"KRISHIBOT" A SMART DEVICE FOR BALCONY AND ROOFTOP PLANT IRRIGATION AND MONITORING SYSTEM USING IOT

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This Report Presented in Partial Fulfillment of the Requirements for the Degree of Bachelor of Science in Computer Science and Engineering

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APPROVAL

This project titled “KRISHIBOT” a smart device for drip irrigation system”, submitted by Foysal Ahmed and Saikat Mazumder and Tithi Sutradhar 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 B.Sc. in Computer Science and Engineering and approved as to its style and contents. The presentation has been held on 3 June 2021.

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DECLARATION

We hereby declare that this project has been done by us under the supervision of **Mr. Shah Md Tanvir Siddiquee, Assistant Professor, Department of CSE** Daffodil International University. We also declare that neither this project nor any part of this project has been submitted elsewhere for the award of any degree or diploma.

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ABSTRACT

We have built an IoT-based smart device name “Krishibot”, which is monitoring and takes care of your plant continuously. This device is made for the rooftop garden and porch plant. To operate this device, require an external power supply and WIFI internet. This device is lite weight and portable. This device is connected to the internet and you can operate and monitor through a mobile apps name “Krishi help”, It also contains an OLED display to show Temperature, Humidity, Soil RH, and Motor status. It also pushes data on the firebase real-time database and Thinks speak server. This device has twin operating modes one is manual and the other is automatic. If you selected manual mode and cannot access the internet or forget to monitor this it will go automatic mode and take care of your plant.

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CHAPTER 1
INTRODUCTION

1.1 Introductions

People living in the city have started showing interest in rooftop gardens. But they don't have time to take care of the gardens and the trees. So, we approach "Krishibot" which is an IoT-based smart device with plant irrigation and monitoring system. The system must be able to measure soil moisture level control for plants. IoT means the Internet of Things. The concept of the Internet of things is nothing new. It is smart processing that can be used by a mobile device to monitor the activities of this device. It is a build of network terminology that sence the information from various sensors, forcing everything to be connected to the Internet to exchange information. The Android application is a general menu-based application in version four. This contains has temperature, motor status, dampness, and moisture status.

1.2 Motivation

Most of the people in the city doing gardens on their rooftops and plant trees on their corridors. Sometimes they didn't take care of the garden when going on vacation or business trips. As a result, give water in the garden is not possible. In this way, we will create a "Krishibot " device through which the garden can be monitored. The garden will be capable of stock water automatically and controlling this device at a distance from anywhere in the world. Monitoring your lawn with this device. Irrigation can be defined as the science of water use land or soil, which means the tree needs to be watered according to the type of soil.

1.3 Project Objective

The people of our country are nature lovers. Many city dwellers have started showing interest in roof gardens. You will need to take care of the garden frequently as there is not enough soil. People living in the city do not have enough time to monitor the care of gardens and trees. Many times, we have to stay out of town during holidays and business trips so we can't observe our plant or garden. So, we have proposed a device IoT-based smart irrigation and plant monitoring system that names "Krishibot" using automation. As a result, we will be free from worries and will be able to know everything from anywhere.

1.4 Expected Outcome

- This device will take care of plant.
- This device can be operated both manually and automatically.
- It provides automatic drip irrigation on the plant.
- You can control this device from anywhere on the earth over the internet using an android application.
- With this device, you can monitor Soil PH, Humidity, and Temperature.
- Store data on firebase's real-time database.
- You can spray water and pesticides on your plant.

1.5 Report Layout

In this report, there are seven chapters include.

Chapter One: Introduction, Motivation, Project Objective, Expected Outcome, Report Layout.

Chapter Two: In chapter two there are Preliminaries, Related Work, Comparative Analysis, Scope of the Problem, Challenges include.

Chapter Three: Business Process Model, Use-Case Modelling & Descriptions, Requirement Collection & Analysis.

Chapter Four: In chapter four Front-end Design, Back-end Design, Interaction Design, and User Experience (UX), Implementation Requirement are including.

Chapter Five: Implementation of Database, Testing Implantation, Final Output.

Chapter Six: Impact on Society, Impact on Environment.

Chapter Seven: Consultation, Scope for Further Development.

Chapter 2
BACKGROUND

2.1 Preliminaries

"Krishibot " allows us to observe our rooftop garden from a far distance. It is a system an IoT-based smart roof and balcony garden irrigation and monitoring system that uses a wireless network that collects data from various sensors and deploys it to different nodes and transmits it to a cloud server via the internet. The device uses an IoT system is powered by ESP8266 Node MCU which corresponds to a temperature sensor, humidity sensor, water level indicator sensor, DC motor, and Wi-Fi module, and android applications. The IoT-based garden checking system when checking water levels, humidity, and humidity levels. It sends reports and notification alerts over the phone about the level and status of a mobile application. The sensors automatically start the water pump if the water level goes down. It is displayed on all data on LCD modules. It is also seen in IoT where it shows information about humidity, temperature, and water level including date and time based on every minute. We can handle this manually and automatically.

