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Smart Irrigation Using GSM Module and Microcontroller

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Abstract— Agribusiness assumes a noteworthy job in our everyday life. In this paper, a review has been done about the run of the mill horticulture techniques utilized by ranchers nowadays and what are the issues they face. Ranchers face serious issues in watering their harvests underneath watering framework, over-watering framework that causes separating and loss of enhancement substance of soil. Also inundating water to the plant in overabundance will build the centralization of high soil content there are a few different ways to develop a solid yield however it requires a great deal of labor which is a weight these days. So as to make it a keen and self-ruling water system framework cloud innovation is being utilized. Microcontroller (MCU NODE), GSM module have been used. This strategy helps in controlling the exact state of the water dimension to the horticulture land dependent on the dampness substance and it routinely illuminates the rancher by means of SMS about the dampness substance, a rancher can likewise observe the constant dampness substance by an application installed in his phone.

Keywords- Cloud, MCU node, GSM module, Dampness , Application.

I. INTRODUCTION

Horticulture assumes a noteworthy job in India's economy. In past generation, it is seen that there isn't much harvest advancement in horticulture part. Sustenance costs are ceaselessly expanding on the grounds that crop rate is declined step by step. The total populace has been expanding step by step and it is evaluated that it will ascend to nine billion by 2060 and individuals are stressed over food. Brilliant cultivating dependent on cloud services with the use IoT innovations will help the ranchers to reduce water and it provides major benefits [1].

More than 60 million individuals into destitution since 2012.There are various number of reasons which are in charge of this ,it might be because of water squander, low soil richness, manure misuse, environmental change. It is exceptionally fundamental to make compelling mediation in horticulture and the arrangement is IoT in combination with Wireless sensor systems. It has significant abilities to change the method for improvement in farming and gives extraordinary commitment to make it keen agribusiness. The principle point of this paper relies upon modernizing the horticultural world by connecting the programming and equipment parts and to perceive how human control can be expelled from water system and to make it a totally self-governing framework. To diminish the interest of sustenance shortage, there is a solid need to improve the nourishment efficiency. Agribusiness is the foundation of any nation and high need to be given to explain any difficulties in this field. Because of the shortage of land water, which is diminishing quickly, there is a need to actualize a technique for decreasing the water wastage. The spontaneous utilization of water results in wastage of water. In Smart Irrigation System the most huge preferred standpoint is that water is provided just when the dampness content in soil goes beneath a pre-set edge esteem. This spares us a ton of water. The ranchers have been utilizing the old water system method by manual control in which the ranchers inundate the land at standard interims by turning the water-siphon on/off at whatever point it is required. This procedure here and there devours more water than required by the yields and once in a while the water supply to the land is postponed because of which the harvests dry out.

This issue can be totally unraveled in the event that we utilize Smart Irrigation System in which the water system will happen just when there will be exceptional necessity of water as proposed by the dampness in the soil.

Soil dampness is critical for the physical basic quality of a plant. So a structure is created by utilizing cloud innovation as the spine with GSM, MCU hub, Water siphon, and sensors to flood the soil by controlling instruments. It is the usage of different innovations like the web, cloud, and the IoT gadgets. Sensors are equipped for giving continuous information of the dampness content in soil and then act accordingly client input. Shrewd cultivating can likewise be called as exactness cultivating. It makes cultivating simple,

financially savvy and improves crop yielding and give better generation. The review has been done to comprehend the diverse innovations and to fabricate feasible shrewd horticulture. The relationship of water system with IoT is the most ideal approach to improve results from the water system utilizing inventive strategies. It can possibly gauge the solid substance of savvy water system like detecting the dampness content, providing water to the field consequently at whatever point required, sending messages by means of GSM module in regards to status of the dampness content in soil, status of the motor (on/off) and at last a portable stand-alone application has been created to view the information in an advanced cell.

Rest of the paper is organized as follows, Section I contains the introduction of necessity of smart irrigation , Section II contain the related work of smart irrigation system , Section III contain the implementation methodology , Section IV describes results and discussion of smart irrigation , Section V contains the conclusions and future scope.

