IoT BASED SMART CROP PROTECTION SYSTEM FOR AGRICULTURE

Domain: IOT

A PROJECT REPORT

Submitted by

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CHAPTER 1

INTRODUCTION

1.1 PROJECT OVERVIEW

With increasing population across the world, food production and farming need to get increasingly productive and capable of high yields in limited time. The scope for manual experimentation, viability assessment through trial-and-error etc... are no longer feasible. According to the UN Food and Agriculture Organization, "the world will need to produce 70% more food in 2050 than it did in 2006". Low productivity of crops is one of the main problems faced by the farmers in our country. This can be because of two main reasons. Crops destroyed by wild animals and because of bad weather condition increase in temperature, humidity, soil moisture values. This paper provides a solution to the destruction of crops by animals. This system will provide a complete technical solution using the Internet of things (IOT) to the farmers to prevent their crops from wild animals and provide information to the farmers to maximize their production. It also helps the users to supervise the soil moisture content, temperature and humidity values near the cultivation field. And also provides control over periodic watering using application.

Thus, an IoT based crop protection system has been introduced to improve the standard of farming by preventing the cultivation field from varying climatic changes and haunting animals.

1.2 PURPOSE

The main purpose of this project is to increase food production and reduce the financial losses by implementing IoT technology into farming to make cultivation in a better and organized way.

Requirement of low man power and less time consumption. Reduced working hours and work load.

Financial losses may be due to the destruction of crops due to animal intrusion which is detected prevented using generation of an alarm.

CHAPTER 2
LITERATURE SURVEY

- Erastus Ogunti – IoT Based Crop Field Monitoring and Irrigation Automation System.

IoT based crop-field monitoring and automated irrigation system which also can be called Smart farming system can help to reduce wastage, by enabling the effective usage of fertilizer and soil water thereby increasing crop yield. In this work, a system is built to monitor crop-field using sensors (Temperature, Humidity and Soil moisture) and to automate the irrigation system. The data from sensors are sent to the Thing speak API database using wireless transmission. The data can be visualized on the designed Web page where the readings from the sensors can be viewed. The data are encoded in JavaScript Object Notation (JSON) format. The irrigation is automated in that irrigation is only enabled when the soil moisture of the field falls below the threshold for optimal crop growth. The notifications are sent periodically to the web page dashboard as well as the mobile app developed for farmers. The farmer can monitor the field conditions anywhere, anytime.

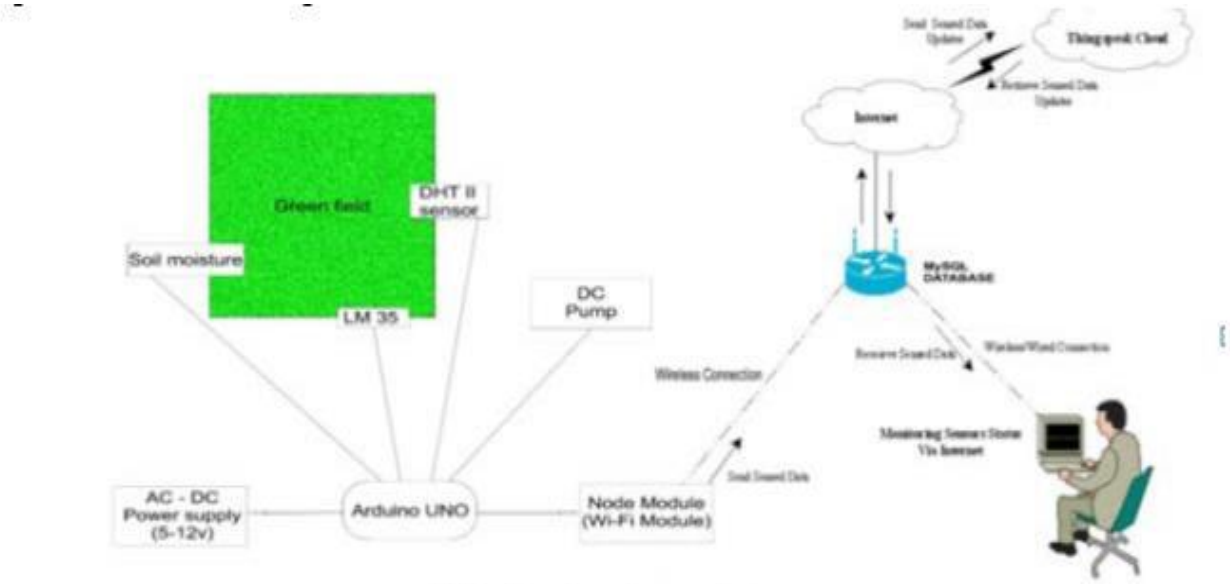


Fig 1. Overview of system design

- Chandana R Laksiri, Mohamed Shafras, Supun Rathnayake, Dhanushika Ranasinghe –

IoT Based Smart Irrigation System for Sri Lankan Agriculture.

The Sri Lankan agriculture sector is comparatively underdeveloped in using technological inputs for farming activities. Therefore, there is an urgent need for efficient agricultural inputs that are effective for farmers. It is hoped to develop this IoT (Internet of Things) based prototype irrigation system to meet the current agricultural needs. This project will develop a prototype of a low-cost IoT based smart irrigation system. Here, an efficient drip irrigation system is developed that can automatically control the water supply to plants based on soil moisture levels in the field. This smart irrigation system has IoT-based communication capabilities to remotely monitor field parameters such as soil moisture levels, temperature and humidity, and control the water supply by the remote user in automatic or manual operation mode. Furthermore, the project incorporates temperature humidity sensors, soil moistures sensors, and rain sensor system that allows the remote user to monitor these parameters over the internet and control the water supply in two separate fields based on them. These parameters obtained from the field are stored in real-time in a remote database. To monitor the extent of factors such as temperature and humidity that cause disease outbreaks in the field through the proposed Smart Irrigation Scheme and

It will provide an efficient, effective and convenient method of supplying water to farmers' crops.

- Galleria Gerace, Fabio Vignoli Natech Sri, Via Algero Rosi - **IoT Solutions for Crop Protection against Wild Animal Attacks.**

Technology plays a central role in our everyday life. There has been a surge in the demand of Internet of Things (IoT) in many sectors, which has drawn significant research attention from both the academia and the industry. In the agriculture sector alone, the deployment of IoT has led to smart farming, precision agriculture, just to mention a few. This paper presents the development of Internet of Things application for crop protection to prevent animal intrusions in the crop field. A repelling and a monitoring system is provided to prevent potential damages in Agriculture, both from wild animal attacks and weather Conditions.

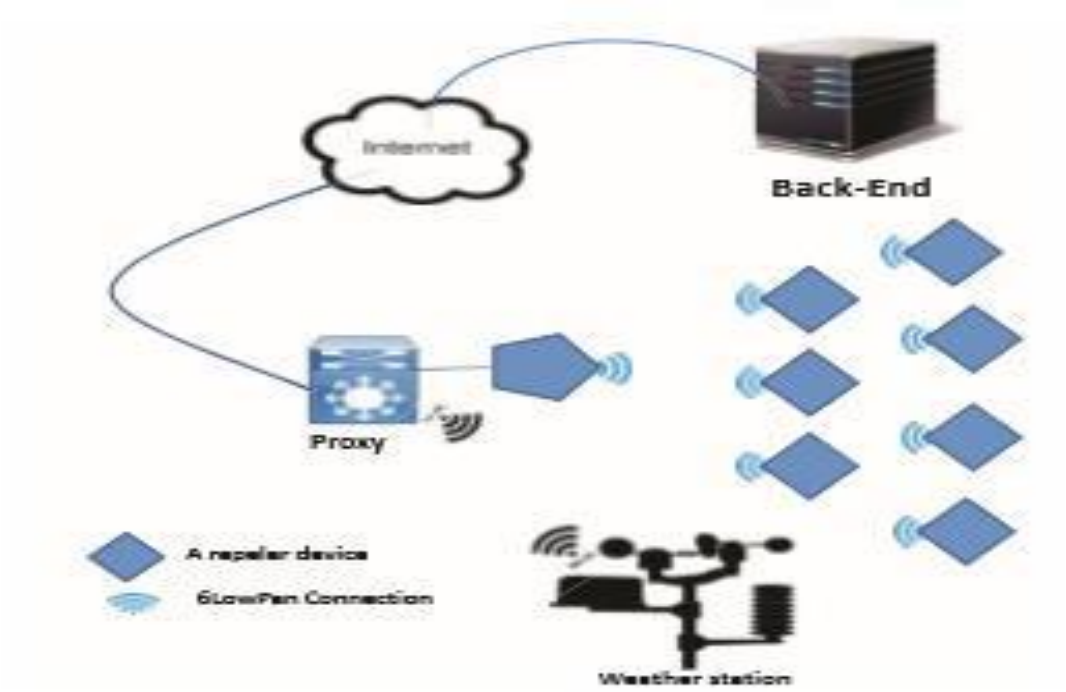


Fig. 5: Network Deployment Architecture

- Ipseeta Nanda, Sahithi Chadalavada, Medepalli Swathi, Lizina Khatua - **Implementation of IIoT based smart crop protection and irrigation system.**

A centralizing method in the area of IIoT (Industrial Internet of Things) contrived for understanding agriculture which is preceding the arrangements low-power devices. This paper yields a monitoring procedure for farm safety against animal attacks and climate change conditions. IoT advances are frequently used in smart farming to emphasize the standard of agriculture. It contains types of sensors, controllers. On behalf of WSN, the ARM Cortex-A board which consumes 3W is the foremost essence of the procedure. Different sensors like DHT 11 Humidity & Temperature Sensor, PIR Sensor, LDR sensor, HC-SR04 Ultrasonic Sensor, and camera are mounted on the ARM Cortex-A board. The PIR goes high on noticing the movement within the scope, the camera starts to record, and the data will be reserved onboard and in the IoT cloud, instantaneously information will be generated automatically towards the recorded quantity using a SIM900A unit to notify about the interference with the information of the weather conditions attained by DHt11. If a variance happens, the announcement of the threshold rate will be sent to the cell number or to the website.

The result will be generated on a catalog of the mobile of the person to take the necessary action.

