SMART FARMER - IOT ENABLED SMART FARMING APPLICATION

A PROJECT REPORT

NALAIYATHIRAN IBM PROJECT

TEAM ID: **PNT2022TMID13034**

Submitted by

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SANJEEV G (20F502)

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in partial fulfillment for the award of the degree

of

BACHELOR OF TECHNOLOGY

in

INFORMATION TECHNOLOGY

KARPAGAM

COLLEGE OF ENGINEERING

Rediscover | Refine | Redefine

Coimbatore - 641 032

Autonomous | Affiliated to Anna University, Chennai

Accredited by NAAC with 'A' Grade

NOVEMBER 2022

KARPAGAM COLLEGE OF ENGINEERING

(AUTONOMOUS)

COIMBATORE – 641 032

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BONAFIDE RECORD OF WORK DONE BY

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Faculty guide	Head of the Department
(Mr.CASTRO S)	(Dr.P.MURUGESWARI)

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SMART FARMER - IOT ENABLED SMART FARMING APPLICATION

ABSTRACT

Agriculture is backbone of any country. About 60% of our country's population works in agriculture or the primary sector. It contributes more to our country's GDP. It employs the majority of India's population. The internet of things research presents a framework in which farmers may obtain extensive information on the soil, crops growing in specific areas, and agricultural yield and productivity. By utilizing resource optimization and smart planning, this technology-based farming solution will assist farmers in making wise agricultural decisions. The development of IOT based intelligent Smart Farming using smart devices is changing the agriculture production by not only increasing the quality and yield but also to make farming cost effective. The goal of this smart Agriculture or farming is to get live data like temperature, soil moisture and humidity to monitor the surrounding environment. All of this is accomplished with the use of temperature, humidity, and moisture sensors. The system being proposed by this paper is done using microcontroller and various sensors. This system is capable of monitoring the parameters in various soil conditions.

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1. INTRODUCTION

1.1 PROJECT OVERVIEW

IoT is bringing revolution to almost every aspect of our lives by changing how we do things. The use of Smart IoT devices is on the rise with all the industries heavily investing in IoT. The main aims of investing in IoT are to improve operations efficiency, improve product quality, and reduce the costs of production. The Agricultural industry is among the industries seeking to reap the benefits of IoT. The use of IoT in agriculture is commonly referred to as Smart Farming or Smart Agriculture. It uses various IoT sensors to send the farm's data, like humidity, temperature, soil moisture, etc. to the cloud which can be monitored and controlled from anywhere in the world. So after knowing about some IoT applications in agriculture, we can say that it is definitely revolutionize the agriculture industry in a few years. IoT has been applied in several areas of agriculture. The development ofSmartFarmer - IoT Enabled Smart Farming Application is day by day turning the face of agriculture production by not only enhancing it but also making it cost-effective and reducing wastage. The aim / objective of this report is to propose SmartFarmer - IoT Enabled Smart Farming Application assisting farmers in getting Live Data (Temperature, Soil Moisture, Humidity) for efficient environment monitoring which will enable them to increase their overall yield and quality of products. The IoT based Smart Farming System being proposed via this report is integrated with Connecting IoT devices to the Watson IoT platform and exchanging the sensor data.Configuring APIs using Node-RED for communicating with a mobile application.Creating a Mobile Application through which the user interacts with the IoT device.

1.2 PURPOSE

IoT plays a key role in smart agriculture. Internets of Things (IoT) sensors are used to provide necessary information about agriculture fields. The main advantage of IoT is to monitor the agriculture by using the wireless sensor networks and collect the data from different sensors which are deployed at various no des and send by wireless protocol. By using IoT system the smart agriculture is powered by NodeMCU. It includes the humidity sensor, temperature sensor, moisture sensor and DC motor. This system starts to check the humidity and moisture level. The sensors are used to sense the level of water and if the level is below the range then the system automatically stars watering. According to the change in temperature level the sensor does its job. IoT also shows the information of Humidity, Moisture level, The temperature level based on type of crops cultivated can also be adjusted. The traditional agriculture and allied sector cannot meet the requirements of modern agriculture which requires high-yield, high quality and efficient output. Thus, it is very important to turn towards modernization of existing methods and using the information technology and data over a certain period to predict the best possible productivity and crop suitable on the very particular land. The adoptions of access to high-speed internet, mobile devices, and reliable, low-cost satellites (for imagery and positioning) are few key technologies characterizing the precision agriculture trend. IoT has been making deep inroads into sectors such as manufacturing, health-care and automotive. When it comes to food production, transport and storage, it offers a breadth of options that can improve India's per capita food availability. Sensors that offer information on soil nutrient status, pest infestation, moisture conditions etc. which can be used to improve crop yields over time.

2. LITERATURE SURVEY

2.1 EXISTING PROBLEMS

In this current present system agricultural land is controlled with few sensors and microcontrollers. The following sensors are soil moisture sensor, ultrasonic sensor. In the current existing system to soil moisture sensor will detect soil moisture content that is water content in the soil and turns on water motor. But there is no automatic control off water motor. In the existing system there is no use of PIR sensor for motion detection or detecting animals. There is no pesticides spray motor control remotely using cloud.

DISADVANTAGES OF EXISTING SYSTEM

- It is not a secure system.
- There is no motion detection for protection of agriculture field.
- Automation is not available.

2.2 REFERENCES

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[2] Universal Paper of advanced science and science and exploration technology.
[3] GRD Journals- Global Research and Development Journal for Engineering | Volume 4 | Issue 3 | February (2019) ISSN: 2455-5703 "Design and Implementation of an Advanced Security System for Farm Protection from Wild Animals".
[4] International Journal of Innovations in Engineering and Science, Impact Factor Value 4.046 e-ISSN: 2456-3463 Vol.4, No. 5, 2019 "Solar Powered Smart Fencing System for Agriculture Protection using GSM & Wireless Camera".

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[6] American Journal of Engineering Research (AJER)2018 eISSN: 2320- 0847 p-ISSN : 2320- 0936 Volume-7, Issue-7, pp-326-330 "Moisture Sensing Automatic Plant Watering System Using Arduino Uno".
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[9] V. L. Akubattin, A. P. Bansode, T. Ambre, A. Kachroo, and P. SaiPrasad, "Smart Irrigation System, 'In International Journal of Scientific Research in Science and Technology, vol. 2, no 5, pp. 343- 345,2016.
[10] K.. R. Kakade, A. R. Pisal, A. V. Chavanss, and S. B. Khedkar, "Smart Irrigation and Crop Suggestion Using Raspberry-P i , International Journal of Scientific Research in Science and Technology, vol. 4, no 4, pp. 235-241, 2017.
[11] M. M. Kamal, N.A.Z.M. Noar, and A.M. Sabri, "Development of Detection and Flood Monitoring via Blynk Apps, 'Indonesian Journal of Electrical Engineering and Computer Science, vol. 10, no I, pp. 361-370,2018.

2.3 PROBLEM STATEMENT DEFINITION

This project, propose an IoT based Smart Farming Agriculture Stick assisting farmers in getting live data of Temperature, Humidity, Soil moisture, PH, etc. for efficient environment monitoring which will enable them to do smart farming and improve their overall yield and quality of products.

