IOT Based Smart Farming

MOIZ SHABBIR KHARODAWALA
19BEE0165
School of Electrical and Electronics Engineering
VIT University
Vellore,Tamil nadu
moiz.shabbir2019@vitstudent.ac.in

SARTHAK MITTAL
19BEE0107
School of Electrical and Electronics Engineering
VIT University
Vellore,Tamil nadu
sarthak.mittal2019@vitstudent.ac.in

PARTH SHARMA
19BEE0392
School of Electrical and Electronics Engineering
VIT University
Vellore,Tamil nadu
parth.sharma2019@vitstudent.ac.in

Abstract— Agriculture plays a vital role in the development of a country. In India about 70% of the population depends upon farming and one-third of the nation's capital comes from farming. Issues concerning agriculture have been always hindering the development of the country.Internet of Things (IoT) technology has brought revolution to each and every field of common man's life by making everything smart and intelligent. The development of Intelligent Smart Farming IoT based devices is day by day turning the face of agriculture production by not only enhancing it but also making it cost-effective and reducing wastage. The most important things of smart farming are environmental measurements and water management. The combination of traditional methods with latest technology such as Internet of Things and wireless Sensor Networks can lead to agricultural modernization. The wireless Sensor Network collects the data from different types of sensors and takes actions on the basis of it. Our smart farming system reduces the manual work and automates the agricultural activities.The aim / objective of this report is to propose IoT based Smart Farming System assisting farmers in getting Live Data (Temperature, Soil Moisture) for efficient environment monitoring which will enable them to increase their overall yield and quality of products. The IoT based Smart Farming System being proposed via this report is integrated with Arduino Technology mixed with different Sensors and an irrigation system.

Keywords—Internet of Things (IoT); Smart Farming;Wireless information transfer

I. Introduction

Our system consists of two main parts, one part monitors the environmental parameters such as temperature, humidity and soil moisture whereas the other part deals with the irrigation process. A battery level monitoring system monitors the environment with the help of various sensors. This helps in analyzing various parameters affecting the yield of crops.

An irrigation system takes care of watering the crop based on the readings taken from various sensors. This system helps in reducing the wastage of water used in irrigation on a day-to-day basis. The project monitors the farm or greenhouse and based upon the readings of different kinds of sensors like temperature, humidity, soil moisture,UV, IR, soil Nutrients and displays types of messages on the serial monitor about the present conditions so that the farmer can take quick action. This will increase the quantity and quality of the crops by properly monitoring the various present conditions. Live data for different parameters can be seen on Laptop and SmartPhones. It makes use of sensor networks for noting the soil properties and environmental factors continuously. Initially the sensors like temperature, moisture sensors, light intensity. The temperature-humidity sensor will sense the temperature and humidity around the atmosphere and send it to the microcontroller. The moisture sensor senses the moisture content in the soil and sends the moisture level of the soil to the microcontroller. In the control section, the received data is verified with the threshold values. If the data exceeds the threshold value the relay turns ON to start the motor and lights. This data is also stored graphically on a local host.

II. Challenges and Impediments to IoT

A. Real-time Monitoring

The objective is to propos IoT based Smart Farming System which will enable farmers to have live data of soil moisture environment temperature at very low cost so that live monitoring can be done.

B. Reducing Water Wastage while Irrigation

The objective is to irrigate the farms only when it is required so that we can save water and use it efficiently.

C. What Would Be Our Approach to Solve the Problem?

The project monitors the farm or greenhouse and based upon the readings of different kinds of sensors like temperature, humidity, soil moisture,UV,IR,soil nutrients conditions so that the farmer can take quick action. This will increase the quantity and quality of the crops by properly monitoring the various present conditions. Live

data for different parameters can be seen on Laptop and SmartPhones.

It makes use of sensor networks for noting the soil properties and environmental factors continuously.

Initially the sensors like temperature, moisture sensors, ldr sensor are connected to the microcontroller where it is placed in a field of agriculture.

The temperature-humidity sensor will sense the temperature and humidity around the atmosphere and send it to the microcontroller. The moisture sensor senses the moisture content in the soil and sends the moisture level of the soil to the microcontroller.

In the control section, the received data is verified with the threshold values. If the data exceeds the threshold value the required output is received(e.g. turning on motor and lights).

