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Flood recovery system in agriculture using internet of things

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Abstract-Thispaper deals with advanced Agriculture with IOT technology. Internet of Things (IoT)is a shared network of objectsor things which can interact with each other provided theinternet connection. IoT plays an important role in agricultureindustry which can feed 9.6 billion people on the Earth.In proposed system, the soil moisture level will be monitored and the motor is ON to irrigate the field but this system is totally different and user free technology to safeguard the farmland. This system has an IOT (Internet of Thinking) technology to control the world wide equipment. When the land is below moisture content the motor connected in that particular field will be activated to irrigate the field. If heavy forecast or flood surround the land, another motor will be used to remove the excess water and deliver it to well or water bed. The advanced technology used here in the project is IOT's by which the user can control and monitor their irrigation methodology at any place by using the IOT techniques.

***Keywords*--Soil moisturesensor, IoT's, Water level sensor, Water pump.**

I. INTRODUCTION

India is an agricultural country. More than seventy per cent of the population dependson agriculture. Thus, our economy is majorly depended on agriculture.The Internet of Things is the network of physical objects-devices, vehicles, buildings and other items embedded with electronics, software, sensors, and network connectivitythat enable these objects to collect and exchange data.In the 21's century, agriculture mainly requires water saving agriculture, mechanical and intelligent agriculture, and high-quality, high-yield. Building anIoT applicationrequires the right selection and combination of sensors,networks and communication modules.Respondents said that they have deployed or plan to use IoT in many areas, including asset tracking, security, fleetmanagement, field force management, energy datamanagement, and condition-based

monitoring. IoT has wideapplications in the fields of transportation, lifestyle, building,agriculture, factory, health care and many more. It is oftendescribed as a network of networks. Due to this, it cans performvarious tasks efficiently and accurately.The water is wasted at each and every outlet knowinglyor unknowingly which adds up to huge amount in the end.Efficient management of the water used at homes is very muchnecessary as, about 50% of water supplied to the cities getswasted through its improper usage. Water management isonly possible, if the user is aware of the quantity of water heuses and the quantity available to him. In an agricultural country like India, news about increasedfarmer suicides (about 26% in 2014) cannot beignored; whereone of the main reasons for it is unavailability of water. Atmany places water is luxuriously wasted while our farm lands don't have enough. Flood recovery system proposes an effective way of controlling the wastage of waterin farms by allowing the user to continuouslymonitor and control the usage of water.

II. SOIL MOISTURE SENSOR

Soil moisture is an important component in theatmospheric water cycle, both on a small agricultural scaleand in large-scale modeling of land/atmosphereinteraction. Vegetation and crops always depend more onthe moisture available at root level than on precipitationoccurrence. Water budgeting for irrigation planning, aswell as the actual scheduling of irrigation action, requireslocal soil moisture information. Knowledge of the

degreeof soil wetness helps to forecast the risk of flash floods, orthe occurrence of fog.Soil water content is an expression of the mass or volumeof water in the soil, while the soil water potential is anexpression of the soil water energy status. The relationbetween content and potential is not universal and dependson the characteristics of the local soil, such as soil densityand soil texture.The basic technique for measuring soil water content is thegravimetric method. Because this method is based ondirect measurements, it is the standard with which all othermethods are compared. Unfortunately, gravimetricsampling is destructive, rendering repeat measurements onthe same soil sample impossible. Because of thedifficulties of accurately measuring dry soil and watervolumes, volumetric water contents are not usually determined directly.Soil moisture sensor can read the amount ofmoisturepresent in the soil surrounding it. It's a sensor, but ideal for monitoring an urban garden, or yourpet plant's water level. This is a must have tool for aconnected garden.This sensor uses the two probes to pass current throughthe soil, and then it reads that resistance to get themoisture level. More water makes the soil conductelectricity more easily (less resistance), while dry soilconducts electricity poorly (more resistance).

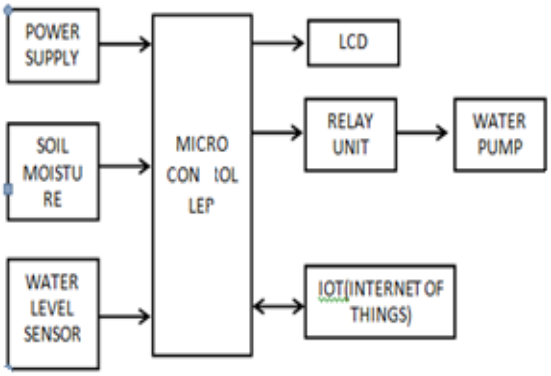

Figure 1: Block Diagram of Flood Recovering System in Agriculture Using Internet of Things

In this existing method the excess water cannot be utilized after it poured into the land but in this proposal method the excess water in the field can be recycled and it can be saved into the well or reservoir. In this proposed method, using internet of things, we can control and monitor during flood times.

