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Monitoring Of Soil Characteristics Using Cluster Based Wireless Sensor Network

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Abstract: - Water was necessary need of every living being. In agriculture lands need more Water for planting vegetables or planting trees. Former can't spend all the time to monitor Water level in lands. By global warming increasing atmospheric temperature. We need to feed Water for plants as soon as possible. For this motive. Existing systems are using single soil moisture Sensor to monitor irrigation level of plant and feed water for it. But the problem was, when it comes Huge forming land. A single sensor can't give accurate value to switch on water motor for plants .To prevent from this issue. We try to create grouped wireless sensors working together to monitor Soil in forming land. A single master sensor will control all sensor reading. After read All the sensors, Temperature, humidity, ph, pesticide. Master will make decision to turn on motor or not. And upload the all information about sensors and motor will upload into cloud for user can monitor anywhere and anytime, he want.

Index Terms - Arduino Uno, Arduino nano, pH sensor ,Temperature ,Humidity ,Pesticide and Moisture Sensor.

I. INTRODUCTION

In our day to day life plants play major vital role. In addition to this water also play a vital role. These things are essential for all ecosystem. But in current conditions there are not much efficient method to measure a huge land surface. Instead of measuring a huge land surface without sufficient sensors. To create array of sensors to measure content of large level agriculture land. Our proposal helps to measure in such a way that even waste or immeasurable lands can be effectively measured. Create a grouped wireless sensors working together to monitor soil in forming land.[1] Now a days indian farmers faces a two major problems. Follows; government promoted a free supply of electricity to generate their motors and pump the water into farming land for irrigation purpose.In some cases, it is found that farmers are misusing the electricity the to run their basic needs. This has become one of the considerable problems among the farmers. To avoid these problems a microcontroller based embedded system has been proposed in the project. The system has a distributed wireless network of soil-moisture and temperature sensors placed in the root of the plants. [2] I our day to day life food and water needs is increasing day by day. In that case, there is a need of utilizing these resources usefully and in a effective manner.one of the method is efficient irrigation management practices for fields. These practices could greatly help in benefitting the knowledge of the irrigation and moisture of the soil. By practicing these methods, we can estimate when and where to use the water in what amount. [3] Agriculture uses 85% of avail freshwater rand it will continue because of the increasing population. There is an urgent need of sustainable use of water for all purposes. An alternative method to determine irrigation needs is plant evapotranspiration (ET), whereas the ET is affected by weather parameters including solar radiation, temperature, wind speed, and crop factors such as their growth , variety and plant density ,soil properties, pest and disease control.6]Taking care of the plants is a popular hobby among many of the peoples, but actually handling their watering schedules and their needs is to be handled in a effective manner. In order to handle this in a friendly manner to home automation, A "plant life sensor" that monitors the soil moisture, light and temperature levels . This Light-Dependent resistor(LDR) also referred to as photo resistor, a negative temperature coefficient (NTC) thermistor. Then soil moisture measures the resistivity of the soil and it will determine soil electrical conductivity.

II. PROPOSED METHOD

This method is based on the internet of things. We need to increase the number of sensors by inserting in a manner that it covers all the terminus of the farming land, and it is crucial. To make this process more accessible, can make it wireless to avert futile chances of the plants getting bogged down with the wire. It unifies all the sensors wirelessly.