2.2 Related Works

In 2015 **Rajendranath Udathu** and **V. Berlin Hen** are trying execution of an automated watering system. The main purpose of this work is to express an automatic watering system founded on sensors connected to a microcontroller. The main reason for using the microcontroller is to send an SMS to the owner's mobile phone remotely. This irrigation system has been tested at various temperatures and humidity levels of various plants. The benefit of soil moisture sensors limits the amount of water in an individual place.[1]

In 2017 **Srishti Rawal** try an automated irrigation system based on IoT-based smart irrigation. Through which soil moisture can be monitored automatically the control uses a

soil moisture sensor that accurately measures the soil moisture level. With this value, the system can withstand the right amount of water more or less irrigation. The system determines the irrigation time depending on the sensors. It can irritate the land automatically without controlling the crop type or moisture level. [2]

In 2018 **Zhang S. Wang M. Shi W. Zheng W try** Invents an end based on balance called water-saving irrigation end method. A measurement plan of the water system based on water balance theory helps to accurately determine infertile soil moisture and make quick decisions. This content presents the theoretical implementation of the water balance process, followed by the process of water purification and grain penetration calculation. Based on theoretical research, this article proposes a small-scale irrigation system for improved care of agricultural items according to the Internet method system detailed design software providing system design. The results of the application show that smart savings can effectively irrigate through water balance based on water conservation. [3]

2.3 Comparative Analysis

There are thousands of around the world about the Automatic Irrigation system. But we can say that our project is different from others. We are introducing an idea to influence people to plant more plans on their porch and rooftop.

2.4 Scope of the Problem

In this section, we are discussing the problem and limitations of this device. All seams are pretty straightforward but a simple problem because we need to figure out how long the water pump ON to get a specific amount of water. This problem we can solve by a

simple trick that we are setting up a delay that once the motor is turned ON it will continue for some time.

To get the right time of delay we are using a simple linear equation that is

$T_{ON} = V_{ml.} G_{[ms/ml]} + K_{[ms]}$

T= Turn on the pump

V =Amount of Water

G = Flow fact

K= Pipe constant.

2.5 Challenges

We need to choose the best sensor and hardware with high accuracy which should be available in our local market. Every piece of equipment has a datasheet, before sketching, one has to have a proper study about the datasheet of each piece of equipment. We have to learn about many new things such as Arduino programming Language, android, and the working principle of ESP 8266 nodemcu WIFI module. Gain proper knowledge about how to control a microcontroller with an android app. Sometimes sensor is not working properly and we cannot find the problem. Then anyway we have figured out where is the problem.

Collect accurate data from a sensor and push them into the database required hard work in this section we have faced a lot of problems.

The two biggest challenges were collecting required equipment and getting together to work on this project during the pandemic situations. Thanks to **Allah** that we have overcome those challenges and complete our project.

Chapter 3
REQUIREMENT SPECIFICATION

3.1 Business Process Model

All the equipment that we have used in this device is connected to a microcontroller. And microcontroller connected with internet and server. Sensor collects data from the spot and sent it to the microcontroller and the microcontroller makes a decision and based on the decision actuator takes action.

