Solar Power Controlled Automated Irrigation System

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Abstract *In India, the field of agriculture is facing a lot of problems due to water scarcity and interrupted power supply. This condition leads to poor irrigation systems and hence the soil losses its moisture content. Thus, making the land unfit for agricultural losses. To avoid this condition, proper irrigation system must be developed, which will help to keep the soil moist in nature. Solar-powered systems are being preferred for use in developing countries instead of other forms of alternative energy because they are extremely durable and can also exhibit long-term economic benefits. Solar powered water pumping systems can be the most appropriate solution for grid isolated rural locations in poor countries where the levels of solar radiation are extremely high*

Keywords: Irrigation, Solar, NodeMCU, Sensors

Introduction

According to the recent statistics, the land used for crop cultivation in India is decreasing at an accelerating rate. Outdated irrigation techniques and availability of water resources are the primary reasons for incoherent production. Hence, technological solutions for agriculture task automation are the need of the hour. In particular, simplified irrigation mechanisms reducing water wastage are very essential, which encourage precision agriculture .Technological solutions for irrigation and agricultural task automation are driven by electric power. Throughout a year India receives solar radiation on an average 3000 hours of sunshine (i.e. 4-7kWh of solar radiation per sq. meters). Hence solar driven technological solutions for agriculture task automation can yield better benefits for Indian environmental conditions. We proposed a solar power controlled automated irrigation system. Sensors collect the information about the water level of fields and update the farmer as well as the microcontroller. The farmer can switch ON and OFF the motor based on the water level even from distant places using a cell phone. However, if the water level reaches to the danger level, then the motor will automatically start to ensure the proper water level in the field.

LITERATURE REVIEW

In the paper authors have traced different sections for temperature and humidity. They have described their work in 5 sections. Section I defines the humidity and temperature by using humidity and temperature sensor DHT11, section II reads the DHT sensor module's output and extracts temperature

and humidity values into a suitable number in percentage and Celsius scale, section III system displays humidity and temperature on LCD, Section IV defines analyzing and designing the system architecture, section V shows the result and future scope.

Solar Powered Automatic Irrigation System In this paper, authors have concluded that the system will be very much useful to the farmers in order to save the limited water resource, which is available for them. The solar based system will reduce their dependency on power supply to the grid. Also, the battery backup helps them to use the power at any time they need it. The sensing device in the tank to check level of water. The event of water level being high will not be allowed. By resonant converter method, the moisture and the pH level sensors are connected to power supply without any wires. This will reduce the risk of malfunctioning of the sensors due to any loose contact or damage of the wires. The user is also provided with the information about the current moisture content and pH level of the soil through SMS with the help of Zigbee module.

IOT Based Smart Agriculture And Soil Nutrient Detection System, This project provides a brief overview of the soil monitoring system using sensors. Various soil sensors are used to measure temperature, moisture and light, humidity and ph value. The information from the sensors in the soil is sent to the MCP3204 A/D converter then from A/D converter it send to the cloud through Raspberry pi. Finally we can see the information saved to cloud on mobile phone as well as laptop. On the basis of information we know which crop is suitable with given 4 soil parameter. Thus this advanced technology helps the farmers to know the accurate parameters of the soil thus making the soil testing procedure easier.