II. RELATED WORK

In this paper "Remote Sensing and Controlling of Greenhouse Agriculture Parameters based on IoT" [2]. In this paper the fundamental point is to detect the green house agribusiness field and control the encompassing parameters like carbon dioxide, dampness substance of the soil, light and temperature and the move is being made by the rancher, the detected information is saved in the cloud account. The rancher can assume responsibility for the green house from far distance dependent on the dampness substance of the soil. It can likewise work naturally shutting and opening of windows dependent on the dampness substance of the soil. Rancher can remotely work the windows to be opened or shut. IOT and cloud innovation is being utilized to deal with the green house remotely from far separations and operate it by the help of cloud technology. It clarifies the need for remote sensor organize in the horticulture farm in order to expand profitability.

In this paper "A Sustainable Agricultural System Using IOT "[3].The author built up a system which will live stream the Horticulture field in a real time just as live video from the server itself, through raspberry pi camera. Online video observing of the mechanical movement is seen by the approved individual by giving client name and secret word. IOT and cloud technology is implemented. Various field parameters will be checked in Real time like dampness substance of a soil, air moistness and the current temperature dependent on the ideal edge esteems programmed water framework will be initiated. Sensors detects the ecological surrounding area and incites an SMS amid basic circumstances, real time readings from the sensors can be viewed in a webpage.

In this paper "Internet of Things (IoT) for Precision Agriculture Application"[4]. In this paper An independent application has been created and executed, DHT11 sensor is utilized which comprises of temperature sensor, moistness sensor and soil dampness sensor is utilized . These sensors are associated with the node MCU and the data gathered by the sensors are sent to the cloud. From the cloud , information is sent to the portable application where a client can see the ongoing information acquired from the sensors, the information is refreshed in a real time and it can be found in application ,its represented in a three distinctive chart dependent on the sensor.

In this paper "A Smart Agricultural Model by Integrating IOT, Mobile and Cloud-based Big Data Analytics" [5]. To evaluate the harvest yields in the farming field couple of advancements are being utilized like cloud innovation, IoT and big data concepts. With the assistance of IoT innovation sensors gather the data from the agribusiness field and the data is sent in the cloud. Later on the sent data in the cloud is investigated by big data and it estimates the cost of fertilizer and the harvest required. In Real time test of the soil, rancher can get the required fertilizer dependent on the farming yield easily.

In this paper "Cloud Service Oriented Architecture for Agriculture through Internet of Things and Big Data" [6]. The creator clarifies about the need of cloud administration in the agribusiness field, with the assistance of cloud administration being actualized in horticulture it gives many number of administrations to the ranchers, it has numerous focal points and it spares a great deal of time. The cloud and IoT innovation is being considered and conveyed for keen cultivating. Sensors are conveyed in the horticulture field and the information assembled by the sensor is sent to the server and the moves are being made by the server consequently relying upon the information. For instance: Programmed watering of plants is done if the dampness content in the soil dips under the predetermined esteem. With the assistance of cloud benefits the rancher can get to the data identified with his cultivating field, information assembled by sensors from any territory. It contains dominatingly segments in Savvy cultivating, those are sensor structure and control system that is used to screen and control the residence field. The advancement used is Web of things to screen and send the vital data from the living arrangement field to the rancher.

In this paper "End-to-End Reliability Analysis of an IoT based Smart Agriculture" [7]. This paper represents start to finish unwavering quality attributes of two primary IoT correspondence structures throughout the system

dependability parameters by utilizing OPNET. The recreation consequences of the system parameters give point by point dependability qualities of the entire framework. The end to-end unwavering quality impacts were reenacted and looked at an alternate number of sensor hubs. While expanding the quantity of sensor hubs, the start to finish unwavering quality of the whole framework is influenced toward the start of the working time frame particularly for the IoT correspondence type II which include longer correspondence way and gadgets. In addition, the postponement can be seen in the correspondence way between sensor hubs and the Wi-Fi switch. Thus, one approach to rapidly improve the dependability and execution of the framework is to build the execution of the main transmission portal between the sensor hubs and the server, which is the switch for this situation. The repetition gadgets, load adjusting arrangement, or expanding transmission data transfer capacity can legitimately decrease the retransmission rate and raise the general unwavering quality of the framework.

