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IOT Based Smart Plant Monitoring System and Energy Meter

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ABSTRACT: In every country agriculture is done from ages which are considered to be scienceand also art of cultivating plants. In day today life, technology is updating and it is also necessary to trend up agriculture too. IoT plays a key role in smart agriculture. Internets of Things (IoT) sensors are used to provide necessary information about agriculture fields. The main advantage of IoT is to monitor the agriculture by using the wireless sensor networks and collect the data from different sensors which are deployed at various no des and send by wireless protocol. By using IoT system the smart agriculture is powered by Node MCU. It includes the humidity sensor, temperature sensor, moisture sensor and DC motor. This system starts to check the humidity and moisture level. The sensors are used to sense the level of water and if the level is below the range then the system automatically stars watering. According to the change in temperature level the sensor does its job. IoT also shows the information of humidity, moisture level by including date and time. The temperature level based on type of crops cultivated can also be adjusted.

KEYWORDS: IoT, Soil, Moisture and Temperature sensors, Relay, Wi-Fi module ESP8266, Thing Speak.

I. INTRODUCTION

One of the largest livelihood providers in India is Agriculture. Agriculture plays an essential role in supporting human life. The rise in population is proportional to the increase in agriculture production. Basically, Agriculture production depends upon the seasonal situations which do not have enough water sources. To get beneficial results in agriculture and to overcome the problems, IoT based smart agriculture system is employed. Global and regional scale agricultural monitoring systems aim to provide up-to-date information regarding food production. In IoT-based smart farming, a system is built for monitoring the crop field with thehelp of sensors like light, humidity, temperature, soil moisture, etc. The farmers can monitor the field conditions from anywhere. IoT-based smart farming is highly efficient when compared with the conventional approach. The proposed IoT based Irrigation System uses Node MCU 325 Module and DHT11 Sensor. It will not only automatically irrigate the water based on the moisture level in the soil but also send the Data to Thing Speak Server to keep track of the land condition. Due to the recent advances in sensors for the irrigation systems for agriculture and the evolution of WSN and IoT technologies, these can be applied in the development of automatic irrigation systems. The system will determine the parameters that are monitored in irrigation systems regarding water quantity and quality, soil characteristics, weather conditions, and fertilizer usage and provide an overview of the most utilized nodes and wireless technologies employed to implement WSN a and IoT based smart irrigation systems.

II. LITERATURE REVIEW

An IOT Based Crop-field monitoring an irrigation automation system describes how to monitora crop field. A system is developed by using sensors and according to the decision from a server based on sensed data, the irrigation system is automated. Through wireless transmission the sensed data is forwarded to web server database. If the irrigation is automated then the moisture and temperature fields are decreased below the potential range. The user can monitor and control the system remotely with the help of application which provides a web interface to user. By smart Agriculture monitoring system and one of the oldest ways in agriculture is the manual method of checking the parameters. In this method farmers by themselves verify all the parameter and calculate the reading. The system focuses on developing devices and tool to manage, display and alert the users using the advantages of a wireless sensor network system.

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It aims at making agriculture smart using automation and IoT technologies. The cloud computing devices are used at the end of the system that can create a whole computing systemfrom sensors to tools that observe data from agriculture field. It proposes a novel methodologyfor smart farming by including a smart sensing system and smart irrigator system through wireless communication technology. This system is cheap at cost for installation. Here one canaccess and also control the agriculture system in laptop, cell phone or a computer.

III. PROPOSED METHODOLOGY

The entire working process of the presented method is shown in Fig. 1.

