Automatic Irrigation Technology for Agricultural field and IOT Based Communication System

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FACULTY OF COMPUTER SCIENCE AND ENGINEERING
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13th February,2020

DECLARATION OF ORIGINAL WORK

I hereby declare that the work in this thesis entitled **"Automatic Irrigation Technology for Agricultural field and IOT Based Communication System"**, submitted to the Faculty of Computer Science and Engineering, Patuakhali Science and Technology University, for the fulfillment of the requirements for the Degree of Bachelor of Science in Computer Science and Engineering, is my original work. I have not plagiarized or submitted the same work for the award of any other degree.

13th February, 2020

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(Sakib Mahmud)

LETTER OF APPROVAL

It is certified that the work contained in the thesis titled "**Automatic Irrigation Technology for Agricultural field and IOT Based Communication System**", by Sakib Mahmud,ID #1502075,REG-06263,CSE 13th batch, has been carried out under my supervision and that this thesis has not been submitted elsewhere for a degree.

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This Thesis is dedicated to my beloved Parents and
Honorable Supervisor

ABSTRACT

Various types of automatic irrigation technologies have evolved rapidly in recent decades. Physical phenomena of irrigation discovered centuries ago have been the starting point for irrigationtechnology over through the world. In this paper, a digital sensor based moisture rate measurement system is designed and experimented. The proposed system comprises a soil moisture sensor connected with a microprocessor for the measurement of moisture of agricultural field.The soil moisture sensor measure the moisture level which is used to when the water pump irrigate the field.When the moisture level get lower then 30%(we can estimate the level by scientifically),the water pump get start and when sensor get moisture level 80%(we can estimate the level by scientifically) then water pump get turned off.ESP8266 NodeMCU V2 Development Board is used as the microprocessor of this system.This module send massage through the cloud server. Blynk app show the massage of the field condition through the farmers smart phone.By this the farmers can know about their field irrigation condtion without going there.By this technology it is possible to irrigate field in scientific way.12v water pump is powered by adapter.

Table of Contents

LIST OF FIGURES

List of Tables

Chapter 1
Introduction

1.1 Introduction

As the world is trending into modern technologies and implementations it is a necessary goal to trend up in agriculture also. Many researches are working in the field of agriculture. Most projects signify the use of wireless sensor network collect data from different sensors deployed at various nodes and send it through the wireless protocol. The collected data provide the information about the various environmental factors. Monitoring the environmental factors is not the complete solution to increase the yield of crops. There are number of other factors that decrease the productivity to a greater extent. Hence automation must be implemented in irrigating fields to overcome these problems. So, to provide solution to all such problems, it is necessary to develop an integrated system which will take care of watering the crops. But complete automation in irrigation is not achieved due to various issues. Though it is implemented in the research level it is not given to the farmers as a product to get benefitted from the resources. Hence this paper deals about Automatic Irrigation System and IOT Based Communication System.

1.2 Motivation

The Internet of Things (IOT) is a technology where in a mobile device can be used to monitor the function of a device. The Internet of Things (IOT) is concerned with interconnecting communicating objects that are installed at different locations that are possibly distant from each

other. Internet of Things (IOT) is a type of network technology, which senses the information from different sensors and makes anything to join the Internet to exchange information. It is describe in Fig:-1.1 for understanding the system.

It can also be used to modify the status of the device. The central processing unit will also include communication device to receive data from the sensors and to be relayed to the user's device. This will be done using a higher communication device such as a Wi-Fi module. The data processed by the central module is converted to meaningful data and relayed to the user. The user can view the data with the help of a handheld device such as a mobile phone or a tablet. Nowadays water scarcity is a big concern for farming. This project helps the farmers to irrigate the farmland in an efficient manner with automated irrigation system based on soil moisture.

Fig:-1.1 Overview of IOT

1.3 Problem Statement

In this research,I deal with the automation of the Irrigation technology for the agricultural field in Bangladesh. Bangladesh is an Agricultural country.The irrigation process of our country is manual. Now-a-days,among south Asian country India and Pakistan develop their smart irrigation system.So,it is a carrying need to develop our automatic and smart irrigation technology for the development of my beloved country.

In this research,which components are used,they are available in Bangladesh.This copmonents are low cost and it is a cost effective research.

Our problem statement is to develop a system ,which can automatically irrigate the agricultural field.This system also send massage through the farmers smart phone and notify the state of the field.

1.4 Objective of the Research

The main objective of this research is to develop Smart IOT Based irrigation technology.By this technology,the farmers can reduce their extra cost of irrigation.The extra work cost will reduce.It is possible to watering the plant in a measured way.For this thesis,I need to overcome many obstacle and it is needed to concern about IOT platform for this thesis.IOT has many challenge for its feathure and advancement.

The remaining chapters of this thesis are organized as follows. Chapter 2 reviews related research work. Chapter 3 describe my proposed system and the details of my research methodology and the performance and related Algorithmic analysis. Chapter 4 provides the experimental results and performance analysis. Finally, in Chapter 5, conclusions are drawn with making a reference to some possible future directions of this research.

Chapter 2

LITERATURE REVIEW

2.1 Introduction

The existing method and one of the oldest ways in agriculture is the manual method of checking the parameters. In this method the farmers they themselves verify all the parameters and calculate the readings. [1]It focuses on developing devices and tools to manage, display and alert the users using the advantages of a wireless sensor network system. [2]It aims at making agriculture smart using automation and IoT technologies. The highlighting features are smart GPS based remote controlled robot to perform tasks like weeding, spraying, moisture sensing, human detection and keeping vigilance. [3]The cloud computing devices that can create a whole computing system from sensors to tools that observe data from agricultural field images and from human actors on the ground and accurately feed the data into the repositories along with the location as GPS coordinates.[4]This idea proposes a novel methodology for smart farming by linking a smart sensing system and smart irrigator system through wireless communication technology.[5]It proposes a low cost and efficient

wireless sensor network technique to acquire the soil moisture and temperature from various location of farm and as per the need of crop controller to take the decision whether the irrigation is enabled or not.[6]It proposes an idea about how automated irrigation system was developed to optimize water use for agricultural crops. In addition, a gateway unit handles sensor information.[7]The atmospheric conditions are monitored and controlled online by using Ethernet

IEEE 802.3.The partial root zone drying process can be implemented to a maximum extent.
[8]It is designed for IoT based monitoring system to analyze crop environment and the method to improve the efficiency of decision making by analyzing harvest statistics.[9]In this paper image processing is used as a tool to monitor the diseases on fruits during farming, right from plantation to harvesting. The variations are seen in color, texture and morphology. [10]In this paper, greenhouse is a building in which plants are grown in closed environment. It is used to maintain the optimal conditions of the environment, greenhouse management and data acquisition.