- N S Gogul Dev, K S Sreenesh, P K Binu **- IoT Based Automated Crop Protection System.**

Low productivity of crops is one of the main problems faced by the farmers in our country. This can be because of two main reasons. Crops destroyed by wild animals and because of bad weather condition. This paper provides a solution to the destruction of crops by animals. This system will provide a complete technical solution using the Internet of things (IOT) to the farmers to prevent their crops from wild animals and provide information to the farmers to maximize their production. Animals are detected using PIR sensors and cameras where animals are identified using Sensor Flow image processing Techniques. Raspberry PI is used as the processing unit of the system and sound buzzers are used to emit the ultrasound frequencies.

2.2 REFERENCES:

S.NO	TITLE	AUTHOR	YEAR	TECHNOLOGY	MERITS	DEMERITS
1.	Smart crop production system using passive infrared sensor	artur tran kiewick, rafulcupek	2013	passive infrared sensor	Detects Motion reliably in indoors as wells in day or dark.	Insensitive to very slow motion of The object
2.	ICT irrigation technology for agriculture	Prof.K. A. Patil& prof.N. R.Kale	2013	ICT irrigation technology	Communication has become quicker and more efficient.	Risk of cyberattacks and hacks.
3.	Smart crop protection system from living object And FIRE using ARDUINO.	Dr.m.chandra& Mohan Reddy	2020	Arduino Uno based system using microcontroller	•It is easy to operate and use.	It cannot be protected Against harsh, dirty Or electrically Noisy environment.
4.	Automated crop field surveillance using computer vision.	Tejas Khare	2017	Crop field surveillance using computer vision.	In this system the long range camera are placed at the corner of field or land with considering maximum Field of view of camera	But this System doesn't work in different circumstance in the night or dark

5.	Smart Agro Using Arduinoand GSM	P Rekha, T. Saranya,	2017	Agro using Arduino	There is no need of manual power to controlling the water pump	It cost is very high
6.	Sensor Based Crop Protection System with IoT monitored Automatic Irrigation	Damini Kalra, Praveen Kumar	2020	Using moisture sensor and Arduino	It automatically water theplants	It may sauses tewater loss.
7.	Smart irrigation &crop protection from wild animals.	Sohaib Pavithra Bhargavi Madhuri	2020	IR sensor and microcontroller	Reduces financial losses.	Wastageof electrical power.
8.	Smart crop protection system from wild animals Birds using IOT.	Sumana Sanjana Sharanya Harish	2011	Microcontrollerer based system	Reduce human power.	It is expensive.

2.3 PROBLEM STATEMENT DEFINITION:

Problem Statement:

- The device will detect the animals and birds using the Clarifai service.
- If any animal or bird is detected the image will be captured and stored in the IBM Cloud object storage.
- It also generates an alarm and avoid animals from destroying the crop.
- The image URL will be stored in the IBM Cloudant DB service.
- The device will also monitor the soil moisture levels, temperature, and humidity values and send them to the IBM IoT Platform.
- The image will be retrieved from Object storage and displayed in the web application.
- A web application is developed to visualize the soil moisture, temperature, and humidity values.
- Users can also control the motors through web application.

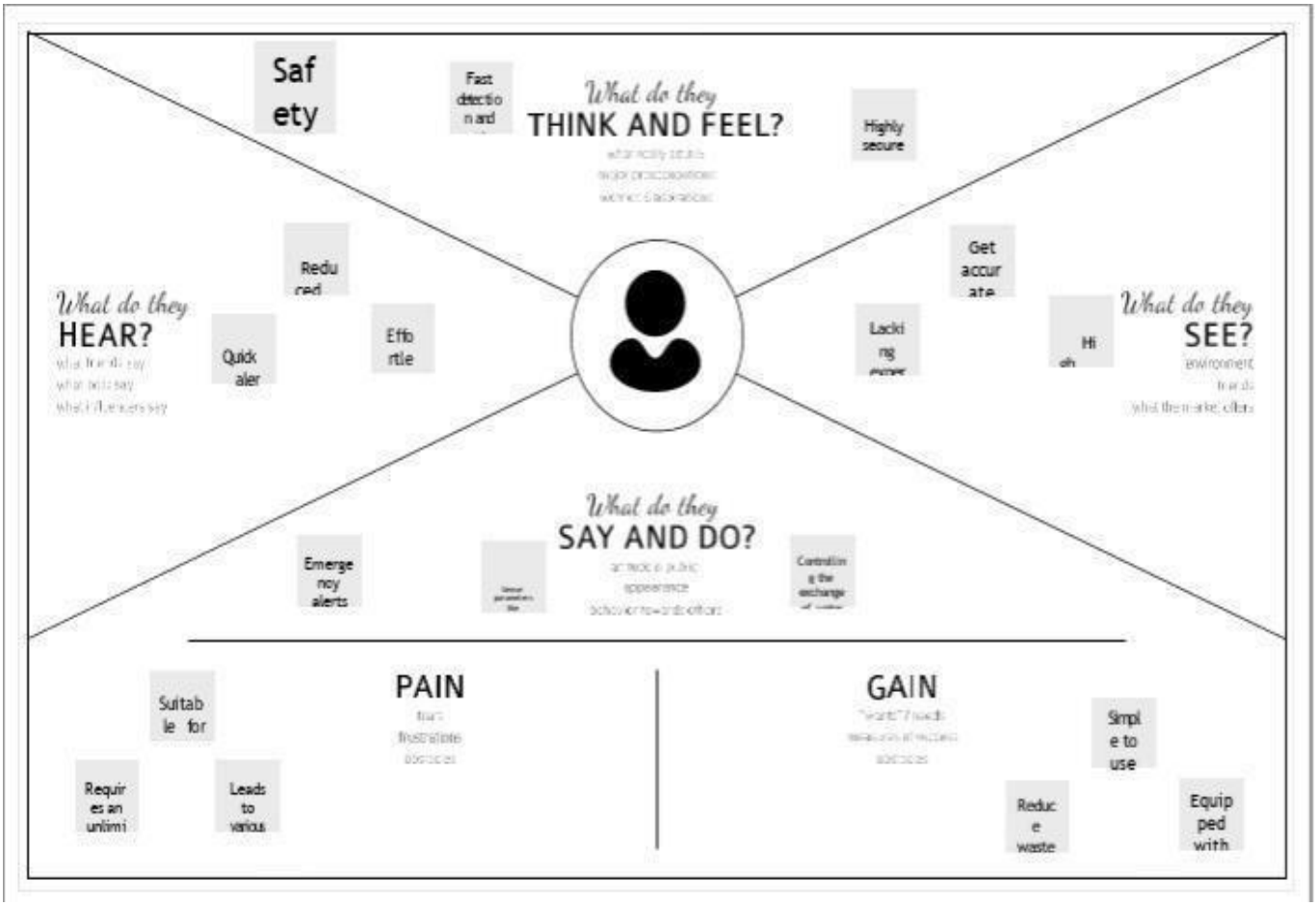
CHAPTER 3

IDEATION PHASE

3.1 Empathy Map Canvas

An **empathy map** is a collaborative visualization used to articulate what we know about a particular type of user. It externalizes knowledge about users in order to

1) create a shared understanding of user needs, and
2) Aid in decision making.



Explanation:

What do they think and feel?

- Higher crop yield.
- safety.
- Highly source.

What do they see?

- Emergency alerts.
- Occur ate.

What do they say and do?

- Production to the various types' crops.
- Growth of Farmer.
- Focus the corruption of Water.

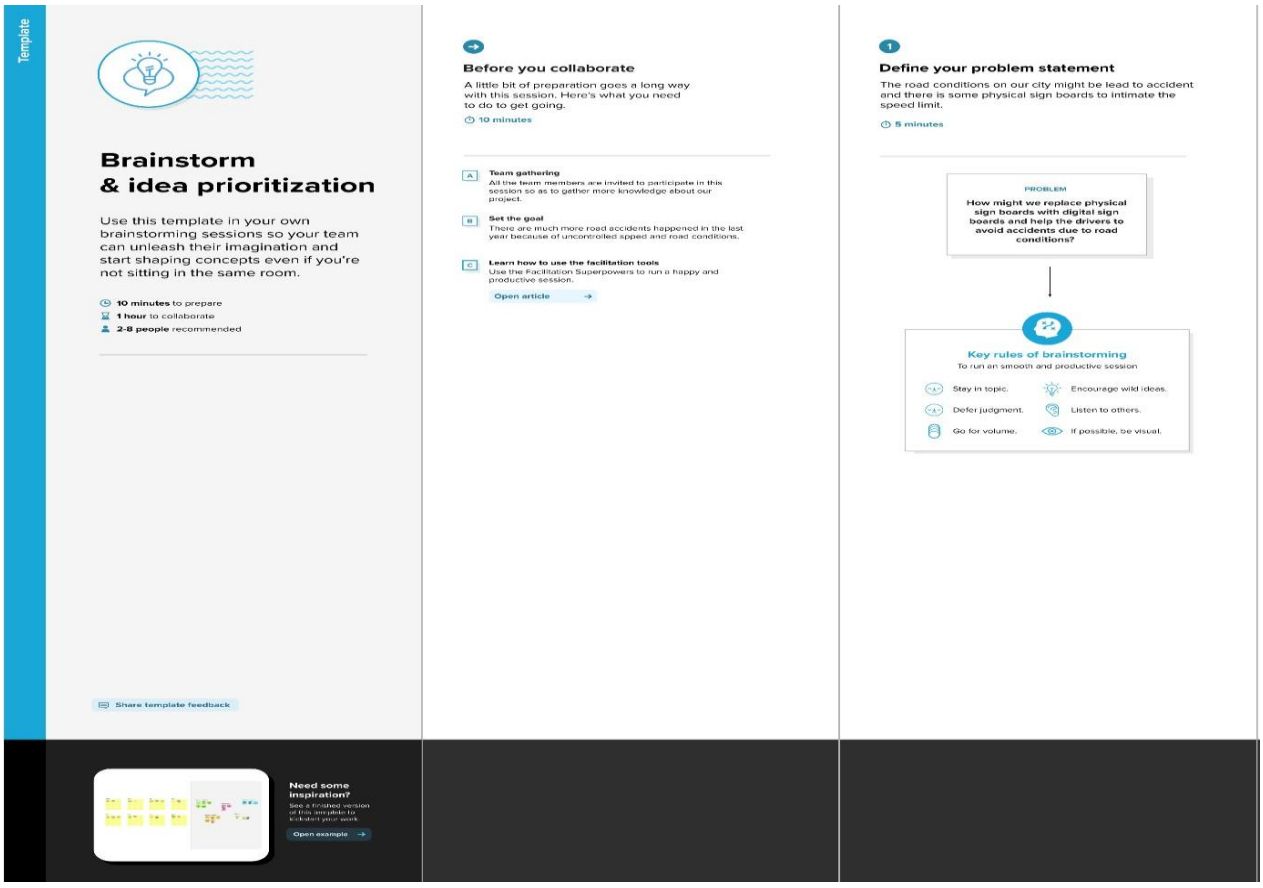
What do they hear?

