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Remote Automation in Farming using Internet of Things

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Abstract

As the world id getting digitized nowadays, there is a necessity for engineers to get digitized. The innovations of the engineers are to be proved in every field and so is the agriculture sector. The farming in agriculture is chosen for digitization as the technology in intending to do work in a click controlled by processors and controllers. Communication should play a great role in farming and have required accessories for proper communication control. The old practices of monitoring are replaced using assembling and controlling components. This enables the farmers to know as well the as understand the real-time needs in the farming field and act accordingly. In this research work, the communication system is developed to automate the ongoing day's work of an agriculturist. The control of irrigation, automation of irrigation, giving needed manure, control of required pesticides, water management and supervision can be made effectively using our system. Sensors and Internet of Things (IoT) plays an important role in important role in the communication layer. The IoT system produces good efficiency in the farming field and can play major role in the future modernized farming in the world.

Keywords: Field farming; IoT; Efficiency; Controlling; Automation.

I. INTRODUCTION

The creation of new technology in the field of farming is very much important and has a major role in the future of agriculture. The development in various field of agriculture hs been identified in this work which portrays the technology behind every needs of farming, application of the real-time needs in a system that is automated by controllers and sent through the internet. The communication happens through the internet and large scale factors have been considered for the effective control of the resources. Effort has been taken such that the system developed is user friendly and low maintenance. So, any lame person can use the system without any difficulty. The communication system consists of controllers as master and other sensors ass slave. It uses the IoT for the effective delivery of the signals. Thus the signal reaches the other side without any delay. The farmers can easily identify the field nature and get the real-time data without physically being on the field. The requirements, implementation are explained in the forthcoming parts.

II. CURRENT IMPLEMENTATION

Generous progressions in the space of farming computerization have been overviewed. In the review os different research about the way of automation in the farming has some different observations the Robotic Process Automation (RPA), picture handling, design acknowledgment and AI so as to accomplish computerization if there should arise an occurrence of huge scope ranch handles the paper likewise talks about precision systems in farming giving an effective crop management. In Advances in nursery robotics and controlled condition horticulture: A change to plant production lines and urban farming one can see how a mix of natural conditions exchanges in ideal development of plants in various arrangements. Usage shared isn't need dependence and are less mindful. For instance, if there should be an occurrence of blunder at any hub of the work process can't be recognized or amended. The facts about the traditional farming and the futuristic agriculture have been deliberately considered for getting maximum efficiency.

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In this paper we are eager to mechanize the correction procedure of any error happening at any hub of the current computerization framework by broadening the work process which causes independent frameworks to flourish with no human mediation. We have likewise executed work processes that will in general increment the degree of robotization in the framework. On recent years agriculture has been an important aspect to develop in terms of digital world. Today's farming is to be done in a way like automation in industry. Many source parameters are to be obtained from the agricultural field and from other resources like solar, water, humidity, and temperature. A device is to be created in order to fulfill all these criteria and the parameters should be obtained. Proper timing is to be maintained in such that those parameters are obtained in an efficient way.

III. REQUIREMENTS

Components used:

● **ARDUINO UNO:** An Atmega328p board is the controller which is the master device which initiates the controlling of other devices and sends signal with the help of IoT interfaced with expanding slots for effective communication. The accessories can be fixed for getting real-time data of the field. The arduino board is a useful microcontroller that acts as the master device. This is the processing unit which does all the internal operations. It manipulates the parameters acquired from the outside sources and passes the information to the outside world. The board controls of Arduino are supportive. It can link with its associated accessories with quick transformation of data from end to end. This is used in the agricultural system for easy access of third party cores and can easily fix the bugs if at all there is any. The external component can be easily fixed to an arduino board. The arduino has the ability to fix the component with proper synchronization. The synchronized data can be used for transmission and reception. The transmission data and the sensor array has a well-equipped fixing with the UNO module. The arrays are have the computing path which can vary digital signal as well. The collected sensor data from the slave side is read at the master controller. In this arduino, it is not necessary the sensor have to be placed equidistant at the slave side. This device as master can pick the data in sequence and has the ability for priority change in the controller pin.