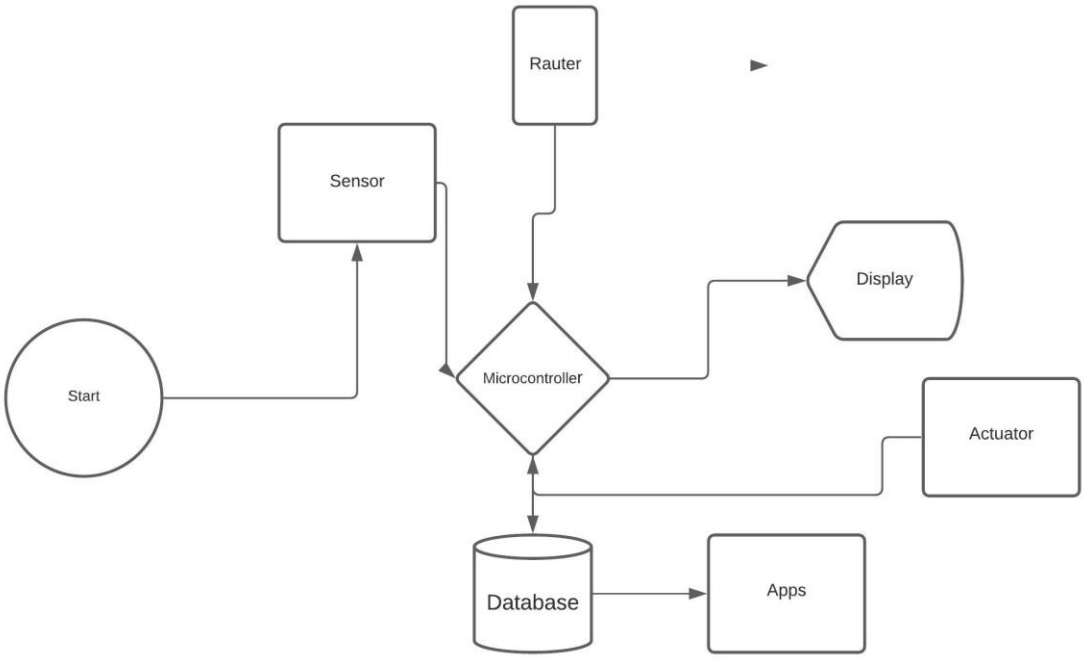

Figure 3.1: Business Process Model

3.2 Use-Case Modelling & Descriptions

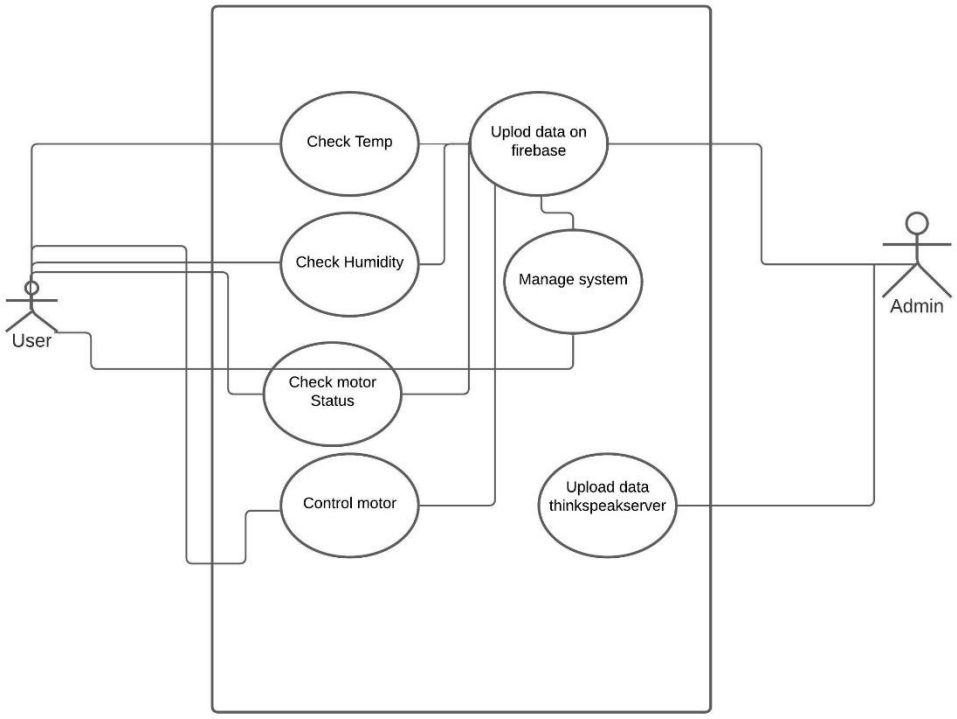

Figure 3.2: Use Case Diagram

3.3 Requirement Collection & Analysis

To build this device we have to collect several components;

- ESP 8266 None MCU V3
- DHT11
- Breadboard
- Jumper Wire
- Soil Moisture Sensor

- OLED display
- 2 Chanel 5V Relay Module
- DC Motor PUMP
- High-Pressure water Pump
- 5V Power Supply
- 12V Power Supply
- Wi-Fi router

3.3.1 ESP 8266 Node MCU v3

ESP 8266 nodemcu V3 is programmable, Wi-Fi enables microcontroller. A Wi-Fi module was added to this microcontroller. It is different from other microcontrollers because an extra feature of it works through the internet. It can be operated over the internet.[4]

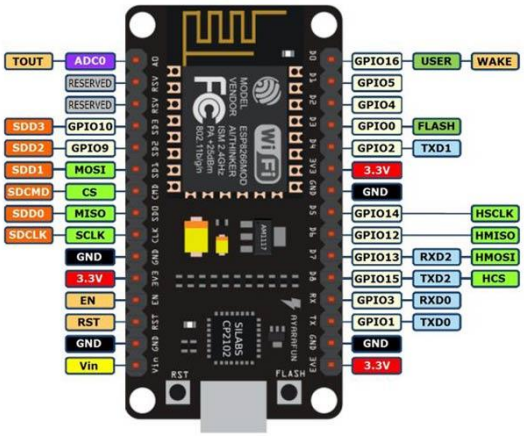

Figure 3.3.1: ESP 8266 node mcu v3

3.3.2 DHT 11 Humidity Sensor

The DHT11 is a very low-cost digital humidity and temperature sensor. It uses humidity and thermistors to measure ambient air. This spreads a digital signal on the data pin. It is very easy to use but with care to capture the data it takes more time.[5]