III. METHODOLOGY

A. Existing System

Agriculture is the backbone of our Nation. In olden days farmers used to guess the fertility of soil and made assumptions to grow which type of crop. They didn't know about the moisture, level of water and particularly weather conditions which were terrible for farmers. They use pesticides based on some assumption which leads to a serious effect on the crop if the assumption is wrong. The productivity depends on the final stage of the crop on which the farmer depends.

Drawbacks of Existing System

- Productivity may or may not be more
- We cannot estimate weather conditions as pollution is increasing gradually etc.

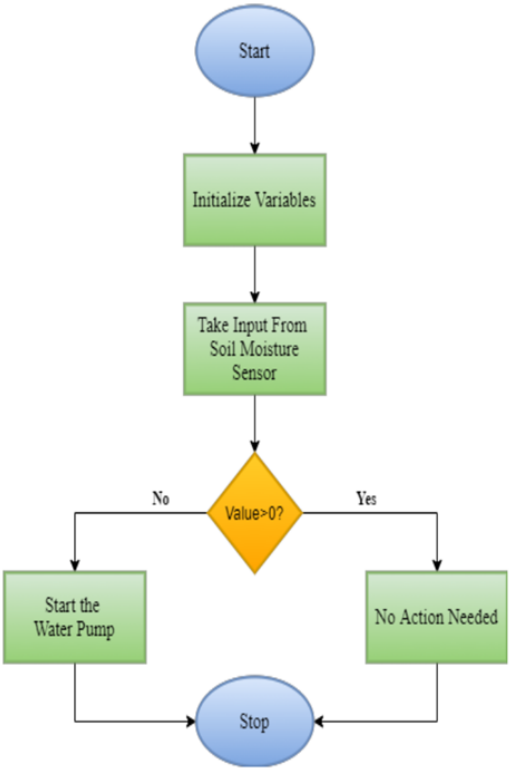
B. Proposed System

To enhance the productivity of the crop there by supporting both farmers and the nation we have to use technology which estimates the quality of crops and gives suggestions. Wireless sensor networks are sensors of different types used to collect the information of crop conditions and environmental changes. This information is transmitted through a network to the farmer or devices that initiate corrective action. Some disadvantages in communication must be overcome by advancing the technology to consume less energy and also by making user interface ease of use.

C. Flow of work

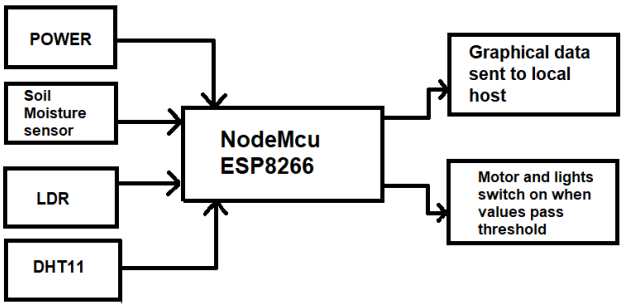
We initialize the parameters and variables and start taking values in said variables from the sensors, we then compare those values with preset thresholds and also send data through the web to be displayed and stored for later use.

Once the data passes a set threshold we do certain actions, such as starting the water pump if water levels are too low.



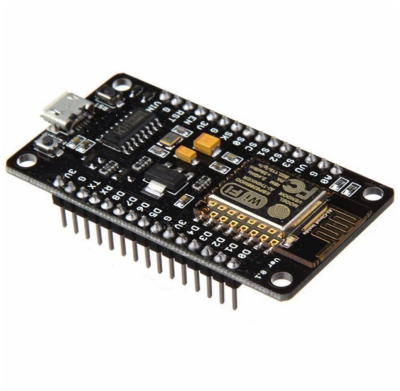
- We carefully monitor the moisture in the soil to turn on and off the motor when required. The motor pump turns ON when the moisture level decreases way below efficient moisture levels, we considered for efficient growth the moisture should be around 40-70%.
- We further monitor the temperature and humidity of the atmosphere and consider that we require an optimal environment to have temperatures in the range of 25-30°C, and the humidity in the range of 60-70%. If the temperature rises too much or the humidity decreases then the motor will turn ON to maintain the range.
- Finally we monitor the status of sunlight(Light intensity in the environment), once the light intensity decreases or if it turns night time then the artificial lights will turn ON so that the crops keep growing even without natural sunlight.

IV. BLOCK DIAGRAM



The main objective of this project is to design a smart Agriculture in order to monitor crop growth. The system mainly consists of Nodemcu Microcontroller, LDR, Humidity Sensor, Moisture Sensor, Temperature Sensor. Initially the system will collect all the parameters regarding the crop and make graphical collection over time, the same thing will be transmitted to the server.