In this paper "IoT Based Low-cost Weather Station and Monitoring System for Precision Agriculture in India" [8]. In this MCU hub is utilized and sensors like temperature and dampness sensor, Atmospheric weight, Rain sensor, Intensity Sensor are associated with the MCU hub and even OLED display is associated with the MCU hub. Sensors accumulate the information and it's handled by MCU hub and the information can be seen in OLED display. The data is sent to the server for the investigation of the information and the information can be viewed in an advanced mobile phone it is represented in a visual method of flowchart figures. It is prepared for giving the farmers progressing atmosphere situation and conditions in and around the green field. It will assist the farmers with doing agrarian endeavor at right and positive time.

III.METHODOLOGY

A programmed water system control framework has been planned and actualized to encourage the programmed supply of satisfactory water from a repository to field or local yields in every single farming season. The technique utilized is to persistently screen the dampness level to choose is water system required, and supply the required content of water. The framework reacts fittingly by watering with the definite required measure of water.

Soil moisture sensor is placed inside the root zone of the field. The sensor gathers the information and transmits the data to the MCU node. Fire Base Cloud technology has been implemented to connect between the devices. An embedded c program was developed to measure threshold value soil moisture sensor that was programmed into a MCU node to monitor the moisture content of the soil. Sensors sense the moisture content of the soil and sends the information to farmer through GSM Module. Farmer gets to know the status of the pump installed in the field via GSM Module without going into the field. At the point when the dampness content reaches over the ideal edge esteem the siphon naturally turns off and when the dampness content dips under the limit esteem the siphon consequently turns on and the message is passed on to the rancher. The framework additionally advises client about any strange conditions like less dampness content through SMS from the GSM module to the rancher's versatile and moves are made as needs be by the rancher.

An android app is been developed and implemented. It is used to check the real time status of the moisture level of the soil and farmer can turn on/off the motor by an app.

A new feature has been developed and added to the mobile application called as Turbo Mode. Turbo feature is used where two water pumps are used simultaneously for faster pumping of the water and turbo mode gets deactivated automatically when it reaches above 50% of the moisture content value and single motor will be pumping the water.

Turbo is activated automatically when it's at zero percent moisture level.

Usually when we turn on the motor manually by a mobile application. Only single motor gets on, turbo mode can be activated manually also by long press of 'ON' button for 2 seconds.

- The Software requirements used are

    1. Firebase cloud
    2. MIT app developer software is being used in creating the android application and even android studio software can be used.

- Hardware components used are

    1. MCU NODE(ESP8266)
    2. GSM MODULE
    3. SOIL MOISTURE SENSOR
    4. JUMPER WIRES
    5. 2 MOTOR PUMP
    6. AC ADAPTOR
    7. L298 MOTOR DRIVER MODULE

1. MCU NODE

Figure 1 : MCU NODE (EP8266)

Node MCU is an open source platform Wi-Fi chip developed by Espressif Systems by TCP/IP protocol. It is mostly used for development for Internet of things embedded applications. It supports 2.4 GHz WiFi(802.11 b/g/n, supporting WPA/WPA2) .

2. GSM Module

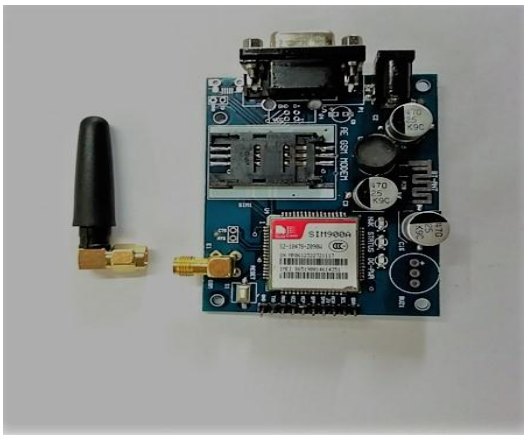

Figure 2: GSM MODULE SIM900A

A GSM module is device which can either be modem device or any other processor to communicate over a network. It supports Short message service, encryption to make phone calls more secure, reliable spectrum efficiency.