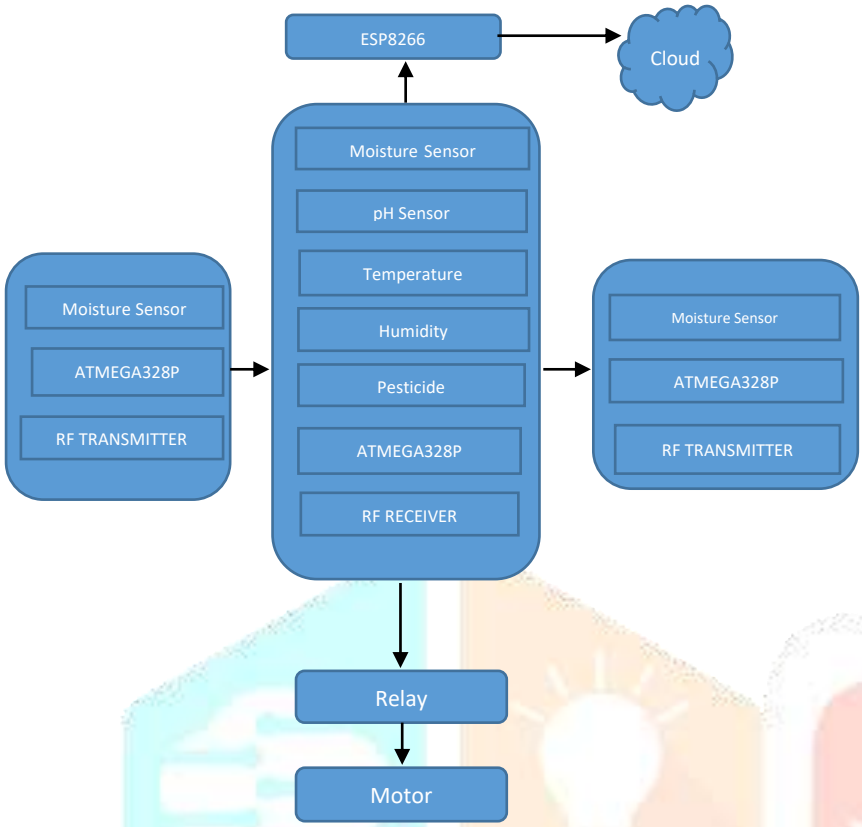

Fig.1 Block Diagram of Proposed System

III. OBJECTIVE

To study about soil quality which helps in getting information about the health of the soil. To determine the soil moisture, Temperature ,humidity and pH ,pesticide based on that, need to supply how much amount of water quantity does the plant needs.To estimate the changes in the soil by inserting the respective soil sensors in the soil and to take preventive measures before the plants gets dead.

IV. DEVICE REQUIREMENTS

All the device requirements including both hardware and software components are listed below,

ARDUINO UNO:

The Arduino Uno is single Microcontroller and it is based on Microchip Atmega328P This Arduino uno consists of 14 digital pins and 6 analog pins and then it can be used for input or output pins. It has 14 digital pin input /output. These 6 can be used as a PWM outputs and ICSP header. It is powered by USB cable or an external 9volt battery, and it accepts a voltage between 7-20volts.It has a 9-15V DC input voltage supply. The Arduino board having all required support needed for microcontroller. It is normally connected to a computer with a USB cable, or it is connected with an AC -to-DC adapter or battery. This board is used as a programmer to sense and control objects. It is flexible in nature and low cost and Arduino has become a most popular microcontroller.

pH SENSOR:

The pH sensor is mainly used for water measurements. This pH sensor is able to measure amount of alkalinity and acidity in presence of water. These pH sensors enable us to ensure the safety and quality of the soil. It measures the processes that occur within the waste water or manufacturing plant. The basic pH value is ranges from 0-14. For example, the pH value water is considered as neutral i.e 7. The substances with higher amount of alkalinity is considered as basic and substances with less amount of alkalinity represents acidic.i.e 0-7. Those pH sensors will allow to keep the pH levels at its best.

Slave 2 Master

WIFI MODULE:

This ESP-01 ESP8266 is a serial WIFI wireless transceiver module. It is capable of hosting an application or offloading all Wi-Fi network. This ESP8266 Module is a self-contained SOC with integrated TCP/IP protocol. This TCP/IP stack can give any microcontroller access to your ESP8266 Wi-Fi module. It has a application pre-programmable command set.i.e A Wi-Fi module comes with a perfect AT command set firmware and can simply connect to the Arduino board. By the result, it can get much Wi-Fi ability as a shield offers to a huge amount of field. This ESP module is cost effective and has a huge, ever growing, community. This module consists of sufficient onboard processing and storage capability and lesser amount of loading during runtime of ESP8266.Its high degree of on-chip application enables for much lesser external circuitry, as it was manufactured to cover the minimal PCB area.

DHT11:

This DHT11 sensor consists of a humidity measurement and NTC temperature measurement component. It uses a thermistor to measure the surrounding air with the help of capacitices humidity sensors .It is a small size and low power consumption .This sensor will transmit signal up-to-20 meter .As the received digital signal spits out on the data pin because there is no analog input pins needed. It has a high reliability and long-term stability as it acquires the digital acquisition technique. So, it is fair enough and simple to use, even though it requires careful timing to catch the data. If we receive the sensor reading, it will last only up to 2 seconds. DHT 11 is a humidity and temperature sensor ,it generates a calibrated digital output . The main applications is for connecting DTH11 sensor with Arduino board is weather monitoring process.

MOISTURE SENSOR:

The soil moisture sensors measures the water content in the soil. It is an electronic device that is designed to detect the presence of water content in the soil, and it is used to measure the soil moisture level. It has a dc supply in the range of 3.5 to 20volts. The output voltage in the range of 0 to 3v, so multimeter can be used to measure the soil moisture levels.