- Simple to be use
- Reduced to the Water.
- Equipped with the crops**.**

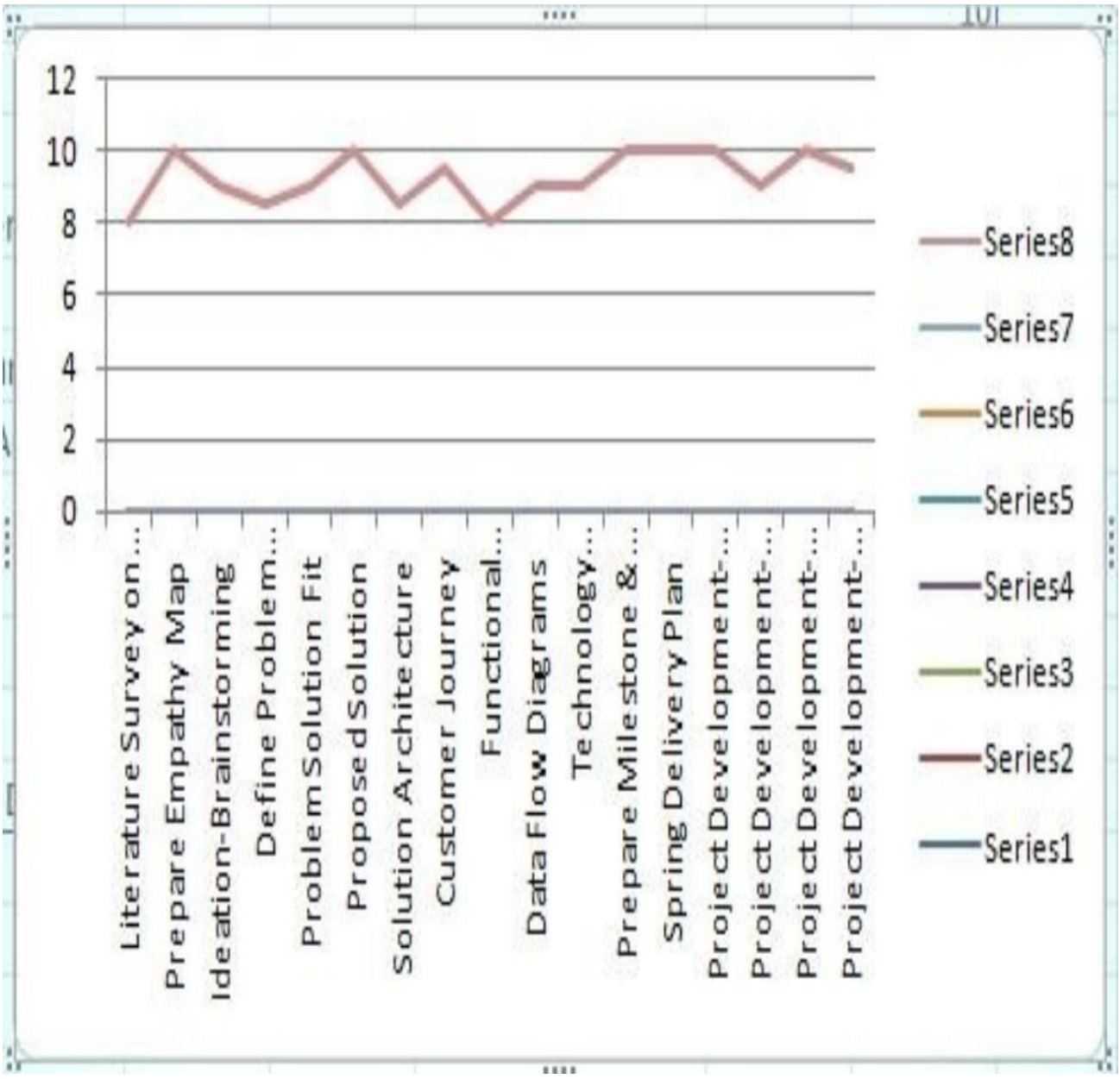
3.2 Ideation and Brainstorming:

A centralizing method in the area of IIoT (Industrial Internet of Things) contrived for understanding agriculture which is preceding the arrangements low power devices. This project yields a monitoring procedure for farm safety against animal attacks and climate change conditions. IIoT advances are frequently used in smart farming to emphasize the standard of agriculture. It contains types of sensors, controllers. On behalf of WSN, the PIC microcontroller board which consumes 3W is the foremost essence of the procedure. Different sensors like DHT 11 Humidity & Temperature Sensor, PIR Sensor, LDR sensor, Ultrasonic Sensor, and camera are mounted on the PIC microcontroller board. The PIR goes high on noticing the movement within the scope, the camera starts to record, and the data will be reserved onboard and in the IIoT cloud, instantaneously information will be generated automatically towards the recorded quantity using a SIM900A unit to notify about the interference with the information of the weather conditions attained by D Ht11. If a variance happens, the announcement of the threshold rate will be sent to the cell number or to the website. The result will be generated on a catalog of the mobile of the person to take the necessary action.

Step-1: Team Gathering, Collaboration and Select the Problem Statement

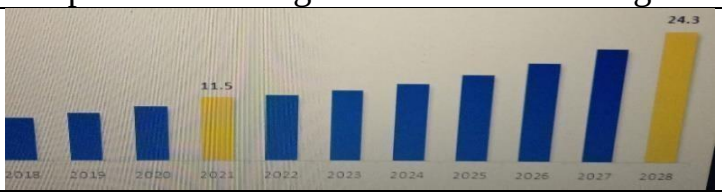


Step-2: Brainstorm, Idea Listing and Grouping

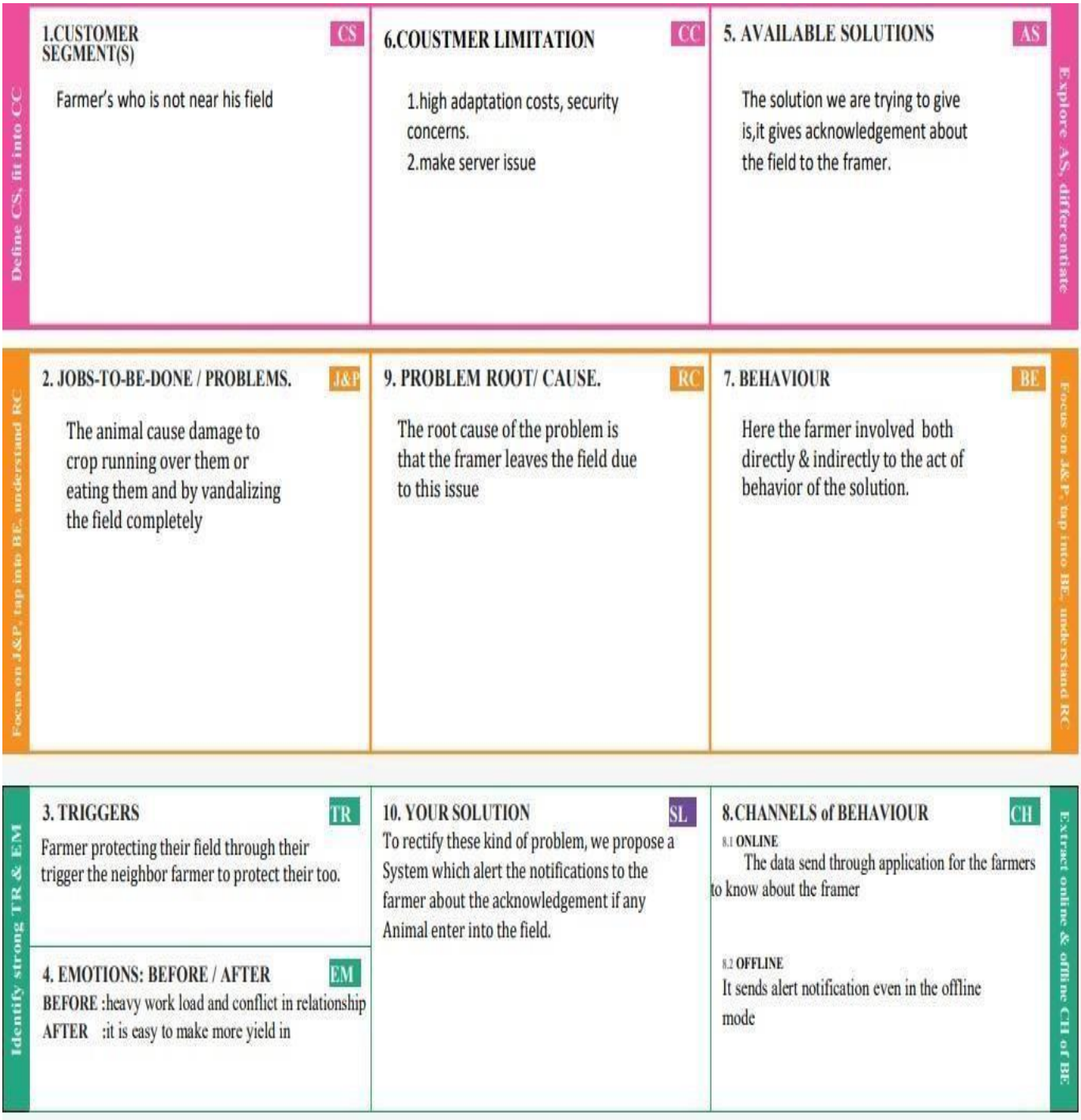


Step-3: Idea Prioritization

3.3 Proposed Solution:

S.NO	Parameter	Description
1.	Problem Statement (Problem to be solved)	Usually crops in the fields are protected against birds and other unknown disturbances by humans. This take an enormous amount of time. Creating a smart automatic system will benefit the farmers inmany different ways.
2.	Idea / Solution description.	Smart Farming has enabled farmers to reducewaste and enhance productivity with the help of sensors (light, humidity, temperature, soil moisturizes.) Further with the help of these sensors, farmers can monitor the field conditions from anywhere.
3.	Novelty / Uniqueness	Role of Sensors: IOT smart agriculture products are designed to help monitor crop fields using sensors and by automating irrigation systems. As a result, farmers and associated brands can easily monitor the field conditions from anywhere without any hassle.
4.	Social Impact / Customer Satisfaction	Water conservation. Saves lot of time. Increased quality of production. Real time data and production insight. Remote monitoring.
5.	Business Model (Revenue Model)	
6.	Scalability of theSolution	Scalability in smart farming refers to the adaptability of a system to increase the capacity, the number of technology device essuch as sensors and fluctuates.

