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IOT Based Automated Irrigation System

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ABSTRACT:
India is a global agricultural powerhouse. Agricultural and its allied activities act as the main source of income and livelihood for more than 80 percent population of India. Also it is home foremploymentof50percentoflabor.SincethetimeismovingforwardpopulationofIndia is increasing rapidly one cannot only depend on farming, so there is a need to bring amendmentsandchangestoagriculturalsystemsothatagriculturecansatisfypeople'sneed.If monitoring is implemented using wired networks, then one has to arrange the wires around each crop which is completely wastage of manpower and money. In the fast-moving world everyone wants things to be done effectively and fast without human hands, such a process is called automation. The best automation technique available is IOT (Internet ofThings).
Keywords: Greenhouse, Automated irrigation, Sensor, Monitoring

I. INTRODUCTION:

Agricultural Internet of Things(IOT) refers to a network technology involves wireless sensors that connects to environmental monitoring and controlling system.[5] This paper investigates thebenefitsofusingIOTbasedongreenhousetodecreasetheeffortsoffarmers.IOTexpands the communication between technology and people by sensing physical world. It allows objects to be accessed remotely across the existing network improving the efficiency and accuracy. The use of IOT in agriculture is a great help to the farmers. The objective of this experimentwas to monitor and control accurate temperature and humidity. The aim of this workwas also extended for smart irrigation and temperature control with the help of IOT. This method of automatic irrigation helped in checking the moisture level of the soil and to supply the required amount of water. The old methods of irrigation like Drip and Flood irrigation are still in use but suffer from limitations of soil erosion and water logging. Also excessive amount of water leads to water as well as time wastage of farmers in field which can be otherwiseutilizedtodosomeotherwork.Tomaximizethecropproduction,itisnecessarythatall parameters such as temperature, soil moisture, humidity should be inspected from time to time which can be effectively done and controlled using IOT. Though certain devices are available in the market to check the water in the soil from time to time, but are unable to sense the moisture inside. This problem can be solved if we use an effective monitoring, and controlling System.The communication mode chosen in this project is Node MCU communication for automatic irrigation.

II. LITERATUREREVIEW:

The proposed system is made up of Node MCU microcontrollers which receive input from various sensorslikesoilandtemperature.FortemperatureDHT11sensorisusedandforsoiltexture and moisture soil moisture sensor is used. In [1], an example of networks integration with IOT has been studied based upon a real-life situation of agricultural manufacturing. A monitoring system with combination of internet and wireless sensors is proposed. Further, lookinginthesystem,anextrainformationdirectionsub-systemisdesigned.Thecollected specificsareprovidedinaformacceptablebyagriculturalresearchfacilities.Intheirwork LiuDanetal.[2]tookaCC2530chipastheelementalandrepresentedthearchitectureand execution of an Agricultural Greenhouse Environment monitoring system established on ZigBee connectivity. In addition, the wireless sensor and nodes take CC2530F256 as to control the environmental statistics. This system embraces data acquisition, data processing, data transfer. The atmosphere temperature is real-time handled by the temperature sensor of the end node and is send to the middle node through a wireless ZigBee established network. The middle node piles up all data, and then sends the data to thePCviaserialport.Atthatverytime,staffmayview,andexaminethedata as well as store thedataon a PC. The real-time specifics were used to manage and monitor the performance of fans and other temperature-controlled implements and accomplish automatic temperature control in the greenhouse. Kun Han et al. [3] proposed the architecture of an embedded system platform placed on GSM network communications. Throughitsoperationinhydrologymonitoringsystem,theauthorsdiscussedproblemsrelated to communication dependability and lightning protection. They also suggested solutions to cover the design of middleware

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software. Hydrology monitoring system established on a wireless communication network is a polished real time application of an embedded system, which comprises of intelligence, high-efficiency. The studies quoted above were baseduponreallifesolutionswith good implementation of software but a limited approach to hardware design.Intheproposed project, hardware design is well integrated with the software simulation.

III. MAJOR COMPONENTS USED:

The main components used in the project are;

- Node MCU: It is an open source IOT platform and comprises of 9 digital pins D0 to D8[digital pins D0 to D8 are used for digital input]. It can only give high or lowvalue, so can be connected to LED, Relay modules, LCD modules or IR sensor. Node MCU operateson3.3V andhasonly1analoginputonleftside.Also,ithasS0toS8pinswhich areusedtoconnectexternaldevicessuchasmemoryorexternalRAM.Supplyvoltage ranges from 7V to12V.
- Relay Module: Relay module an electrical switch which works using an electromagnet controlled by a separate low power microcontroller. These switches aimatopeningandclosingcircuitselectronically.Operatingvoltageofrelaymoduleis 5V and maximum current it takes is of 20mA.
- Soil Moisture Sensor: It is a device used to measure the moisture concentration of soilandcorrespondinglygivestheoutput.Therearetwoprobesofsoilmoisturesensor. When the water level is low in the soil, the analog voltage is also low. The analog voltage keeps increasing as conductivity increases between electrodes ofsensor.