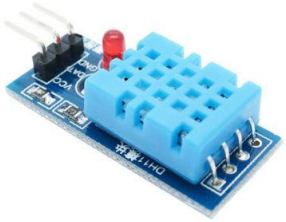

Figure 3.3.2: DHT11 Humidity Sensor

3.3.3 Breadboard

A breadboard is a plastic-made temporary circuit that holds an electronics component. It is used to try out an idea. The main advantage of this board no soldering require and easy to change connections and replace a component.

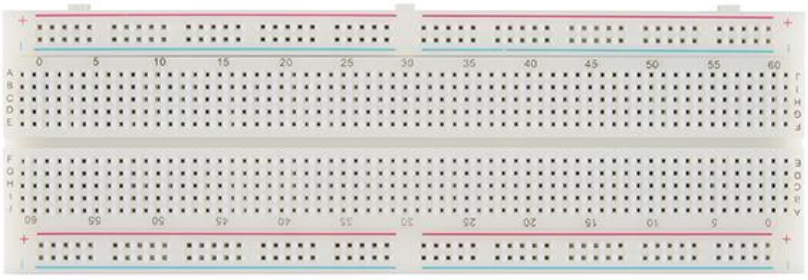

Figure 3.3.3: Breadboard

3.3.4 Soil Moisture Sensor

The soil moisture sensor is a component that measures soil moisture levels by capacitive sensoring. It converts the capacitance into voltage. The main purpose to use it is a long-lasting sensor which in many cases is made of corrosion-resistant material giving long life service.[6]

Figure 3.3.4: Soil Moisture Sensor

3.3.5 Jumper Wire

Jumper wires are used to connect components without soldering. Easy to use just plug and play.

Figure 3.3.5: Jumper wire

3.3.6 .96 OLED Display

An OLED display is a display that is very nice in contrast to a dark environment. The pixels consume energy only when it is on.

Figure 3.3.6: .96 OLED Display

3.3.7 5V Relay Module

5V relay module Its job is to control the spontaneous circuit. It is a spontaneous switch to control the high current circuit with a low current signal.

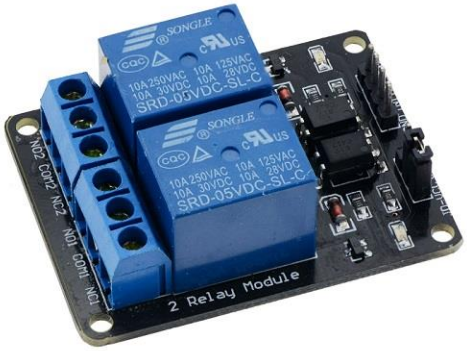

Figure 3.3.7: 2 Channel 5V relay Module

3.3.8 DC Motor

We are using a high-speed dc motor in our device. The output of the motor 2000rpm in 12V.

Figure 3.3.8: DC Motor

CHAPTER 4
DESIGN SPECIFICATION

4.1 Front-end Design

Our system includes both hardware and software sections. For the hardware section, at first, we are designing the system on fritzing which is software for design electronics circuit.[7]