The several factors which affect the amount of water required by crops in various climatic conditions are:

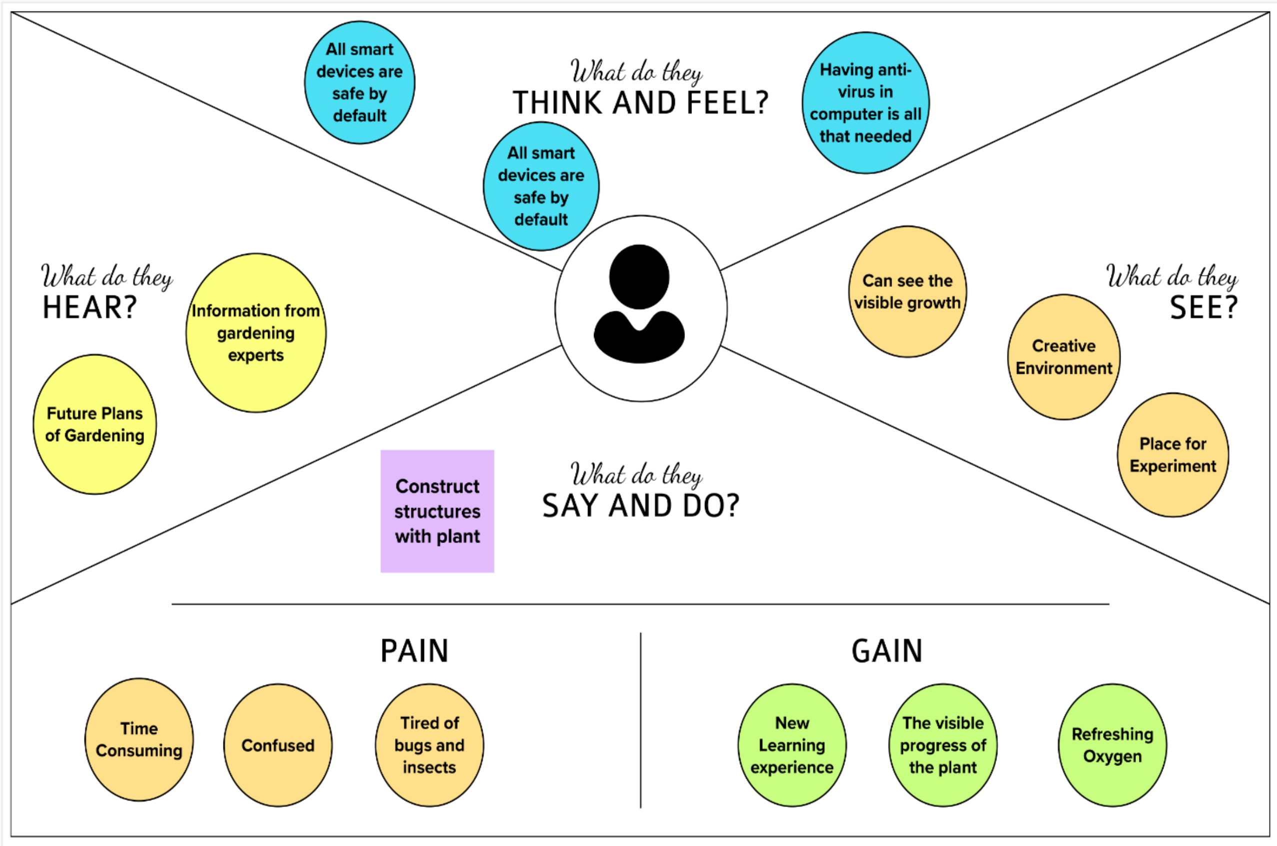
1) Temperature.
2) Humidity.
3) Sunshine.
4) Wind speed.

The key advantages of smart farming are:

1) Proper water management preventing the wastage of water.
2) Soil management for checking pH level and moisture in the soil.
3) Crop monitoring using cameras to detect infections and diseases in crop.
4) Weather monitoring for live monitoring and crop sowing time.

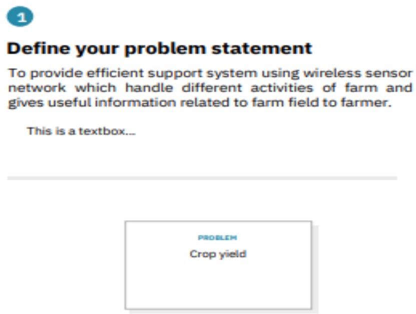
3. IDEATION AND PROPOSED SOLUTION

3.1 EMPATHY MAP CANVAS

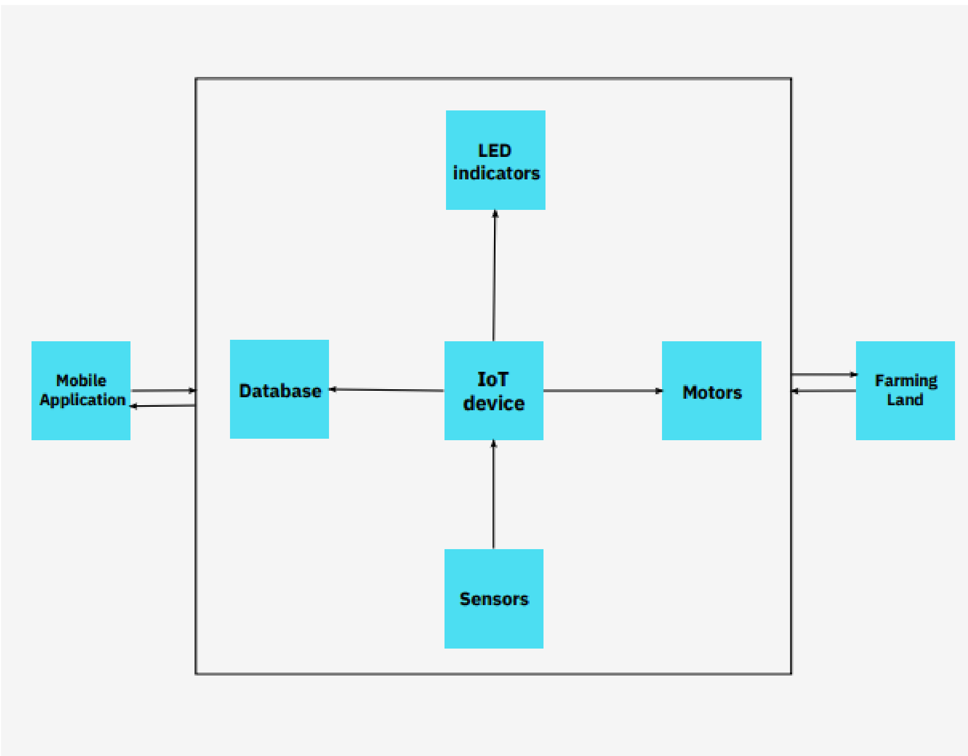


3.2 IDEATION AND BRAINSTORMING

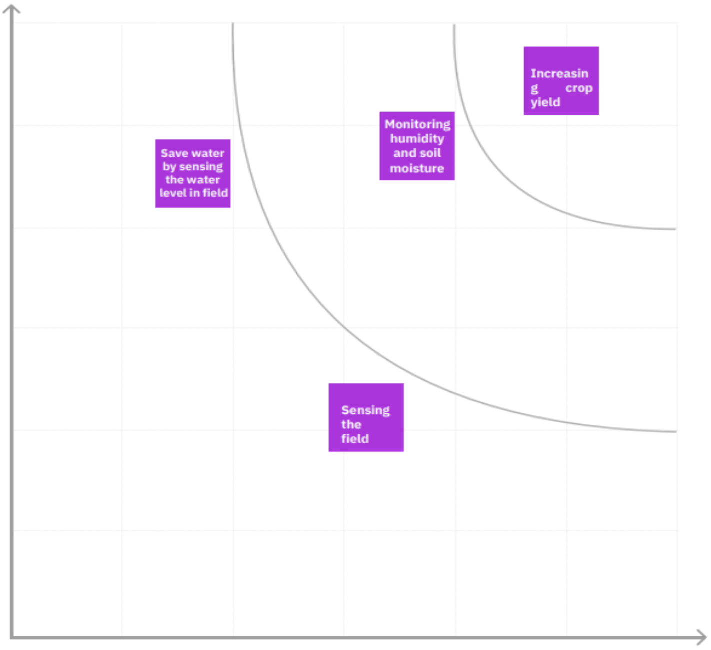
3.2.1 Team Gathering, Collaboration and Select the Problem Statement



