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Smart Farming

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Abstract: *Agriculture being the broadest economic sector in India, it plays a vital role in overall economic development. Traditional methods in agricultural practices have become extremely inadequate to cater to the rapidly increasing needs. Thus it has become vitally important to adopt novel technologies to raise agricultural standards. Currently, there is no practical end-to-end integrated technology solution platform available to increase overall crop yield nor confirmed communication platform nor infrastructure for agriculture management. Introducing technology in agriculture arena will be in no doubt increase the proficiency of certain farming activities. In this paper we have proposed an approach for smart and precise farming by connecting various equipment to form IoT framework. Smart farming system is based on Internet of Things with real-time monitoring environmental factors, which is aimed at managing and keeping track of the crop growth. Our system focuses on the measurement of key parameters such as temperature, soil moisture content and humidity. Based on these parameters a pump is set to operate when the measurements meet the threshold value. Detailed strategies of the system are stated in this paper.*

Index Terms—*Internet of Things, sensors, pump, adruino uno, internet gateway, data center and cloud*

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I. Introduction:

Farming is one of the major economic activity of our country. In spite of this, modern technology is found everywhere but in agriculture sector. Farmers still restore to traditional and conventional technology. They prefer manual distribution of seeds and ploughing, two to three crops per year pattern, unscientific systems od cultivation. They trust and believe in labour work. This leads to more chances of human error which affects the productivity of crops. Other factors like unseasonal climatic changes poses major challenge for farmers. The introduction of advancing technology in the field of agriculture can bring about radical changes in the crop production due to improved farming techniques.

Inculcating IoT to improve current farming methods can bring ground-breaking results. Internet of Things (IoT) is the inter-networking of physical devices which has the ability to transfer data over a network without requiring human-to-computer or human-to-human interaction. It focuses on studying the environmental factors to improve crop yield for that it suggests a wireless sensor network to collect data from field and send it to the main central server. Alone environmental factors are not adequate to increase field output. It also requires proper irrigation facility.

We need to implement an integrated system that will ensure more productivity.

This paper proposes smart farming by IoT framework and sensor technology. We aim to implement system that performs various tasks like sensing soil moisture content, temperature, humidity and water level in water reservoirs. From this data, a pump can be operated via a web-portal. Controlling the devises operation will be done by interfacing sensors with micro-controller.

II. Background

Field of Invention

This invention involves an internet of things based smart farming technique that can monitor environmental parameters in real-time, automatically keeps the farmer updated about the same via a website and also lets the farmer operate pump from the website.

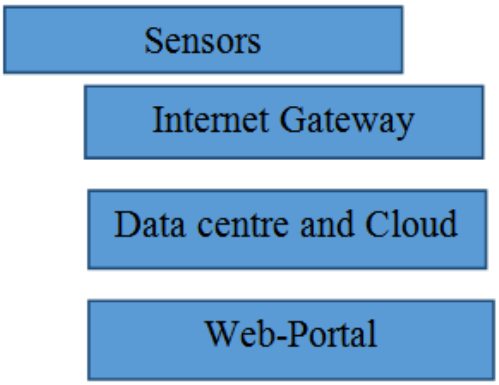
Description of the related art:

Agriculture plays a significant role to our nation that holds a large population but is still a developing country, as a foundation closely related to national economies. At present, the farms in our country are managed primarily through manual inspection, whose efficiency is acutely low. As an instance, if a practitioner wants to get the data about environmental parameters like air temperature and humidity, soil moisture content, water level, etc. of the farm, he himself has to go to the farm and check the thermometer, humidity indicator or other

devices. In many instances farmer take decisions solely based on his past experiences which proves to be very inaccurate. The crop automatic management systems now available are provided to the farmer as an intelligent systems with the integrated services, such as measuring and configuring, thus achieving the scientific management of agricultural fertilization in a way. However these intelligent systems require more space because of its large volume and are quite expensive. There also exists some small farm fertilizing and watering system that are isolated and closed which is limited to a confined area of the farm. A farmer can check or monitor some environmental parameters when he gets to the farm and operates the computer inside on the spot. Once he leaves, he cannot get real-time information inside.

III. System Architecture:

They system follows the architecture of Inter of Things (IoT). It consists of four stages.



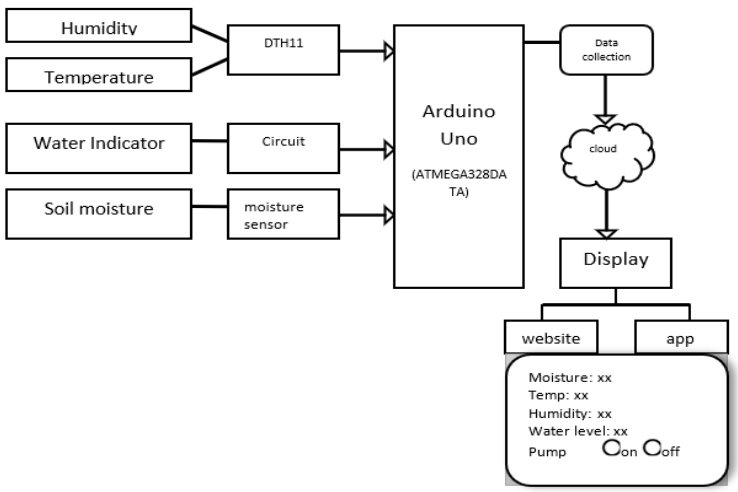
1. Sensors: A sensor is a device that is used for detecting and responding to some type of input from the physical environment. Data processing is required in every stage of IoT framework. In this we have used three sensors namely temperature and humidity sensor, soil moisture sensor and water level indicator.