2.2 Automatic Irrigation Overview

Irrigation by help of freshwater resources in agricultural areas has a crucial importance. Because of highly increasing demand for freshwater, optimal usage of water resources has been provided with greater extent by automation technology and its apparatus such as solar power, drip irrigation, sensors and remote control[1]. Sensor–based irrigation systems have been studied in many applications (Stone et al., 1985; Jacobson et al.,1989; Zazueta and Smajstrla, 1992; Meron et al., 1995;Wyland et al., 1996; Testezlaf et al., 1997; Abreu and Pereira, 2002; Kim et al., 2008, 2009). In last two decades, with development of wireless technologies,several researches focused on autonomous irrigation with sensors in agricultural systems (Oksanen et al.,2004; Zhang, 2004).
The demand for new water saving techniques in irrigationis increasing rapidly right now. In order to produce“more crop per drop”, growers in (semi) arid regionscurrently explore irrigation techniques in the range from using less fresh water (Balendonck et al., 2008; Ngaira,2007). One of them is making agriculture in a manner of sense, which uses different type of sensors (Lopez,etal.,2009). In today’s world, as we see rapid growth in global population, agriculture becomes more important to meet the needs of the human race[2]. A GSM based Automatic irrigation control system for efficient use of resources and crop planning by using an Android mobile is presented in1 by Pavithra D. S. In this system the communication is based on SMS.

The user communicates with the centralized unit and the centralized unit communicates with the system. SMS is received by GSM module and the information is sent to ARM7 which also receives some data from sensors and the result is displayed on the LCD[3].

2.3 Overview of IOT

Internet of Things is widely used in this research.In this project,I use the IOT platform for the automatic communication between the user and the base station.Processor or the wifi module send notification through the cloud

2.3.1 Understanding the complexity

Imagine using an IoT device like a simple thermostat to control the temperature of your home. Most of these devices can tell if you are away from your home, If attackers were to compromise the device, they could turn on the heat in the summer or shut the heat off during winter when temperatures are below 0 degrees. Imagine Nuclear power plants and data centers using IoT devices to automate their controls and being compromised. Understanding the complexity of vulnerabilities, and how serious of a threat they pose is going to become a huge challenge. To mitigate the risk, any project involving IoT devices must be designed with security in mind, and incorporate security controls. Because these devices will have hardware platforms and software that enterprises may never had insight into before, the types of vulnerabilities may be unlike anything organizations have dealt with previously.This is why it’s critical not to underestimate the elevated risks of many IoT devices.

2.3.2 Vulnerability management

Another big challenge for enterprises in an IoT environment will be learning how to quickly patch IoT device vulnerabilities and how to prioritize them. Because most IoT devices require a firmware update inorder to patch the vulnerability, the task can be hard to accomplish in real time. For example, if a printer requires firmware upgrading.

IT departments are unlikely to be able to apply a patch as quickly as they would in a server or desktop system. Upgrading custom firmware often requires extra time and effort.

2.3.3 Identifying security controls

In the IT world, redundancy is critical. If one product fails, another is there to take over. The concept of layered security works similarly, but we still have to see how well enterprises can layer security and redundancy to manage IoT risk.

The challenge will be identifying where security controls are needed for Internet-connected devices, and then implementing effective controls. Given the diversity that will exist among these devices, organizations will need to conduct customized risk assessments, often relying on third-party expertise, to identify what the risks are and how best to contain them.

2.3.4 Disruption and denial-of-service attacks

Disruptive cyberattacks, such as distributed denial-of-service attacks, could have bad consequences for an enterprise. If thousands of IoT devices try to access a corporate website or data service feed that isn't available, a company's happy customers will become frustrated, resulting in revenue loss, customer dissatisfaction and potentially poor reception in the market.

Also, many of the challenges to IoT are similar to those found in a bring your own device environment. Capabilities for managing lost or stolen devices will be critical for dealing with compromised IoT devices, so having this enterprise strategy in place will help mitigate the risks of corporate data ending up in the wrong hands.

2.3.5 Security analytics capabilities

The variety of new devices connecting to the Internet will create a flood of data for enterprises to collect, process and analyze. While certainly organizations will identify new business opportunities based on this data, new risks emerge as well as the others.

2.4 Related Work

There are many technologies which are developed by the basis of Internet of Things.For that development,there are many iot related device are used for this development.

Advantages Of IoT Devices[4]

There are several advantages of these smart devices and some of them are given below.

- IoT encourages the interaction between devices called as a machine to machine interaction.
- It provides good automation and control.
- Integrated with more technical information, so it is better to operate.
- IoT possesses strong monitoring feature.
- It saves a lot of time.
- IoT helps to save more money by reducing manual task and time.
- Automating daily life tasks makes good monitoring of devices.
- Increased efficiency and time-saving.
- With good features make a better quality of life.

Disadvantages

Though there are several advantages, there are certain disadvantages too.

Enlisted below are the various demerits:

- Internet of Things devices does not have any international compatibility standard.
- They may become highly complex resulting in failure.
- Internet of Things devices may get affected by privacy and security breach.
- Reduced safety for users.
- Reduction in the employment of manual tasks thus resulting in job reductions.
- Internet of Things device may take control of life in due course of time with increasing AI technology.

Top five IOT devices for 2020[link:- https://www.softwaretestinghelp.com/iot-devices/]

1.Google Home Voice Controller

Google Home Voice Controller is a smart IoT device which allows the user to enjoy features like media, alarms, lights, thermostats, control the volume and much more functions just by their voice.

