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Soil Moisture Monitoring and Smart Irrigation System using IOT and Mobile Application

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Abstract: *Water is a basic need in all plantations, human, economic operations. Farmland, renewable energy, the economic areas. Even with human needs water and its properties takes the most vital role in sustainability of the agricultural, office, home plants. The most critical part occurs here is maintaining the water moisture in soil and maintain the humidity and moisture of the soil accordingly. The critical role becomes in the huge green houses, offices, homes .Therefore using the IoT based smart irrigation system does a certain task to make sure the proper and efficient use of watering and maintaining the climate temperature and humidity. Therefore, the critical role that information technology methods and internet communication technologies (ICT) play in irrigation and temperature maintenance to limit the excessive waste of water and to control and monitor humidity and temperature. In this paper, we have to review research that uses the internet of things (IoT) as a communication technology that controls the preservation of the available amount of water humidity and not wastes it by homeowners and farmers and temperature controlling. In contrast, they use water, and we have also reviewed some researches that preserve soil moisture and maintain the proper growth and health of plants and automaton in the daily life based irrigation system reduce human efforts.*

Keywords: Smart Moisture Management, Smart Plant Management; IoT; Soil Humidity; Microcontroller; Sensors; Controller Mobile Application

I. INTRODUCTION

Soil moisture is the temporary storage of water within a shallow layer of earth's upper surface, as compared to the total amount of water available throughout the globe it is important in agronomic, and meteorological processes at all spatial scales. Detection and irrigation management. Information of soil moisture can be also used as an indicator for such as drought and flooding and for environmental changing, such as dust storms and erosion. However, accurate estimation of soil moisture through the in suitable measurement is too expensive because it needs a replication sampling process to analyze the periodical change in soil moisture. And even the climate or temperature controlling takes the tremendous effect on the plants growth and productivity. The automation in this two factors or conditions may make the productivity and efficiency of plans more efficiently and effectively.

II. LITERATURE REVIEW

Rain in general and water in particular poses a major problem for the farmers. This is due to dissimilar climatic conditions. Hence, there is a need to use optimal water for the plant/crop in order to utilize the available water resources effectively without affecting the yield. The IoT and Cloud computing technologies can effectively be used in such a scenario by supplying water to the plant(s) till the soil around it attains the required moisture level and then stopping the supply of water by switching the motor off from the remote area. Reading the moisture level and switching the motor off can be accomplished by a smart phone. Several papers have appeared in the literature which discusses measurement and monitoring the agricultural parameters by using different controllers and sensors. The work carried out by some researchers related to soil moisture measurement is as follows:

In this project we intent to develop a smart wireless sensor technology-based system, which was used for measurement of soil moisture using in-situ sensors. The sensor web technology, it gives the three-dimensional soil moisture

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information of fields as a function of time. Ina system is proposed to record the environmental parameters which are received from the sensors. Smart phone application (software) is used to process and analyse the information. The system is integrated with ATMega2560 Microcontroller, Fc28 soil moisture sensor. Ina system was developed which measures the soil moisture, temperature and humidity by using the sensors which are placed in a monitored area.

Microcontroller is used to gather the information from the sensors. The acquired data is graphically visualized through module. The whole developed system is powered by battery package. The objectives of the developed system are consumption of water, electricity, humidity, temperature and increase the quality of food grains and yield of crops. In a system is developed that used to effectively supply the water in cultivated fields automatically using IoT based wireless sensor networks.

The system takes and analyses the data from the sensors and supplies the water that is needed for the cultivation field. Ina system is designed which measures and monitors the moisture present in the agriculture fields. The principle of the moisture sensor is moisture depends on resistance change between two points in the soil. The sensor data is transmitted using Bee wireless communication technology. The hardware is developed using PIC16F876A microcontroller and a moisture sensor. The moisture data are graphically displayed on a mobile application using Blynk software. In a system was developed which gives the estimation of soil moisture with the help of wireless underground sensor networks using Spatial-Temporal correlation. Ina wireless sensor network system was developed which acquires the real-time information of electrical conductivity, temperature and volumetric water content of soils at different locations and different depths. The sensor data is transmitted in long distance through cellular networks and internet service. Ina smart sensor-based system was developed for monitoring the agriculture environment.