3.2.2 BRAINSTORM, IDEA LISTENING AND GROUPING



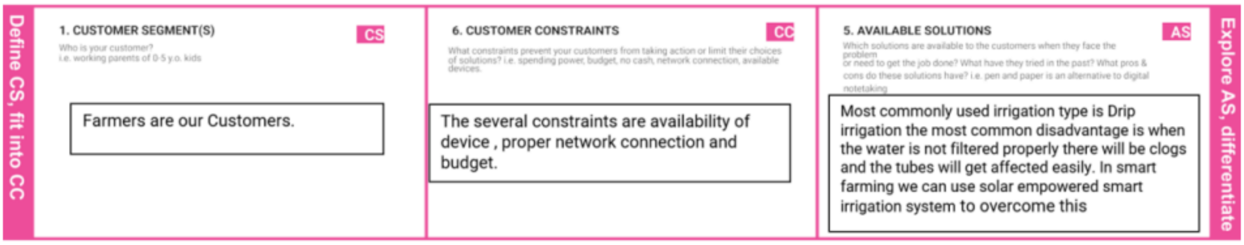
3.2.3 IDEA PRIORITIZATION



3.3 PROPOSED SOLUTION

S.no	Parameter	Description
1	Problem Statement (Problem to be solved)	To make farming easier by choosing several constraints in agriculture and to overcome those constraints, to increase production quality and quantity using IOT.
2	Idea / Solution description	Using smart techniques like monitoring farms climate, smart irrigation and soil analysis.
3	Novelty / Uniqueness	Solar power smart irrigation system which helps you to monitor temperature, moisture ,humidity using smart sensors
4	Social Impact / Customer Satisfaction	It is better than the present modern irrigation system by using this method we can control soil erosion. There will be better production yield.
5	Business Model (Revenue Model)	As the productivity increases customer satisfaction also increases and hence need for the application also increases, which increases the revenue of the business.
6	Scalability of the Solution	It is definitely scalable we can increase the constraints when the problem arises.

3.3 PROBLEM SOLUTION FIT



Define CS, fit into CC

1. CUSTOMER SEGMENT(S) CS

Who is your customer?
i.e. working parents of 0-5 y.o. kids

Farmers are our Customers.

6. CUSTOMER CONSTRAINTS CC

What constraints prevent your customers from taking action or limit their choices of solutions? i.e. spending power, budget, no cash, network connection, available devices.

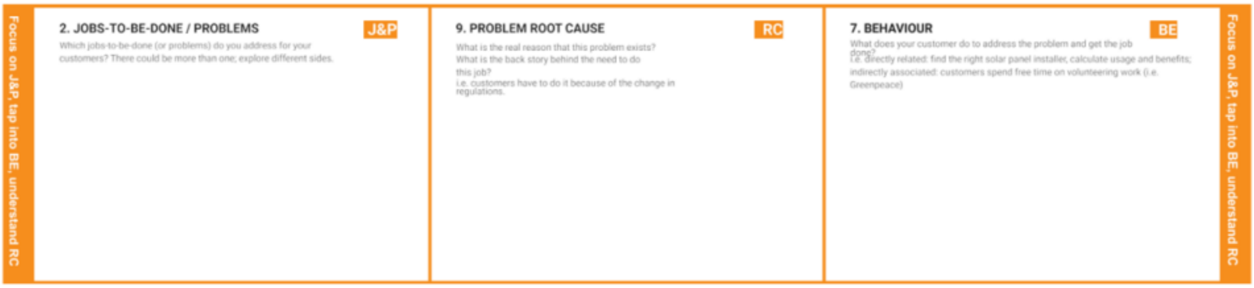
The several constraints are availability of device , proper network connection and budget.

5. AVAILABLE SOLUTIONS AS

Which solutions are available to the customers when they face the problem or need to get the job done? What have they tried in the past? What pros & cons do these solutions have? i.e. pen and paper is an alternative to digital notetaking

Most commonly used irrigation type is Drip irrigation the most common disadvantage is when the water is not filtered properly there will be clogs and the tubes will get affected easily. In smart farming we can use solar empowered smart irrigation system to overcome this

Explore AS, differentiate



Focus on J&P, tap into BE, understand RC

2. JOBS-TO-BE-DONE / PROBLEMS J&P

Which jobs-to-be-done (or problems) do you address for your customers? There could be more than one; explore different sides.

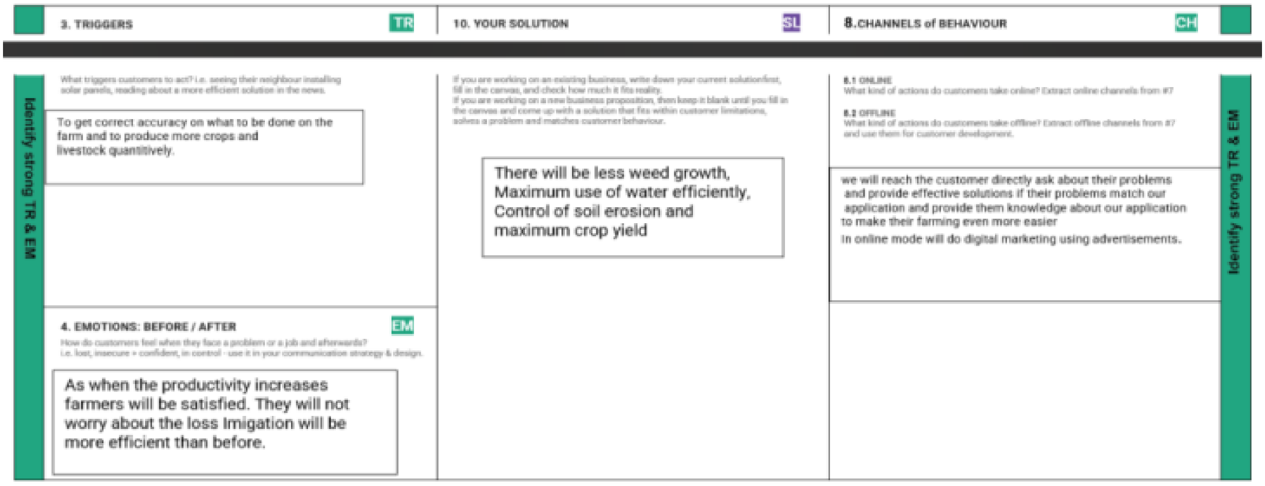
9. PROBLEM ROOT CAUSE RC

What is the real reason that this problem exists? What is the back story behind the need to do this job?
i.e. customers have to do it because of the change in regulations.

7. BEHAVIOUR BE

What does your customer do to address the problem and get the job done?
i.e. directly related: find the right solar panel installer, calculate usage and benefits; indirectly associated: customers spend free time on volunteering work (i.e. Greenpeace)

Focus on J&P, tap into BE, understand RC



Identify strong TR & EM

3. TRIGGERS TR

What triggers customers to act? i.e. seeing their neighbour installing solar panels, reading about a more efficient solution in the news.

To get correct accuracy on what to be done on the farm and to produce more crops and livestock quantitively.