III. SYSTEM DESIGN

In this work low cost soil moisture sensor is used. They continuously monitor the field and send it to the web server using NRF24LO1 transmitter and receiver and Ethernet connection at receiver ends. The sensor data are stored in database. The web application is designed in such a way to analyze the data received and to check with the threshold values of moisture, humidity and temperature. The decision making is done at server to automate irrigation. If soil moisture is less than the threshold value the motor is switched ON and if the soil moisture exceeds the threshold value the motor is switched OFF.

A. *Data Acquisition*

The sensor isinterfaced with Arduino microcontroller and programmed.Once it is programmed it is placed inside a box and kept inthe field. The soil moisture sensor has two probes which areinserted into the soil.The probes are used to pass currentthrough the soil. The moisture soil has less resistance andhence passes more current through the soil whereas, the drysoils has high resistance and pass less current through thesoil.The resistance value help to detect the soil moisture. Bury the sensor at root level. Since the sensor takes an average across the blade for a precise reading at particular depth, bury it horizontally such that water will not pool on the blade.

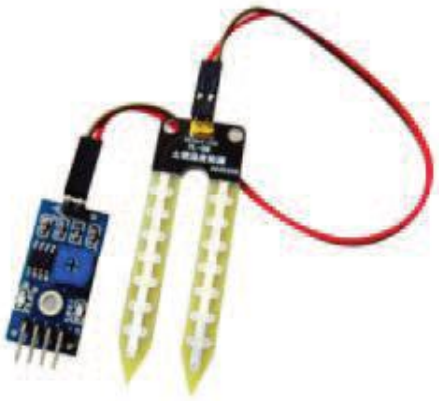

Figure 2: Picture of Soil Moisture Sensor

B.*WirelessDataTransmission*

The data acquired from sensors are transmitted to the web server with the help of or through wireless transmission.NRF24L01 module is used for wireless transmission between the field and the web server.NRF24l01 uses 2.4GHz transceiverfrom Nordic semiconductor. The data rate of this module is 256Kbps/1 Mbps/2Mbps.The voltage required is 1.9-3.6V.NRF24L01 is cheaper than other wireless

transmission modules like Zigbee.The transmitter and receiver modules areconnected with arduino boards. The transmitter is place in thefield and the receiver is placed in the system end.Thetransmitter and receiver is gave an id while configuring it. Allthe transmitters in the field should know the receiver's IDwhich is the destination address. The receiver will receive datafrom various transmitters kept in the field. The receiver at thesystem end is connected to the web server via Ethernet.The Ethernet is a standard in computernetworks technology for Local Area networks. The Ethernet isused here because of its low cost while interfacing witharduino micro-controller and fast connection establishment.When the data from the transmitter receives the receiver, itsends request to the web server. The Ethernet cable isconnected to the arduino micro-controller using Ethernetshield for arduino. The arduino Ethernet will be assigned an IP address which should be in the range our network.Thearduino is given with the address of the web server to sendrequest. The web server designed using PHP script to insertvalues in the appropriate table. The web server processes therequest and stores the received data in its database. The wireless data transmissionsare done by using NRF24L01.