A. NodeMcu(ESP8266)



NodeMCU is an open source firmware for which open source prototyping board designs are available. The name "NodeMCU" combines "node" and "MCU" (micro-controller unit). The term "NodeMCU" strictly speaking refers to the firmware rather than the associated development kits.

Both the firmware and prototyping board designs are open source. The firmware uses the Lua scripting language. The firmware is based on the eLua project, and built on the Espressif Non-OS SDK for ESP8266. It uses many open source projects, such as lua-cjson and SPIFFS. Due to resource constraints, users need to select the modules relevant for their project and build a firmware tailored to their needs. Support for the 32-bit ESP32 has also been implemented.

The prototyping hardware typically used is a circuit board functioning as a dual in-line package (DIP) which integrates a USB controller with a smaller surface-mounted board containing the MCU and antenna. The choice of the DIP format allows for easy prototyping on breadboards. The design was initially based on the ESP-12 module of the ESP8266, which is a Wi-Fi SoC integrated with a Tensilica Xtensa LX106 core, widely used in IoT applications.

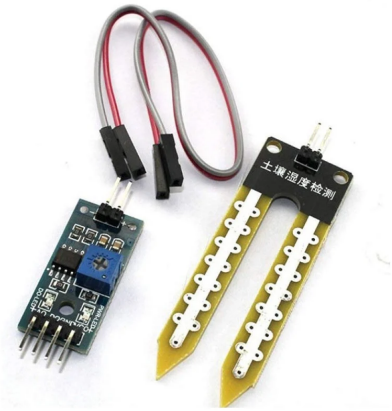
B. Power Supply

The sensor and node is directly powered by the usb cord.

C. Sensors

I. Soil moisture sensor

Soil moisture sensors measure the water content in soil. A soil moisture probe is made up of multiple soil moisture sensors. One common type of soil moisture sensor in commercial use is a frequency domain sensor such as a capacitance sensor.

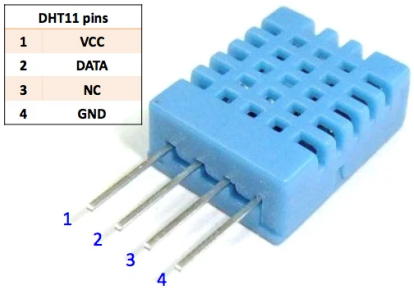


Sensor Measuring soil moisture is important in agriculture to help farmers manage their irrigation systems more efficiently. Not only are farmers able to generally use less water to grow a crop, they are able to increase yields and the quality of the crop by better management of soil moisture during critical plant growth stages.

II. DHT11

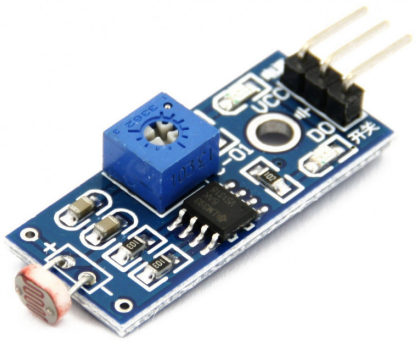
You can measure temperature more accurately than using a thermistor. The sensor circuitry is sealed and not subject to oxidation, etc. The LM35 generates a higher output voltage than thermocouples and may not require that the