3.4 Problem Solution Fit:



CHAPTER 4

REQUIREMENT ANALYSIS

4.1 FUNCTIONAL REQUIREMENTS

Functional requirements may involve calculations, technical details, data manipulation and processing, and other specific functionality that define what a system is supposed to accomplish. Behavioral requirements describe all the cases where the system uses the functional requirements, these are captured in use cases.

Following are the functional requirements of the proposed solution.

FR No	FUNCTIONAL REQUIREMENTS	DESCRIPITION
FR-1	**PIC Microcontroller**	It is the board in which the sensors are goingto integrate.
FR-2	**1.DHT 22** **2.PIR Sensor**	To sense the Temperature and humidity of the land. To detect the motion of animals
FR-3	**Ultrasonic sensor**	To detect the variety of vehicle.
FR-4	**GSM modem**	GSM is being used for sending data to the user.
FR-5	**IBM Cloud Storage**	To store the information Gathered by the sensors.
FR-5	**MIT APP Inventor**	To connect the cloud storage and UsersDevice.

4.2 NON- FUNCTIONAL REQUIREMENTS

Functional Requirements are the constraints or the requirements imposed on the Non system. They specify the quality attribute of the software. Non-Functional Requirements deal with issues like scalability, maintainability, performance, portability, security, reliability, and many more.

Following are the non-functional requirements of the proposed solution

FR No.	**Non-Functional Requirements**	**Description**
NFR-1	**Usability**	To help calculate a temperature and humidity of the land and it can be used to detect the motion of the animals.
NFR-2	**Reliability**	It is reliable since all the sensors will sense the same thing and intimate the messages.
NFR-3	**Performance**	Using this device, to increase efficiency for farmers and provide better predictability
NFR-4	**Availability**	The user can get this device and it will help the user in a great manner.
NFR-5	**Scalability**	The agriculture land can be enhanced to a greater level since it has ability to sense the temperature, humidity and animal detection**.**

CHAPTER 5

PROJECT DESIGN

5.1 DATA FLOW DIAGRAM

A Data Flow Diagram (DFD) is a traditional visual representation of the information flows within a system. A neat and clear DFD can depict the right amount of the system requirement graphically. It shows how data enters and leaves the system, what changes the information, and where data is stored.

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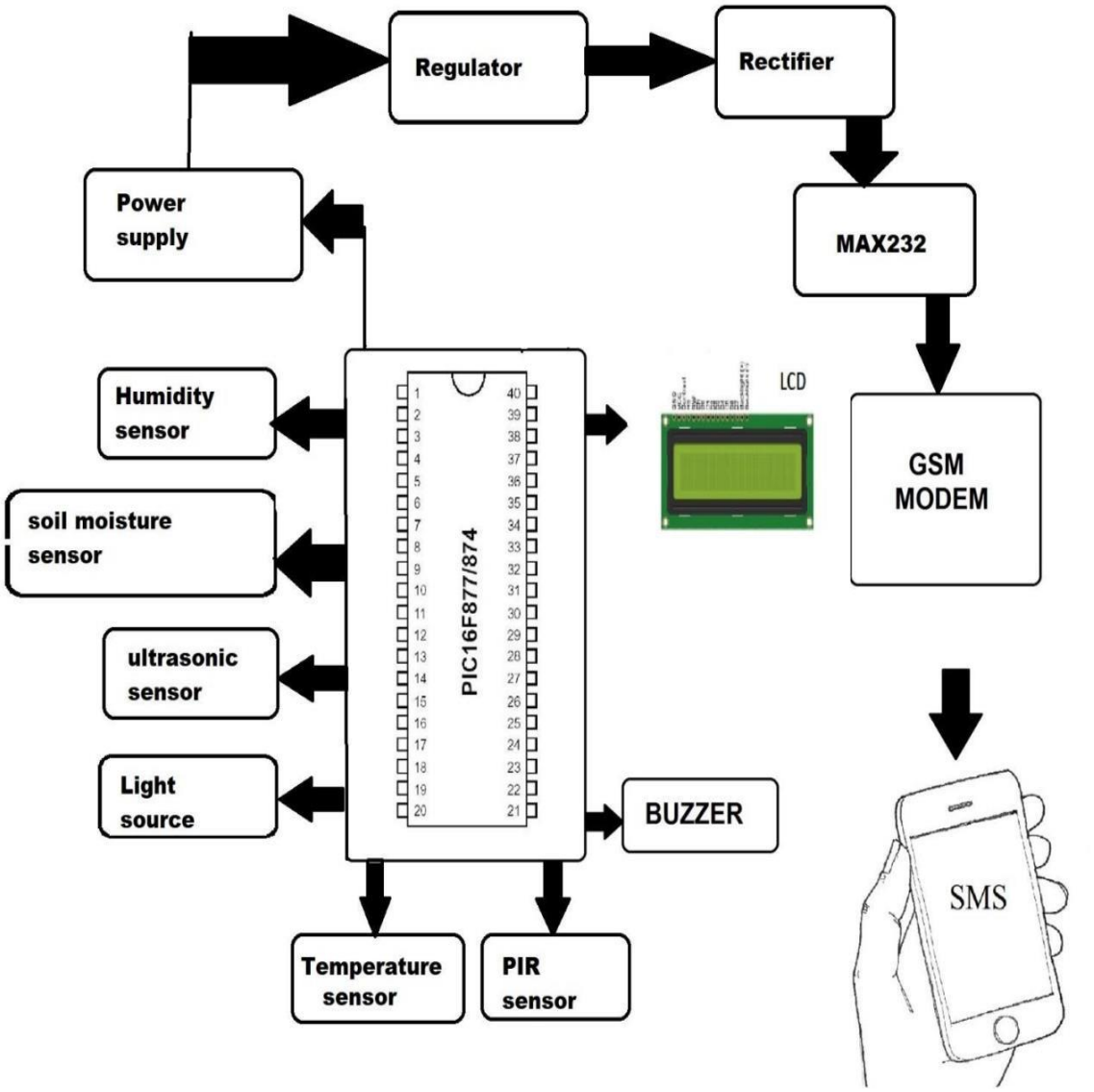


5.2 SOLUTION AND TECHNICAL ARCHITECTURE:

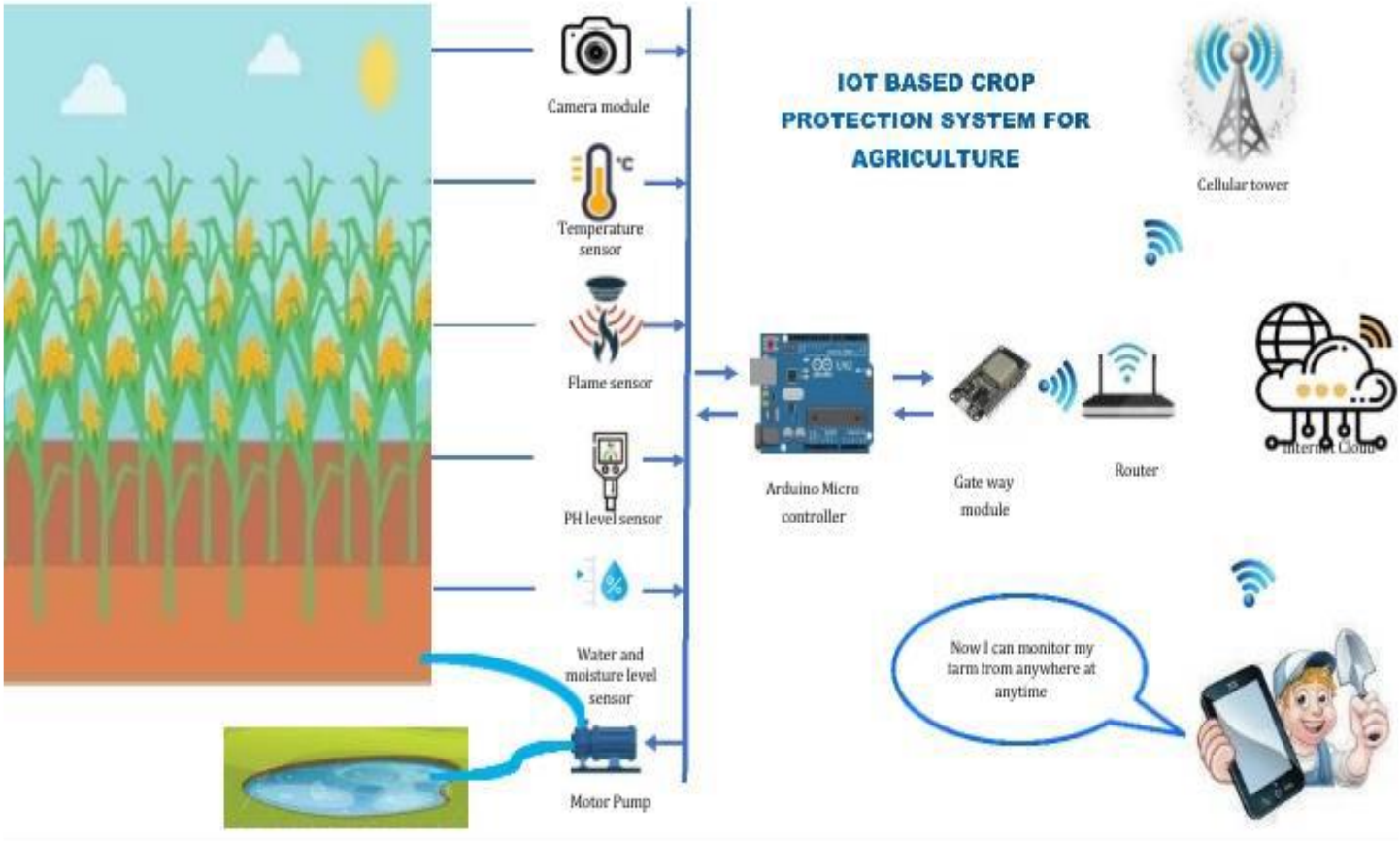
5.2.1 SOLUTION ARCHITECTURE:

Solution architecture is a complex process – with many sub-processes – that bridges the gap between business problems and technology solutions. Its goals are to: • Find the best tech solution to solve existing business problems.

