AUTOMATED PLANT WATERING

BY

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This Report Presented in Partial Fulfillment of the Requirements for the Degree of Masters of Science in Computer Science & Engineering

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DHAKA, BANGLADESH

DECEMBER 2018

APPROVAL

This Project titled **"Automated Plant Watering"**, submitted by Md. Ariful Islam, ID:123-25-269 to the Department of Computer Science and Engineering, Daffodil International University, has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of M.Sc. in Computer Science and Engineering and approved as to its style and contents.

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I hereby I hereby declare that this project has been done by me under the supervision of **Dr. Sheak Rashed Haider Noori**, Assistant Professor & Associate Head, Department of Computer Science and Engineering, Daffodil International University. I also declare that neither this project nor any part of this project has been submitted elsewhere for an award of any degree or diploma.

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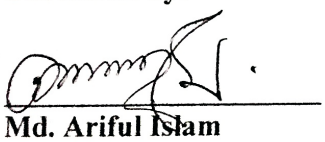

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ACKNOWLEDGEMENT

First I express my heartiest thanks and gratefulness to almighty Allah for His divine blessing makes me possible to complete this project successfully.

I fell grateful to and wish my profound my indebtedness to **Dr. Sheak Rashed Haider Noori, Assistant Professor & Associate Head,** Department of Computer Science and Engineering, Daffodil International University, Dhaka. Deep Knowledge & keen interest of my supervisor in the field of IoT influenced me to carry out this project. His endless patience, scholarly guidance, continual encouragement, constant and energetic supervision, constructive criticism, valuable advice, reading many inferior draft and correcting them at all stage have made it possible to complete this project.

I would like to express my heartiest gratitude to **Dr. Syed Akhter Hossain**, **Professor and Head**, Department of CSE, for his kind help to finish my project and also to other faculty member and the staff of CSE department of Daffodil International University.

I would like to thank my entire course mate in Daffodil International University, who took part in this discuss while completing the course work.

Finally, I must acknowledge with due respect the constant support and patients of my parents.

ABSTRACT

Our country is an agricultural based country. Agriculture is the largest employment sector in Bangladesh. The performance of this sector has an overwhelming impact on major macroeconomic objectives like employment generation, poverty alleviation, human resources development, food security, etc.

As we already moved into a digital era, every system needs to be digitalized. But our agricultural sector is not digitalized yet. Digitalization in the agricultural sector is so important to reduce time expense, manpower cost and produce more foods in a short period of time.

In the agriculture sector, watering is major parts, because plants need water to survive and to produce foods on time. But it's too tough to maintain the manual watering system. That's why I have developed an **Automated Plant Watering** system to give water on plants automatically by measuring the soil sensor. It will reduce cost and save time and also save plants, which needs water periodically.

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CHAPTER 1

Introduction

1.1 Background

Farming assumes a key job in Bangladesh by contributing 12 percent to its fares, 21 percent to its GDP and utilizing in excess of 60 percent of its work drive. The predominance of horticulture will proceed with well into the 21st century as the country battles against destitution and endeavors to raise the way of life of its kin through continued monetary development[1].

Another issue emerges where we are in the computerized time, yet our farming isn't digitalized yet. That makes a bunch of issues, with respect to creation loses, time costs, labor reliance, and plant establishing issues.

We have to do digitalize our horticulture segment. With the goal that we are building up a mechanized plant watering framework, which will give water naturally in plants. That framework will spare our time, plants and cost.

1.2 Problem of The Existing System

Two of the foremost broadly recognized issues with watering system need to do with plant water booking. Plant water planning is essentially noting the inquiries of "When do I water?" and "To what extent do I water?". Starting a plant water cycle as well before long as well as running a plant water cycle moreover long is considered over watering. At any rate this training squander water and cash. Nonetheless, overwatering can cause plant harm whenever done on a drawn-out premise. In like way, starting a plant watering cycle past the point of no return or not running the system for a adequately long time allotment is considered beneath watering and can cause reduced yields and destitute plant quality which can impact fetched.