4. EMOTIONS: BEFORE / AFTER EM

How do customers feel when they face a problem or a job and afterwards?
i.e. lost, insecure > confident, in control - use it in your communication strategy & design.

As when the productivity increases farmers will be satisfied. They will not worry about the loss Irrigation will be more efficient than before.

10. YOUR SOLUTION SL

If you are working on an existing business, write down your current solution first, fill in the canvas, and check how much it fits reality.
If you are working on a new business proposition, then keep it blank until you fill in the canvas and come up with a solution that fits within customer limitations, solves a problem and matches customer behaviour.

There will be less weed growth, Maximum use of water efficiently, Control of soil erosion and maximum crop yield

8.CHANNELS of BEHAVIOUR CH

8.1 ONLINE
What kind of actions do customers take online? Extract online channels from #7

8.2 OFFLINE
What kind of actions do customers take offline? Extract offline channels from #7 and use them for customer development.

we will reach the customer directly ask about their problems and provide effective solutions if their problems match our application and provide them knowledge about our application to make their farming even more easier
In online mode will do digital marketing using advertisements.

Identify strong TR & EM

4 REQUIREMENT ANALYSIS

4.1 FUNCTIONAL REQUIREMENTS

Following are the functional requirements of the proposed solution

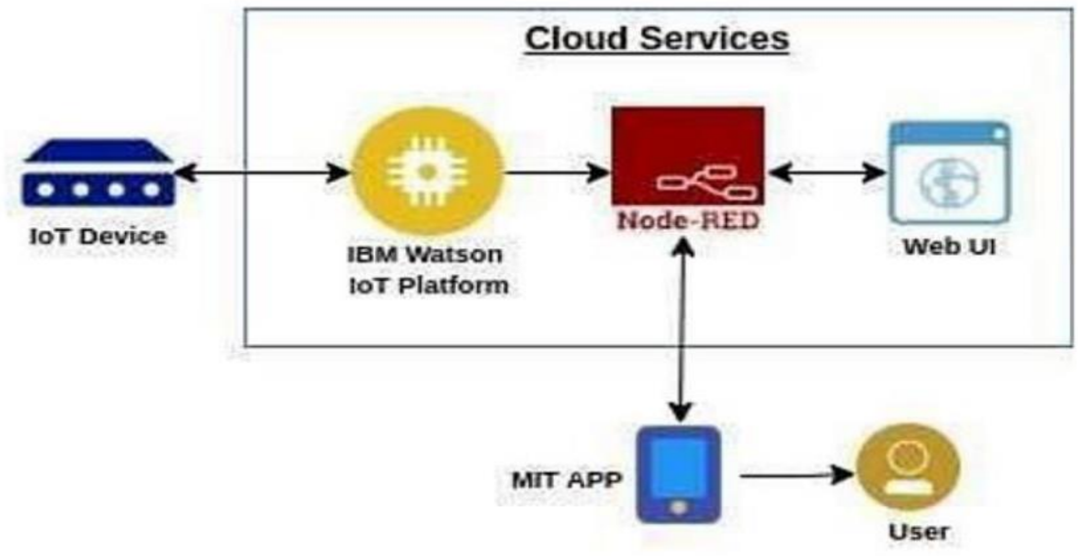
FR NO.	Functional Requirement (Epic)	Sub Requirement(Story /Sub - Task)
FR - 1	User Registration/Login	Via Email Via Phone number
FR - 2	User Dashboard	Single Sample Prediction Multiple Sample Prediction View User History
FR - 3	Output Dashboard	Visual Representation Report Generation

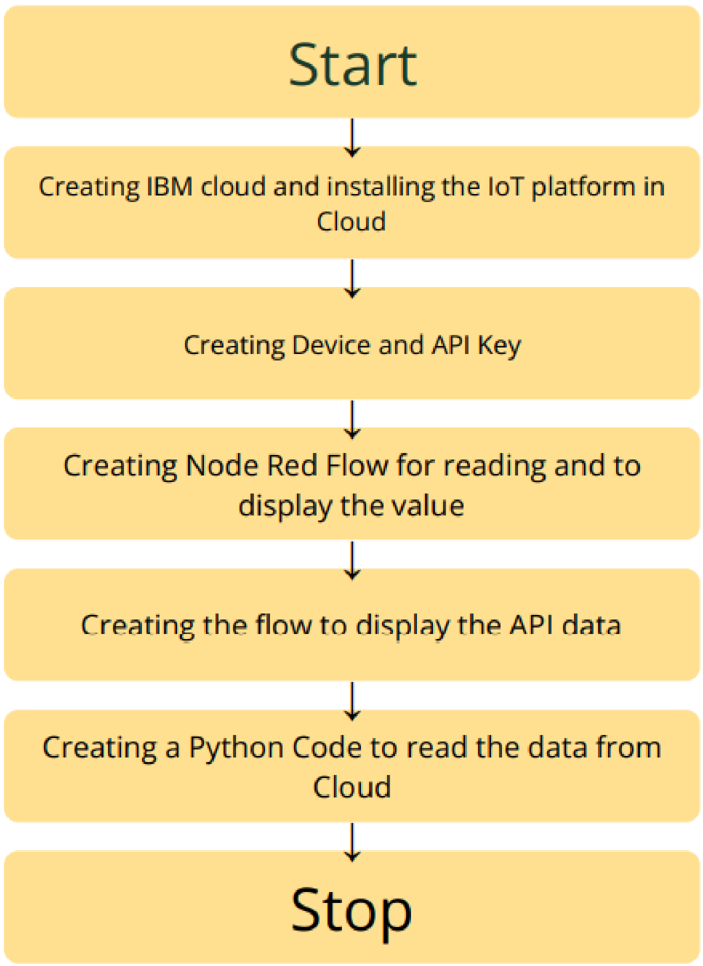
4.2 NON-FUNCTIONAL REQUIREMENTS

FR NO.	Non-Functional Requirements	Description
NFR-1	Usability	A user-friendly interface that makes processing easier for the user Prediction are visually represented by the model.
NFR-2	Security	User authentication: To have secured access, the user might have a private dashboard.
NFR-3	Reliability	The mode is capable should be able to handle massive amounts of data and run several samples at once
NFR-4	Performance	The model's accuracy is good because it combines several ML methods
NFR-5	Availability	The website is portable and responsive to mobile devices. To run on any device, only the most minimal configuration are needed