SYSTEM DEVELOPMENT

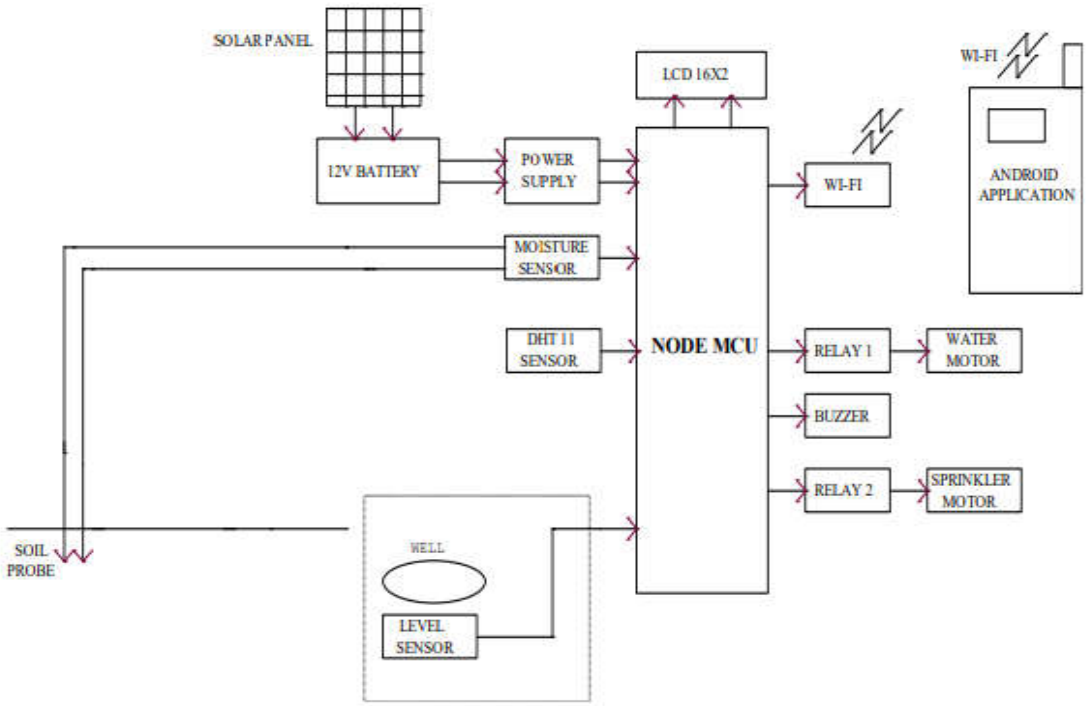
This system provides an automated irrigation which helps in analyzing moisture level of the soil. The primary application of this project is for farmers where they do not have the enough idea that how much amount of water is needed for the crop. Solar panel charges the battery through charge controller. From the battery, supply is given to the motor directly in this work. Here the sensing circuit controls the motor. The sensors used are soil moisture sensor, temperature & humidity sensor. The sensor detects the values of soil moisture, temperature &humidity at different points in the field. Microcontroller according to pre-set value compares the measured values. Based on the error between the pre-set and measured values, motor ON/OFF condition is controlled.

Proposed Methodology

The proposed system uses the solar energy to produce the required electrical energy using solar panels. Using solar energy as a renewable energy source from solar panels, dependency on the power grids will be reduced. We will use sensors such as moisture sensor, DHT11 sensor and level sensor for the complete project. The sensors will continuously monitor the moisture content in soil, temperature and humidity as well as level of the water in the well so that using NODE MCU, we can control and monitor the water motor and sprinkler motor. As the system is IoT based, we will be able to monitor the performance of the system using Android application. Thus minimizing the efforts of farmers as well as electricity bill. LCD 16x2 will display temperature, humidity as well as moisture sensed by the sensors.

Block Diagram

In this proposed system we are going to use IoT-based automation. In this system we are using latest microcontroller that is NODE MCU which has inbuilt Wi-Fi technology. The system works with the help of internet android application. In this system we are going to use Blynk application which will continuously monitor the temperature, humidity and moisture level with the help of DHT11 sensor and moisture sensor. In that application on android mobile, we will be able to provide the touch-switches so that we can manually operate the water motor and sprinkler motor manually also. With the help of internet technology we can remotely monitor and control from anywhere and it also covers all the drawbacks from the existing system which uses GSM or Wireless systems. Also, the solar energy will be used for the charging of battery and it will be free of cost. The main advantage of solar system is in daytime, but we can store the electricity into the battery and we can utilize it for 24 hours because in rural area electricity is not available all the time due to loadshading



.Figure 1: Block Diagram

Circuit Diagram

In this project we have understood the power supply provided to the battery as well as• a battery charger circuit. We have simulated this result with the help of Proteus software. For the whole working of the project, power supply is a very important feature so we• design each and every component with calculations. Also we have gone through concept of DHT11 sensor and moisture sensor.