Taking a gander at these issues inside and out is the way to limiting their budgetary and reasonable effect on products.

1.3 Project Goal

Since these days, within the time of cutting-edge contraptions and advancement, the life of individual have to be more clear and continuously profitable, there's a prerequisite for a few computerized systems that are prepared for supplanting or reducing human effort in their day by day works out and employment.

Here we show one such system, named as robotized plant watering system, which is truly a demonstrate of controlling plant watering workplaces that utilization sensor innovation to distinguish soil clamminess with a sensor so as to create a sharp changing contraption to assist an extraordinary numerous people. Seem we subsequently water our domestic and garden plants without irritating our neighbors when we select to require a few time off or somewhere else for a critical parcel? The fitting reaction is yes which is the elemental objective of this undertaking.

1.4 Project Advantages

Here we display one such system, named as robotized plant watering system, which is truly a demonstrate of controlling plant watering workplaces that utilization sensor development to distinguish soil clamminess with a sensor so as to create a sharp changing contraption to assist a awesome numerous people. Might we thus water our domestic and garden plants without bothering our neighbors when we select to require a few time off or elsewhere for a critical part? The suitable reaction is yes which is the elemental objective of this undertaking?

These are a number of request that can be listened routinely and reply each one of them is enabling and concurred on the grounds that cutting edge advancement outfits us with an broad assortment of conceivable results these days. As a matter of truth, there's an

outstandingly direct and saving reply for each one of these request and perplexities and the solution is **Automated Plant Watering** system, which will save the plant, save time and last but not the least, will save your money also.

CHAPTER 2

System Overview

2.1 Automated Plant Watering

Automated plant watering is a plant watering framework which is robotized, that implies plant will get water naturally by estimating soil dampness. With this mechanized plant watering framework soil will get legitimate water and furthermore we can stay away from water wastage.

This system utilizes sensor innovation alongside a solitary board PC framework and different gadgets so as to carry on like keen exchanging system which detects soil dampness level and floods the plant if essential.

In spite of the fact that the system made in that way would be the most proper for home utilization as an answer for every day and regular issues, there is a wide range of potential outcomes of actualizing these frameworks as a long haul answer for some farming issues.

2.2 Accomplishment Challenges

Achievement challenges are this kind of errand which is extremely hard to survive. Be that as it may, things can be understood. There are a heaps of difficulties came ahead to create mechanized plant watering framework, for example, soil dampness estimation, water source, control supply and so on.

2.3 Soil Moisture

A sensor is utilized to gauge soil dampness which sends system to the system that dirt is dampness or not. That signal is the significant contribution of this system, since it will send the signal to begin watering or not. In the event that sensor find that there is no water in the plant it will send signal to the system to begin the water siphon.

2.4 Watering

At the point when soil dampness sends a signal to the system, that there is no water in the plant, at that point the system will on the switch of the water siphon. Water siphon will begin and it will take water from the water source and give water to the plant.

2.5 Power Supply

We can use a solar panel for the system. It will help to run the system by using solar power, so there will be no tension of the power supply and that will reduce the cost.

2.6 Summary

In this chapter, I have discussed the overall automated plant watering system. Where a soil moisture sensor will detect the moisture and then it will send signal to the system, which will activate the water pump. Here I also showed that some complication to complete my project and how the complication was solved.

CHAPTER 3

Equipment of the System

3.1 Introduction

In spite of the fact that there are a few companies offering these frameworks made in different ways, there's a straightforward way in which one can construct his/her claim plant watering system in fair some hours, in the event that all required materials are accessible at the side fundamental required information approximately hardware.

3.2 Tools Used in This System

For the purpose of building this system one will need to properly connect the following:

1. Raspberry Pi 3 Model B
2. Relay
3. 3-6v Submersible Pump
4. Soil Moisture Sensor
5. Flexible Water Line
6. USB Connector
7. Jump Wire
8. Power Source (Solar Panel)
9. Water Source
10. Plant with Soil

3.3 Raspberry Pi

The Raspberry Pi could be a progression of small single-board PCs made in United Kingdom by the Raspberry Pi establishment to progress the instructing of principal computer program building in schools and in making countries. The primary show wound up verifiably more predominant than predicted, moving exterior its objective showcase for utilizations, for case, apply autonomy. It does exclude peripherals, (for illustration, supports and mice) and cases. Be that because it may, some ornament has been joined into many official and casual packs [2].