3. L298 Motor driver Module

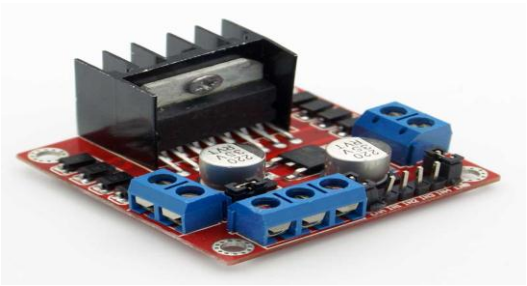

Figure 3: L298 MODULE

L298 is a motor driver module used to connect the motor pump and provide with power supply to the motor pump.

4. Motor pump

Figure 4:DC Motor Pump

A DC Motor is used in pumping the water to the soil.

5. Soil moisture sensor

Figure 5: Soil moisture Sensor

The dampness sensor is produced using erosion safe material which can be put inside the loam. It is utilized to gauge the volumetric water substance of soil.

6. Jumper wires
It is used to interconnect the component modules.

7. AC adaptor

It is used to provide current to the modules.

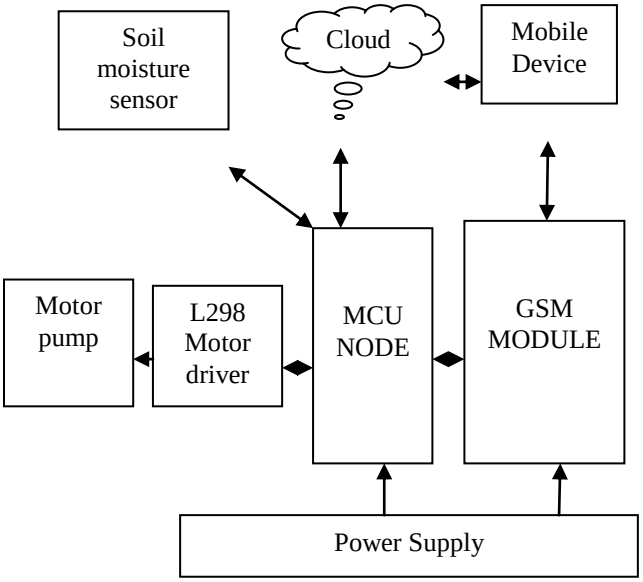

Figure 6:Block diagram of smart irrigation system