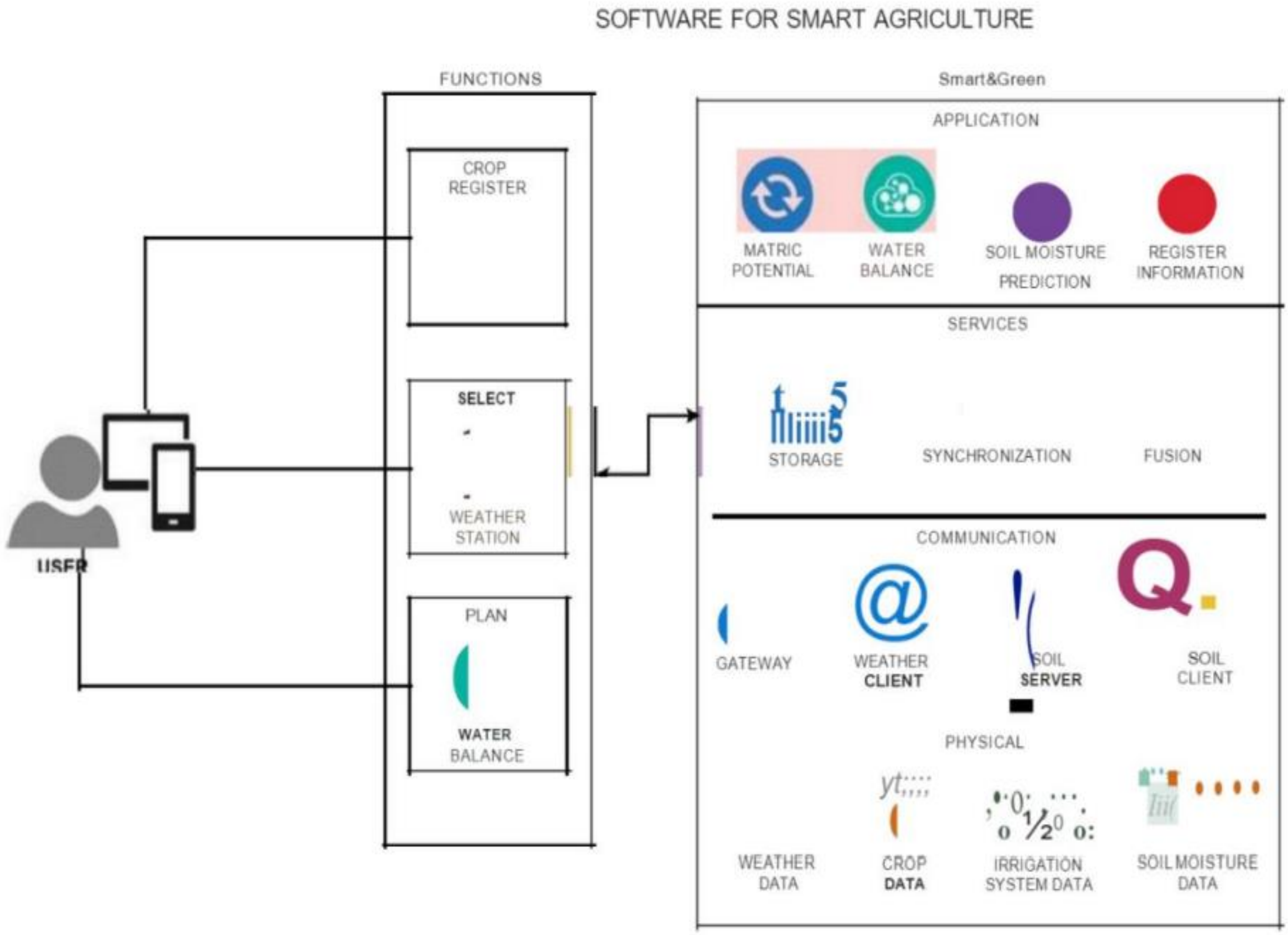
5 PROJECT DESIGN

5.1 DATAFLOW DIAGRAM





5.2 SOLUTION AND TECHNICAL ARCHITECTURE



5.3 USER STORIES

User Type	Functional Requirements	User Story Number	User Story/Task	Acceptance Criteria	Priority	Relea
Customer	Code	USN 1	Python code		High	Sprin 1

Customer	**Software**	**USN 2**	**IBM Watson IOT platform,Workflows for IOT scenarious using Node- red**		**High**	**Sprint 2**
Customer	**MIP app**	**USN 3**	**To develop an application using MIT**		**High**	**Sprint 3**
Customer	**Web UI**	**USN 4**	**To make the user to interact with the software**	**User can access the app for the services**	**High**	**Sprint 4**

6 PROJECT PLANNING AND SCHEDULING

6.1 SPRINT PLANNING AND ESTIMATION

Product Backlog, Sprint Schedule, and Estimation

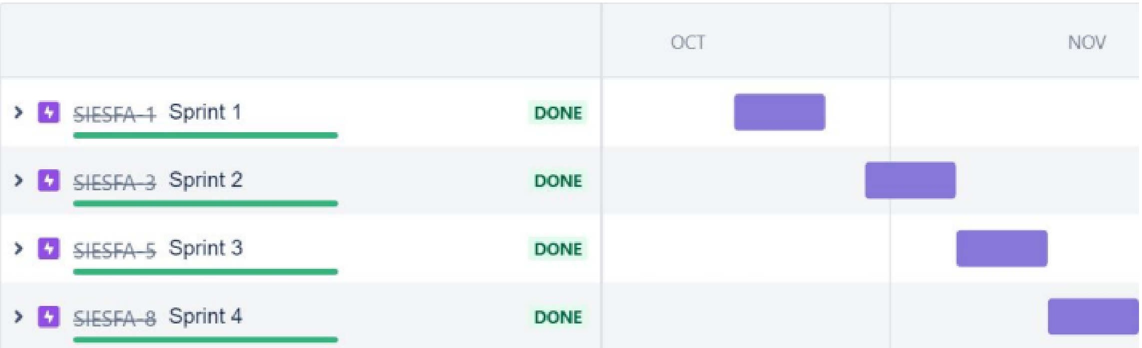
Sprint	Functional Requirement	User Story Number	User Story / Task	Story Points	Prioirity
Sprint -1	Code	USN - 1	Developing a Python Code	2	High

Sprint - 2	Software	USN - 2	Creating device in the IBM Watson IOT scenarious using Node-Red	2	High
Sprint - 3	MIT App Inventor	USN - 3	Develop an application for the Smart farmer project using MIT App InvSoentor	2	High
Sprint - 3	Dashboard	USN - 3	Design the Modules and test the app	2	High
Sprint - 4	Web UI	USN - 4	To make the user to interact with software	2	High

6.2 SPRINT DELIVERY SCHEDULE

Sprint	Total Story Points	Duration	Sprint Start Date (Planned)	Sprint End Date (Planned)	Story Points Completed(as on Planned End Date)	Sprint Release Date(Actual)
Sprint - 1	20	6 Days	24 Oct 2022	29 Oct 2022	20	29 Oct 2022
Sprint - 2	20	6 Days	31 Oct 2022	05 Nov 2022	20	05 Nov 2022
Sprint - 3	20	6 Days	07 Nov 2022	12 Nov 2022	20	12 Nov 2022
Sprint - 4	20	4 Days	14 Nov 2022	17 Nov 2022	20	17 Nov 2022

6.3 REPORTS FROM JIRA



7 CODING AND SOLUTIONING

7.1 FEATURE 1:

PYTHON CODE:

* Its for "Remote ON and OFF"

* Identifing Soil Moisture Temperature and Humidity

```
 import wiotp.sdk.device
import time
import os
import random
myconfig = {
 "identity": {
 "orgId":"3lnltf",
 "typeId":"NodeMCU",
 "deviceId":"12345"
 },
 "auth":{
 "token":"12345678"
 }
}
client = wiotp.sdk.device.DeviceClient(config=myconfig, logHandlers=None)
client.connect()
def myCommandCallback(cmd):
 print("Messure recived from IBM ToT Platform: %s" %
cmd.data['command'])
 m=cmd.data['command']
 if(m=="Motor is switched on"):
 print("Motoris switched on")
```

```
 elif(m=="motoroff"):
 print("Motor is switched OFF")
 print("")
while True:
 soil=random.randint(22, 100)
 temp=random.randint(-20, 125)
 hum=random.randint(0, 100)
 myData={'soil_moisture':soil, 'temperature':temp,'humidity':hum}
 client.publishEvent(eventId="status",msgFormat="json",
data=myData,qos=0, onPublish=None )
 print ("Published data Successfully: %s",myData)
 time.sleep(2)
 client.commandCallback= myCommandCallback
client.disconnect()
```