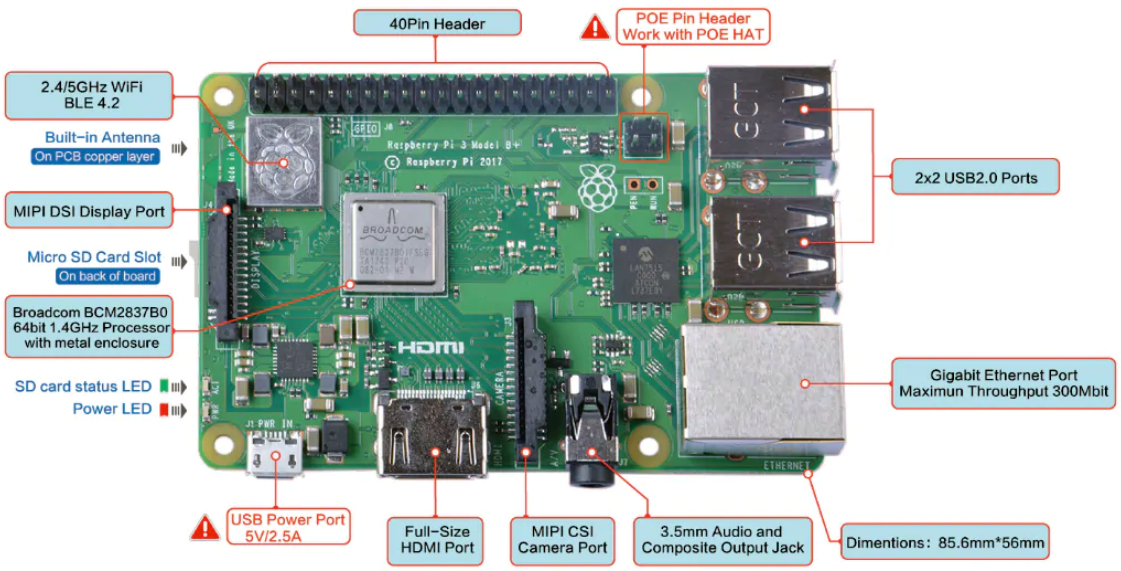

Fig 3.1: Raspberry Pi Model B+

3.4 Relay

A hand-off is an electrically worked switch. Numerous exchanges utilize an electromagnet to mechanically work a switch, be that as it may, other working guidelines are moreover utilized, for case, solid state exchanges. Exchanges are utilized where it is imperative to control a circuit by a diverse low-control hail, or where some circuits must be controlled by one hail. The primary exchanges were utilized in long partition broadcast circuits as enhancers: they reiterated the hail rolling in from one circuit and re-transmitted it on another circuit. Exchanges were utilized broadly in phone exchanges and early PCs to perform reliable errands.

A kind of hand-off that can bargain with the tall control required to particularly control an electric motor or on the other hand diverse burdens is known as a contactor. Solid state exchanges control circuits with no moving parts, instead of utilizing a semiconductor contraption to perform trading. Exchanges with balanced working qualities and once in a whereas different working circles are utilized to shield electrical circuits from over-

burden or faults; in current electric control systems these capacities are performed by progressed rebellious still called "cautious transfers".

Fig 3.2: 5V Relay

Appealing catching trades require one beat of circle capacity to move their contacts in a single heading, and another, diverted beat to move them back. Emphasized beats from a comparable information have no impact. Charming trapping trades are productive in applications where obstacle with control ought to not to have the capacity to modify the contacts.

Alluring snaring exchanges can have either single or twofold circles. On a singular circle contraption, the exchange will work one way when control is associated with one limit and will reset when the limit is turned around. On a twofold twist contraption, when the enchanted voltage is associated to the reset circle the contacts will alter. Discuss conditioning controlled alluring bolt exchanges have single twists that utilize directing diodes to partitioned among work and reset bearings[3].