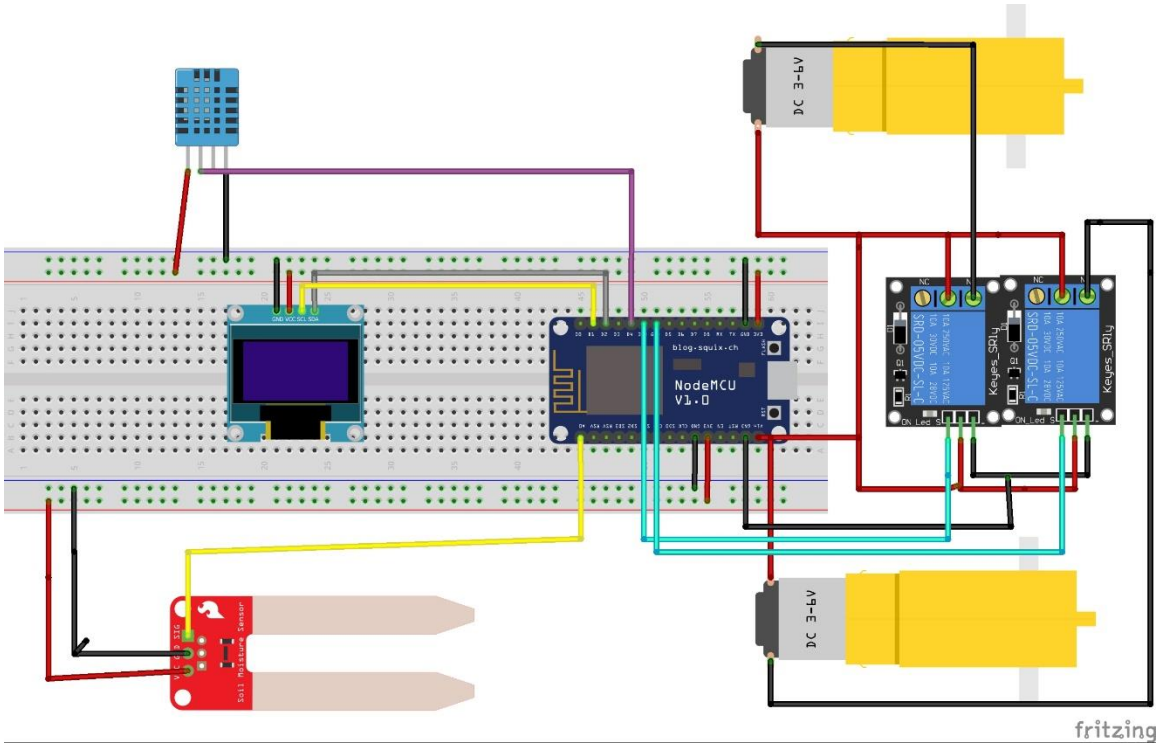

Figure 4.1.1: Front-end Design for Hardware sections.

For the software part, we are using android studio for UI design.

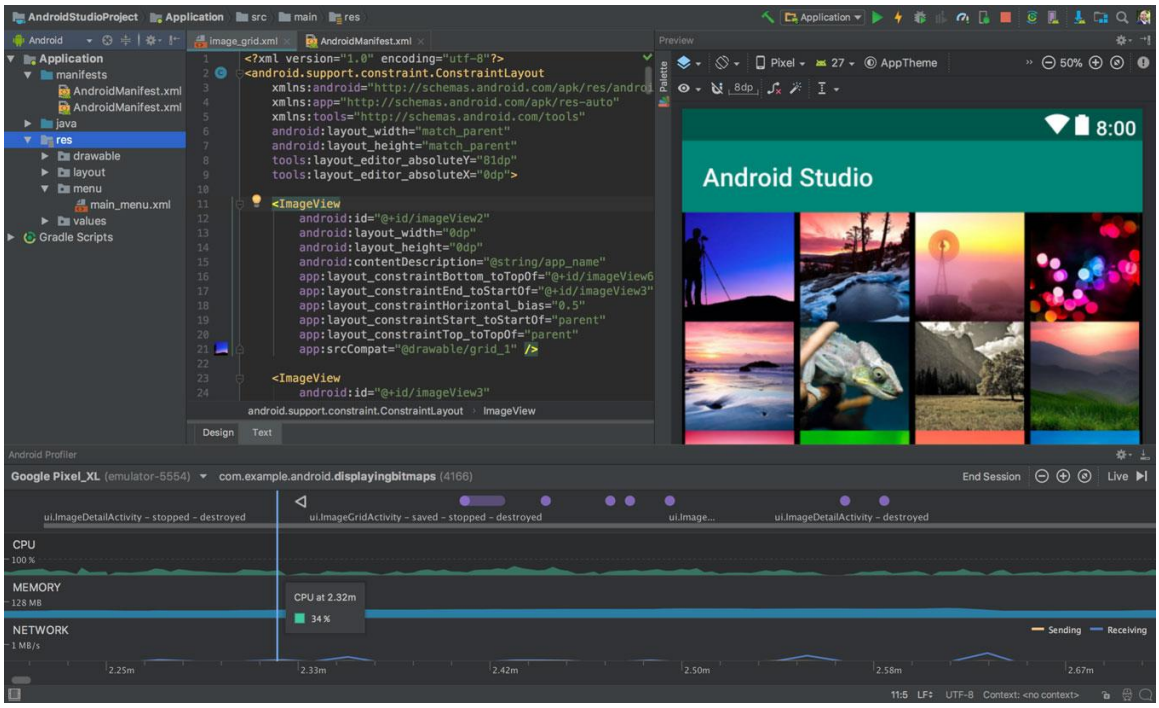

Figure 4.1.2: Fornt-end design for software

4.2 Back-end Design

For Back-end Design includes

- Ready the sketch of ESP8266.
- Connect all the sensors with ESP8266.
- Connect OLED display for showing data.
- Push data on the think speak server.
- Sending data to the firebase database.