7.2 FEATURE 2:

For MIT app inventor

```
<!DOCTYPE html>
<!-- saved from
url=(0048)http://ai2.appinventor.mit.edu/#5592391764279296 -->
<html style="overflow: auto;"><head><meta http-equiv="Content-Type"
content="text/html; charset=UTF-8"><style>HTML{margin:0
!important;border:none !important;}.dragdrop-handle{cursor:move;user select:none;-khtml-user-select:none;-moz-user-select:none;}.dragdrop draggable{zoom:1;}.dragdrop-dragging{zoom:normal;}.dragdrop-
positioner{border:1px dashed #1e90ff;margin:0 !important;zoom:1;z index:100;}.dragdrop-flow-panel-positioner{color:#1e90ff;display:inline;text align:center;vertical-align:middle;}.dragdrop-proxy{background color:#7af;}.dragdrop-selected,.dragdrop-dragging,.dragdrop proxy{filter:alpha(opacity \= 30);opacity:0.3;}.dragdrop-movable-panel{z index:200;margin:0 !important;border:none !important;}</style>
```

```
 <meta http-equiv="X-UA-Compatible" content="IE=10">
 <!--meta name="gwt:property" content="locale=en_US"-->
 <!-- Title is set at runtime. -->
 <title>MIT App Inventor</title>
<!-- Google Analytics. -->
<script type="text/javascript" async="" src="./MIT App
Inventor_files/ga.js.download"></script><script type="text/javascript">
 var _gaq = _gaq || [];
 _gaq.push(['_setAccount', 'UA-28621056-1']);
 _gaq.push(['_setDomainName', 'ai2.appinventor.mit.edu']);
 _gaq.push(['_setAllowLinker', true]);
 _gaq.push(['_trackPageview']);
 (function() {
 var ga = document.createElement('script'); ga.type =
'text/javascript'; ga.async = true;
 ga.src = ('https:' == document.location.protocol ? 'https://ssl' :
'http://www') + '.google-analytics.com/ga.js';
 var s = document.getElementsByTagName('script')[0];
s.parentNode.insertBefore(ga, s);
 })();
</script>
 <link type="text/css" rel="stylesheet" href="./MIT App
Inventor_files/gwt.css">
 <link type="text/css" rel="stylesheet" href="./MIT App
Inventor_files/blockly.css">
 <link type="text/css" rel="stylesheet" href="./MIT App
Inventor_files/ai2blockly.css">
```

```
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Inventor_files/hsvapalette.css">
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 <div class="floatingBox">
 <h2> App Inventor needs JavaScript enabled to run.</h2>
 </div>
 </noscript>
 <script src="./MIT App
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Inventor_files/07550E3C801A777506EB0AD54C97601D.cache.js.downloa
d"></script><style type="text/css">/* Chart.js */
@keyframes chartjs-render animation{from{opacity:.99}to{opacity:1}}.chartjs-render monitor{animation:chartjs-render-animation 1ms}.chartjs-size monitor,.chartjs-size-monitor-expand,.chartjs-size-
monitor shrink{position:absolute;direction:ltr;left:0;top:0;right:0;bottom:0;overflow:hi
dden;pointer-events:none;visibility:hidden;z-index:-1}.chartjs-size-
monitor expand>div{position:absolute;width:1000000px;height:1000000px;left:0;top
:0}.chartjs-size-
monitor shrink>div{position:absolute;width:200%;height:200%;left:0;top:0}</style><s
tyle>.blocklyDraggable {}
.blocklySvg {
Light {
display: none;
}
.badBlock>.blocklyPath {
 stroke-width: 3px;
 stroke: #f00;
}
.badBlock>.blocklyPathLight {
 display: none;
}
.blocklyDragging>.blocklyPath,
.blocklyDragging>.blocklyPathLight {
fill-opacity: .8;
stroke-opacity: .8;
}
.blocklyDragging>.blocklyPathDark {
display: none;
```

```
}

.blocklyDisabled>.blocklyPath {

fill-opacity: .5;

stroke-opacity: .5;

}

.blocklyDisabled>.blocklyPathLight,

.blocklyDisabled>.blocklyPathDark {

display: none;

}

.blocklyText {

cursor: default;

fill: #fff;

font-family: sans-serif;

font-size: 11pt;

}

.blocklyNonEditableText>text {

pointer-events: none;

}

.blocklyNonEditableText>rect,

.blocklyEditableText>rect {

fill: #fff;

fill-opacity: .6;

}

.blocklyNonEditableText>text,

.blocklyEditableText>text {

fill: #000;

}
```

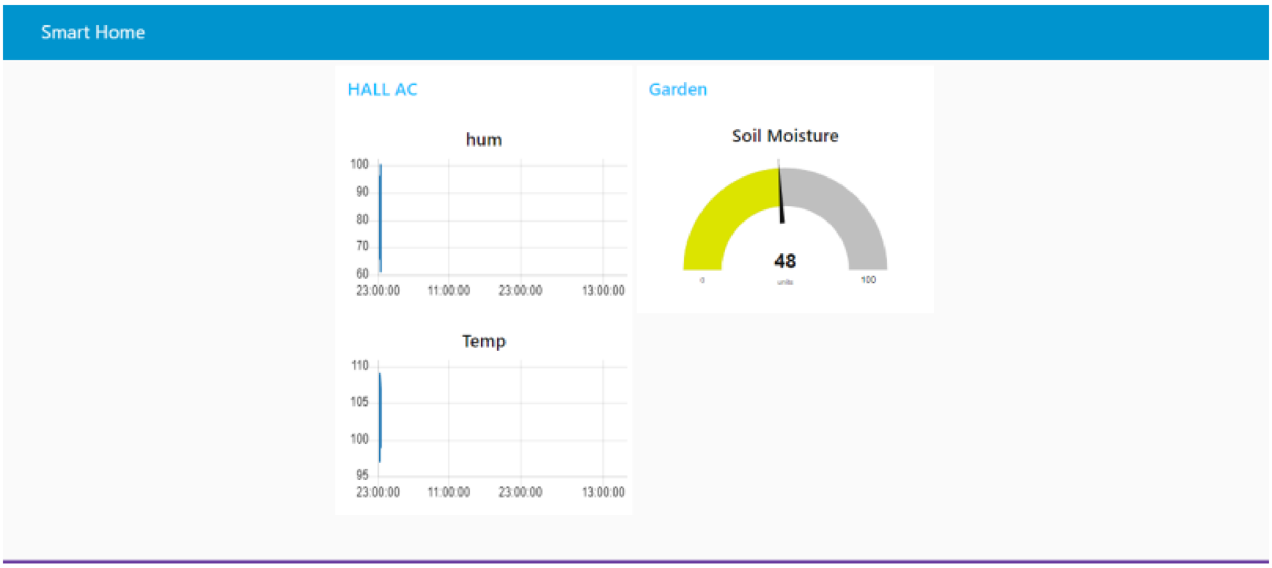
```
.blocklyEditableText:hover>rect {
stroke: #fff;
stroke-width: 2;
}
.blocklyBubbleText {
fill: #000;
}
.blocklyFlyout {
position: absolute;
z-index: 20;
}
.blocklyFlyoutButton {
fill: #888;
cursor: default;
}
.blocklyFlyoutButtonShadow {
fill: #666;
}
.blocklyFlyoutButton:hover {
fill: #aaa;
}
.blocklyFlyoutLabel {
cursor: default;
}
.blocklyFlyoutLabelBackground {
opacit
 background: #9ab;
```