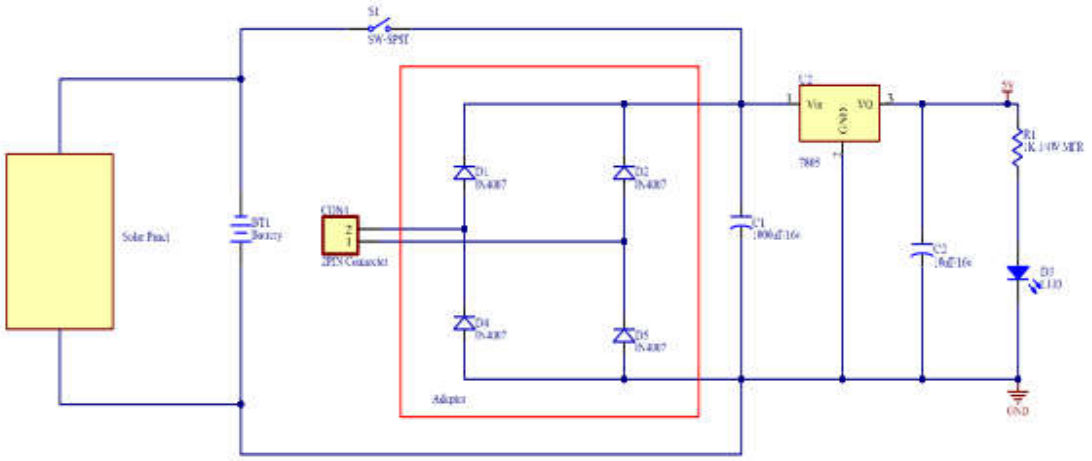


Figure 2: Circuit Diagram

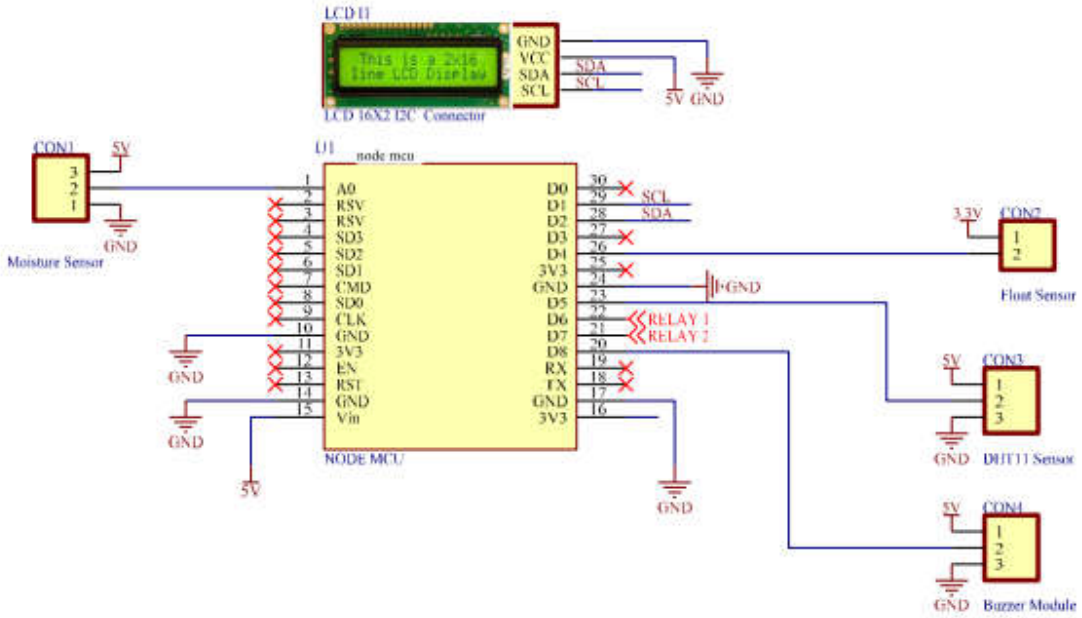


Figure 4: Interfacing Diagram

Results

The control strategy for the system in this work is developed for the individual parameters to be controlled as follows

The temperature control requires the definition of two threshold limits: upper limit and lower limit. When the upper limit is exceeded, a fan is activated to cool the greenhouse environment.

When the temperature drops below the lower limit, the fan is deactivated while a heater is activated and vice-versa.

Humidity control is defined by a threshold set by the user. When the humidity of the greenhouse enclosure falls below this threshold, a fogging system is activated and then deactivated when optimum condition is restored. If the humidity is more, then fans are switched on to reduce the humidity.