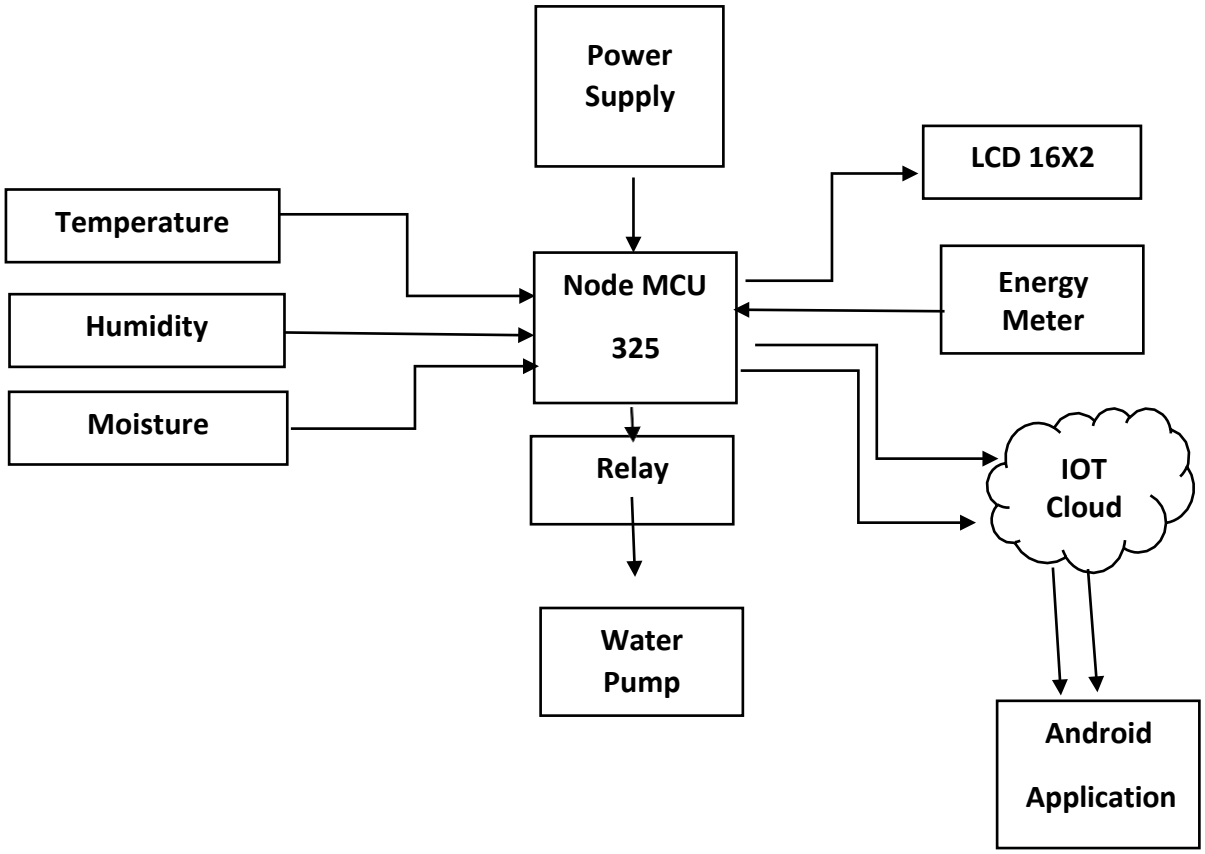

Figure 1: Proposed Methodology of System

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Required Modules:

Hardware requirements

- Soil moisture sensor
- Temperature/Humidity sensor (DHT-11)
- Relay
- Pump
- Power supply
- Energy Meter
- Arduino IDE
- LCD 16x2

Moisture Sensors:

The Moisture sensor is used to measure the water content (moisture) of soil. when the soilis having water shortage, the module output is at high level, else the output is at low level.This sensor reminds the user to water their plants and also monitors the moisture content of soil. It has been widely used in agriculture, land irrigation and botanical gardening.

Figure 2: Soil Moisture Sensor

Temperature/Humidity Sensor (DHT-11):

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. Each DHT11 element is strictly calibrated in the laboratory that is extremely accurate on humidity calibration. The calibration coefficients are stored as programmes in the OTP memory, which are used by the sensor's internal signal detecting process. The single-wire serial interface makes system integration quick and easy. Its small size, low power consumption and up-to-20 meter signal transmission making it the best choicefor various applications, including those most demanding ones. The component is 4-pin singlerow pin package. It is convenient to connect and special packages can be provided according to users' request.