For all the above operations we have to ready a sketch. For sketch, we are using Arduino IDE.

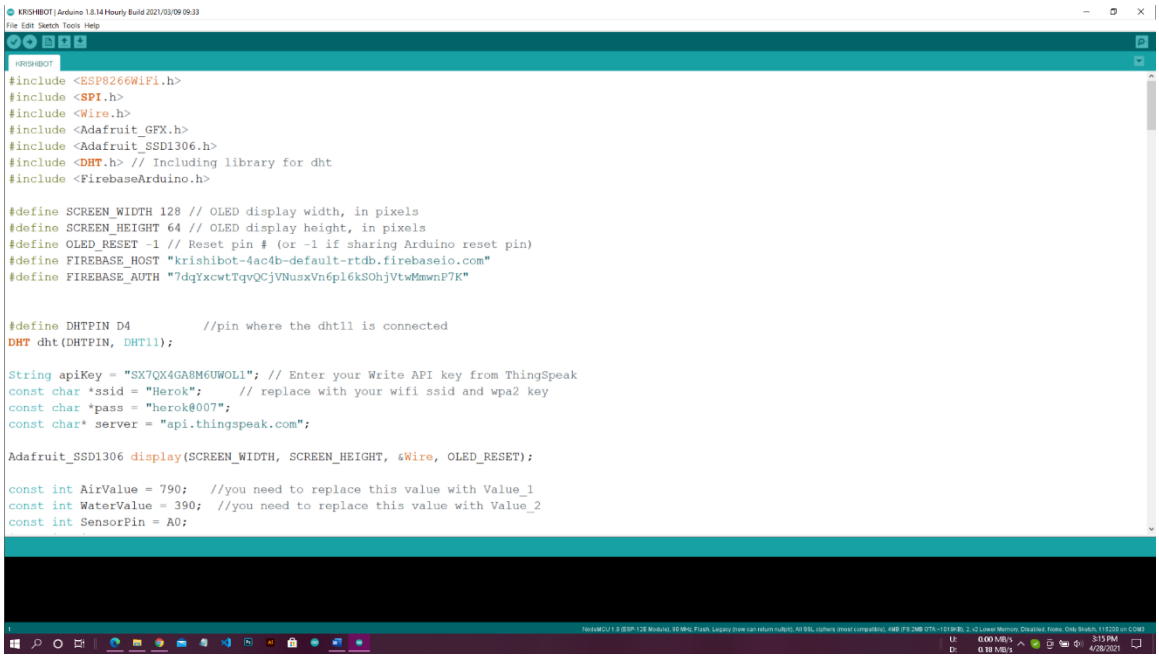

Figure 4.2: Back-end design process.

4.3 Interaction Design and User Experience (UX)

Interaction design means designers create solutions centered on user's needs. The aim and behavior when interacting with the product.

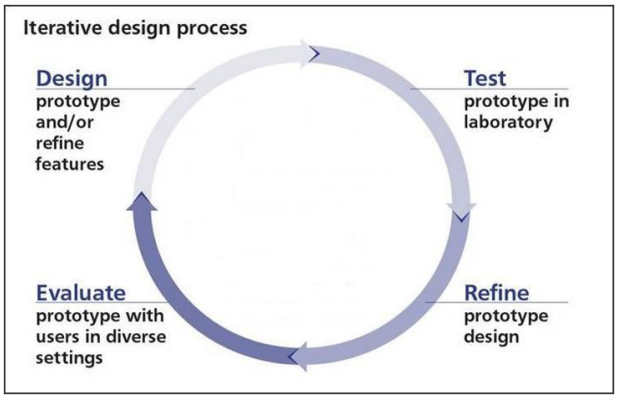

Figure 4.3.1: Interaction design

For our project, we had to collect all the required equipment. Then we have to prepare a design model and simulate our design method Business process model, Circuit sketch, Use case diagram. Our project includes wireless networking. Sensors collect data and send data to the cloud by using a microcontroller. Based on the data actuator are take action.[8]