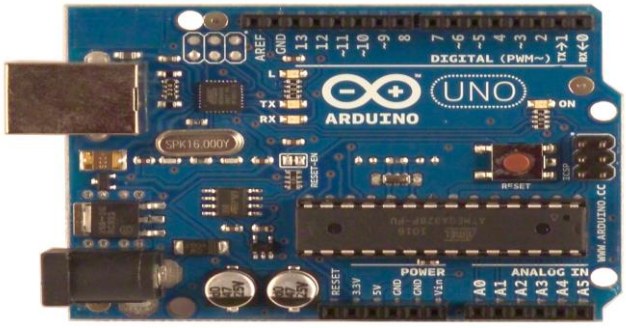

Figure 2 - Arduino board

16X2 liquid DISPLAY –

Visual display is needed to know the analog data operations. Each and every operation can be displayed such that the farmers may know the real-time data. Parameters that are incoming as well as outgoing can be displayed using the 16x2 sandwiched. It has light modulating properties made up of liquid crystals. The display screens are to be present in the devices such that display in real-time helps the farmers in knowing the realtime data. Action can be taken by them then and there. A larger pixel display can also be used but this 16x2 display can be much more comfortable enough in fixing with the arduino

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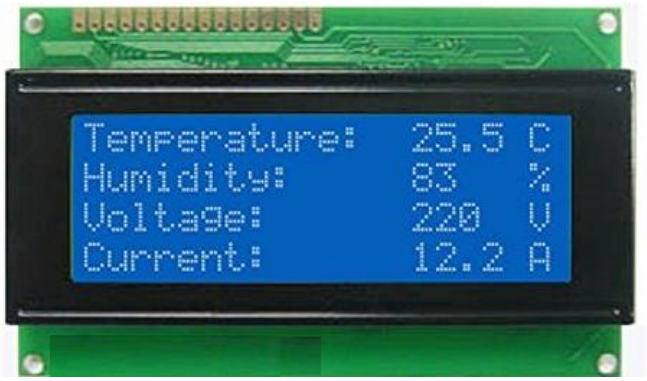

Figure 3 - 2x16 Liquid Crystal Display

In smart high tech farming system the devices like arduino with displaying is necessary for the farming and the growth of the plants as farmers use this technology in understanding the farmland nature and act accordingly. Any parameter that is obtained in the field should be displayed in LCD display and if necessary beep sound can be introduced with LED lightings. This way of doing will enable the farmers to easily identify the current situation that is going in the field.

● **PH SENSOR** – A logical instrument such as pH meter is used to quantify the hydrogen particle that has a capacity of demonstrating the acidity level and the pH value. The improved trends in today's farming and the farming field needs electronic devices like sensors to get the required parameters from the field. It is based upon the application a sensor is chosen. PH sensor gives accurate value for the sensing the field, it converts the analogous value to electrical signal thereby giving it the controller. This device finds the alkalinity of the water and transmits the data to the controller part. It acts as a slave device which can produce the output, the result of which is given as input to the master device. Most ph sensor devices have limitations on accuracy. But for the agricultural farm, the pH sensor is more than enough and gets the real time data as the ph electrodes are made by a special composition material.

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Figure 4 - Ph device sensor

● **DHT11** – The DHT11 might be an essential, ultra-ease computerized temperature and moistness sensor. It utilizes a capacitive dampness sensor and a thermistor to live the incorporating air, and lets out an advanced sign on the information pin (no simple information pins required). DHT11 deliberately acquires data without any fault. The sensor can give nee data every two second. This enables the master device to get the updated value then and there. The realtime information and the changing data can be acquired and used for calculation. It is a powerful transducer that can originally give out converted datas as analog electrical signal with accuracy even though it is a low power device.

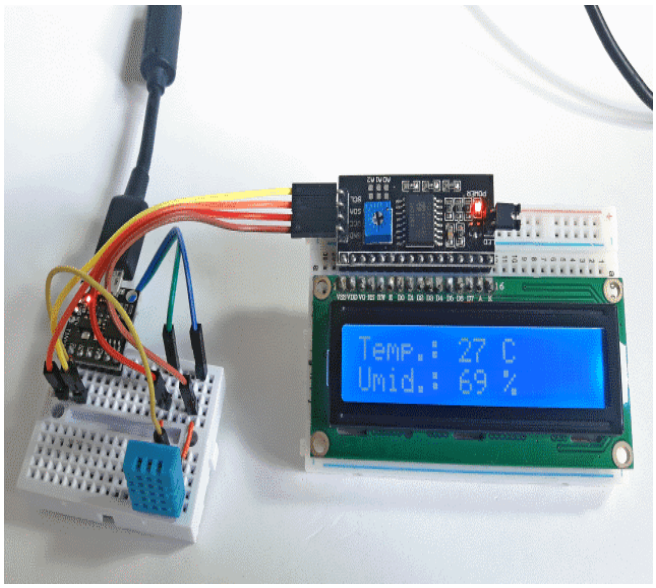

Figure 5 - DHT11 Sensor

● **MOISTURE SENSOR** – The moisture in the soil and the measurement of the amount of water content can be identified. The volume of water can be measured and if necessary it can be directed to irrigate. This sensor gets proper accuracy in measuring the sensor parameters like temperature and moisture. It is then calibrated. The sensor monitors the condition the soil, the moisture. The physical conditions are monitored to give out the sensed data to the master device. A transceiver can be used to transmit the data to the other side.