Figure 3: Soil Moisture Sensor

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Relay:

A relay is used as electrically operated switch which is shown in Figure 4. It has a set of inputterminals for a single or multiple control signals and a set of operating contact terminals. The switch may contain number of contacts in multiple contact forms which make contacts or break contacts. Relay is used to turn on the water pump in order to maintain the moisture level of thecrop.

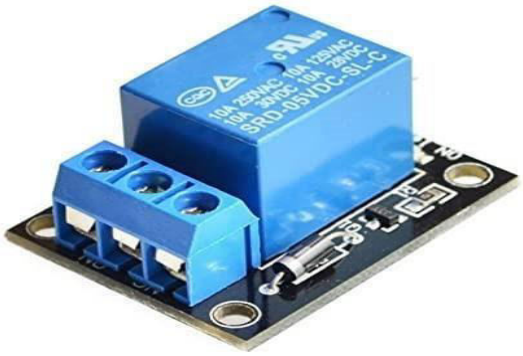

Figure 4: Relay

Water pump:

The DC 3-6V Mini Micro Submersible Water Pump shown in Figure 5 is a low cost, small sizeSubmersible Pump Motor. It operates with a 2.5 to 6V power supply. It can pump up to 120 litres per hour with a very low current consumption of 220mA. Just connect the tube pipe to the motor outlet, submerge it in water, and power it.

Figure 5: Water Pump

Power Supply:

Power supply shown in Figure 6 is an electrical device which supplies electric power to an electrical load. The first function of a power supply is to convert electric current from a sourceto the correct voltage, current and frequency to power up the load. As a result, power suppliesare also referred to as electric power converters. Some power supplies are separate standalonepieces of equipment while others are built into the load appliances that they power.

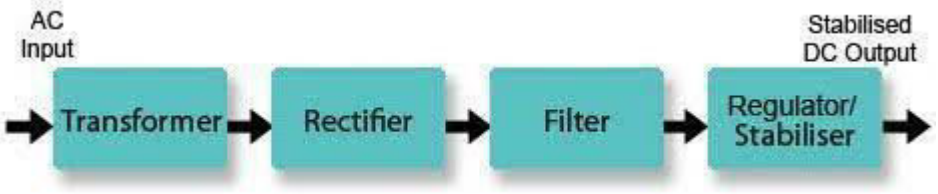

Figure 6: Block diagram of a power supply

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Energy Meter: -

Energy meter used here is clamp energy meter .230V AC mains is the input given to the transformer and AC mains is converted to low voltage. Energy meter measures the live current,voltage and power in terms of KW-h. Microcontroller reads these parameters and send it to thecloud. Node MCU is a Wi-Fi device which has a microcontroller in it. This connects the localrouter through IoT. The status of these parameters can be obtained through mobile or laptop.

Figure 7: Energy Meter

Arduino IOT Cloud:

Arduino IoT Cloud is an application that helps makers build connected objects in a quick, easyand secure way. You can connect multiple devices to each other and allow them to exchange real-time data. You can also monitor them from anywhere using a simple user interface. Arduino IoT Cloud is fully integrated in the Arduino Create ecosystem, you will be able to generate a template code in Arduino IoT Cloud and then edit and upload it to your board using the Arduino Web Editor.