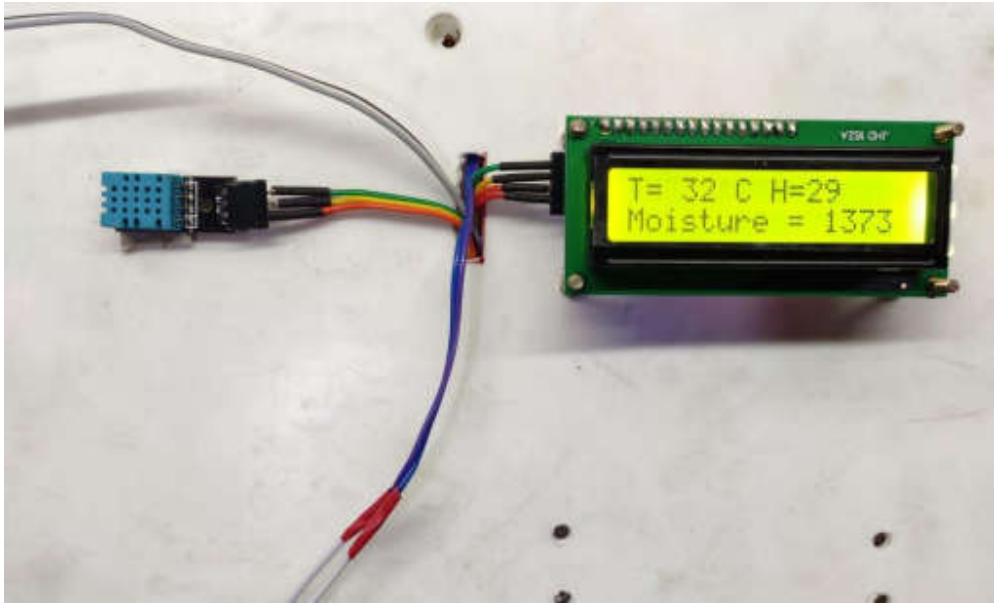


Figure 5: LCD display

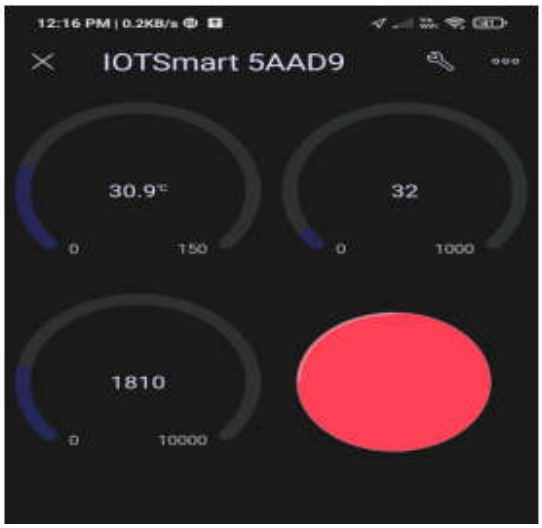


Figure 6: Smart Board

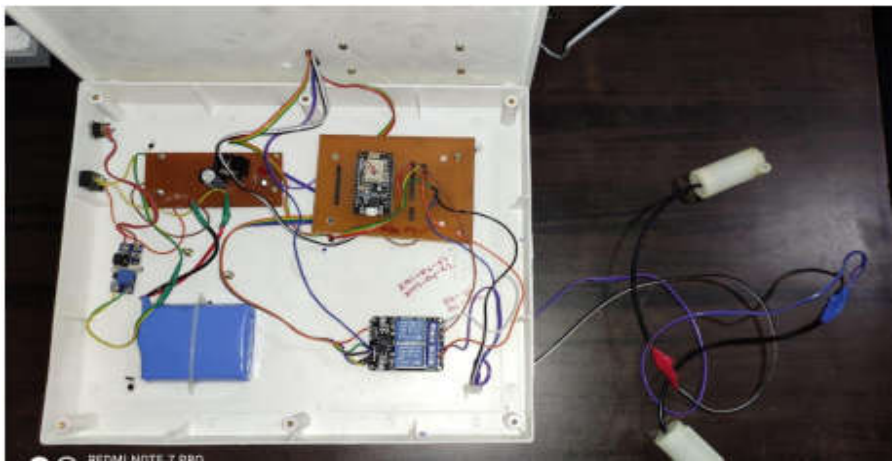


Figure 7: Actual Implementation

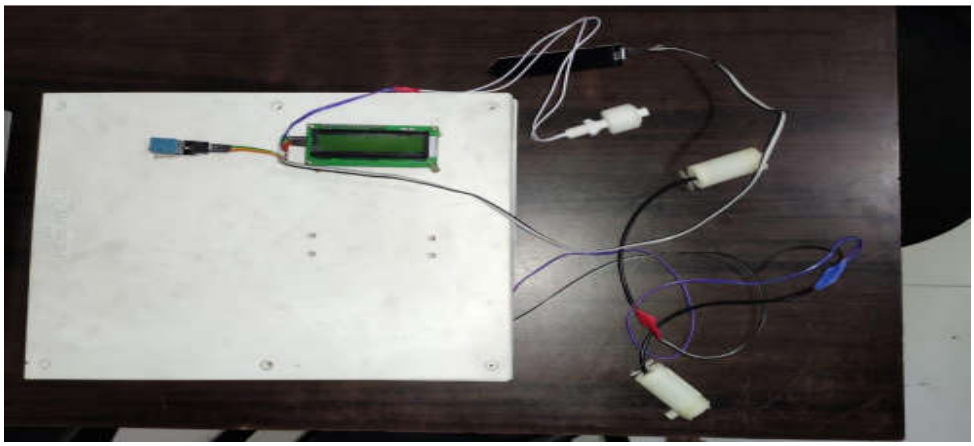


Figure 8: Actual implementation

CONCLUSION

Thus, we have successfully studied various sensors interfacing with Node-MCU microcontroller. We also studied and worked for the hardware (PCB making, power supply design, drilling, soldering, and wiring) of the project. We studied that, using IoT technology, user can itself monitor and control the devices in the agricultural field as per our application

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