3.5 Submersible Pump

A submersible siphon (or sub siphon, electric submersible siphon (ESP) may be a contraption which encompasses a hermetically settled motor close-coupled to the siphon body. The complete gathering is submerged within the fluid to be siphoned. The

guideline favorable position of this kind of siphon is that it turns away siphon cavitation, an issue related with a tall stature differentiate between siphon and the liquid surface.

Fig 3.3: Mini Submersible Pump

Submersible siphons thrust fluid to the surface rather than fly siphons pulling fluids. Submersibles are more profitable than stream siphons.

3.6 Soil Moisture Sensor

Soil moisture sensors degree the volumetric water substance inside the soil. Since the facilitate gravimetric estimation of free-soil moisture requires evacuating, drying, and weighting of an outline, soil moisture sensors degree the volumetric water substance in a circuitous way by utilizing a number of other properties of the soil, for outline, electrical impediment, dielectric unfaltering, or communication with neutrons, as an center individual for the clamminess substance. The affiliation between the think property and soil moisture must be balanced and may alter unforeseen upon natural factors, for outline, soil sort, temperature, or electric conductivity. Reflected microwave radiation is influenced by the soil wetness and is utilized for blocked off recognizing in hydrology and agribusiness. Supportive test defiant can be utilized by agriculturists or nursery laborers.

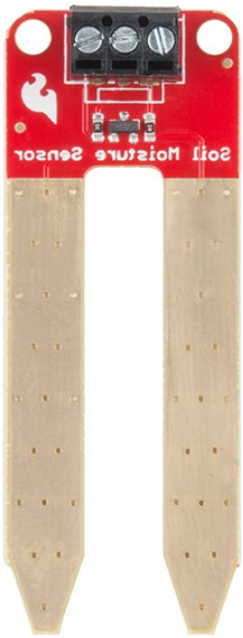

Fig 3.4: Soil Moisture Sensor

Soil dampness sensors customarily insinuate to sensors that gage volumetric water substance. Another course of sensors degree another property of dampness in soils called water potential; these sensors are ordinarily insinuated to as soil water potential sensors and consolidate tensiometers and gypsum squares[4].

3.7 Water Line

Water line, traditionally known as water pipe is used to distribute water from source to destinations.

3.8 USB Connector

USB connector is an all-inclusive sequential transport (USB) connector is a connector between a PC and a fringe gadget, for example, a printer, screen, scanner, mouse or console. It is a piece of the USB interface, which incorporates sorts of ports, links, and connectors.

3.9 Jump Wire

A hop wire (something else called jumper wire, or jumper) is an electrical wire, or gathering of them in a interface, with a connector or adhere at each conclusion (or a few of the time without them – fundamentally "tinned"), which is customarily utilized to interconnect the parts of a breadboard or other demonstrate or test circuit, interior or with other equipment or fragments, without fixing [5].

Fig 3.5: Female to Female Jump Wire

Particular jump wires are fitted by embedding's their "conclusion connectors" into the openings gave in a breadboard, the header connector of a circuit board, or a bit of test adapt.

3.10 Power Source (Solar Panel)

Photovoltaic sun-oriented sheets hold daylight as a wellspring of imperativeness to form control. A photovoltaic (PV) module may be a bundled, related get together of commonly 6x10 photovoltaic sun-powered cells. Photovoltaic modules contain the photovoltaic show of a photovoltaic framework that produces and supplies sun-powered control in exchange and private applications. Each module is assessed by its DC resign control underneath standard test conditions (STC), and customarily grows from 100 to 365 Watts

(W). The capability of a module chooses the zone of a module given the proportionate assessed abandon – an 8% compelling 230 W module will have twofold the locale of a 16% competent 230 W module. There are one or two monetarily open sun-based modules that beat the capability of 24%. A solitary sunlight-based module can make reasonable a compelled degree of concentrated; most establishments contain different modules.