ARDUINO NANO:

The Arduino Nano, as the name implies itself, is a complete, compact and bread-board friendly microcontroller board. It is a small board based on ATmega328P (Arduino Nano 3.x). Arduino Nano has a similar function as Arduino duemilanove ,but with a base of different package. It is built with the same microcontroller of Arduino UNO. It is a plastic quad flat pack with 32 pins where as there are only 30 pins in the UNO. The additional 2pins in the Nano serve for ADC uses. The main advantage is that it has 8 ADC ports. Unlike other boards, Arduino Nano does not have a DC power jack, instead of that it has a mini USB port. The compelling feature of the Nano is that it chooses the strongest power source with its inherent difference. This port is used for programming and serial monitoring. The microcontrollers can be programmed using programming languages like C and C++.

RF TRANSMITTER AND RECEIVER**:**

This RF transceiver module has a complete RF transmitter and receiver module which can be used to transmit data up to 3KHz. This transmitter module is straightforward to generate and it consumes a low current (typical. 11mA). Data can be connected directly from a microprocessor. These RF transmitter receiver module is a low cost solution. This low cost solution for using 433MHz.

V. METHODOLOGY

Array sensor, a group of sensors consistently used for lumping the information. Its advantage of using over a single sensor lies in the fact that it adds new dimension to observe and to estimate more parameters. Master sensor control-it receives all the eruditions from the sensor and transmits to the wireless fidelity and motor controller. Master sensor takes the decision to power on(or)off motor. It can integrate every sensor with wireless modification.

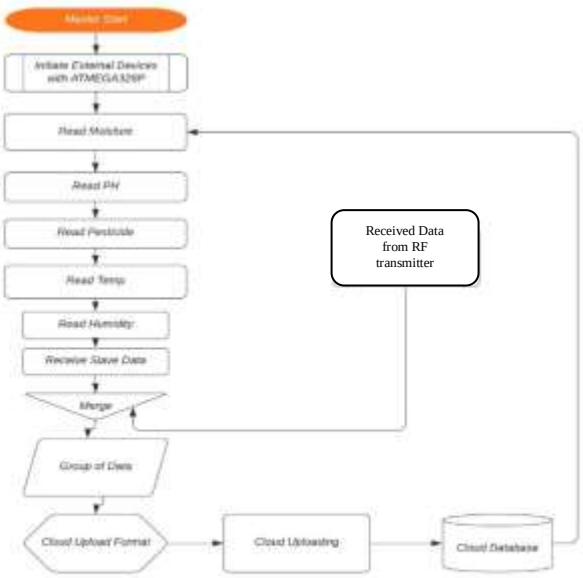

Fig.2 Flow Chart

VI. IMPLEMENTATION OF MODEL

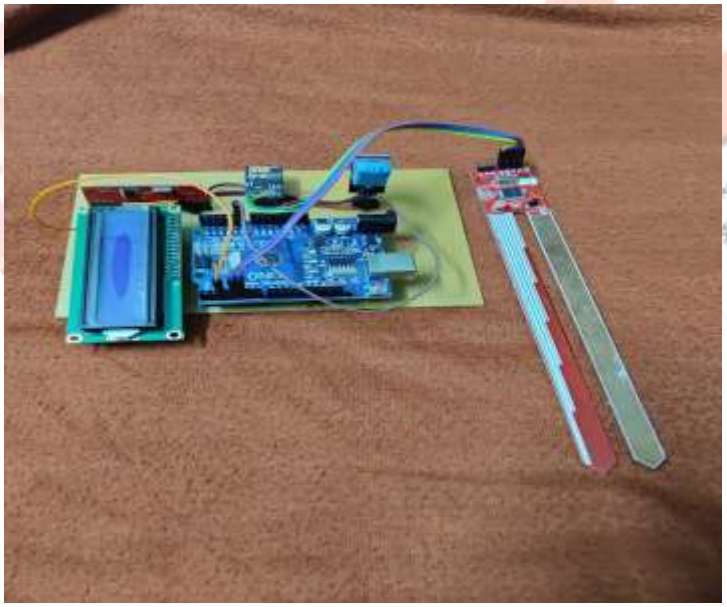

Fig.3 Hardware Implementation

VII. EXPECTED OUTCOME

The expected results of our system are given as,

The system,

- By increasing the sensitivity of the sensor value in land, we can produce better outcome if needed.
- It helps to reduce human effort to maintain the water supply for land.
- Increase smartness for controller in land maintenance.
- We can store data in cloud, so whenever we needed to analyze the value we can confab the readings.
- It can be used for further operation in future and alimentation in the farming land.

VIII. CONCLUSION

The overall the project was success, It has proved that it will amend and augur the status of plant and their respective needs of it . As well it helps in saving of water and reduces the work load of farmers in a good manner. Among all of these uses, we can understand that how cardinal and mandatory is this type of progression. It is valuable for surveying and aligning the characteristics of the soil in a virtuous method.

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