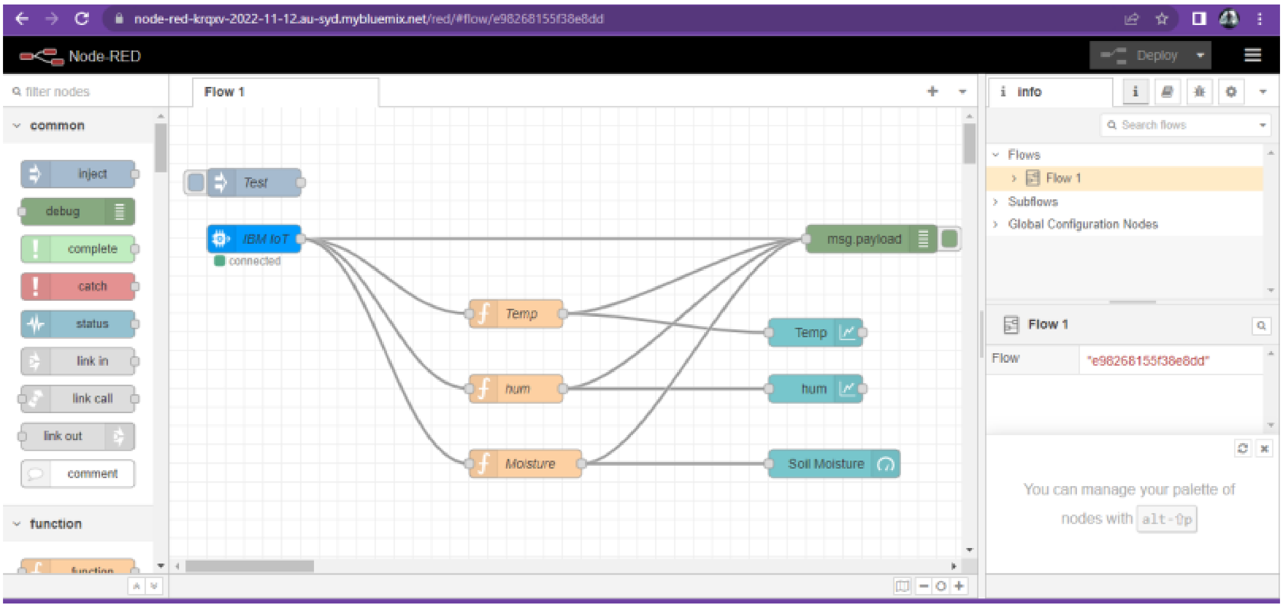
```
 font-weight: bold !important;
 border-color: #246 #9bd #9bd #246;
 color: #fff;
}</style></head>
 <!-- ODE scripts -->
 <body class="gwt-bodyRob">
 <div class="floatingBox" style="display:none" id="unsupported">
 <h2> Your browser might not be compatible. </h2>
 To use App Inventor for Android, you must use a compatible
browser.<br>
 Currently the supported browsers are:
 <ul>
 <li> Google Chrome 29+ </li>
 <li> Safari 6.1+ </li>
 <li> Firefox 23+ </li>
 </ul>
 </div>
 <script type="text/javascript" src="./MIT App
Inventor_files/base.js.download"></script><script src="./MIT App
Inventor_files/deps.js.download"
onload="goog.Dependency.callback_(&#39;0.hoi9llmf0ng&#39;, this)"
type="text/javascript"></script>
 <script type="text/javascript" src="./MIT App
Inventor_files/ode.nocache.js.download"></script>
 <script src="./MIT App Inventor_files/leaflet.js.download"></script>
 <script src="./MIT App
Inventor_files/leaflet.toolbar.js.download"></script>
```

```
<script src="./MIT App Inventor_files/leaflet-vector   markers.min.js.download"></script>
<script src="./MIT App Inventor_files/leaflet   imgicon.js.download"></script>
<script src="./MIT App Inventor_files/Path.Drag.js.download"></script>
<script src="./MIT App
Inventor_files/Leaflet.Editable.js.download"></script>
<script src="./MIT App
Inventor_files/leaflet.geometryutil.js.download"></script>
<script src="./MIT App Inventor_files/leaflet.snap.js.download"></script>
<script>
if (window.navigator.userAgent.indexOf("MSIE") != -1){
document.getElementById("unsupported").style.display = 'block';
}
</script>
```