• Describe the structure, characteristics, behavior, and other aspects of the software to project stakeholders.

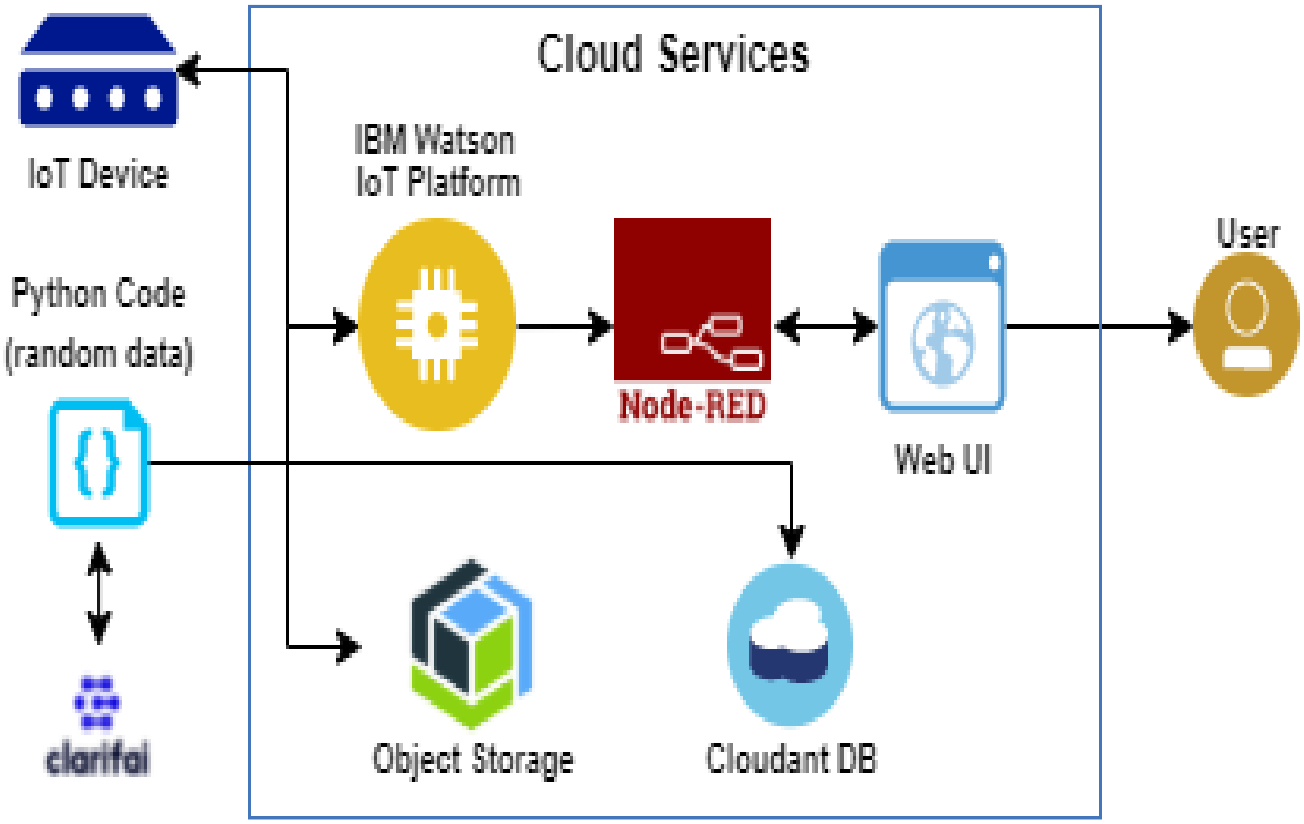
• Define features, development phases, and solution requirements.

• Provide specifications according to which the solution is defined, managed, and delivered.



5.2.2 TECHNICAL ARCHITECTURE:

Technology architecture deals with the deployment of application components on technology components. A standard set of predefined technology components is provided in order to represent servers, network, workstations, and so on.



5.3 USER STORIES:

UserType	Functional requirement (Epic)	User Story numberr	User Story/Task	Acceptance criteria	Priority	Release
Customer (Mobile user)	**Registration**	**USN - 1**	User can enter into theweb application	I can access my account/ dashboard	**High**	**Sprint 1**
		USN-2	User can register their credentials like email id and password	I can receive confirm email & click confirm	**High**	**Sprint 1**
	Login	**USN-3**	User can log into the application by entering email & password	I can login to my account	**High**	**Sprint 1**
	Dashboard	**USN-4**	User can view the temperature	I can view the data given by the device	**High**	**Sprint 2**
		USN-5	User can view the level of sensor monitoring value	I can view the data given bythe device	**High**	**Sprint 2**

Customer (Web user)	Usage	USN-1	User can view the web page and get the information	I can view the data given bythe device	High	Sprint3
Customer	Working	USN-1	User a ct According to the alert given by the device	I can get thedata work according to it	High	Sprint3
		USN-2	User turns ON Buzzer/Sound Alarm when the disturbance will occur on field.	I can getthe data work according to it		Sprint4
Customer care Executive	Action	USN-1	User solve the problem when some faces any usage issues	I can solve the issues when some one fails to understa nd the procedu res	High	Sprint4
Administ ration	Administ ration	USN-1	User storeevery information	I can store the gained informatio n	High	Sprint4

CHAPTER 6

PROJECT PLANNING AND SCHEDULING

6.1 SPRINT PLANNING AND ESTIMATION

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Registration	USN-1	As a user, I can register for the application by entering my email, password, and confirming my password	2	High	M.Sathya
Sprint-1	login	USN-1	As a user enter the username and password which is already existing.	2	High	M.Sathya
Sprint-2	Forecasting the weather	USN-2	As a user, we can monitor he weather conditions like humidity temperature etc...	2	High	N.Selvambikai
Sprint-2	Sensing moisture condition of the soil	USN-2	As a user, we can know about soil moisture condition. controlling the motor pump for waterflow.	2	High	S.Divya
Sprint-3	Detectin g the motion in certain range	USN-3	Fencing system are helpful in providing security against animals and birds.	2	High	A.Afhran nisha
Sprint-3	coding	USN-3	Fencing system are helpful in providing security against animals and birds.	2	High	N.Selvambikai

Sprint-4	Checking the crops conditions.	USN-4	Here farmer needs to update the condition of crops.	2	High	P.Sharumathi

6.2 SPRINT DELIVERY SCHEDULE:

Sprint	**Total Story Points**	**Duration**	**Sprint Start Date**	**Sprint End Date (Planne)**	**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	12 NOV 2022
Sprint-3	20	6 Days	07 Nov 2022	12 Nov 2022	20	19 Nov 2022
Sprint-4	20	6 Days	14 Nov 2022	19 Nov 2022	20	20 Nov 2022

Velocity:

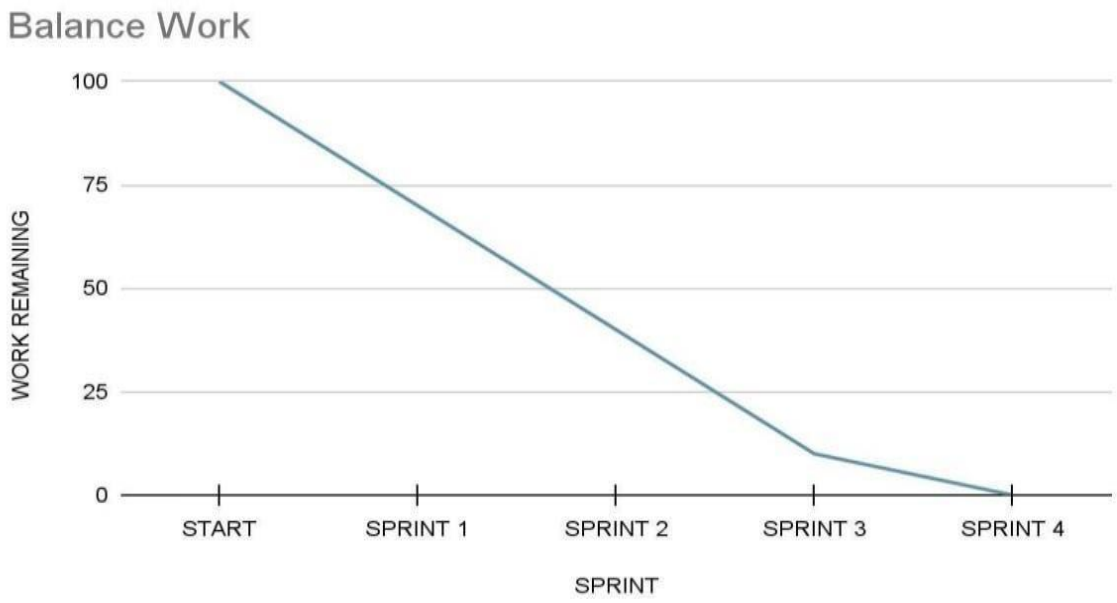
Imagine we have a 10-day sprint duration, and the velocity of the team is 20 (points per sprint). Let's calculate the team's average velocity (AV) per iteration unit (story points per day)

$$AV = \frac{sprint\ duration}{velocity} = \frac{20}{10} = 2$$

Burndown Chart:

A burn down chart is a graphical representation of work left to do versus time. It is often used in agile software development methodologies such as Scrum. However, burn down charts can be applied to any project containing measurable progress over time.

