected to the battery through diode. Battery charged by solar power. Solar panel able to charge 12V and 7Amph. All devices are operated in 12Volt DC supply from battery. In this system peripheral interface controller (PIC) microcontroller place a major role by controlling and monitoring the greenhouse system. Controller is interfaced with the 16*2-character LCD display. It helps to show parametric values and user can set or reset the values of parameters. Inputs are connected to I/O ports of controller. Soil moisture sensor is used for measure water content in soil. This is working under the principle of dielectric. Sensor will fix at 3cm depth of soil. When the soil moisture level is low sensor should give signal to the controller and the solenoid valves are actuated through relay. If moisture level is attained the maximum value solenoid will be stopped. In this method we controlled the required water level for crops. Humidity sensor is used to measure water content in atmosphere. Humidity level maintenance is important for healthy crops so we controlled humidity by using sprayer. The sprayer is used to spray water in mist form. This will be maintaining humidity. This is maintaining a humidity level from minimum to maximum level Sprayer is actuated by submersible pump. Temperature sensor (dht11) is used to measure the temperature inside green house. This is used to maintain certain range of temperature inside green house. Whenever temperature rise at high then sprayer is actuated to reduce temperature. If the temperature is low then artificial light will glow to increase temperature. In our project we maintain temperature at optimum level Submersible pump is used to increase discharge of water from tank. So, there is no human resource often required to monitor and irrigate the field. Through maintaining optimum conditions inside the greenhouse yield of the crop is increased.

Elements of block diagram: -

1.MICROCONTROLLER ATMEGA328

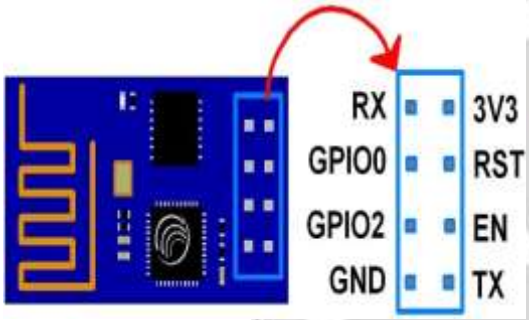


2.LCD

LCD is a flat-panel display or other electronically modulated optical device that uses the light-modulating properties of liquid crystals combined with polarizers. Liquid crystals do not emit light directly, instead using a backlight or reflector to produce images in colour or monochrome. LCDs are available to display arbitrary images (as in a generalpurpose computer display) or fixed images with low information content, which can be displayed or hidden, such as preset words, digits, and seven-segment displays, as in a digital clock. They use the same basic technology, except that arbitrary images are made from a matrix of small pixels, while other displays have larger elements. LCDs can either be normally on (positive) or off (negative), depending on the polarizer arrangement .

3.ESP8266 WI-FI MODULE

The ESP 01 ESP8266 Serial WIFI Wireless Transceiver Module is a self-contained SOC with integrated TCP/IP protocol stack that can give any microcontroller access to your Wi-Fi network. The ESP8266 is capable of either hosting an application or offloading all Wi-Fi networking functions from another application processor. ESP8266 is Wi-Fi enabled system on chip (SoC) module developed by Espressif system. It is mostly used for development of IoT (Internet of Things) embedded applications



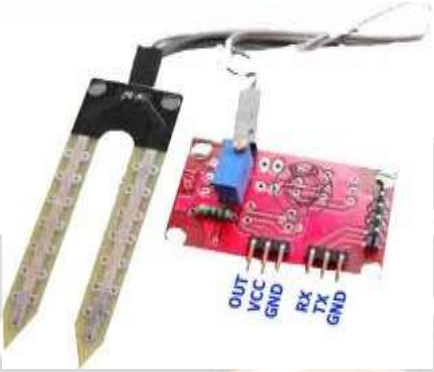
4.SENSOR

Temperature and humidity Sensor

This drobox DHT11 Temperature & Humidity Sensor features a temperature & humidity sensor complex with a calibrated digital signal output. By using the exclusive digital-signal-acquisition technique and temperature & humidity sensing technology, it ensures high reliability and excellent long-term stability. This sensor includes a resistive-type humidity measurement component and an NTC temperature measurement component, and connects to a high-Performance 8-bit microcontroller, offering excellent quality, fast response, anti-interference ability and cost-effectiveness.

Soil Moisture Sensor

This sensor can be used to test the moisture of soil, when the soil is having water shortage, the module output is at high level, else the output is at low level. By using this sensor one can automatically water the flower plant, or any other plants requiring automatic watering technique. Module triple output mode, digital output is simple, analog output more accurate, serial output with exact readings.

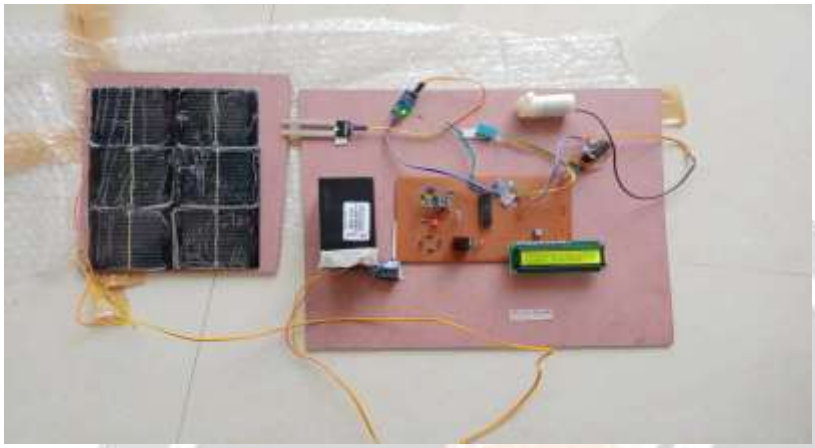


Light dependent resistors (LDR)

Light dependent resistors, LDRs or photoresistors are electronic components that are often used in electronic circuit designs where it is necessary to detect the presence or the level of light

V. HARDWARE IMPLEMENTATION

The actual module of solar powered smart greenhouse environment monitoring using iot is shown in below figure . different type of sensors like DHT11, soil moisture sensor, LDR , sense temperature humidity, soil moisture in soil and light intensity and display all data on LCD display.



VI. CONCLUSIONS

The primary applications for this project are for farmers and gardeners who do not have enough time to water their crops/plants. It also covers those farmers who are wasteful of water during irrigation. The project can be extended to greenhouses where manual supervision is far and few in between. The principle can be extended to create fully automated gardens and farmlands. Combined with the principle of rain water harvesting, it could lead to huge water savings if applied in the right manner. In agricultural lands with severe shortage of rainfall, this model can be successfully applied to achieve great results with most types of soil. The greenhouse parameter control system for desired conditions is implemented. The sensor devices available are integrated with Microcontroller board is very useful. The setting needs series of observations and study inter dependency of various parameters, such as temperature, humidity and sun light intensity. Arduino board makes it easy to install and maintain the system. The system deployment in test green house is studied implies need of poly house structures study, inside, outside environment study, crop needs etc. Simply controlling given parameters is not enough. DC supply can be given in the form of a battery bank easy to charge with solar system. There are limitation in terms of seasonal measurements and crop needs. The user awareness of how to check system operation is a basic need to be fulfilled.

VII. REFERENCES

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