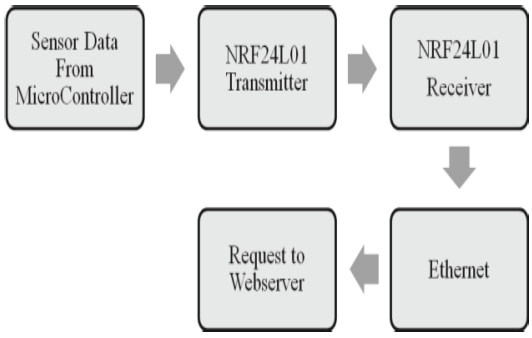

Figure 3: Concept of Data Transmission

C.*DataProcessing&Decision Making*

The data received from the field are wirelessly transmittedusing NRF24L01 and then saved in web server mysqldatabaseusing Ethernet connection at receiver end. Periodically thedata are received and stored in database. The data processingis the task of checking the various sensors data received fromthe field with the already fixed threshold values.The threshold values vary according to the crops planted.This is because different crops need different amounts ofwater. For example in a paddy field to produce 1 kg of rice5000 litter of water and for wheat it is litters. Thesensor values also vary according to the climatic conditions.The soil moisture will be different in summer, winter and rainy seasons.The threshold value is fixed afterconsidering all these environmental and climatic conditions.The motor will be switched ON automatically if the soilmoisture value falls below the threshold and vice versa. Thefarmer can even switch on the motor from mobile using mobile application. Here IoT is used for transmitting and receiving the signals from and to the farmland. IoT is the fastest growing concept. Internet of Things is having a wide range of applications.

D.*Automationof Flood RecoverySystem*

The flood recovery system is automated once the controlreceived from the web application or mobile application. Therelays are used to pass control from web application to theelectrical switches using Arduino micro-controller. A relay isan electrically operated switch. The circuits with low powersignal can be controlled using relay. There different types ofrelays which include reed relay, solid state relays, and protectiverelay etc. The relay used here is Solid State Relay (SSR).If anexternal voltage is applied across the ends the relay switchesON or OFF the circuit.

E. *Water Level Sensor:*

It is mainly used for sensing the water level in the crop field. This project is having two water levels one is HIGH level and another one is LOW level. If the water level is HIGH the motor will turns ON to collect the water back to the well. If the water level is LOW the motor will turns ON by the indication of Soil Moisture Sensor.

Figure 4: Diagram of Water Level Sensor

F. *Relay Module*

Basically the relays are mainly used for switching purpose in many applications. Here the relay plays main role. The relay activates the water pump based on the sensor activations.Ifthe water level is LOW the soil moisture sensor is activated and it switches the relay circuit to turns ON the motor. If the water level is HIGH the water level sensor is activated and it switches the relay circuit to turns ON the motor.

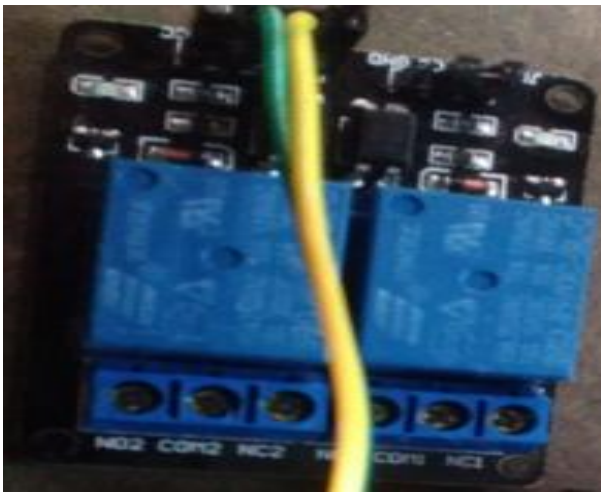

Figure 5: Diagram of Relay Circuit

Algorithmfor Proposed System

It states the steps that the proposed system undergoes.
Step 1: Start the process.
Step2: Initialize power is supplied to GSM.
Step 3: Check the moisture level (less than or more than).
Step 4: If the level will be more than a fixed criteria, no need to irrigation.
Step 5: If Moisture level is less than a fixed criteria, start irrigation.
Step 6: Initialization of pump.
Step 7: After the process completed,it moves to original state.
Step 8: Stop the process.

IV. SIMULATION PROCESS

1.Open the software Keil uVision4 from the desktop menu.
2. Select project> New project, Name the project such as example AGRICULTURE.
3. Now click file> New and enter the program in that window.
4. Save the program .C or.asm, if the program is in C or assembly language.
5. From target 1 menu on the work space, right click on the Source Group 1 and choose, add files to group source group 1 and add the file that we saved.
6. Now you can see the file, LED blinker's on the work space under source group 1.
7. Go to Project> Build Target and you can see errors and warnings in the program, if it is zero you can go to the next step(#8).
8. Select Debug> Start/Stop Debug Session.
9. Again click on Debug> Run and it will start the simulation.
10. To view the output(logic of the program), simply go to Pheperipherals> I/O ports> port 1
There you can see the pin 1 is blinking according to the program.