IV. SPECIFICATIONS OF COMPONENTSUSED:

The detailed specifications of the components are briefed below;

- NodemcuESP8266Board is used for the microcontroller.
- LM393 comparator chip is used by the soil sensor. Though it has a dual output mode, yet theanalog output gives a higher accuracy. A digital output of 5V or 0V is produced respectively when the moisturecontent is high or low in thesoil.
- The triggering of Relay module uses a high trigger current less than 5mA. Though the output ability of the portis weak, still pull or drive capability of the circuit can be increased. It can be also used asa microcontroller development board or home appliancemanagement.
- 12VDCSolenoidWaterAirValveSwitch is also used. It helps tocontroltheflowoffluidsandalso actasavalve which is generallyclosed.Whena12VDCsupplyisappliedonthetwoterminals, the valve opens to help water flowthrough.

V. ADVANTAGES OF PROPOSEDPROJECT:

There are many benefits of the proposed experiment.

Firstly, the most appealing benefit of our project, automated irrigation system, is that it conserves water.This helps our lawn to be healthy as only required and necessary resources will be provided.Secondly, the project also helps to reduce water bills automatically by reducing the wastage of water. Thirdly, theproposed project uses technology to save of time. Lastly, the proposed project may help in increasing water efficiency as water can bedirected to the places mostneeded.

VI. BLOCKDIAGRAM:

Figure 1 shows the block diagram of smart automated irrigation with the help of sensors, microcontrollerandblynkapp.

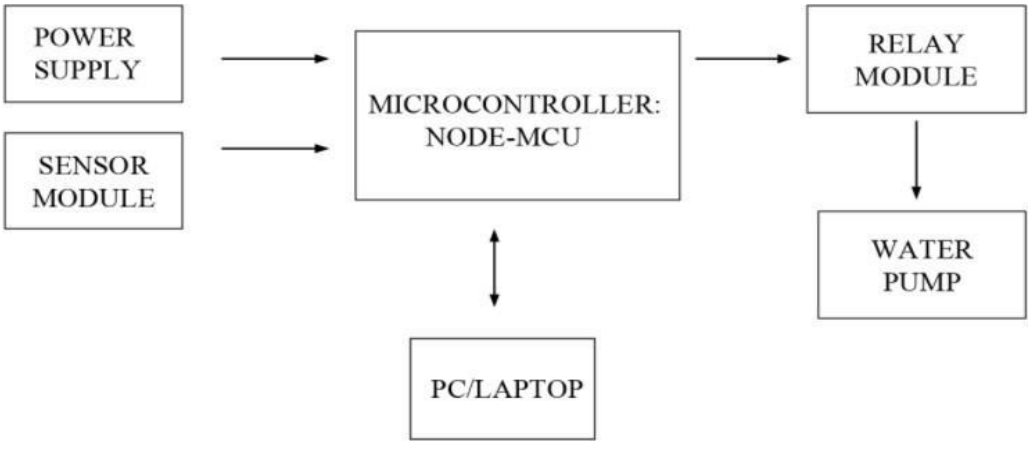

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Figure-1 [Block Diagram of Automated Irrigation System]

Thisprojectinvolvesanembeddedsystemforautomaticcontrol waterforagriculturalirrigation.It also uses a wirelesssensornetworkforpracticallysensing of an irrigationsystem.The major role is played by soil moisture sensor which senses the moisture in soil and helps to regulate the water supply. The working of the soil moisture sensor and relay module is depicted in Figures 2 and 3 respectively.

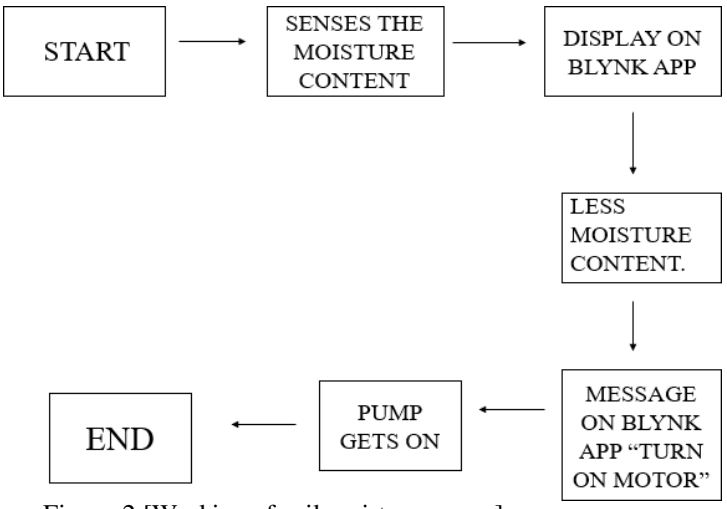

Figure-2 [Working of soil moisture sensor]