Cost: US $ 130
YouTube Link: Google Home Voice Controller
Top Features:

- Google home allows a user to listen to media.
- Let's the user to control TV and speakers.
- It is capable of managing timers and alarms.
- It can remotely handle the volume and home lights as well.
- It helps the user to plan their day and get things done automatically.

Fig 2.1:- Google Home Voice Controller

2. Amazon Echo Plus Voice Controller

Amazon Echo Plus voice controller is a popular and reliable IoT device. It is capable to run songs, do phone calls, set timers and alarms, ask questions, provide information, check the weather, manage to-do & shopping lists, manage house instruments, and several other things.

Cost: US $ 99.99
YouTube Link: Amazon Echo Plus voice controller
Top Features:

- Amazon Echo can play songs, connect to external speakers or headphones.
- It is capable of making calls and messaging on voice command.

- Amazon Echo has around 6-7 microphones, good technical specification and sound cancellation. It is capable of hearing your voice from all the directions even when songs are played.

Controls compatible smart home devices including lights, plugs, and more.

Fig 2.2:- Amazon Echo Plus Voice Controller

3. Amazon Dash Button

Amazon Dash Button is basically a device that gets connected over internet Wi-Fi and makes sure that the user does not lack important household items like soft drinks, grocery material, medical and personal care, kids and any pet items ever again.

If a user wants to fully utilize the Dash Button, then the user must be an Amazon Prime member.

Cost: US $ 4.99
YouTube Link: Amazon Dash Button
Top Features:

- It allows the user to order products quickly and there is no need to recall the message again and it also helps to reduce the time frame for searching the required product by the user.
- Amazon Dash Button also allows the user to reorder from popular brands – like Bounty, Tide, Cottonelle, Glad, Clorox etc.
- It does not accept fresh order if the prior order is not complete unless the user allows multiple orders.
- It is a good and reliable IoT product that is developed for making the user's lifestyle simple and easy.

Fig 2.3:- Amazon Dash Button

4. August Doorbell Cam

August Doorbell Cam is an effective IoT innovation. August Doorbell Cam allows you to answer your door from anywhere or remote location. It constantly checks your doors and also captures motion changes in your doorstep.

Cost: US $ 199
YouTube Link: August Doorbell Cam
Top Features:

- Doorbell Cam pairs with all August Smart Locks to easily let guests into your home.
- The integrated floodlight delivers clear, full-color HD video even full-color.
- It constantly monitors your doorstep and will click the moments leading up to a motion alert.
- Free 24 hour video recording.
- It comes with a speedy and hassle-free installation process.

Fig 2.4:- August Doorbell Cam

5. August Smart Lock

August Smart Lock has proven to be a reliable security IoT device. It allows the user to manage their doors from any location hassle-free. It helps the user to keep thieves away and family in your home.

Cost: US $ 220

YouTube Link: August Smart Lock

Top Features:

- Allows the user to know about each and every person coming and going into your home.
- Provides unlimited digital keys and no fear of stolen key.
- It gives the status updates of your door as it is properly closed or not.
- It has a good auto-unlock feature and as soon as the user arrives near the door it opens automatically.
- Easy installation and is compatible with most standard single cylinder deadbolts.

Fig 2.5 :- August Smart Lock

This new wave of connectivity is going beyond laptops and smartphones, it's going towards connected cars, smart homes, connected wearables, smart cities and connected healthcare. Basically a connected life. According to Gartner report, by 2020 connected devices across all technologies will reach to 20.6 billion.

1.Smart Home

With IoT creating the buzz, ‘Smart Home’ is the most searched IoT associated feature on Google. But, what is a Smart Home? Wouldn’t you love if you could switch on air conditioning before reaching home or switch off lights even after you have left home? Or unlock the doors to friends for temporary access even when you are not at home. Don’t be surprised with IoT taking shape companies are building products to make your life simpler and convenient.

Smart Home has become the revolutionary ladder of success in the residential spaces and it is predicted Smart homes will become as common as smart phones.

2.Connected Cars

The automotive digital technology has focused on optimizing vehicles internal functions. But now, this attention is growing towards enhancing the in-car experience.

A connected car is a vehicle which is able to optimize it’s own operation, maintenance as well as comfort of passengers using onboard sensors and internet connectivity.Most large auto makers as well as some brave startups are working on connected car solutions. Major brands like Tesla, BMW, Apple, Google are working on bringing the next revolution in automobiles.

3.Industrial Internet

Industrial Internet is the new buzz in the industrial sector, also termed as Industrial Internet of Things (IIoT). It is empowering industrial engineering with sensors, software and big data analytics to create brilliant machines. According to Jeff Immelt, CEO, GE Electric, IIoT is a “beautiful, desirable and investable” asset. The driving philosophy behind IIoT is that, smart

machines are more accurate and consistent than humans in communicating through data. And, this data can help companies pick un-efficiencies and problems sooner.

There have so many applications of IOT in Now-a-Days.

Chapter 3

Research Methodology

3.1. Introduction

In this system, soil moisture sensor senses the moisture level of the soil. If soil will get dry then sensor senses low moisture level and automatically switches on the water pump to supply water to the plant. As plant get sufficient water and soil get wet then sensor senses enough moisture in soil. After which the water pump will automatically get stopped.

I have used a mini 12v water pump in this system using power supply from 220v current source.I have used a 12v Adapter for powering the Mini Water Pump.There is required a 12v relay module for powering the Mini-Water Pump. So, to reduce all the high cost bearing complexity and

available power supply, I use Bangladesh Polli-Bidut current supply which operates Mini-Water Pump motor according to the NodeMcu Module code.