output voltage be amplified



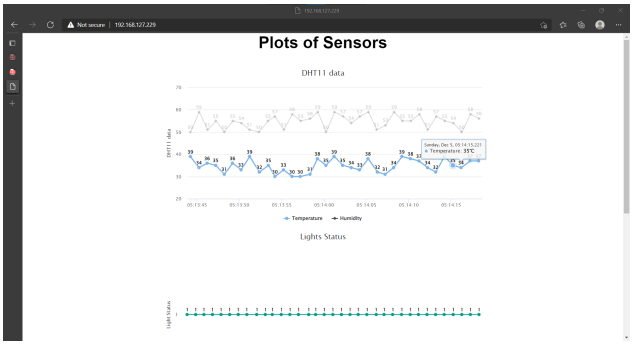
III. LDR sensor

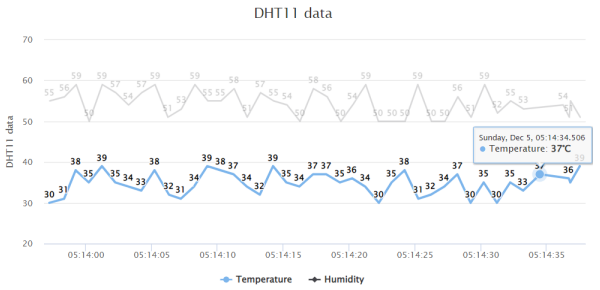
A Light Dependent Resistor (LDR) is also called a photoresistor or a cadmium sulfide (CdS) cell. It is also called a photoconductor. It is basically a photocell that works on the principle of photoconductivity. The passive component is basically a resistor whose resistance value decreases when the intensity of light decreases.

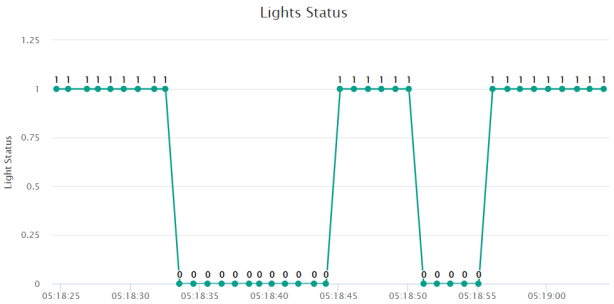


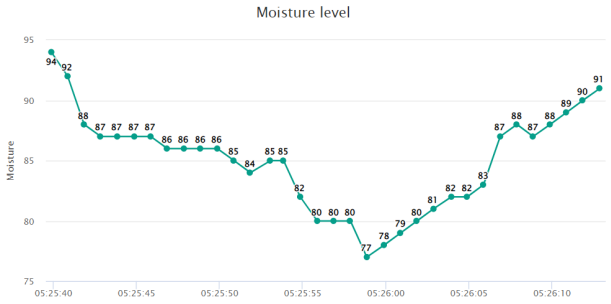
This optoelectronic device is mostly used in light varying sensor circuits, and light and dark activated switching circuits. Some of its applications include camera light meters, street lights, clock radios, light beam alarms, reflective smoke alarms, and outdoor clocks.

RESULTS AND IMPLEMENTATION









We have built a local server to represent the environmental data graphically using HTML+JS.

The entire data is sent through nodemcu using Asynchronous servers which requests and handles multiple connections at same time at high speeds, which makes it extremely reliable for farm's environmental data.

CONCLUSION AND FUTUREWORK

Thus, the paper proposes an idea of combining the latest technology into the agricultural field to turn the traditional methods of irrigation to modern methods thus making easy productive, and economical cropping. Some extent of automation is introduced enabling the concept of monitoring the field and the crop conditions within some long-distance ranges using cloud services. The advantages like water saving and labor-saving are initiated using sensors that work automatically as they are programmed. This concept of modernization of agriculture is simple, affordable and operable.

(i) Later, it can be interfered with HYDROPHONICS which is hydro-irrigation method (requires no soil) for complete transformation of phase of Irrigation.

(ii)Every other person can monitor condition of the filed by working at their own places without being present in the field, thus encouraging agriculture.

References

[1] Balaji Bhanu, Raghava Rao, J.V.N. Ramesh and Mohammed Ali Hussain,“Agriculture Field Monitoring and Analysis using Wireless SensorNetworks for Improving Crop Production”, 2014 Eleventh InternationalConference on Wireless and Optical Communications Networks(WOCN).

[2] LIU Dan, Cao Xin, Huang Chongwei, JI Liang Liang, “Intelligent agent greenhouse environment monitoring system based on IOT technology”,2015 International Conference on Intelligent Transportation, Big Data & Smart City

[3] Joseph Haule, Kisangiri Michael, “Deployment of wireless sensor networks (WSN) in automated irrigation management and scheduling systems: a review”, Science, Computing and Telecommunications(PACT), 2014, Pan African Conference.

[4] S. Vijayakumar, J. Nelson Rosario, “Preliminary Design for Crop Monitoring Involving Water and Fertilizer Conservation Using WirelessSensor Networks”, Communication Software and Networks (ICCSN),2011 IEEE 3rd International Conference.

[5] G. Nisha, J.Megala, “Wireless Sensor Network Based AutomatedIrrigation and Crop Field Monitoring System ", 2014 Sixth InternationalConference on Advanced Computing (IcoAC).