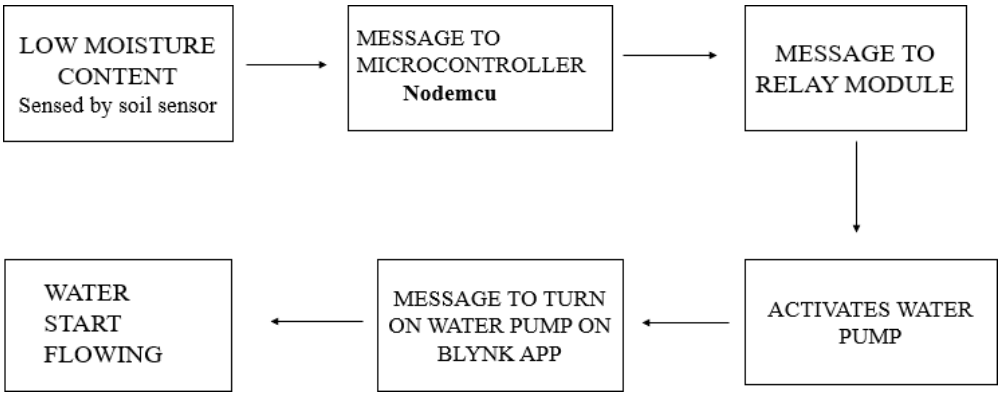

Figure-3 [Working of Relay Module]

VII. CIRCUITDIAGRAM:

The detailed circuit diagram for the different components is given in Figure 4. The hand on connections presented on a board is also shown in Figure 5.

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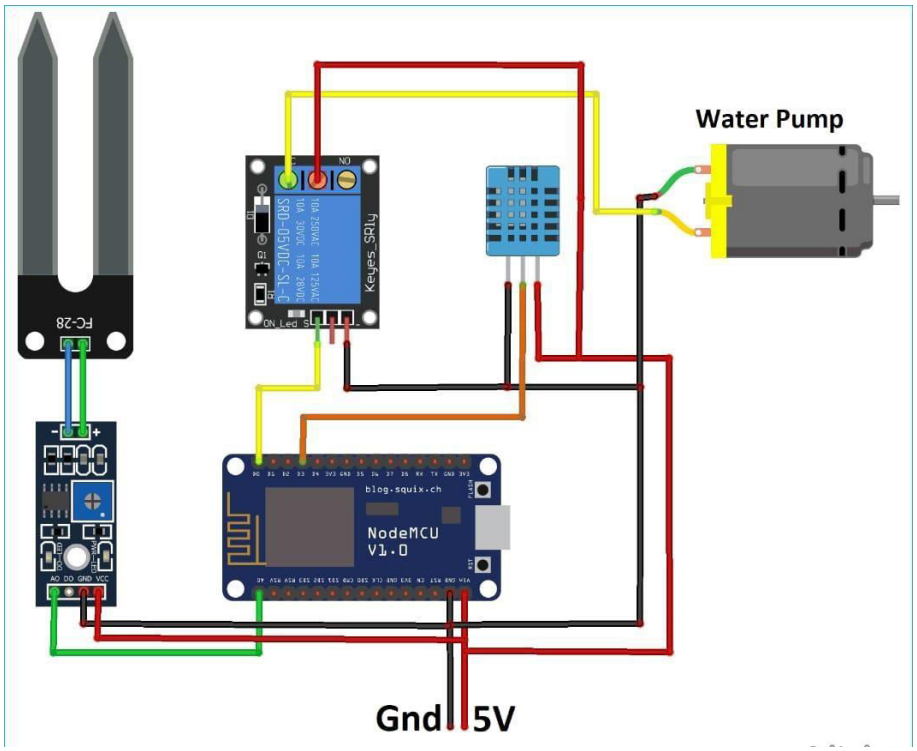

Figure-4 [4] [Circuit Diagram of Connections of project]