3.1.1 Methodology

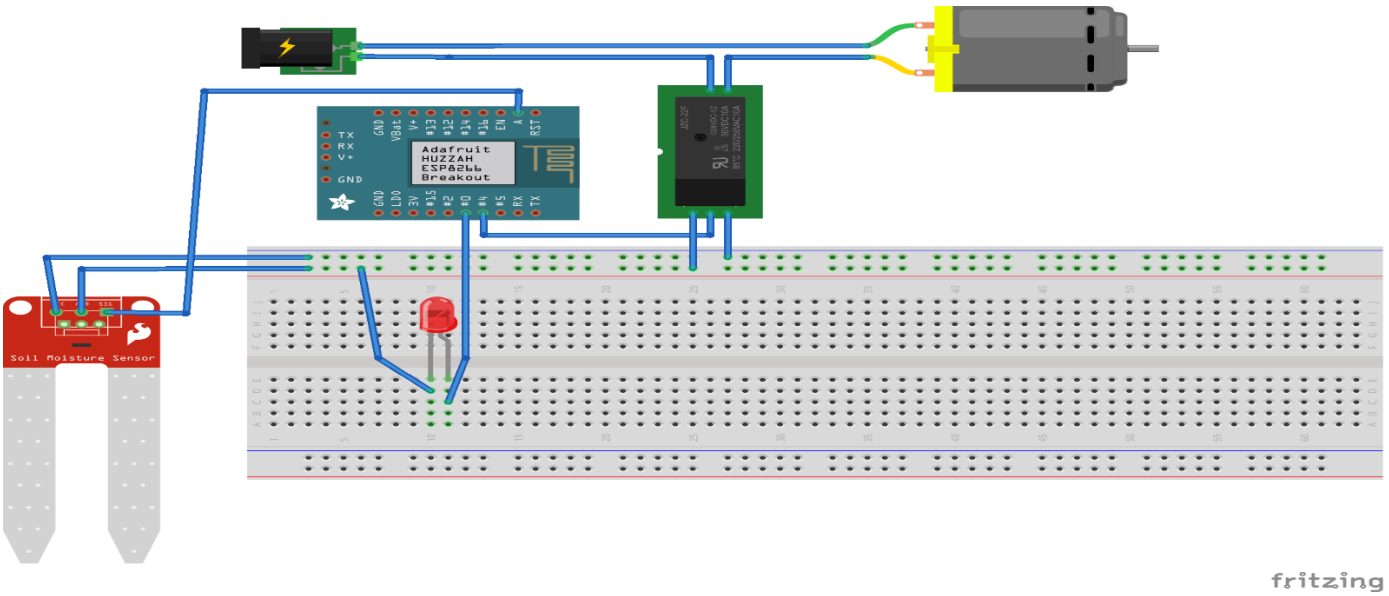

Fig:-3.1 Circuit Diagram of the System

These equipments are used here

1. 12v DC water pump
2. 12v relay Module
3. Soil Moister Sensor
4. Male/Female Jumper Wire
5. Water Tube
6. Power Supply
7. LED
8. ESP8266NodeMcu Wifi Module
9. Bread Board

3.1.2 Methodology for Automatic Irrigation Technology

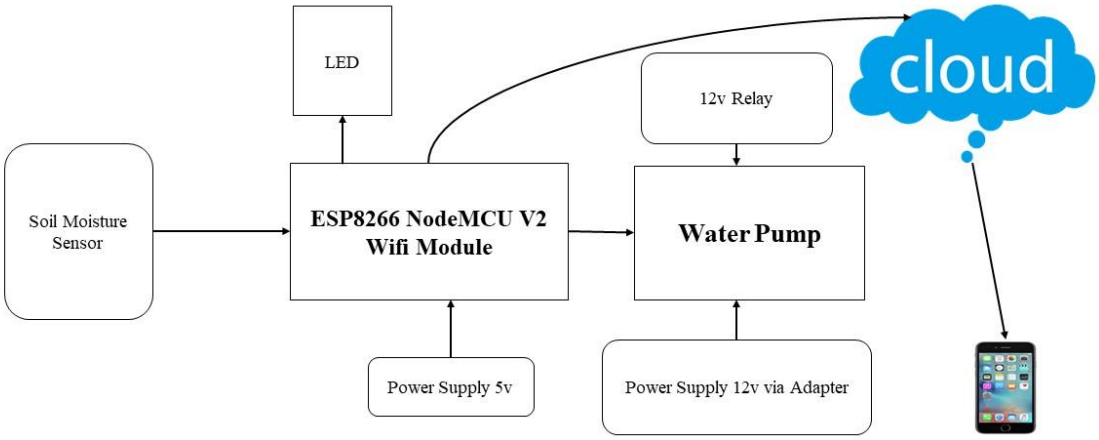

Figure:-Block Diagram of Automatic Irrigation Technology and IOT Based Communication System

Fig 3.2:- Block Diagram of the System

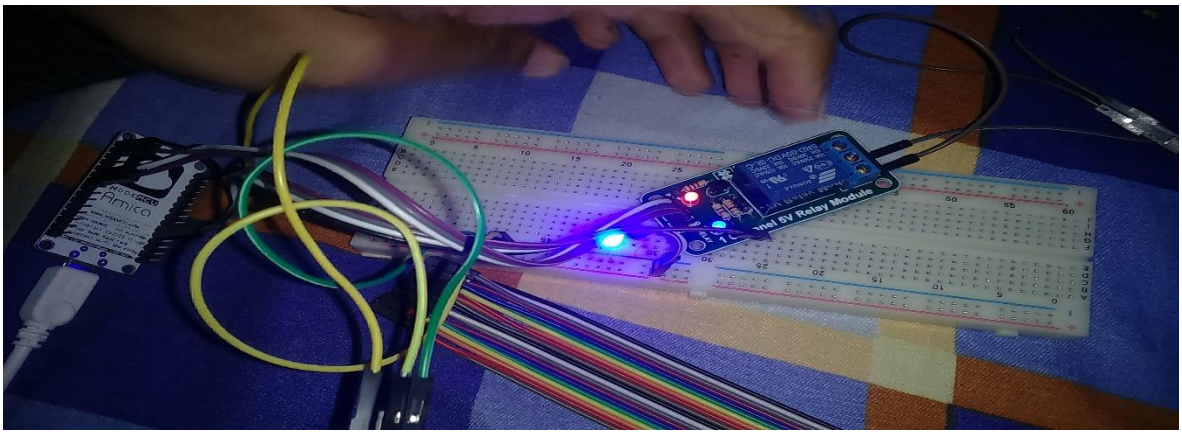

Fig 3.3:- Snapshot of the Experiment

3.1.2.1 Soil Moisture Sensor

The soil moisture sensor is one kind of sensor used to gauge the volumetric content of water within the soil.