Burndown Chart:

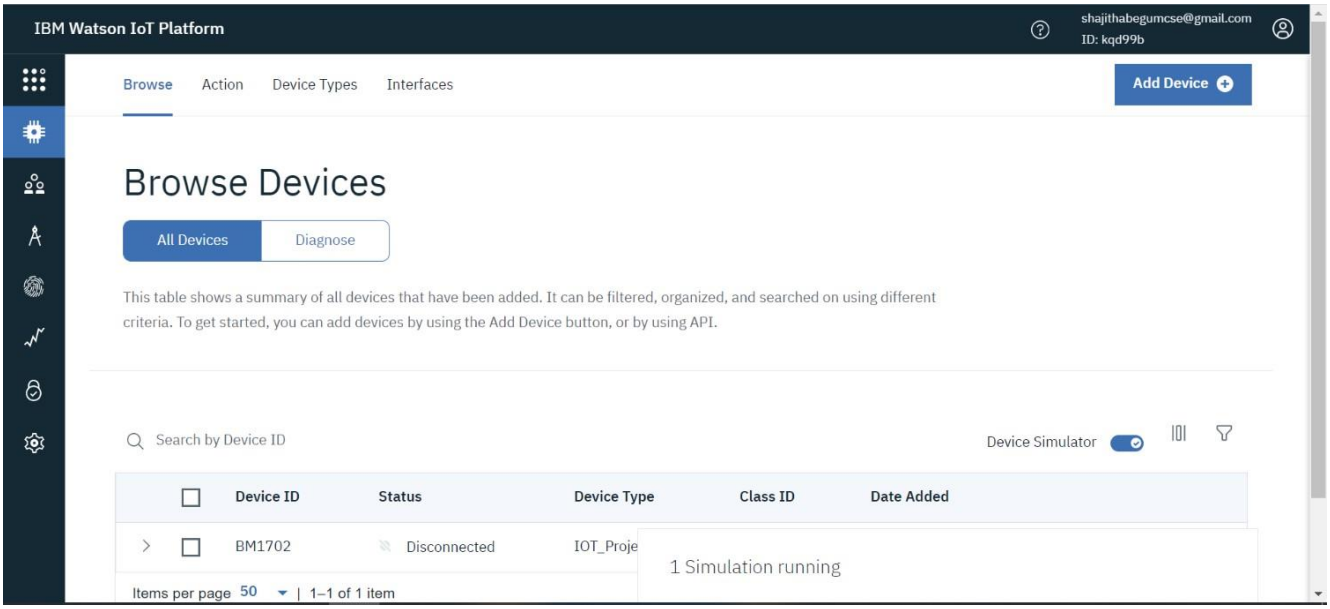


CHAPTER 7

CODING AND SOLUTIONING

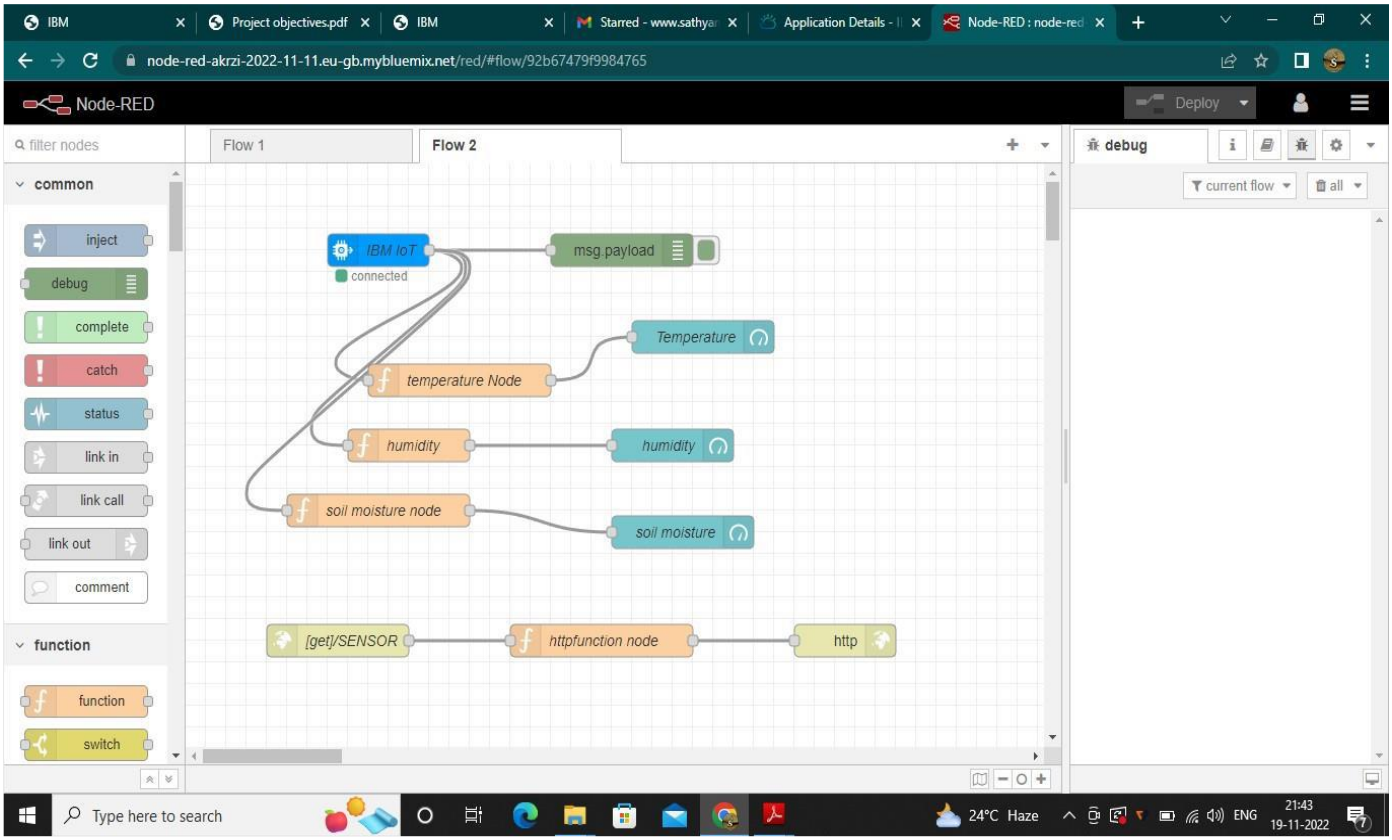
7.1 FEATURE 1

7.1.1 Creating IBM Watson device and getting simulation:

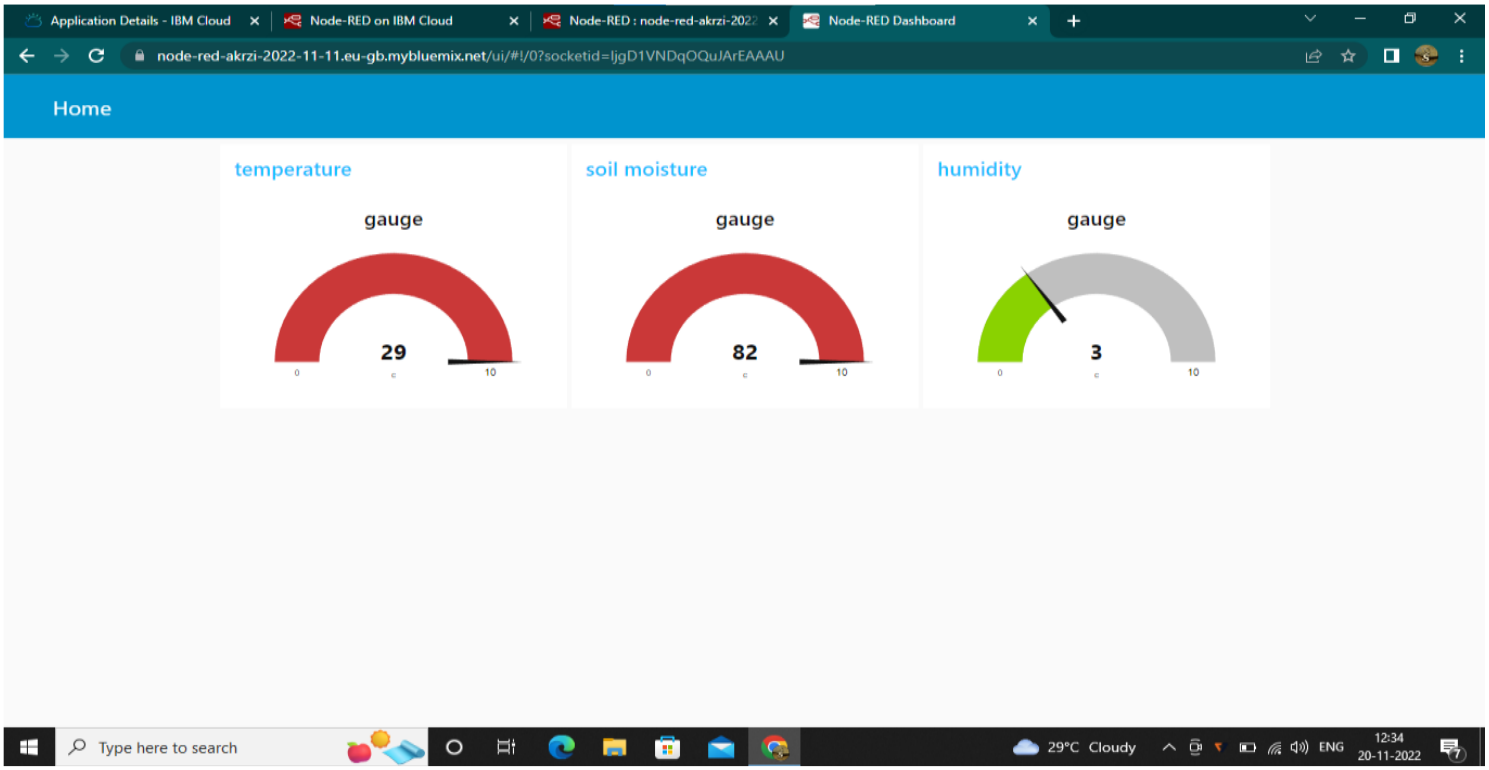


The IBM Watson Device is created and it was coded with JSON language to get the simulation.