CHAPTER 4

Soil Moisturizing System

4.1 Introduction

A simple method to preserve water in the horticultural segment is to introduce a dirt dampness sensor. Soil dampness sensors measure the measure of water in the dirt to keep up reliable and perfect soil conditions for plants. At times, introducing a dirt dampness sensor lessens private water system by as much as half.

There are a few sensors for the Raspberry Pi that can gauge moistness, temperature and different qualities. By and by, these modules are solely appropriate for the air and not planned for use in the earth.

4.2 Tools Used in This System

To build a soil moisture system, we need those tools listed below, as I already discussed in previous sections:

1. Raspberry Pi
2. Soil Moisture Sensor
3. Jump Wire

4.3 Working Guideline

To build the system, we need to follow those steps:

1. Take jumper wire and connect to soil moisture sensor 3 pin, which are:
    A. SIG
    B. VCC
    C. GND
2. Connect VCC (Power Supply) to the GPIO 5V power pin[6].
3. Connect GND to GPIO GND pin.
4. Connect soil moisture sensor signal wire to GPIO pin 21[6].

Connection is done. Now let's see the figure below, which represents the connection of the system.

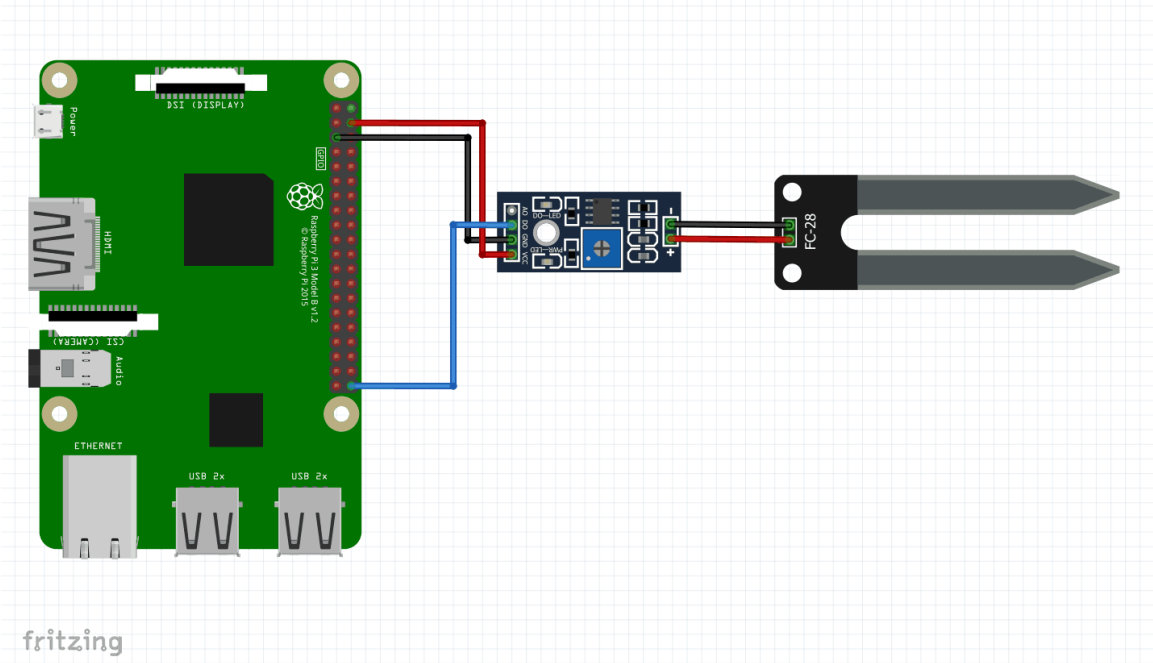

Fig 4.1: Soil Moisture Sensor Connectivity

4.4 Code

Open any python editor as I am using Python 3 editor in my raspberry PI. Let's do the following code:

```
importRPi.GPIOas GPIO
import time


moisture_sensor = 21

GPIO.setmode(GPIO.BCM)
GPIO.setup(moisture_sensor, GPIO.IN)


def callback(moisture_sensor):
ifGPIO.input(moisture_sensor):
print (“No Water Detected!”)
else:
print (“Water Detected!”)

GPIO.add_event_detect(moisture_sensor, GPIO.BOTH, bouncetime=300)
GPIO.add_event_callback(moisture_sensor, callback)



#infinite loop
while True:
time.sleep(1)
```

4.5 System Output

After finishing the code, just put the soil moisture sensor in a dry soil pot and run the code from the editor, you will find on terminal printed out **“No Water Detected!”** and if you put that on a water pot, you will find that **“Water Detected!”** is printed on terminal.

