Soil Monitoring System for Improvement of Soil Yield

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***Abstract*— Land and crop use figures form the backbone of the Agricultural Statistics System. Consistent and timely information on crop area, crop production and land use for great importance to agricultural planners and policy makers for efficient agricultural development and for taking decisions on procurement, storage space, public allocation, export, import and many other related issues. The precision agriculture has been promoted by the many developments in the field of Sensor network. These network provide valuable information for harvest, work management, growth of crops, and prevention of crop diseases that helps farmers to take preventive and prolific measures for future emergency. This paper focuses on introducing cloud computing as a new approach used to further enhance their application and benefits to the field of agriculture by providing real time information anywhere in the world through internet.**

Keywords*— *Internet of Things in Agriculture, Sensor Actor Networks, Cloud computing, Arduino Uno, WiFi module, Precision Agriculture.

I. INTRODUCTION

Lower productivity in agriculture is often cited as one of the major problems faced by most of the developing countries. Many issues associated with agriculture can broadly be divided as issues related to environment monitoring and control of green house. These issues play a major role in the enhancement of the productivity and prevention of diseases in the crops.

The resurfacing of global recession has caused ripples across both the developed and the developing economies. Agriculture sector will have to be much more efficient and resilient to ensure global food security. Indian farmers are at great disadvantage in terms of size of farm, technology, buy and sell, government policies, etc. Information and Communication Technology (ICT) can moderate some of the harms to farmers. After the World Wide Web (of the 1990s) and the mobile Internet (of the 2000s), it's now heading to the third and potentially most "disruptive" phase of the Internet revolution—the "Internet of Things" (IOT) which is also known as "Ubiquitous Computing". IOT applications include miscellaneous areas including farming, healthcare, sell, transport, environment, supply chain management, transportation monitoring etc. Applications in agriculture contain soil and plant monitoring, greenhouse environment monitoring and manage systems, monitor food supply chain, looking towards animals, etc. Precision farming equipment with wireless links to data composed from remote satellites and ground sensors can take into account crop conditions and adjust the way each individual part of a field is farm—for example, by spreading additional fertilizer on areas that need extra nutrients. The networking of things or physical objects must be cost effective and useful to the end users for acceptance and wide scale implementation of IOT. Global ICT Standardization Forum for India has listed the potential benefits of IOT as: (i) Improved presentation, visibility and scalability, (ii) Better and more cost effective service, (iii) Transparency of physical flow and detailed location information, (iv) Enhance good organization, precision, mobility and automation

II. PROBLEM STATEMENT

Based on the above context, there is a need for a classification of data, which take care of all the different aspects in analyzing the frequently occurring Data. The proposed system devices a simple system, using which Farmer can get real time data on his website, so that he can take preventive and productive measures to increase the yield soil.

III. SCOPE OF PROPOSED SYSTEM

With the development of information technology in our society one can expect that computer systems to a larger extent will be embedded into our environment. Crop growth and production are basic information of national social and economic. Crop growth and production are related to the people's livelihood. The information is significance for making national and regional socioeconomic development planning, making plans of agriculture imports and exports to ensure national food security, guiding and regulating planting structure adjustment and improving the management level of the relevant enterprises and farmers. The timely and accurate regional agricultural condition monitoring is the basis of macro-control of the national agriculture. Use of remote sensing can realize the intelligent control of agricultural production, improve the monitoring accuracy and reliability, refinement, rich monitoring content, and expand the scope of

monitoring. At the same time the results via the internet timely to support agriculture production decision.

Overview of the Proposed System

After a detailed study of all the requirements necessary for the execution of the system, a detailed block diagram is shown in Figure 1 of the proposed Soil Monitoring System.

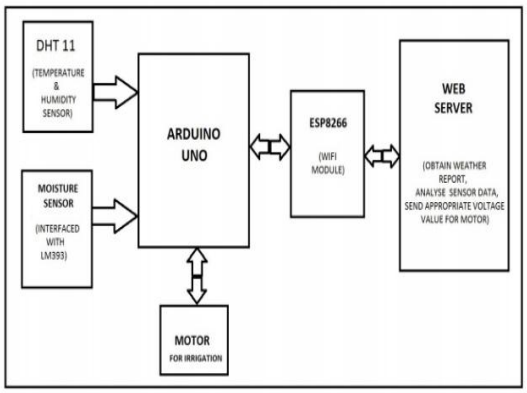

Fig 1 Block diagram of Soil Monitoring System

The DHT11 is a basic, ultra low-cost digital temperature and humidity sensor. It uses a capacitive humidity sensor and a thermistor to measure the surrounding air, and spits out a digital signal on the data pin (no analog input pins needed). Its fairly simple to use, but requires careful timing to grab data. The DHT11 humidity and temperature sensor measures relative humidity (RH) and temperature. Relative humidity is the ratio of water vapor in air vs. the saturation point of water vapor in air. The saturation point of water vapor in air changes with temperature.