As the straight gravimetric dimension of soil moisture needs eliminating, drying, as well as sample weighting.

These sensors measure the volumetric water content not directly with the help of some other rules of soil like dielectric constant, electrical resistance, otherwise interaction with neutrons, and replacement of the moisture content.

The relation among the calculated property as well as moisture of soil should be adjusted & may change based on ecological factors like temperature, type of soil, otherwise electric conductivity. The microwave emission which is reflected can be influenced by the moisture of soil as well as mainly used in agriculture and remote sensing within hydrology.

Fig 3.4:-Soil Moisture Sensor

3.1.2.2 Pin Configuration

This module also includes a potentiometer that will fix the threshold value, & the value can be evaluated by the comparator-LM393. The LED will turn on/off based on the threshold value.

- VCC pin is used for power
- A0 pin is an analog output
- D0 pin is a digital output
- GND pin is a Ground

Working Principle

This sensor mainly utilizes capacitance to gauge the water content of the soil (dielectric permittivity). The working of this sensor can be done by inserting this sensor into the earth and the status of the water content in the soil can be reported in the form of a percent.This sensor makes it perfect to execute experiments within science courses like environmental science, agricultural science, biology, soil science, botany, and horticulture

Specifications

The specification of this sensor includes the following.

- The required voltage for working is 5V
- The required current for working is <20mA
- Type of interface is analog
- The required working temperature of this sensor is 10°C~30°C

3.1.2.3 Water Pump

I used a 12v mini water pump which is operated by one 12v relay module.It's name is 10L/min DC 12V Brushless Water Pump Original.

Fig 3.5:-12v submersible water pump

Features:

- Specifications: 10L/min 600L/H 160GPH, 16ft (5m), DC12V, 1.1A, 8W, come without plug (bare wire).
- It can be used in computer cooling system, Garden fountain, Aquarium, car cooling, humidifier, air conditioner, other cooling and circulation systems.
- Brushless, permanent magnetic rotor, maintenance-free. Stator and circuit board sealed by epoxy resin.
- Super long working life (more than 40,000 hours).
- Small in size, high efficiency, low consumption, low noise (less than 38db).

Specifications:

Max flow rate: 10L/min 600L/H 160GPH

Max lift height: 16ft (5m)

Noise: <40dB (most 38dB)

Power consumption: 8 W

Rated voltage: 12V DC

Rated current: 1.1A

Power supply: Solar panel; DC electric source; battery

Max working temp: 50 C/122F

Fluids: Water, oil, gasoline, acid and alkali solution

Waterproof level: IP68

Driving method: Brushless, Permanent Magnetic

Life span: More than 30000hrs

Pump material: ABS

Diameter of inlet: 16mm (3/5 inch thread)

The diameter of outlet: 11.5mm (1/2 inch thread)

Package included:

1 x 12V DC Water Pump (bare wire)

Note:

1. working at rated voltage (DC12V/1.1A). The positive pole is red wire, the negative pole is black wire/blue wire.
2. This pump is a centrifugal pump, it can't vent the air automatically, so it must be operated by submersible installation.
3. When blocking, long-running is not allowed.
4. Preventing any hard particles entering the pumps.

3.1.2.4 Output

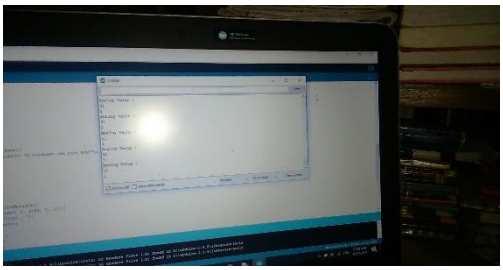

Fig 3.6 :-Moisture value output

3.1.3 Methodology for IOT Support

Internet of Things is supported by the wifi module which is work like microprocessor.

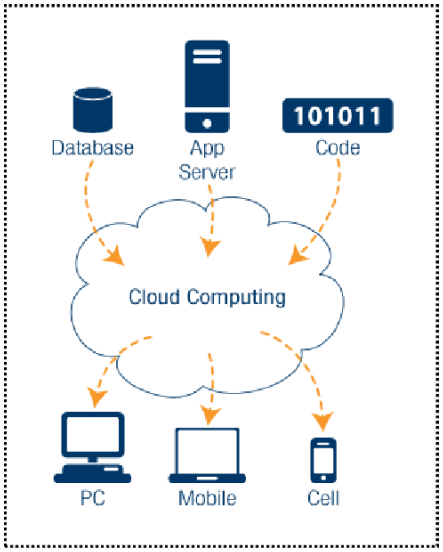

Fig 3.7:-Cloud Communication

3.1.3.1 Module Specification

The Development Kit based on ESP8266, integrates GPIO, PWM, IIC, 1-Wire and ADC all in one board. Power your development in the fastest way combine with NodeMCU Firmware.

R2 version had CP2102 USB-TTL instead, larger current support, slim board can put on breadboard.

Note: NO need to install driver for CH341 (replaced by CP2102), and NO need to flash firmware when you get it and use on first time. This is different with version R1.
To flash R2, please see the update on Nodemcu wiki page.
High quality USB cable is needed for this board to give high current supply, otherwise your board won't be recognized.The hardware documentation for the board can be found on nodemcu-devkit repo,including schematics and PCB layout designed with Altium Designer.

- Wi-Fi Module – ESP-12E module similar to ESP-12 module but with 6 extra GPIOs.
- USB – micro USB port for power, programming and debugging
- Headers – 2x 2.54mm 15-pin header with access to GPIOs, SPI, UART, ADC, and power pins
- Misc – Reset and Flash buttons

- Power – 5V via micro USB port
- Dimensions – 49 x 24.5 x 13mm

3.1.3.2 Capabilities

This system can send massage of the start and the shut down process and the moisture level of the field.