III.. SMART IRRIGATION SYSTEM

The smart irrigation system is an automatic irrigation schedule that considers environmental conditions to ensure plants and crops receive the ideal amount of water. Convection removes soil moisture, while irrigation and Rainfall bring the added water content. It allows the design of automatic irrigation by identifying conditions specific to each root zone. The design was generally based on the control board (CB), which comprises ten main sections and other sensors, for the device proposed. They are Arduino Mega 2560, two shield relay, one moisture sensors, one 220V mini water pumps, LM35DZ temperature sensor and SIM900 GSM Shield. These components are also equipped with one water pumps. For analogy input, the first humidity sensors are attached to the Arduino A0 pin to obtain the moisture content of the soil. The Vic pin (+) is connected to the 5V Arduino pin. The second humidity sensor, which is attached with A1, is connected simultaneously to the bottom of the tank. The third humidity sensor is connected with A2 to get the critically high value when the tank is filled with water. A3 port attaches with an analogy pin to the Rain Drop Sensor. It attaches to relay models and connects with two water pumps, D2 and D3 are classified as digital pins. The D18 and D19 bind to GSM Shield so that the homeowner receives SMS.

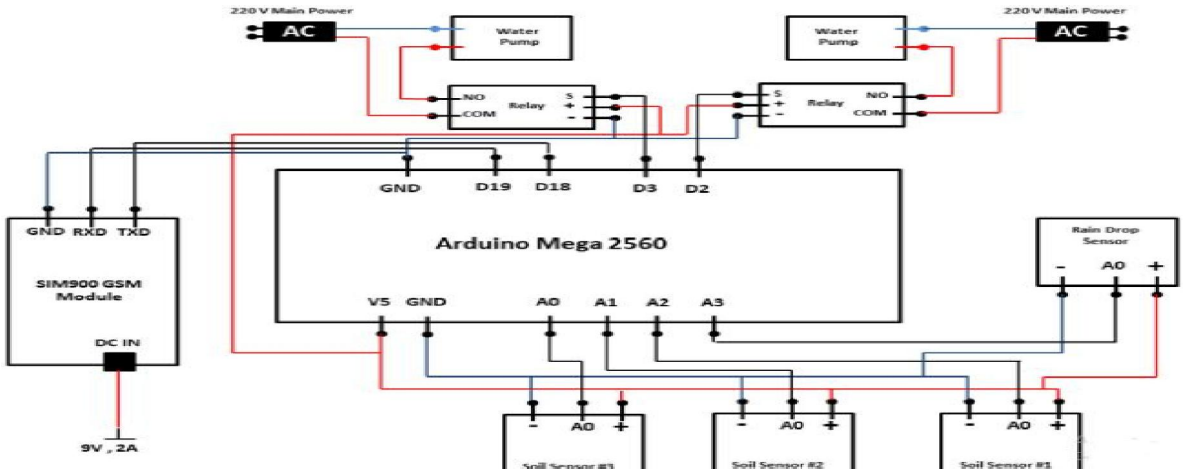

Fig 1. Irrigation System Architecture

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Internet of Things (IoT) The development of the Internet of Things (IoT) facilitates connecting devices equipment through the internet, which would be very useful in the automation of the distribution of water and malfunctions or leakage monitoring. The principal architecture for IoT comprises three layers: the physical layer, the network layer, and the application layer. At the physical layer, sensors collect data from the outside environment, turn that data into usable information. Well, time-sensitive data should be processed the moment they are collected.