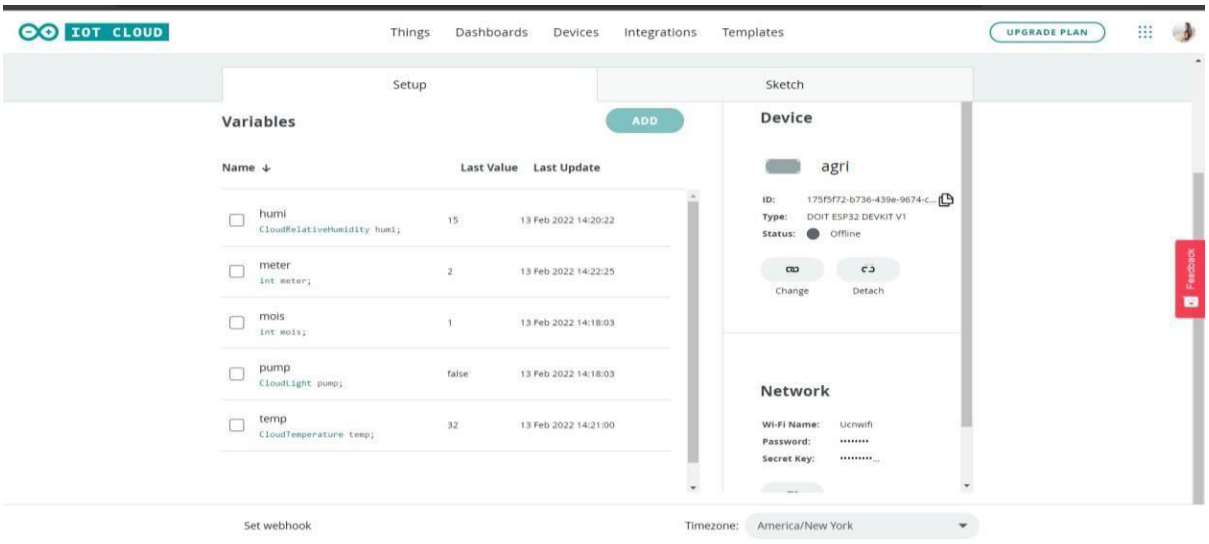

Figure 8: Arduino IOT Cloud

LCD 16x2:

LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in variousdevices and circuits. It is used to print Moisture sensor, Pressure, Humidity and Light Intensity.

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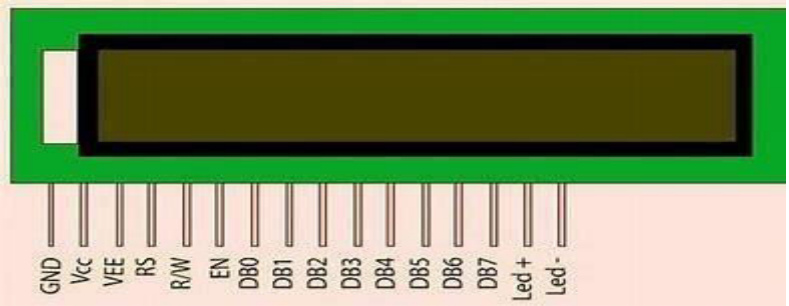

Figure 9: LCD 16x2

Working:

The smart agriculture monitoring system is tested under various conditions. The soil moisture sensor is used to test the soil for all climatic conditions and results are interpreted successfully.The moisture output readings at different weather conditions is taken and updated. Wi-Fi is usedto achieve the wireless transmission. The values of soil moisture sensor purely depend on the resistivity of the soil. The value of the sensor at beginning of wet condition is 0. The sensed value is sent to microcontroller through Node MCU and motor pump gets OFF in this condition.The maximum threshold value upon dry soil is1023. When the sensed value by sensor reaches the threshold value, the microcontroller trigger the relay and motor gets ON. When sufficient amount of water is supplied to plants, the motor pump is turned ON and is turned OFF automatically.

Advantages:

- It is easy to maintain and cost is reasonable to purchase. The components which areused are easily available.
- It has advantage to observe the status on smartphone or laptop using internet. Theinformation is up to date even in absence of farmer.
- The collected data is updated and the farmer is conscious about the status of the crop.
- To achieve more effective and accurate details of crop several additional sensors canalso be included.

IV. RESULT

The output of proposed system is fast accurate and secure. Hence the experimental results showthe proposed system is easy to access and product the plant from being rotten or drought. Oncehe temperature and soil moisture levels are back to normal values it can be turn off by clickingon the same button.

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V. CONCLUSION

IoT will help to enhance smart farming. Using IoT the system can predict the soil moisture level and humidity so that the irrigation system can be monitored and controlled. IoT works in different domains of farming to improve time efficiency, water management, crop monitoring,soil management and control of insecticides and pesticides. This system also minimizes humanefforts, simplifies techniques of farming and helps to gain smart farming. Besides the advantages provided by this system, smart farming can also help to grow the market for farmer with single touch and minimum effort.