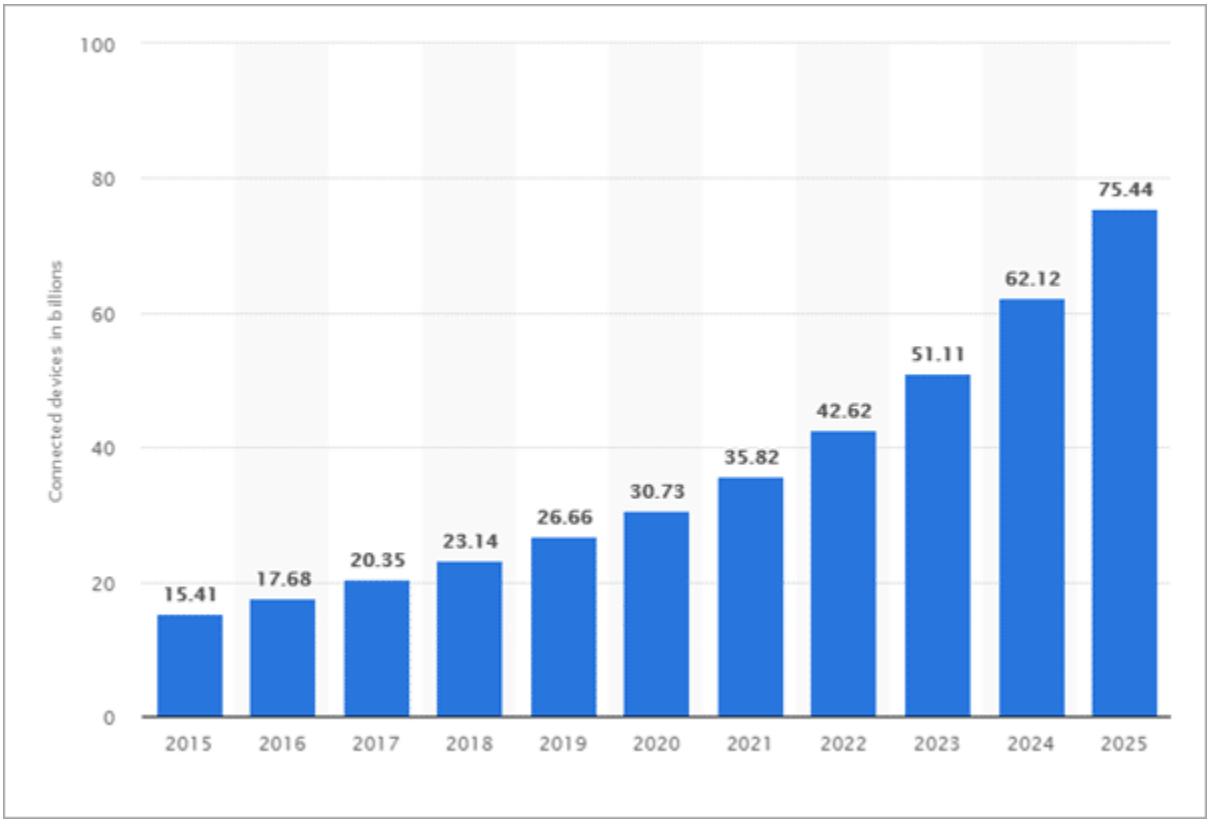

Fig 3.8 :-Rapid Growth of IOT through the recent years

3.1.3.3 Pin Description

ESP8266 Pin	Description
CH_PD	Pull high, connect to Vcc +3.3V
Vcc	Power Supply +3.3V
TXD	Connect to RXD (white) of PL2303HX USB-Serial converter cable
RXD	Connect to TXD (Green) of PL2303HX USB-Serial converter cable
GPIO0	Pull low, connect to GND pin
GND	Power Supply ground

Table 1:-pin description of the wifi module

3.1.3.4 Cloud Communication

The nodemcu module connect with the cloud and send notification through the cloud.Blynk application get the massage from the cloud.

Fig 3.9:-cloud computing

3.3 Algorithm Design

Algorithm is the basic of the program.so,it is important to evaluate the algorithm of this technology. An Algorithm is a sequence of steps to solve a problem. Design and Analysis of Algorithm is very important for designing algorithm to solve different types of problems in the branch of computer science and information technology. This tutorial introduces the fundamental concepts of Designing Strategies, Complexity analysis of Algorithms, followed by problems on Graph Theory and Sorting methods. This tutorial also includes the basic concepts on Complexity theory.