2. Internet Gateway: It consists of Wi-Fi module which helps to transfer the data from sensors via microcontroller to storage cloud.

3. Data centre and cloud: The data collected are to be forwarded to cloud-based systems, from which data can be retrieved, analysed and stored.

4. Web-portal: the data collected by sensors can be displayed on a website and further it can control equipment via internet.

Flow Diagram



IV. Objective:

The proposed system consists of three sensors that continuously takes in data from the farm environment and reports it to the micro-controller (Arduino Uno) which reads the output code of an analog-to-digital converter. The wireless communication technology applied in Arduino uno will get an IP address from connection to the nearest Wi-Fi router. The data is transmitted to various clients via internet.

a. DHT11: It is a basic digital temperature and humidity sensor. It requires 3.5V to 5.5V to operate. It measures temperature of range 0^0 C to 50^0 C and humidity from 20% to 90%. Its data pin connected to the Arduino Uno microcontroller's input pin.

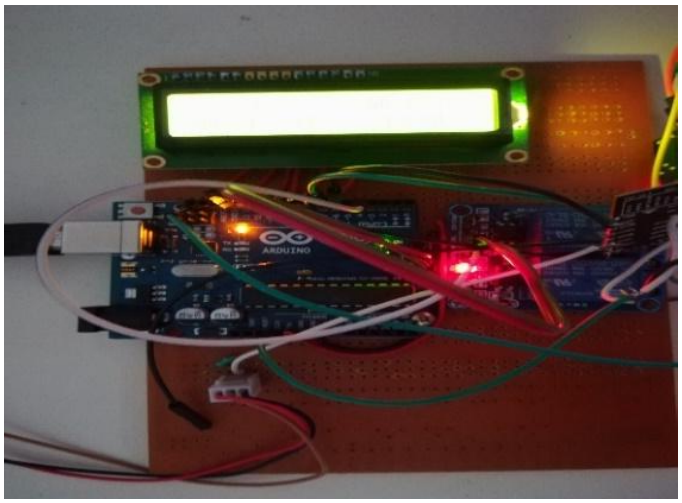
b. ESP-12E Wi-Fi module: It is used to connect to Wi-Fi. It has integrated ADC (analog-to-digital convertor). Other pins are RST (reset), EN (chip enable pin), VCC (3.3V power supply), GND and many others.

c. Water-level indicator: The circuit consists of 6 resistors, 3 LEDs and 3 transistors. transistors are used as switch. 3 resistors are at base of transistors so that it can resist maximum base current. 3 resistors with LEDs so that it can drop voltage, else LEDs high voltage can blow it up. There are four wire (points 0% to 100%) to measure different water level. When water level reaches to one point the +ve side of battery gets connected with the base of transistors through water. So, when +ve voltage is applied to the base of transistors it gets in on state and current starts flowing from collector to emitter.

d. Soil moisture sensor: It consists of two probes which are inserted in the soil. It gives digital output of 5V when the moisture level is high and 0V when moisture level is low.

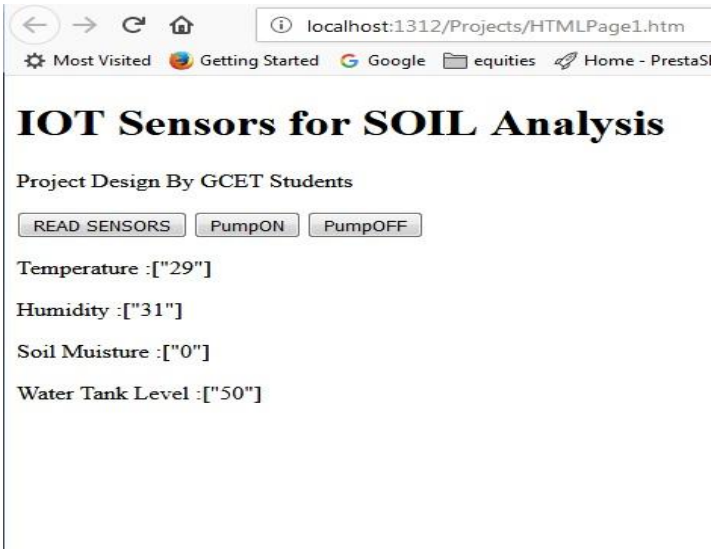
e. Relay: A 5V relay is used as a switch. As Arduino Uno operates at 5V, it cannot control higher voltages devices directly. So, relay provides an isolation between Arduino running at 5V and AC appliances running at 220V AC.

f. Arduino Uno: It is a microcontroller board that is based on the ATmega328P, which has 14 digital input/output pins, 6 analog pins, a USB connection and a reset button. We can connect it to a computer with USB cable or power it with AC-to-DC adapter or battery and program it as required.



V. Conclusion

The aim of the project is to promote the intelligent and automation in farming using a new domain or technique called Internet of Things. The systems provide 80% accuracy and continuous data update. It provides efficient irrigation facility with less labour required. It uses embedded system and communication technology. The smart farming approach is particularly important for agricultural practitioners in developing countries who are at a risk of food insecurity as a result of constant climate change and who have limited resources. The adoption of this technique will boost the growth of agriculture in India where major income comes from the agricultural industry.



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