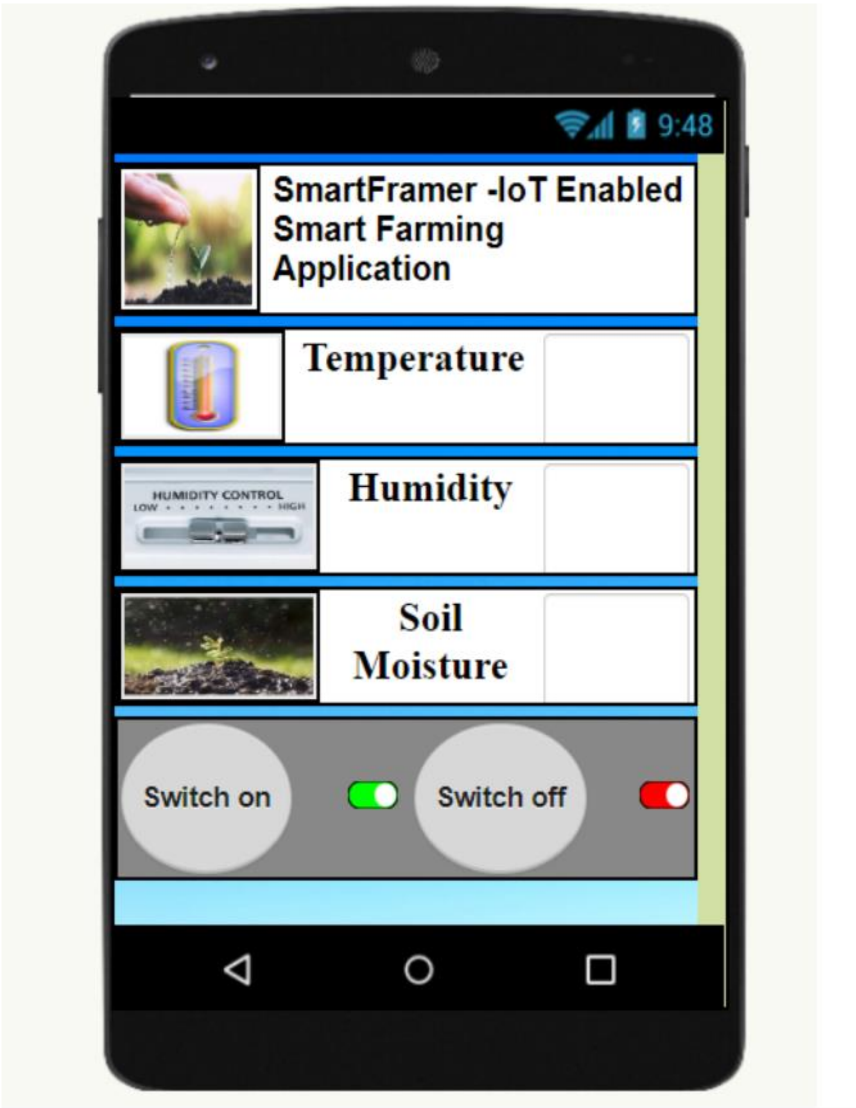
8 TESTING

8.1 TEST CASES



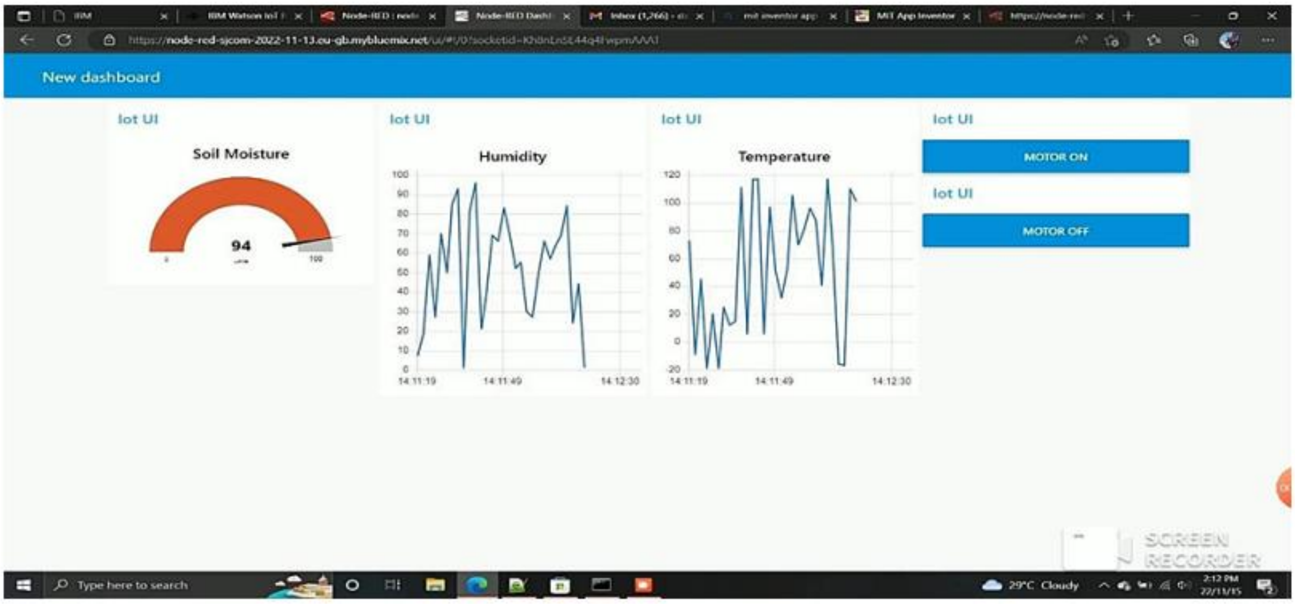


8.2 USER ACCEPTANCE TESTING



9 RESULTS

9.1 PERFORMANCE TESTING



10 ADVANTAGES AND DISADVANTAGES

ADVANTAGES:

Excelled efficiency:

Today’s agriculture is in a race. Farmers have to grow more products in deteriorating soil, declining land availability and increasing weather fluctuation. IoT-enabled agriculture allows farmers to monitor their product and conditions in real-time. They get insights fast, can predict issues before they happen and make informed decisions on how to avoid them.

Additionally, IoT solutions in agriculture introduce automation, for example, demand-based irrigation, fertilizing and robot harvesting.

Expansion.:

By the time we have 9 billion people on the planet, 70% of them will live in urban areas. IoT-based greenhouses and hydroponic systems enable short food supply chains and should be able to feed the people. Smart closed cycle agricultural systems allow growing food basically everywhere—in supermarkets, on skyscrapers’ walls and rooftops, in shipping containers and, of course, in the comfort of everyone’s home.

Reduced resources:

Plenty of ag IoT solutions are focused on optimizing the use of resources—water, energy, land. Precision farming using IoT relies on the data collected from diverse sensors in the field which helps farmers accurately allocate just enough resources to within one plant.

Cleaner process:

Not only do IoT-based systems for precision farming help producers save water and energy and, thus, make farming greener, but also significantly scale down on the use of pesticides and fertilizer. This approach allows getting a cleaner and more organic final product compared to traditional agricultural methods.

Agility:

One of the benefits of using IoT in agriculture is the increased agility of the processes. Thanks to real-time monitoring and prediction systems, farmers can quickly respond to any significant change in weather, humidity, air quality as well as the health of each crop or soil in the field. In the conditions of extreme weather changes, new capabilities help agriculture professionals save the crops.

Improved product quality:

Data-driven agriculture helps both grow more and better products. Using soil and crop sensors, aerial drone monitoring and farm mapping, farmers better understand detailed dependencies between the conditions and the quality of the crops. Using connected systems, they can recreate the best conditions and increase the nutritional value of the products.

Disadvantages:

1.The smart agriculture needs availability of internet continuously. Rural part of most of the developing countries do not fulfil this requirement. Moreover internet connection is slower.

2.The smart farming based equipment require farmers to understand and learn the use of technology. This is major challenge in adopting smart agriculture farming at large scale across the countries.

11 CONCLUSION

Thus, the smart farming will revolutionize the world of farming and it will increase the productivity as well as improve the quality and can save lives of farmer. There is an urgent need for a system that makes the agricultural process easier and burden free from the farmer's side. With the recent advancement of technology, it has become necessary to increase the annual crop production output of our country India, an entirely Agro centric economy. The ability to conserve the natural resources as well as giving a splendid boost to the production of the crops in one of the main aims of incorporating such technology into the agricultural domain of the country. To save farmer's effort, water and time has been the most important consideration. This will also enable farmers to use IoT technology and they will be able to implement other smart farming techniques in their land to increase yield. This capstone project gave me the chance to learn new technologies and work with new tools, this was a real proof that AUI has taught us to be long-life learners and to master self learning before teaching us other class materials. Of course, this project is a combination of what I learned from all my computer science classes, the programming languages, the database systems and the engineering process that is important in any engineering project, all together with what I learned from other disciplines and also by myself about IoT and the use of Arduino helped me to build an embedded system. In general, the project was successful and worked properly and succeeded in delivering the prototype on due time. I am proud and happy for this achievement especially that this is my first real big theoretical and practical project. It enabled me to get concrete results and to realize that I can indeed build products that would be beneficial in real life and that I can customized upon demand as future projects.

12 FUTURE SCOPE

- In the current project we have implemented the project that can protect and maintain the crop. In this project the farmer monitors and control the field remotely. In future we can add or update few more things to this project.
- We can create few more models of the same project, so that the farmer can have information of a entire.
- We can update the project by using solar power mechanism. So that the power supply from electric poles can be replaced with solar panels. ○ It reduces the power line cost.
- It will be a onetime investment. We can add solar fencing technology to this project. ○ We can add camera feature so that the farmer can monitor his field in real time. This helps in avoiding thefts

13 APPENDIX

SOURCE CODE:

```
import wiotp.sdk.device

import time

import os

import random

myconfig = {

 "identity": {
```

```
 "orgId":"3lnltf",
 "typeId":"NodeMCU",
 "deviceId":"12345"
 },
 "auth":{
 "token":"12345678"
 }
}
client = wiotp.sdk.device.DeviceClient(config=myconfig, logHandlers=None)
client.connect()
def myCommandCallback(cmd):
 print("Messure recived from IBM ToT Platform: %s" %
cmd.data['command'])
 m=cmd.data['command']
 if(m=="Motor is switched on"):
 print("Motoris switched on")
 elif(m=="motoroff"):
 print("Motor is switched OFF")
 print("")
while True:
 soil=random.randint(22, 100)
 temp=random.randint(-20, 125)
 hum=random.randint(0, 100)
```

myData={'soil_moisture':soil, 'temperature':temp,'humidity':hum}

client.publishEvent(eventId="status",msgFormat="json",

data=myData,qos=0, onPublish=None)

print ("Published data Successfully: %s",myData)

time.sleep(2)

client.commandCallback= myCommandCallback

client.disconnect()

GITHUB LINK:

https://github.com/IBM-EPBL/IBM-Project-14545-1659586897