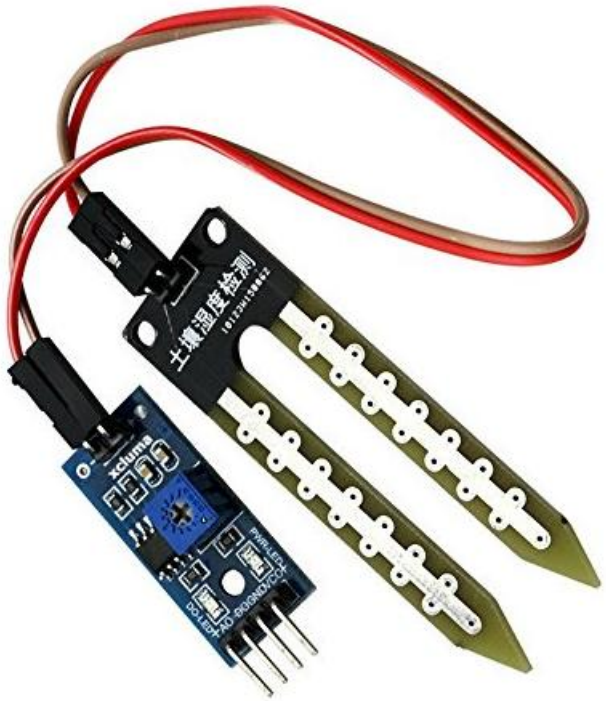

Figure 6 - Soil Moisture Sensor

The distance of transmission depends on the capacity of the transceiver. With the help of this type of sensor, the irrigation necessity can be made for the farm field. When there is less moisture in the soil, the master device can make the arrangements for irrigating the field. The realtime data can be acquired from the sensor so that the soil and the land are not left dried. In today's farming, soil moisture sensor is also use in pot gardening. This makes us to use limited water with maximum usage.

GSM module

GSM establishes communication with the master and slave devices where a system device is used as master with sensors as slave. The data is transmitted from one device to another device without any delay. The system is used for synchronous communication in the field such that the real time data is obtained then and there. The frequency band use is 900MHz. it digitizes the data and sends the information in the channel with an ability of 64kbps data rate. Use of this module in out method produces improved spectral efficiency. The systems also can be developed for SMS

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sending features so that the farmers can have the realtime data at their hands.

Figure 7 - GSM Module

WORKING OF DEVICE

C. Observed output

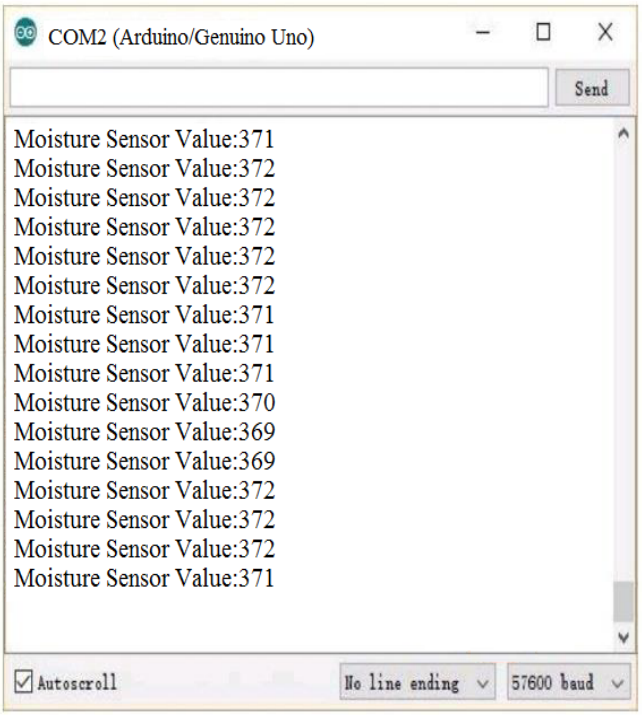

Figure 8 – Soil moisture values

Figure 8 delineates the yield readings got from the dirt dampness sensor the given readings can be aligned and mapped with various field crops during programming of a given independent module. These readings can be utilized further as a limit an incentive in the work process. The edge esteem fluctuates as indicated by the example utilized.