3.3.1 Algorithm for NodeMcu

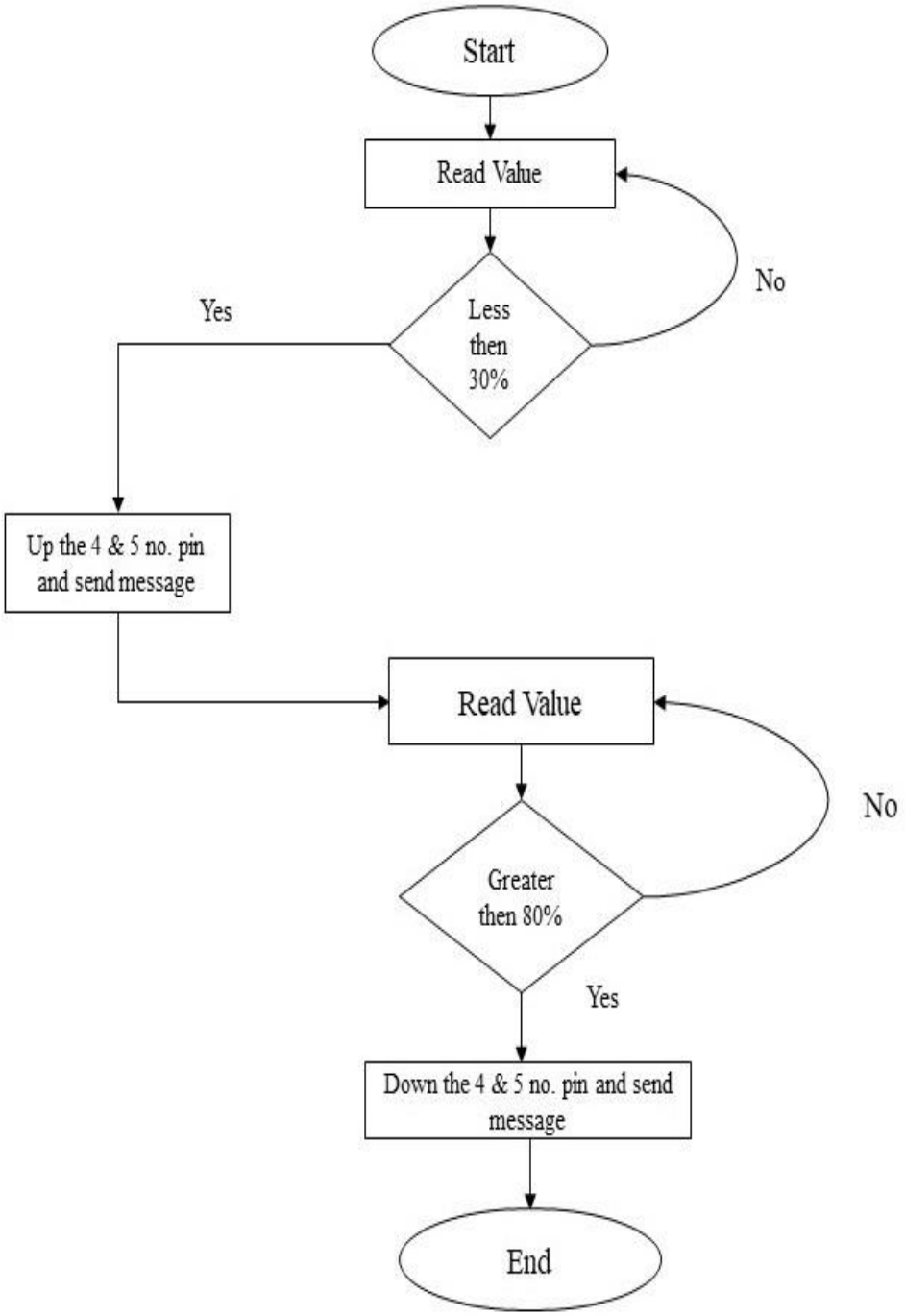

Fig:-Algorithm for Nodemcu (processor)