CHAPTER 5

Plant Watering System

5.1 Introduction

To build the system first, we need to build the flow diagram, that will make our system designing easy. First we need to put the soil moisture sensor in an input, if that input is returning true, then system will start the pump, otherwise it will not start the pump.

5.2 System Flow Diagram

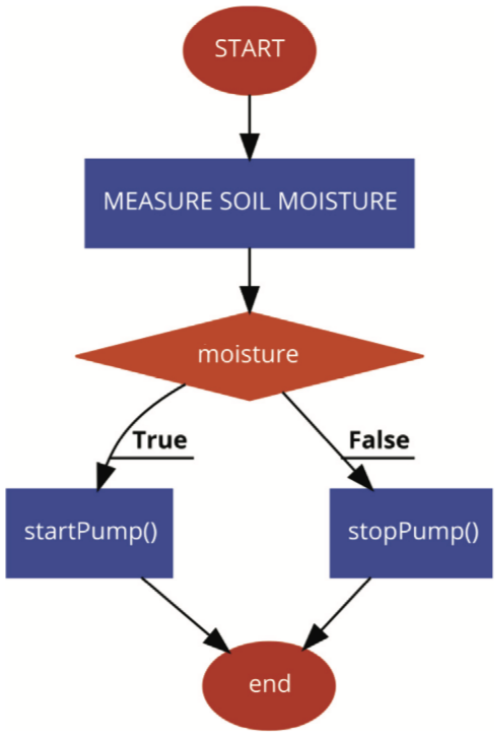

Fig 5.1: System Flow Diagram

In this diagram I describe about the system workflow. When moisture sensor is true it will send the signal to on the pump and if moisture sensor is false it will send signal to stop the pump.

5.3 Working Guideline

The fundamental working guideline behind this framework is in interfacing the dirt dampness sensor, which was recently installed into the plant, to the Raspberry Pi, which is additionally associated with other electronic segments.

Estimation of soil moisture is finished by the sensor which advances the data and parameters with respect to the dirt dampness[7]to the system, which controls the siphon. In the event that the dimension of soil dampness dips under a specific esteem, the framework sends the flag to the hand-off module[8] which at that point runs a siphon and a specific measure of water is conveyed to the plant. When enough water is conveyed, the siphon quits doing its work.