IV. WORK FLOW

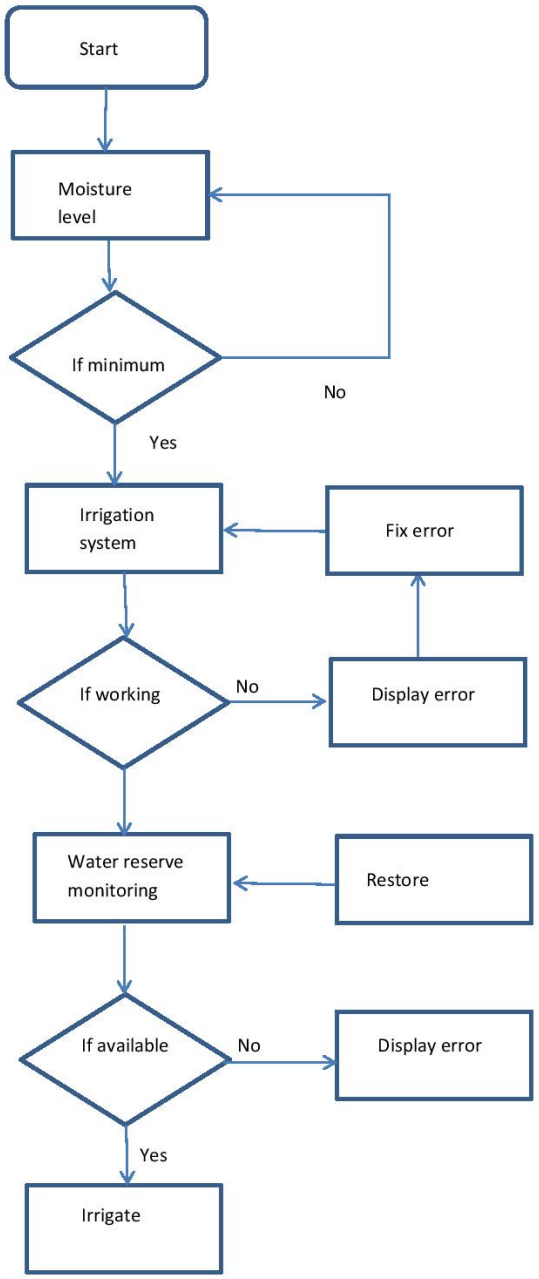

Figure 9 – Automation in water management

Figure portrays work processes related with the water execution framework.

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● The framework first checks the dampness of the soil and the dirt.
● If the dampness is not exactly as that of the edge esteem then the water system framework is checked.
● If the water system does not work then the controller and the administration group is alerted about the issue and important moves are made to fix the framework.
● If the water system works typically well then framework gives the level of water to be supplied and checked with the needed quantity.
● If the water level is low then the rancher and overhauling are educated about the circumstance and water in the tank is leveled.

● If the water level is adequate at that point crops are flooded.

V. FLOW OF SOIL CARE

The work process in figure speaks to computerization of soil care and manure inadequacy identification. The procedure runs into stages the principal stage checks if there is an effectiveness of inadequacy of some random manure the subsequent stage check which compost, unequivocally, is causing that issue. There are two sorts of sensors joined to play out this work process. The primary arrangements of sensors screen the pH estimation of the dirt alongside sensors for supplements check which screen the piece of the dirt. The second arrangement of sensors screen the lack/exorbitance of a given manure before the siphon is begun the water level at the hold is checked. In the event that the water level is not exactly the edge esteem, at that point the water system activity is prematurely ended. Rancher and administration group is informed. When the hold is topped off then work process continues further. The gadget runs a few work processes so as to perform different assignments that are related with the element which prompts the total robotization of the element this decreasing human intercession. Such work processes can be utilized to computerize the necessity of the yields.

Algorithm for the pH level:

1. start the process
2. monitor the soil composition
3. if soil pH>threshold
4. Then check excess fertilizer
5. display()
6. check parameters
7. display()
8. if pH<threshold
9. then check fertilizer deficiency
10. display()

VI. CONCLUSION

Agriculture had assumed a significant work in India's monetary development from that point forward and kept on being there later on. The ranchers, then again, are confronting difficulties in various periods of agribusiness. The issues utilizing IoT and computerization which can be settled and overseen for a large portion of the rural work and the ranchers can plan which harvests to develop as indicated by the market instead of investing a large portion of the energy in crop support and creation it can likewise assist ranchers with giving more opportunity to their own life subsequently expanding the normal social standard of the general public.

VII. FUTURE SCOPE

Farming mechanization can be amalgamated with future horticulture frameworks, for example, hydroponics, aeroponics or aquaponics. We can plan to fabricate an independent agribusiness framework in future which do not require any human intercession and the yields can be planted developed and collected without human mediation. Likewise, the yields developed utilizing this instrument will develop a lot quicker and will be natural. One can envision a colossal structure with vertical homesteads working independently, developing yields and providing oxygen to the whole city. Investigation can help distinguish which yields to develop as indicated by the interest.

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