7.1.2 Creating NODE-RED Service that displays the simulation:

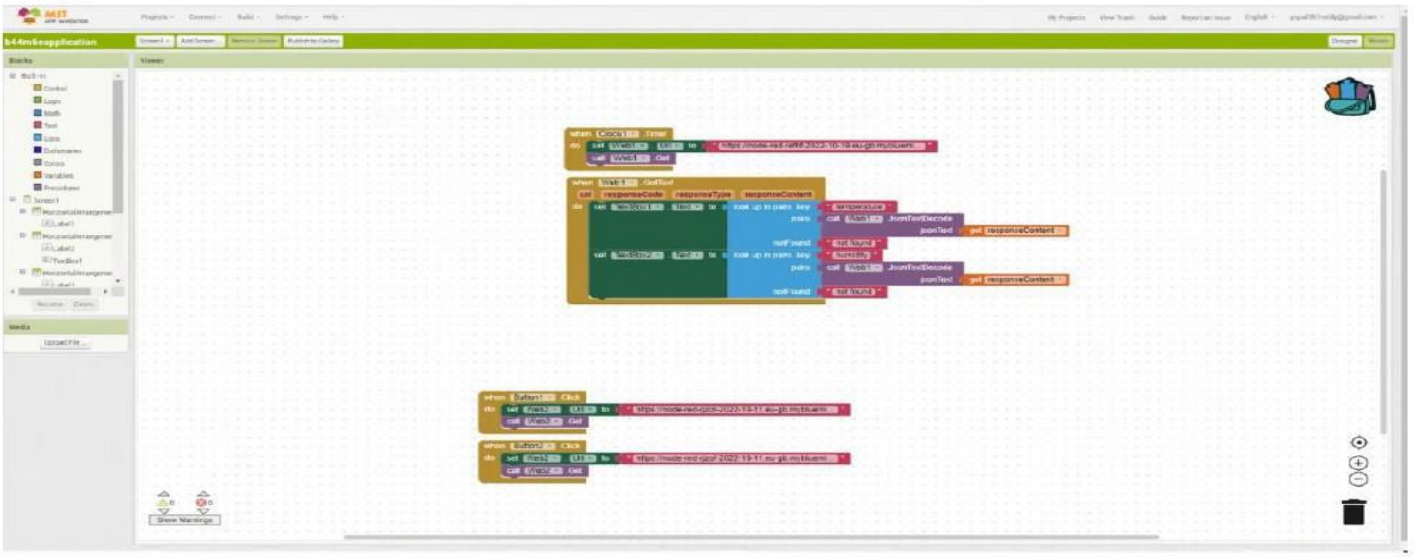


7.1.3 Web UI design:



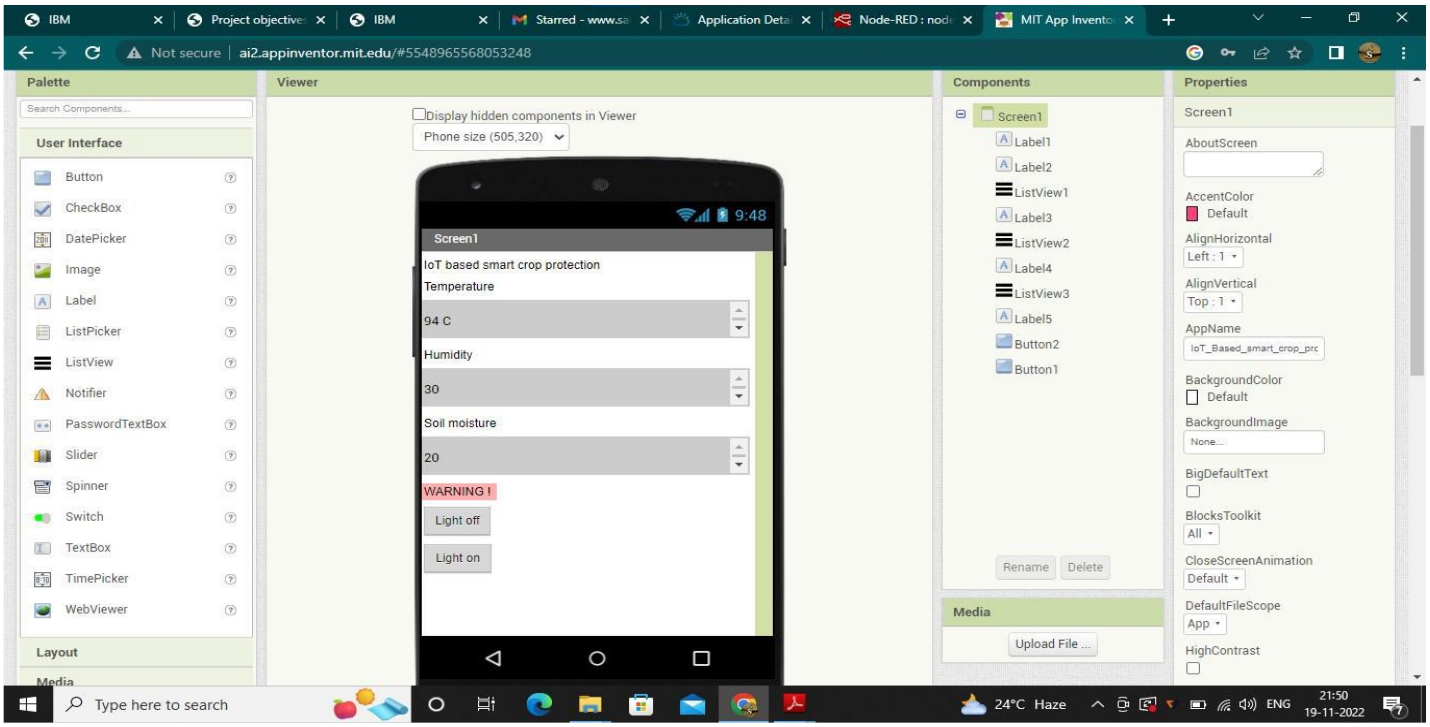
7.2 FEATURE 2

7.2.1 MIT App Inventor Backend



The MIT App inventor is used to connect the NODE-RED Output to the user's device. A link from the NODE-RED has to be generated to make use of MIT App Inventor. The designed front-end will be displayed on the User's device itself.

7.2.2 MIT App Inventor Frontend



CHAPTER 8
TESTING

8.1 TEST CASES:

Test case ID	Feature Type	Component	Test Scenario	Pre-Requisite	Steps To Execute	Test Data	Expected Result	Actual Result	Status	Commnets	TC for Automation(Y/N)	BUG ID	Executed By
LoginPage_TC_OO1	Functional	Home Page	Verify user is able to see the temperature and humidity informtion in their mobile device	Necessary information is should displayed	1.User verifies the device in the car 2.Click on the required and necessary information 3.Verify popup information is displayed or not	IOT DEVICE	Working as expected	pop up notification is displayed	Pass	Easy to access	Y		Tester_testerid001
LoginPage_TC_OO2	UI	Home Page	Verify the UI elements in the device	Temperature,Message ,Diversion,Speed warning ,Visibility information should displayed	1.User verifies the device in the car 2.Click on the required and necessary information 3. Verify popup information is displayed with UI elements a. Temperature notification b. Message notification c.Diversion notification d.Speed warning notification e.Visibility notification	IOT DEVICE	Working as expected	Application should show following UI elements a.Temperature is displayed b.Humidity is displayed c.Diversion is displayed d.Speed warning is displayed e.visible	Pass	Every notification displayed	Y		Tester_testerid001
LoginPage_TC_OO3	Functional	Home page	Verify , user is able to connect into device with Valid credentials	Temperature,Message ,Diversion,Speed warning ,Visibility information should displayed	1.User verifies the device in the car 2.Click on the required and necessary information 3.Verifiy popup information is displayed or not 4.Temperature information is displayed 5.Message information is displayed 6.Diversion notification is displayed 7.Speed warning notification is displayed 8.Visibility notification is displayed	Temperature -36 Humidity-20 Diversion-Take diversion Speed warning-limit speed Visibility-Visible	a.Temperature is displayed b.Humidity is displayed c.Diversion is displayed d.Speed warning is displayed e.visible	Working as expected	Pass	Every notification displayed	Y		Tester_testerid001
LoginPage_TC_OO4	Functional	Home page	Verify, user is able toconnect into device with InValid credentials	Temperature,Message ,Diversion,Speed warning ,Visibility information should displayed	1.User verifies the device in the car 2.Click on the required and necessary information 3. Verify popup information is displayed or not 4. Temperature information is not displayed 5. Message information is displayed 6. Diversion notification is displayed 7. Speed warning notification is displayed 8. Visibility notification is displayed	Temperature -error Humidity-20 Diversion-Take diversion Speed warning-limit speed Visibility-visible	a.Temperature is not displayed b.Humidity is displayed c.Diversion is displayed d.Speed warning is displayed e.visible	Working as not expected	Fail	Tempeature information is not displayed	N	BUG 1234	Tester_testerid001
LoginPage_TC_OO5	Functional	Home page	Verify, user is able toconnect into device with InValid credentials	Temperature,Message ,Diversion,Speed warning ,Visibility information should displayed	1.User verifies the device in the car 2.Click on the required and necessary information 3.Verifiy popup information is displayed or not 4.Temperature information is displayed 5. Message information is not displayed 6. Diversion notification is displayed 7.Speed warning notification is displayed 8.Visibility notification is displayed	Temperature -36 Humidity-error Diversion-Take diversion Speed warning-limit speed Visibility-visible	a.Temperature is displayed b.Humidity is not displayed c.Diversion is displayed d.Speed warning is displayed e.visible	Working as not expected	Fail	Humidity information is not displayed	N	BUG 1234	Tester_testerid001
LoginPage_TC_OO6	Functional	Home page	Verify, user is able toconnect into device with InValid credentials	Temperature,Message ,Diversion,Speed warning ,Visibility information should displayed	1.User verifies the device in the car 2.Click on the required and necessary information 3.Verifiy popup information is displayed or not 4.Temperature information is displayed 5.Message information is displayed 6.Diversion notification is not displayed 7. Speed warning notification is not displayed 8. Visibility notification is displayed	Temperature -36 Humidity-20 Diversion-error Speed warning-error Visiblity-visible	a.Temperature is displayed b.Humidity is displayed c.Diversion is not displayed d.Speed warning is not displayed e.visible	Working as expected	Fail	Diversion and speed warning information is ot displayed	N	BUG 1234	Tester_testerid001

8.2 USER ACCEPTANCE TESTING:

8.2.1 Purpose of Document

The purpose of this document is to briefly explain the test coverage and open issues of the IOT device project at the time of the release to User Acceptance Testing (UAT).