3.3.2 Algorithm for Water Pump

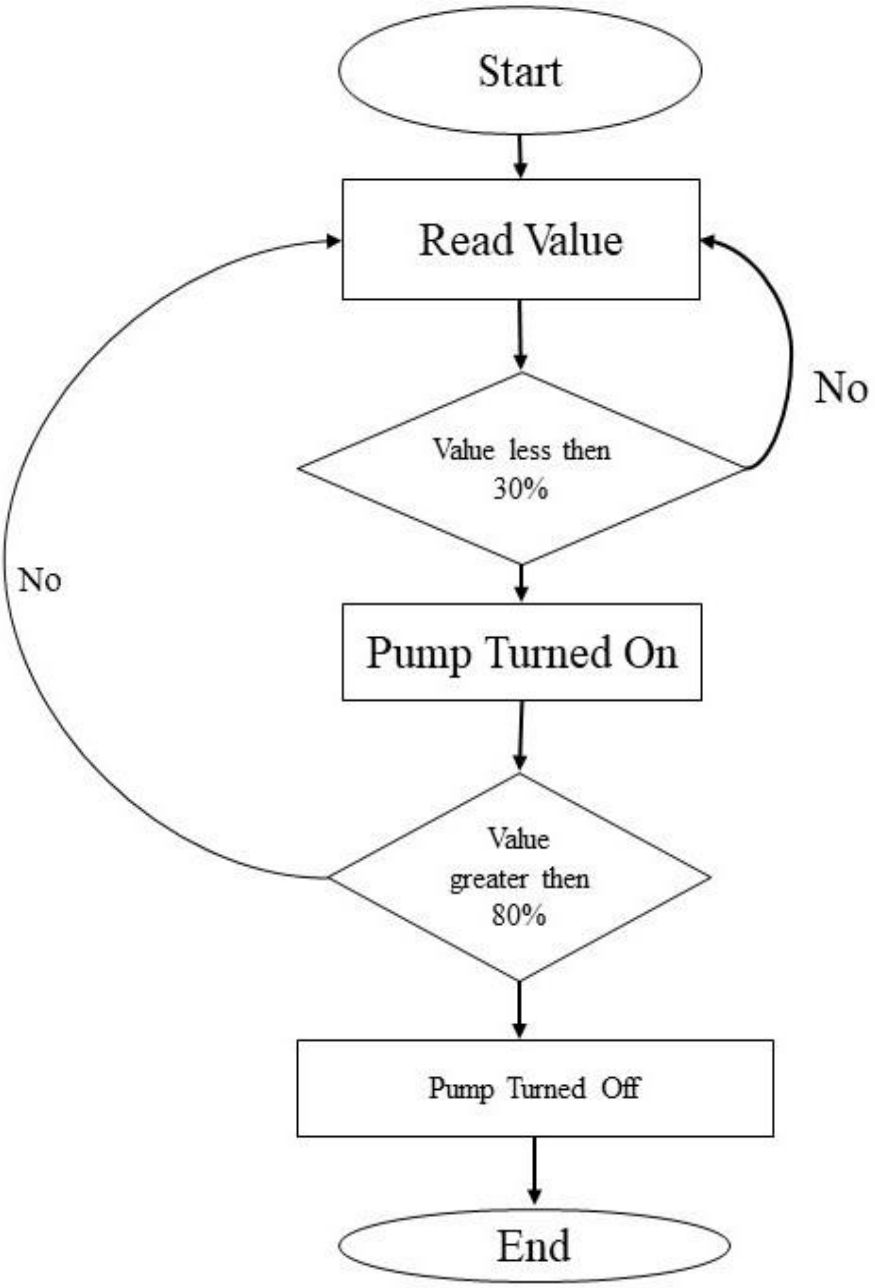

Fig:-Algorithm for Water Pump

3.3.3 Algorithm for LED

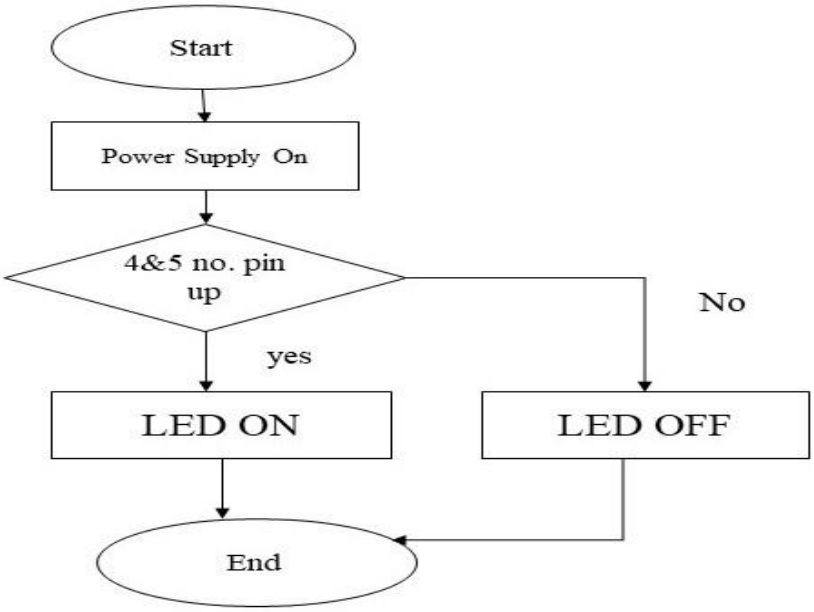

Fig:-Algorithm for LED

3.3.4 Algorithm for Soil sensor

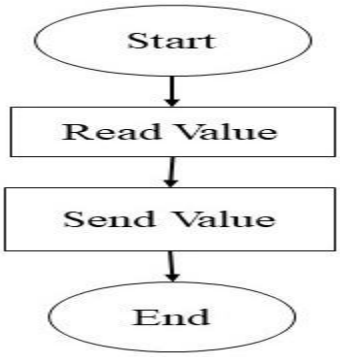

Fig:-Algorithm for Soil Moisture Sensor

3.4 Summary

With The sum of these algorithms and by the methodology ,the research of the Automatic Irrigation Technology and IoT based communication system is developed.

Chapter 4

Result and Discussion

4.1 Introduction

In this chapter,there have the Final implementation,Soil Moister Sensor Algorithm,Water Pump Algorithm etc.By applying this algorithms and the software codeing the whole process is complete accuretlly.

4.2 Comparison with other Method

Traditional Agricultural Monitoring

In some of the traditional irrigation system, irrigation is scheduled by monitoring the soil and water status by employing tension meter and drip irrigation by automating the controller system in sandy soil In some irrigation system, fuzzy logic controller been implemented for an efficient irrigation system for field having different crops. Fuzzy logic increases the accuracy of measured value and accordingly assists in decision making.

Green house based modern agriculture need to be precisely controlled in terms of humidity and temperature. The atmospheric conditions of plants inside the green house vary from place to place which makes it difficult towards maintaining uniformity at all places in farmhouse manually. So towards this, GSM been used towards reporting the status about irrigation for farmer’s mobile handset.

4.3 Limitation

1.Privacy**:-**This is a great concern when it comes to exchanging valuable information regarding anything. Since everything will be connected breaching inside the network would be easy by the hackers. By entering into just a part of network would reveal everything regarding an individual or organization or both (may be). What if your office colleagues know what medicines you take or where did you go last night?

2. Safety**:-**If a situation comes like a notorious hacker changes your medical prescription and you are supplied expired medicines or those medicinal drugs to which you are allergic to, then there would be a health disaster. Since the consumer that time would be dependent entirely on the technology there would be least probability that he would bother checking anything. The verification today is done manually by the consumer himself but no one knows what will happen later.

3.Compatibility**:-** At present there is no international standard for device compatibility. For example, home based appliances and equipments may be getting problems in connecting with laptops or mobile phones. Also Apple devices don't accept the connectivity with any other device. Likewise different manufacturers need to agree upon this else people will prefer buying only one brand and there would be monopoly.

4. Risk and Challenges in IOT:- Although it has been with us in some form and under different names for many years, the Internet of Things (IoT) is becoming the thing when it comes to tech and evolution. The ability to connect, communicate with, and remotely manage an infinite number of networked, automated devices via the Internet is becoming widespread.

The transition from closed networks to enterprise IT networks to the public Internet is accelerating and is raising alarms about security.

As we become increasingly reliant on intelligent, interconnected devices in every aspect of our lives, security is very much a central issue for the Internet of Things.

Despite the opportunities of IoT, there are many risks that must be considered. Here are five of the many risks that will be essential in an Internet of Things world, as well as some recommendations to help companies prepare for the challenge.

Chapter 5

CONCLUSION

5.1 Conclusion

The hardware is interfaced with all the sensors in the board. The hardware components include the ESP NodeMcu, a water pump, relay,12 V Adapter, wi-fi sensor (ESP 8266) and the soil moisture sensor is interfaced. The board is powered by a Laptop. The system has been tested for watering a plant in a garden.

5.2 Future Work

The application of agriculture networking technology is need of the modern agricultural development, but also an important symbol of the future level of agricultural development; it will be the future direction of agricultural development. After building the agricultural water irrigation system hardware and analyzing and researching the network hierarchy features, functionality and the corresponding software architecture of precision agriculture water irrigation systems, actually applying the internet of things to the highly effective and safe agricultural production has a significant impact on ensuring the efficient use of water resources as well as ensuring the efficiency and stability of the agricultural production.With more advancement in the field of IoT expected in the coming years, these systems can be more efficient, much faster and less costlier. In the Future, this system can be made as an intelligent system, where in the system predicts user actions, rainfall pattern, time to harvest,animal intruder in the field and communicating the information through advanced technology like IoMT can be implemented so that agricultural system can be made independent of human operation and in turn quality and huge quantity yield can be obtained.

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