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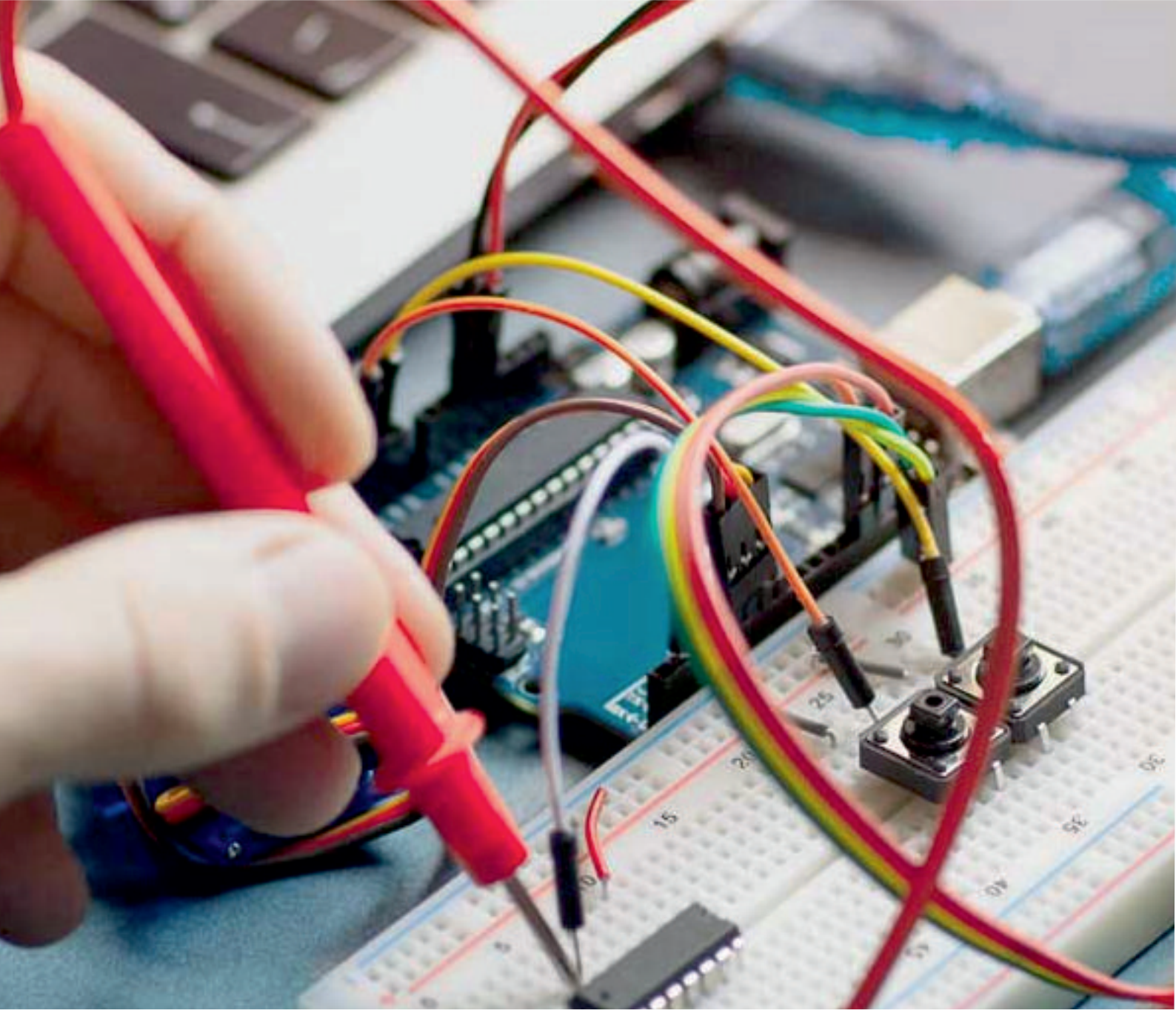

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