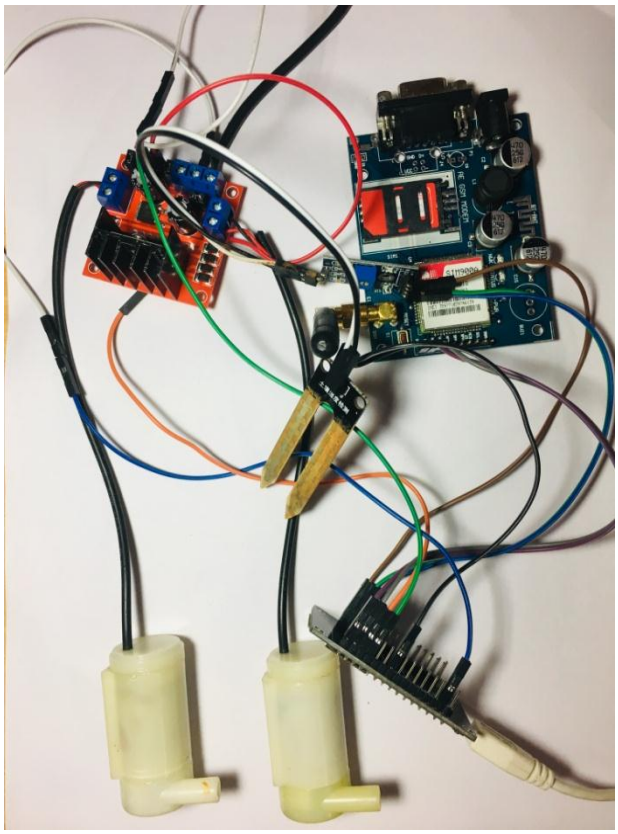

Figure 7: Total setup of a smart irrigation system

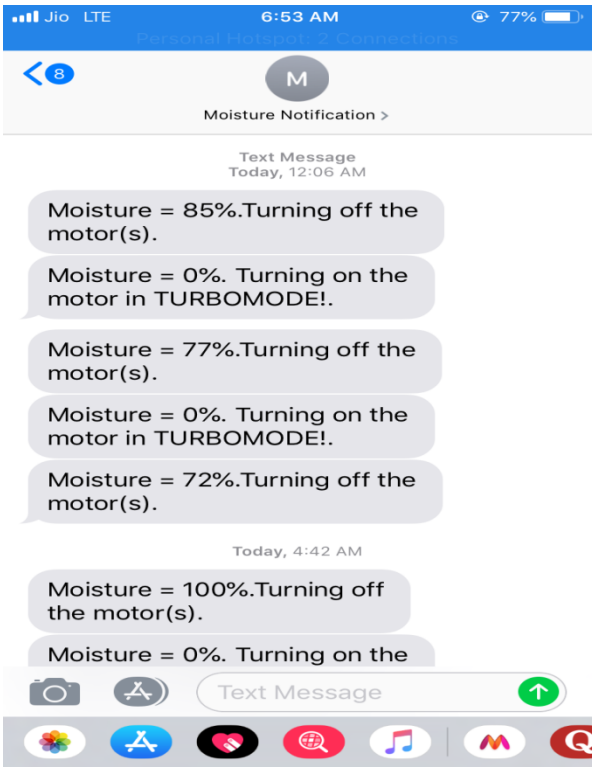

Figure 8: Screen shots of notifications automatically turned(ON/OFF)

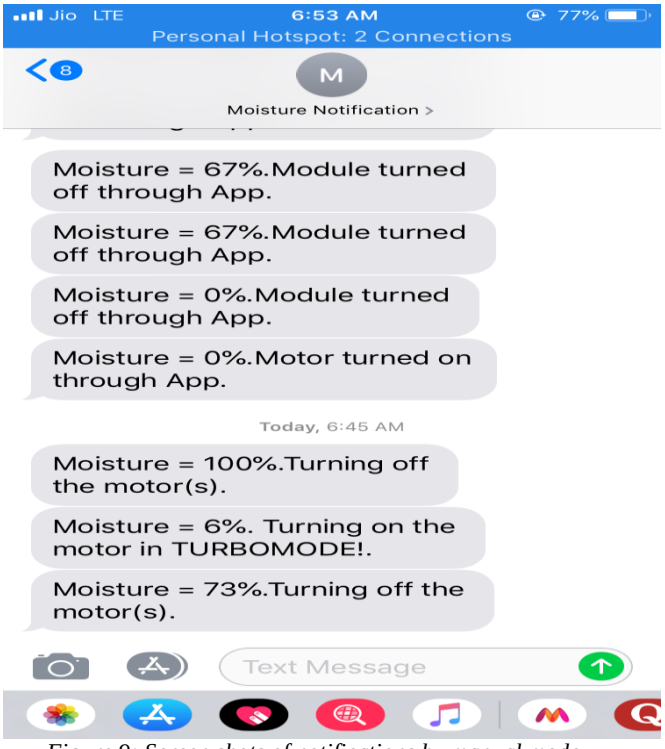

Figure 9: Screen shots of notifications by manual mode

IV .RESULTS AND DISCUSSIONS

The smart irrigation system was successfully implemented and tested on a garden plant. The sensors when placed inside a dry soil, it immediately notified via SMS to the mobile phone, turbo mode was activated and two motor pump simultaneously started pumping the water and as soon as it reached above the threshold value the pump automatically turns off and it notified via SMS motor has been turned off.