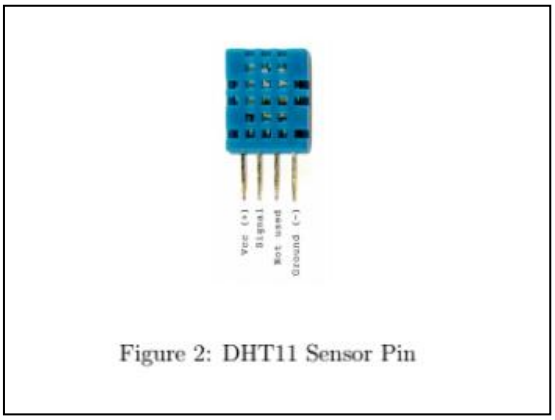

Figure 2: DHT11 Sensor Pin

Soil Moisture Sensor

Soil moisture sensor measure the water content in soil. Measuring soil moisture is important in agriculture to help farmers manage their irrigation systems more efficiently. The module uses LM393 comparator to compare the soil moisture level with the preset threshold. When the soil moisture deficit module outputs a high level, and vice versa. The Figure 3 shows a soil moisture sensor.

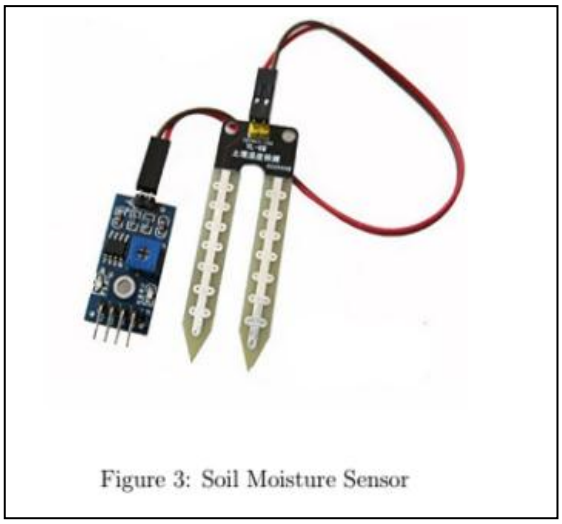

Figure 3: Soil Moisture Sensor

Arduino Uno

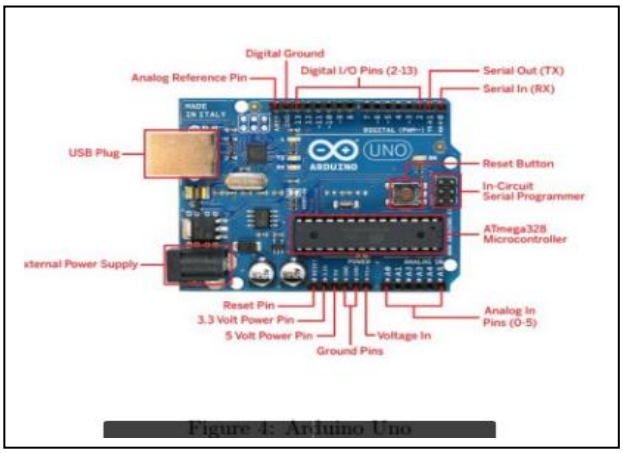

Figure 4: Arduino Uno

The Arduino Uno is a microcontroller board based on the Atmel's ATmega328.It has 14 digital input/output pins (of which 6 can be used as PWM outputs) and 6 analog inputs. The Arduino Uno can be powered via USB connection or with an external power supply. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable (not included). Arduino IDE supports Windows, Mac OS X or Linux. The Figure 4 shows a well labelled Arduino board.

WiFi Module (ESP8266)

The ESP8266 WiFi Module is a self-contained SOC with integrated TCP/IP protocol stack that can give any microcontroller access to your WiFi network. The ESP8266 is able of either hosting an application or offloading all Wi-Fi networking functions from another application processor. Each ESP8266 module comes pre-planned with an AT command set firmware, meaning, you can simply hook this up to your Arduino device and get about as much WiFi-ability as a WiFi Shield offers (and that's just out of the box)! The ESP8266 module is an enormously cost effective board with a huge, and ever growing, community .The Figure 5 shows the ESP8266 Wifi Module.

Figure 5: Wifi Module ESP8266

Web Server

The values from the sensor will be constantly updated at regular intervals. These values will be then analyzed along with the weather information obtained from the internet to provide with the voltage value. The web server will host a database of the ideal values of the environment and soil parameters for various which will be used for comparison.

V. CONCLUSION

The use of sensor Network and Cloud services in agricultural field provides high potential benefits which are economically worth in the field of agriculture. In this project we have proposed the IoT-based agricultural monitoring system which has built on the long-standing desire of farmers to ensure their land remains productive into the future. It also addresses the community's expectations and concerns for safe food and for environmental protection. An agricultural production system for the agricultural production using IoT technology and implemented it as GUI visualization software was designed. The IoT based agricultural production system through correlation analysis between the crop statistical information and agricultural environment information has enhanced the capacity of farmers, researchers, and government official to examine current conditions and predict future harvest.

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