SIMULATION OUTPUT

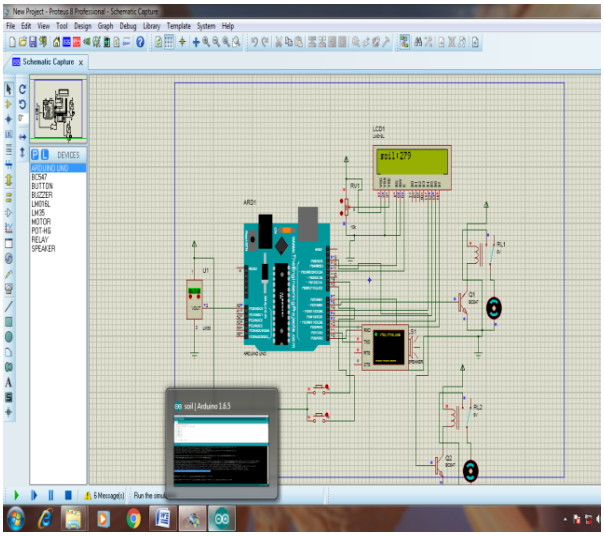

Figure 6: Simulation Output of Flood Recovering System in Agriculture Using Internet of Things

HARDWARE OUTPUT

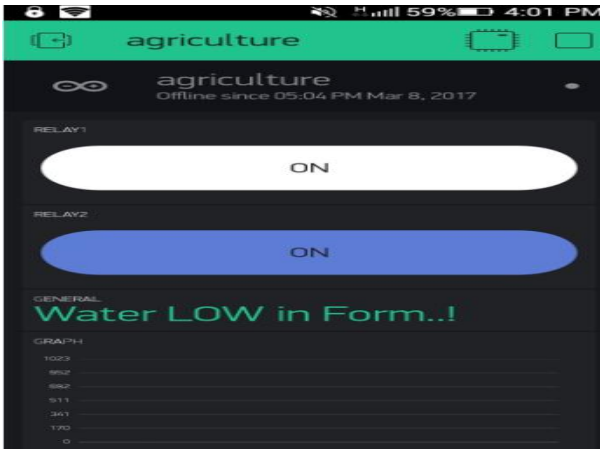

Figure 7: Output Waveform of Flood Recovering System Flood Recovering System in Agriculture Using Internet of Things

HARDWARE IMPLEMENTATION

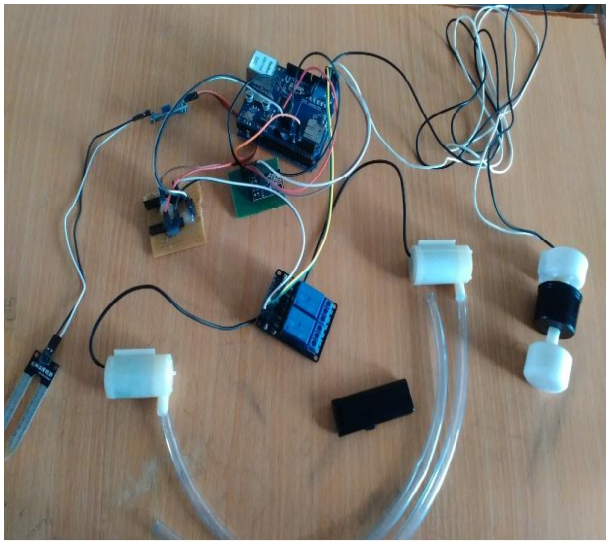

Figure 8: Implementation of the Flood Recovering System in Agriculture Using Internet of Things

V. CONCLUSION

The automated irrigation system has been designed andimplemented in this paper. The system developed is beneficialand works in cost effective manner. It reduces the waterconsumption to a greater extent. It needs only minimal maintenance. The power consumption has been reduced very much. Thesystem is very usefulin areas where water scarcity is a major problem. The developed system ismore helpful and gives more feasible results. The project helps to supply theright amount of water to the crops and remove the excess amount of water. There has been rapid increase in the development oftechnology leading toadvance concepts like WSN, IoT, and 5Getc. There are some basic resources on the earth that arenecessary to sustain life, but with the advancement intechnology most of these resources are being depleted ordestroyed in one way or the other. These advance technologiesare mostly exploitedto make our life easier. But there areseveral applications of these technologies that are not yetexploited or given importance, which can be exploited toreduce the depletion of the natural resources maintaining theecological balance and making the life of our future generationeasier.

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