8.2.2 Defect Analysis

This report shows the number of resolved or closed bugs at each severity level, and how they were resolved

Resolution	Severity 1	Severity 2	Severity 3	Severity 4	Subtotal
By Design	9	5	3	2	19
Duplicate	1	1	3	1	6
External	2	3	1	1	7
Fixed	10	2	3	18	33
Not Reproduced	1	1	2	1	5
Skipped	1	1	2	1	5
Won't Fix	1	4	3	1	9
Totals	25	17	17	25	84

8.2.3 Test Case Analysis

This report shows the number of test cases that have passed, failed, and untested.

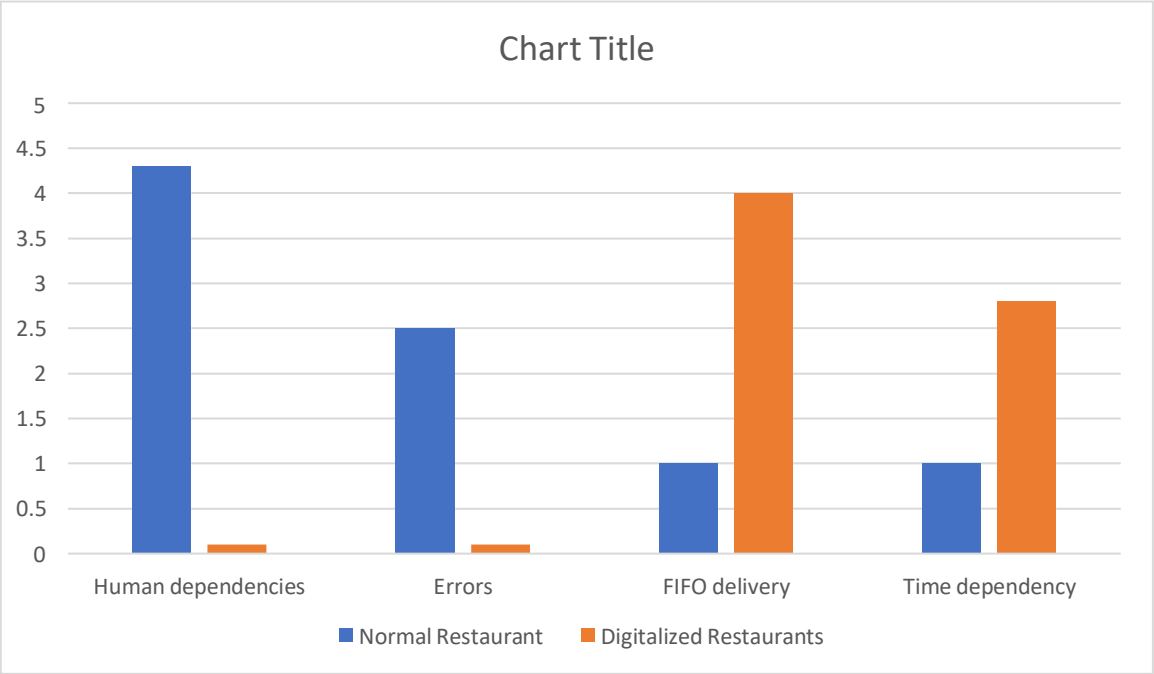
Section	**Total Cases**	**Not Tested**	**Fail**	**Pass**
Print Engine	5	0	0	5
Client Application	45	0	0	45
Security	1	0	0	1

Outsource Shipping	3	0	0	3
Exception Reporting	6	0	0	6
Final Report Output	5	0	0	5
Version Control	3	0	0	3

CHAPTER 9

RESULTS

9.1 PERFORMANCE METRICS



PARAMETERS	DIGITALIZED AGRICULTURE	NORMAL AGRICULTURE
HUMAN DEPENDENCY	Human requirement will be more.	Can perform well without that much human
ERRORS	Human made mistakes while noting down the order	Machines will not make that mistake
FIFO DELVERY	Customer may be failed to satisfy with First In First Out delivery.	Guarantees First In First Out delivery
TIME DEPENDENCY	Should wait for the bearer to note down the order.	Can be used by the user which is time consuming.

CHAPTER 10

ADVANTAGES & DISADVANTAGES

Advantages:

- . With the implementation of IoT in agriculture, processes are managed more effectively in the field.
- Smart agriculture is much more effective than traditional agriculture.
- With IoT, farmers can monitor the animals closely, even if they are distant.
- IoT enabled agriculture solutions enhance the agility of the farming processes.

Disadvantages:

- It cannot be protected against harsh, dirty or electrically noisy environment.
- Initial and maintenance cost is very high.
- Insensitive to very slow motion of the object**.**

CHAPTER 11
CONCLUSION

Crop protection from animal intrusion and changing environmental conditions is important for the successful cultivation of the crops which can be achieved using IoT. The development of agricultural sector will always be a priority especially given the dynamics of the world today. This testing phases of the project justifies that this project can be used in a real time farming environment. Also, the project was developed after studying the market requirement which makes it extremely suitable in the context of present scenarios. The post survey result provides that the system is useful in real time scenario and end users are interested in using this system. Therefore, using IoT in agriculture has a big promising future as a driving force of efficiency, sustainability, and scalability in this industry.

CHAPTER 12

FUTURE SCOPE

The performance of the system can be further improved in term of the operating speed, memory capacity and instruction cycle period of the microcontroller by using another high-end controller. The number of channels can be increased to interface a greater number of sensors which is possible by using advanced versions of controllers. This device can be made to perform better by providing the power supply with the help of renewable sources. Time bound administration of fertilizer, insecticides and pesticides can be introduced. A water meter can be installed to estimate the amount of water used for irrigation and thus giving a cost estimation and a solenoid valve can be used for varying then volume of water flow. This project can be made based on Image processing in which wild animal and fire can be detected by cameras and if it comes towards farm then system will be directly activated through wireless networks. Wild animals can also be detected by use wireless networks such as laser wireless sensors and by sensing this laser or sensor's security system will be activated.

APPENDIX

A1 - SOURCE CODE

```
import wiotp.sdk.device
import time
import random
myConfig={
"identity": (
"orgId": "gagtey",
"typeId": "GPS",
"deviceId":"12345"},
"auth": {
"token": "12345678"
}}
def myCommandCallback (cmd):
print ("Message received from IBM IoT Platform: %s" % cmd.data['command']) m-
cmd.data['command']
client= wiotp.sdk.device.DeviceClient (config=myConfig, logHandlers=None)
client.connect()
def pub (data):
client.publishEvent (eventId="status", msgFormat="json", data=myData, qos=0,
print("Published data Successfully: %s", myData)
while True:
myData={'name': 'Train1', 'lat': 17.6387448, 'lon': 78.4754336)
pub (myData)
time.sleep (3)
#myData('name': 'Train2', 'lat': 17.6387448, 'lon': 78.4754336)
#pub (myData)
#time.sleep (3)
myData={'name': 'Train1', 'lat': 17.6341908, 'lon': 78.4744722)
pub (myData)
time.sleep(3)
myData={'name': 'Trainl', 'lat': 17.6340889, lon': 78.4745052)
pub (myData)
time.sleep(3)
myData={'name': 'Trainl', 'lat': 17.6248626, 'lon': 78.4720259)
pub (myData)
time.sleep (3)
myData={'name': 'Trainl', 'lat': 17.6188577, 'lon': 78.4698726


pub (myData)
time.sleep (3)
myData={'name': 'Train1', 'lat': 17.6132382, 'lon': 78.4707318)
```

```
pub (myData)
time.sleep (3)
client.commandCallback = myCommandCallback
client.disconnect()
```

QR SCANNER CODE:

```
Import cv2
import numpy as np
import time
Import pyzbar.pyzbar as pyzbar
from ibmcloudant.cloudant_v1 import CloudantV1
from ibmcloudant import CouchDbSessionAuthenticator
from ibm_cloud_ sdk_core.authenticators import BasicAuthenticator
authenticator= BasicAuthenticator ('apikey-v2-
16u3crmdpkghhxefdikvpssoh5fwezrmuup5fv5g3ubz', 'b0ab119f45d3e6255eabb978
service Cloudant V1 (authenticator-authenticator) service.set_service_url('https://apikey-v2-

b0ab119f45d3e6255eabb978e7e2f0
cap= cv2.VideoCapture (0)
font cv2.FONT HERSHEY PLAIN
while True:
frame cap.read()
decodedobjects pyzbar.decode (frame)
for obj in decodedObjects:
#print ("Data", obj.data)
a-obj.data.decode('UTF-8')
cv2.putText (frame, "Ticket", (50, 50), font, 2,
(255, 0, 0), 3)
#print (a)
try: response = service.get_document (
db='booking, doc_id = a
).get_result()
print (response) time.sleep(5)
except Exception as e:
print ("Not a Valid Ticket")
time.sleep (5)
cv2.imshow("Frame", fram

if cv2.waitKey(1) & 0xFF==ord('q'):
break
cap.release()
cv2.destroyAllWindows ()
client.disconnect()
```