In the ADRUINO code the moisture were set as least=10, avg=50, stable=70(which delineates the corresponding resistance value in digital format). The motor was also turned (ON/OFF) manually by an application and it notifies via sms that motor has been turned (ON/OFF) manually by an app. We can also check the Real-time status of the moisture content of the soil by an application.

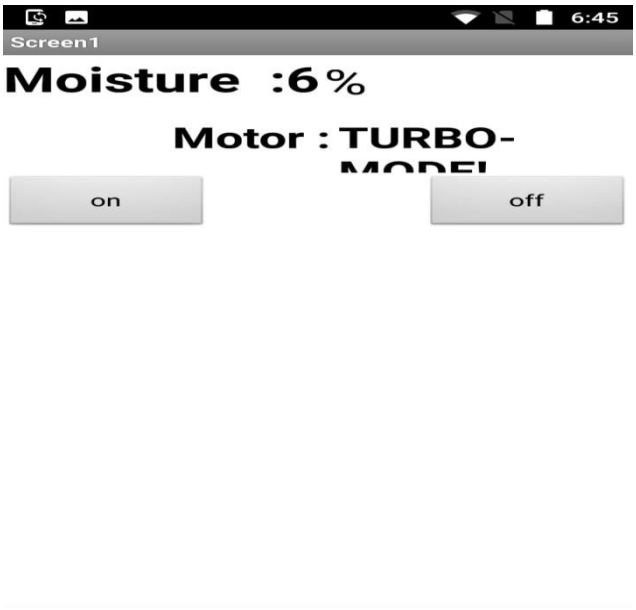

Figure 10: Android application during turbo mode

Figure 11: Android app when motor is switched off manually

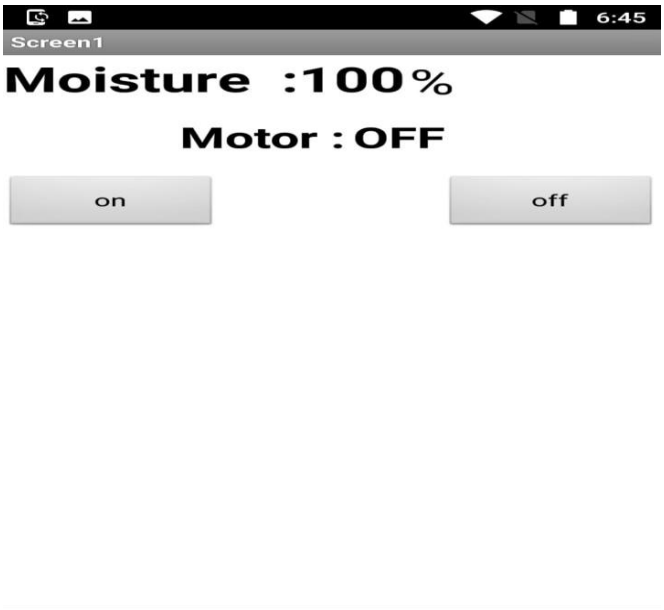

Figure 12: When the moisture content reaches the specified threshold value the motor turns off automatically

III. CONCLUSION AND FUTURE SCOPE

There is a pressing prerequisite for a framework that makes rural procedure simpler and load free from the rancher's side. This framework has been created insignificant prerequisites of equipment and in the meantime more exactness and precision. Because of old water system methods water wastage is a far more than we think. By the execution of IoT in horticulture the rancher issues can be settled.

Future scope can be carried by adding new modules to this system by making it completely autonomous by using solar power and reducing the usage of the electricity. As the solar power can be stored in batteries and it can be connected to this module, no need to depend on power supply.

Tiny drones can be developed at a cheaper price and can be implemented. With the help of sensors and digital imaging capabilities it can gives farmer a richer picture of the fields and it's useful in improving crop yields and farming efficiency. The drones movements can be made autonomous without the human help, thus it will reduce a lot of burden to the farmers.

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