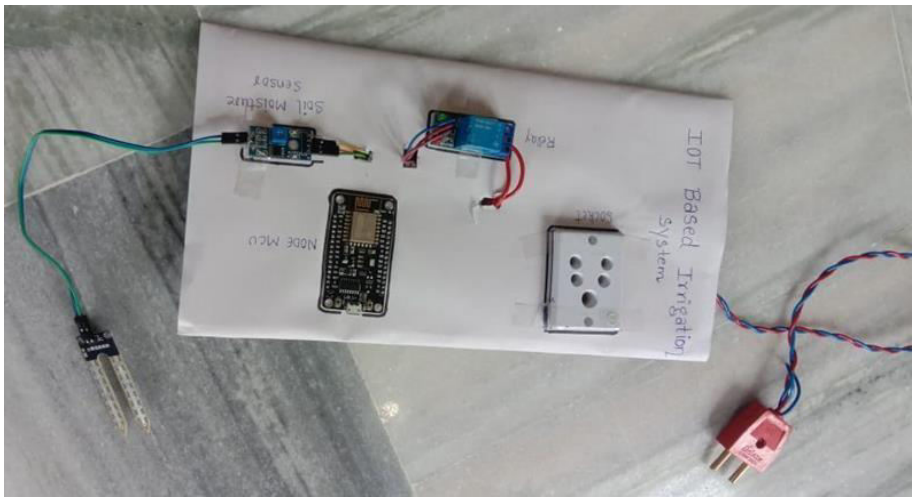

Figure 5 [Hands on connections of the project]

VIII. METHODOLOGY:

Firstly, the code is uploaded after the relay module and activation of node MCU. Once the node MCUwas activated it received the instructions from sensors about the level of water andidealtemperature.Whetherhighorlow,itgaveacommandtomicrocontroller. This helped togive further messages to relay module. However, if the popped messageindicated low water level on the screen through blynk app, the relay module was instructed to turn the power of the waterpump. This automated the irrigation process. On the other hand, if the water level indicated high, the command was given to turn off the water pump which could be again done easily through the app. Thus, the pump could be automatically operated through easy operation on the blynk app..

IX. BLYNK APPNOTIFICATIONS:

The different notifications can be observed through Figures 6 and 7 respectively for high and low moisture contents.

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Figure 6[High Moisture Content Message]

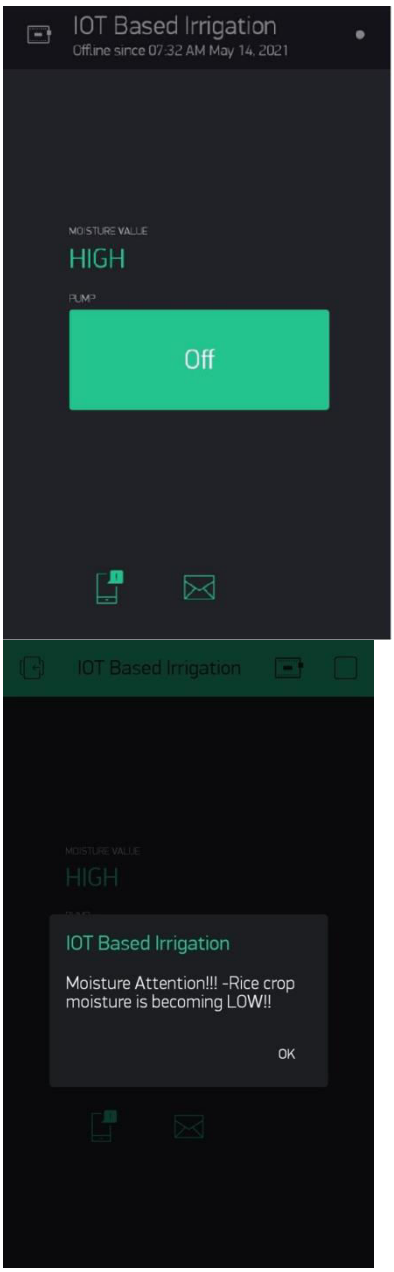

Figure 7[Low Moisture Content]

X. RESULT:

In this paper, we have tried to showcase the results of an IOT based smart irrigation forthe branch of agriculture. All collected specifics can also be stored on your pc/laptop and graphics are attainable for analysis at any time for monitoring perfect growth of your crop. It gives more precision and accuracy in data and crop yield. This project is attainable, expedient and cost effective for adjusting water resources in agriculture. The put-up also

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reduces power consumption, maintenance and complexity. The performance of the project is stable and the applicationissuitableandeasy.Throughtheimplementationofthissystem,itwillbebeneficial for crops and make the whole planting process more timely, scientific and extensive, which can improve the level of crop production. After implementation and testing of the wholesetup and project, it shows good network connection between thesensors.

XI. CONCLUSION AND FUTURE SCOPE:

IOT automated irrigation system for monitoring moisture and temperature of soil was proposedbyNodemcuandblynkapp.ThispaperrepresentsanIOTtechnologyapplication inthefieldofagriculture,toachievebestpossiblewaytoirrigatetheplants.Thesystemallows monitoringandcontrollingtheconditionofirrigation,soilmoistureandhumiditywhichallthe sensor collected periodic acquisition data in the greenhouse and send the data to the microcontroller. The data were sent from transmitter to receiver and also to the display ofeither a smart device or a laptop.
Infutureadvancement,thissystemalsocanbemorespecificandaccurateforplantrequirement by adding others sensors parameter such as pH level, fertilizer, air flow and oxygen.

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