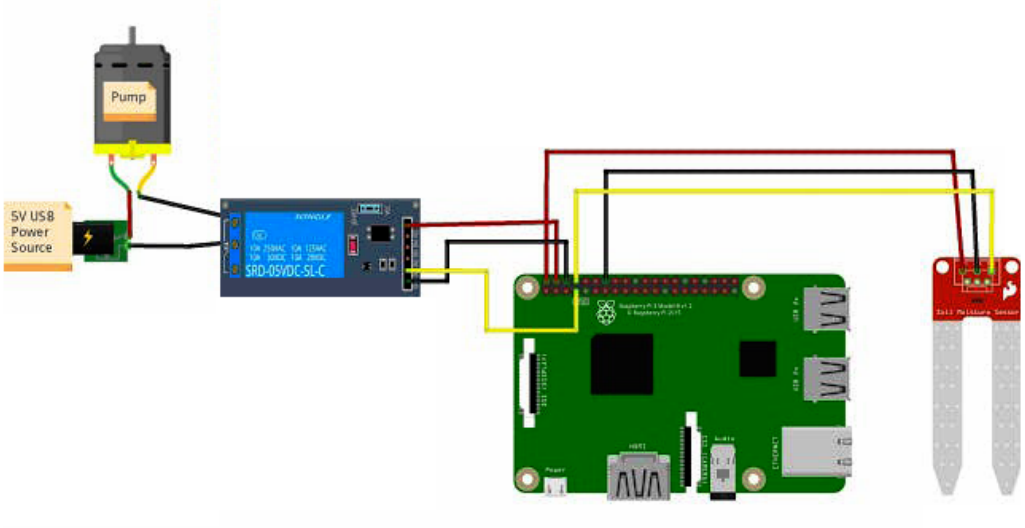

Fig 5.2: System GPIO Connection

The power supply has a task to power the complete system and the recommended voltage should respect the input supply range for the system.

Relay module is a straightforward circuit comprising of a solitary transistor, a few resistors, diodes, and a hand-off and it is controlled carefully by framework.

Soil moisture module is consisting of the two parts: amplifier circuit and probes. This module has digital and analogueoutput, where computerized yield is set to consistent 1 when the edge is actuated. The limit is set by potentiometer. Analogoutput gives constant

data in regards to the dampness in the plant and this yield is utilized in the system. A water siphon is associated with the hand-off module and it just works when the hand-off module gets a direction from the system, which is described in Figure 4.2, whose working principle is described via flow diagram in Figure 4.1.

5.4 Working Instructions

To build the automated plant watering system I have followed those steps, listed below:

1. Take jumper wire and connect to soil moisture sensor 3 pin, which are, VCC (Power), GND, SIG.
2. Connect soil moisture sensor VCC pin to the GPIO 5V power pin.
3. Connect soil moisture sensor GND to GPIO GND pin.
4. Connect soil moisture sensor signal wire to GPIO pin 21.
5. Connect submersible pump negative wire to the USB negative wire.
6. Connect submersible positive wire to relay's NO pin.
7. Connect USB positive wire to relay's COM pin.

5.5 Code

```
importRPi.GPIOas GPIO
import time

water_pump = 20
moisture_sensor = 21

GPIO.setmode(GPIO.BCM)
GPIO.setup(moisture_sensor, GPIO.IN)

GPIO.setup(water_pump,GPIO.OUT)
def callback(moisture_sensor):
ifGPIO.input(moisture_sensor):
GPIO.output(water_pump, GPIO.LOW)
else:
GPIO.output(water_pump, GPIO.HIGH)

GPIO.add_event_detect(moisture_sensor, GPIO.BOTH, bouncetime=300)
GPIO.add_event_callback(moisture_sensor, callback)
```

5.6 Result

At whatever point a require for water was recognized by the sensor, framework sent a flag to the pump to begin watering the plant until sufficient amount of water was not conveyed. At whatever point a require for water was recognized by the sensor, framework sent a flag to the pump to begin watering the plant until sufficient amount of water was not conveyed [9].

5.7 Discussion

Mechanized plant watering framework can be utilized to illuminate numerous issues within the world giving both contract and wide applications and arrangements, where for the previous there's an illustration of mechanized watering of plant at whatever point somebody goes on get-away and takes off plants alone at home, which empowers the plants to induce the precise sum of required water and anticipates unpredictable watering which leads to mineral misfortune within the soil.

CHAPTER 6
Conclusion

6.1 Conclusion and Future Possibilities

In spite of the fact that it is by all accounts all the more requesting and testing, there are numerous different potential outcomes like making complex associations of plants of comparable assortment or alleged Internet of Plants.

Likewise, utilizing in excess of one sensor is another thought for an exploratory endeavor, yet there are additionally numerous other trial and test like thoughts, for example, utilizing sun-oriented power supply, clock for setting water system framework and so on.

In any case, freely of the path used to develop it, there is no uncertainty that this framework can be extremely useful in taking care of numerous issues, from those that appear to be innocuous to those that are on the size of the most essential and most hazardous ones for human populace. By methods for this framework, it is conceivable to control the measure of water discharged from the way toward watering the plant. In spite of the fact that it tends to be extremely useful for humankind by and large, agriculturists, specialists, and botanists are the general population who could have the greatest advantage of utilizing this framework.

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