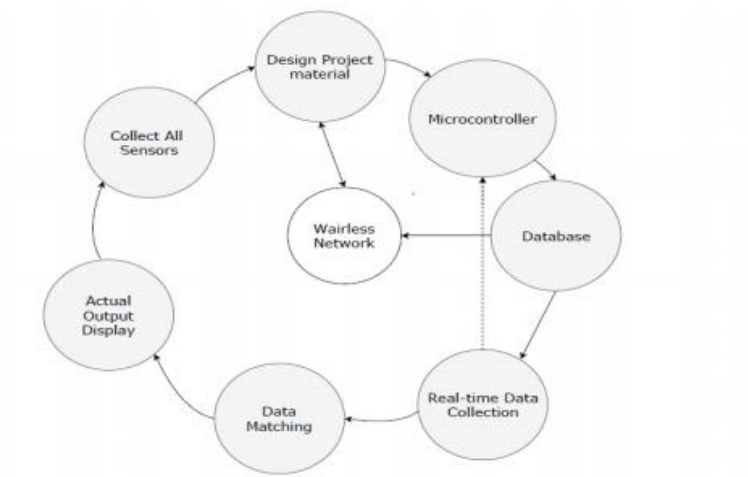

Figure 4.3.2: Interaction Design

4.4 Implementation Requirement

For Implementation of this device, we are using 3 types of sensors

- ❖ Capacitive soil moisture sensor (Inside).
- ❖ Humidity Sensor (Upper).
- ❖ Temperature sensor (Upper).

For the implementation, we must need those sensors and find out that the sensor is work properly.

CHAPTER 5
IMPLEMENTATION AND TESTING

5.1 Implementation of Database

It puts the DBMS render on the standard machine and updates a file database so that this hardware can be run more accurately and programming can be done and database and store data is taken. This type of database creates security and gives different clients what architects envision reasonable access to their needs.[10]

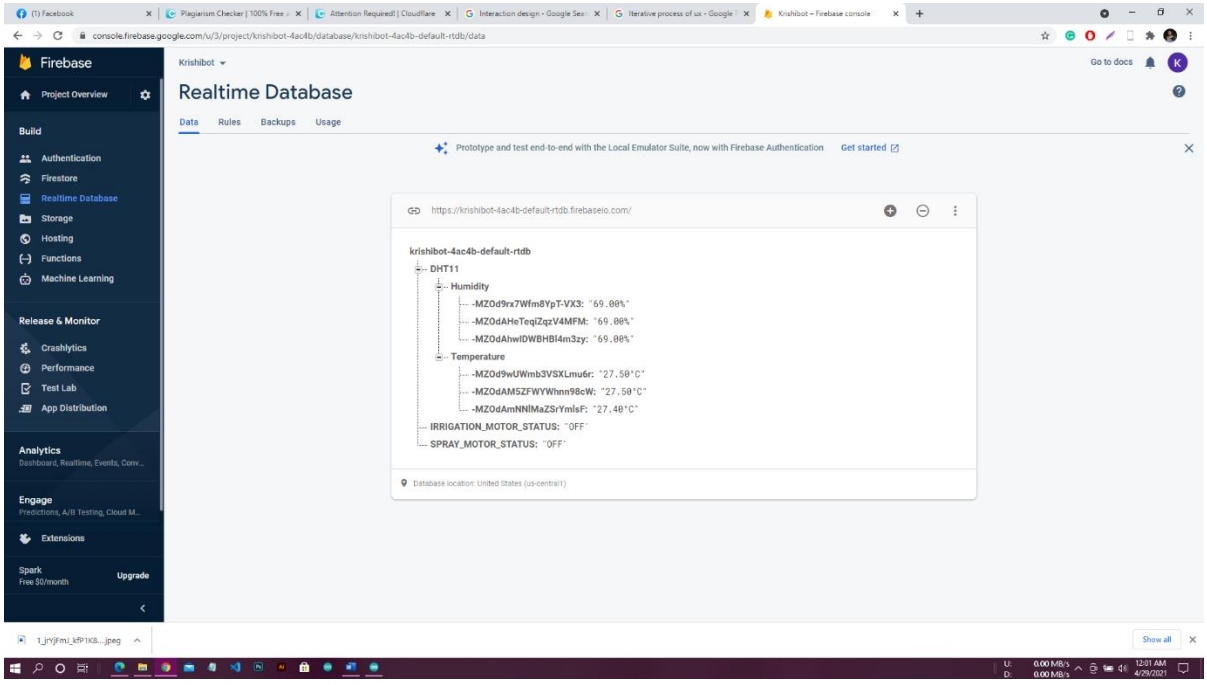

Figure 5.1: Implementation of Database

5.2 Testing Implantation

Testing is a very necessary part for a development project. In this section, we are check and verify the output that gives the prospective output.

No	Input	Prospective Outcome	Obtained Outcome	Status	Date
1	• Put the soil sensor on dry soil. • Dht11 is on	• Irrigation motor is On • Push data on firebase • Show data on Display • Show data on Apps	• Yes • Yes • Yes • Yes	Pass	29 April, 2021
2	• Put the soil sensor on wet soil. • DHT11 is on	• The irrigation motor is turned off • Push data on firebase • Show data on Display • Show data on Apps	• Yes • Yes • Yes • Yes	Pass	29 April, 2021
3	• Motor is on by apps • Motor is off by apps	• Motor turned On • Motor turned of • Show status on apps	• Yes • Yes • Yes	Pass	29 April, 2021

Table 1: Test Result

5.3 Final Output

The device that we have made is perfectly working as its expected output. Sensors are collected data from the environment perfectly and show data on OLED display. Also, send data on the Firebase database and think-speak server. This device also perfectly working with its Android apps. The device can be operated by using android over the internet. Everything is working perfectly.