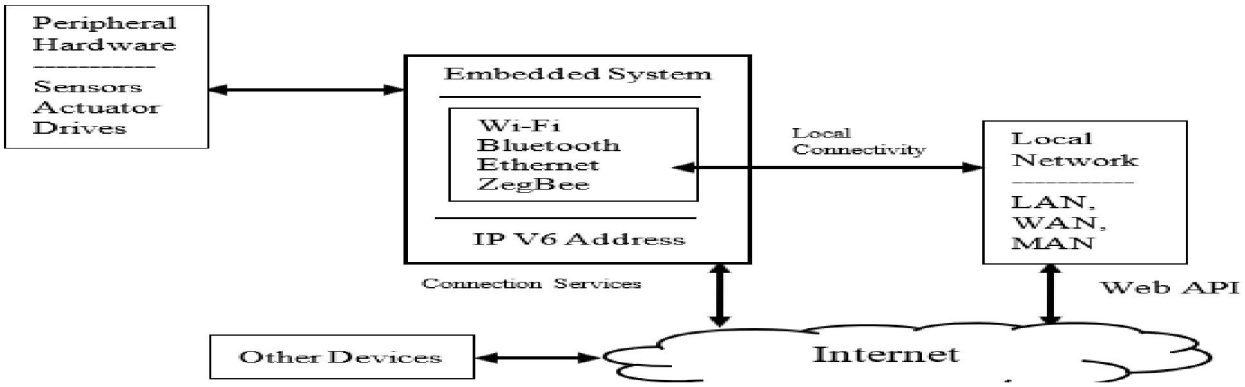

Fig 2. Basic Architecture of IoT

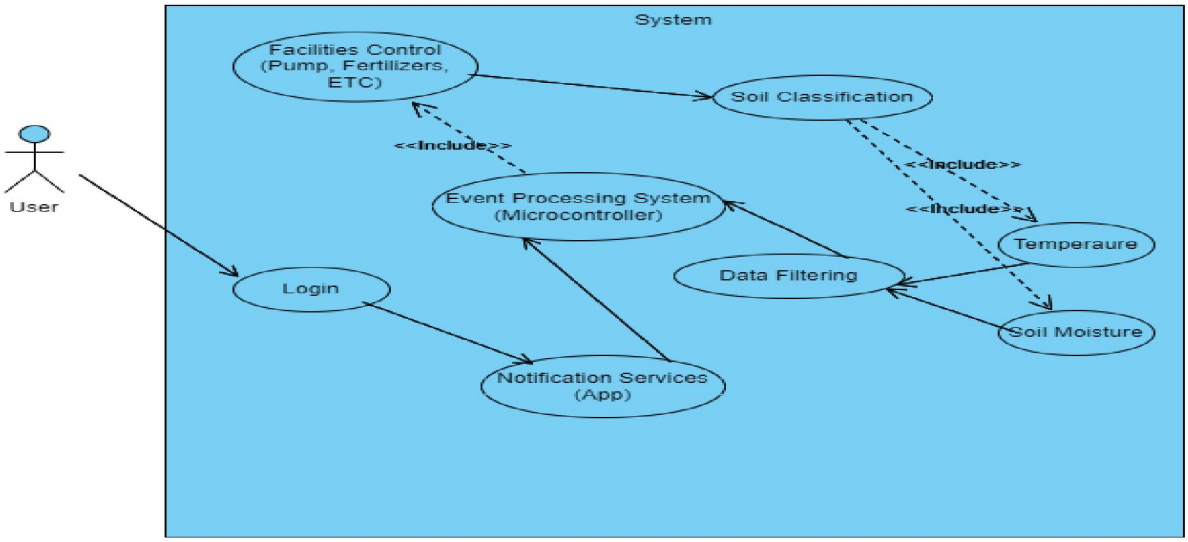

Fig 3. Use case diagram for system

3.1 Moisture Detection

FC-28 soil moisture sensor is a simple sensor can be used to detect soil moisture present in the plant watered device. The output of FC-28 is in terms of analogy volt-age for measuring soil moisture. The sensor module has a LM393 driver. It is designed specially from a single supply over a wide range of voltages. The sensor module has a potentiometer to adjust the level of sensitivity. The sensor operating voltage is 3.3-5 V.

3.2 Blynk Mobile Application

Using mobile application, farmers are used to monitoring and controlling their crops anywhere without a computer. Thus, we use Blynk mobile application for Android mobile devices. Blynk app was designed by especially for IoT. It can control hardware and displays the sensor data. It has buttons, sliders, graphs, drag and drop buttons and other functional widgets on the phone. This app is installed on Android mobile phones. Accessing the application and then create a new project.

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3.3. Sensors

Many sensors are available in electronic stores for water monitoring. Such sensors are temperature sensors, Humidity sensors, Soil Moisture sensor, etc.

Soil moisture sensor is a simple breakout for soil and similar materials to measure humidity. The sensor of soil moisture is relatively easy to use. The two large exposed pads serve as sensor samples, acting together as a variable resistor. The longer the water in the soil, the better and will result in lower resistance and higher output SIG the conductivity between the pads.

Temperature sensor is used to measure the temperature around the plant or crop and derive the certain result and process the certain results to the Arduino microcontroller.

IV. CONCLUSION

Monitoring and measurement of moisture and humidity parameters in real time are crucial for developing the cultivation and maintenance. In this paper, we have designed and developed a system for monitoring and measurement of soil moisture using Cloud IoT and Android system. The device is to record the real- time data using IoT and Blynk application on Mobile system. Using mobile computing technology, the person can observe the data anywhere and can react quickly based on the soil moisture and even the user can perform the operations manually with the Blynk mobile application accordingly. Whole process of humidity and temperature management in n the hands of the user and the whole process will be automated for efficiency and better productivity.

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