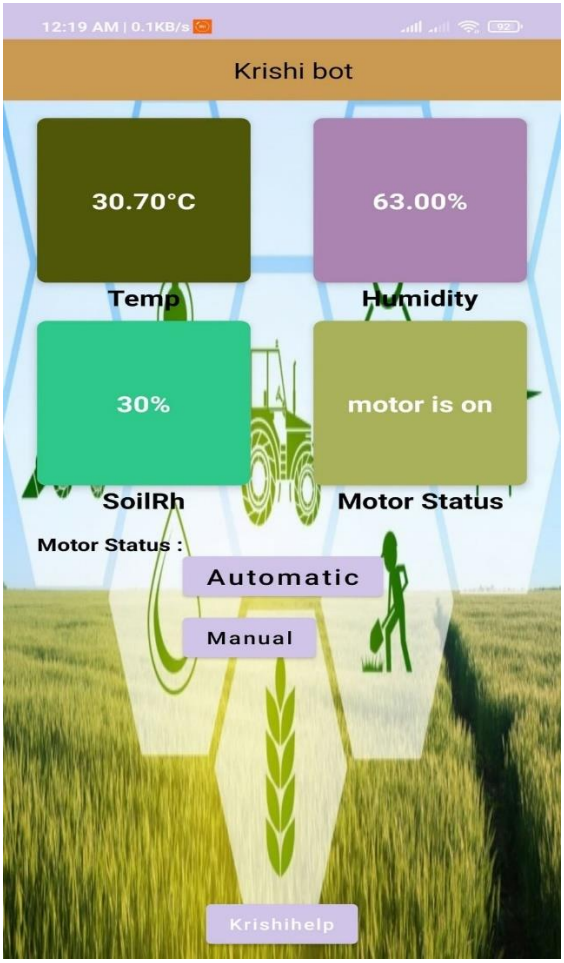

Figure 5.3: Final output software part

CHAPTER 6
IMPACT ON SOCIETY

6.1 Impact on Society

It is possible to observe the roof gardens and corridor plants very easily through "Krishibot". This will reduce the waste of labor and time. It is very easy for those who live in the city to observe the plants. They will be able to observe the plants through "Krishibot" at any time when they go outside. By doing this, they will always be free from worries. As a result, many people will be able to plant more plants. For this reason, the beauty of society will increase.

6.2 Impact on Environment

Plants play an important role in maintaining the balance of the environment. The more plants are planted, the more oxygen will increase. Climate change will be reduced, clean air will be available. This will keep the environment healthy and beautiful. By planting more and more plants, vegetables and fruits can be obtained from the trees. In winter, trees can play the role of air protection for your home, helping you save on heating costs. Which makes the environment dangerous for people? So, planting more plants will reduce the amount of carbon dioxide in the air. This will maintain the balance of the environment.[9]

CHAPTER 7

CONCLUSION AND FUTURE SCOPE

7.1 Conclusion

Every man in our country loves gardening. The people of the city are very interested in rooftop gardening. This makes the roof environment pleasant. Each country should have 25 percent afforestation But, in our country, only 16 percent, considering that rooftop gardening plan will reduce oxygen deficiency and enhance the beauty of the roof. In this project main theme is When we go to village or other places for work, we can take care of the garden through “Krishibot”. When the amount of water in the tree becomes less then you can give us water from anywhere through the app. When the acidity of the gardening soil decreases, we can know it through notification. we used two pics motor for this project, one the simple motor and the other is the high-pressure motor. Whenever the amount of water is low it turns on automatically and gives the same amount of water. we used a sensor inside the field to see if it was like drinking, this allows us to know if the amount of water is coming. The people of the city do not want to garden because they cannot take care of it in time as a result of our discovery of “Krishibot”. Hopefully, this method will be followed in the coming days and will spread widely in the agricultural sector as a result of which many people will be interested in roof gardening. This will help maintain the balance of the environment in the future.

7.2 Scope for Further Development

In further we will upgrade our device day by day. We will make this device more automated and more efficient. In this device, we can add various sensors like NPK. By collecting those value systems can suggest fertilizer.

In the apps section: We are developing only android apps, In the future, we develop apps for ISO devices. In this apps, we want to add a very interesting feature that crops disease by using image processing. Also suggest solution of the disease.

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