IOT BASED SMART CROP PROTECTION FOR AGRICULTURE

PROJECT BASED LEARNING

Submitted by

TEAM ID :PNT2022TMID11461

SOWMIYA N.K(910619194084)

SRI MEENAKSHI.P(910619104085)

SRUTHIKA G.S(910619104088)

VASHUNDARA K.R(9106191904098)

SURYA P(910619104091)

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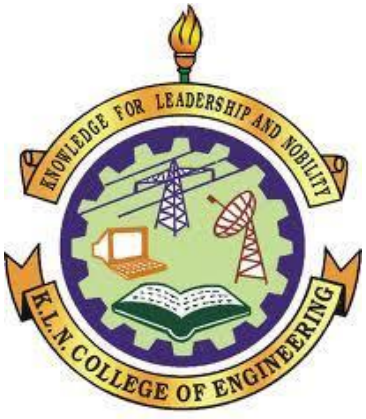

K.L.N. COLLEGE OF ENGINEERING, POTTAPALAYAM
(An Autonomous Institution, Affiliated to Anna University, Chennai)

ANNA UNIVERSITY: CHENNAI 600 025

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ABSTRACT

A centralizing method in the area of IoT (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.

IoT (Industrial Internet of Things) tendencies are often utilized in smart farming to boost the standard of agriculture. But our productivity remains enormously diminutive as associated to world standards. Societies after pastoral areas drift to a municipal extent for her lucrative commerce besides they can't deliberate on crofting.

Moderate smart irrigation systems are utilized to afford the solution for dissimilar variety of plants in spite of getting the solution for moisture related issues Weather conditions like temperature, humidity and moisture are difficult to check manually frequently overcome all these a new system is proposed constructed on cloud of Effects (IoT). Wildlife requisite overlaps personage laypeople, creating fee to inhabitants and cultivated field. Wild animals regularly ruin eminence of crops.

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INTRODUCTION

The Smart protection system defines that this project help to farmer for the protection of a farm. We have designed this project for the only secure from animals but we this project have the provision to secure from the human begins also. (Industrial Internet of Things) tendencies are often utilized in smart farming to boost the standard of agriculture. But our productivity remains enormously diminutive as associated to world standards, Societies after pastoral areas drift to a municipal extent for her lucrative commerce besides they can't deliberate on crofting. In detail, moderate smart irrigation systems are utilized to afford the solution for dissimilar variety of plants in spite of getting the solution for moisture related issues Weather conditions like temperature, humidity and moisture are difficult to check manually frequently overcome all these a new system is proposed constructed on cloud of Effects (IoT).Wildlife requisite overlaps personage laypeople, creating fee to inhabitants and cultivated field. Wild animals regularly ruin eminence of crops [20]. The low productiveness is mainly due to the reasons, the crop ruined by means of untamed animals and yield ruined by way of nature object [34]. Cultivators are experiencing numerous challenges for attaining more production due to unexpected encounters of animals, slight sorts of species, beetles, some hazardous snakes and weather circumstances. Within the existing system, electrical protection is used to give up untamed animal assaults on vegetation which leads to the death of animal. The surveillance and monitor of the tiny species, bugs and snakes are tough because of their aspect and flora of effort

1.1 Project Overview

The main aim of our project is to protect the crops from damage caused by animal as well as divert the animal without any harm. Crops in farms are many times ravaged by local animals like buffaloes, cows, goats, birds etc. This leads to huge losses for the farmers. It is not possible for farmers to barricade entire fields or stay on field 24 hours and guard it. So here we propose automatic crop protection system from animals. IoT-based agriculture system helps the farmer in monitoring different parameters is

field like soil moisture, Temperature, humidity using some sensors. Farmers can monitor all the sensor parameters by using a web or mobile application even if the farmer is not near his field. Watering the crop is one of the important tasks for the farmers. They can make the decision whether to water the crop or postpone it by monitoring the sensor parameters and control the motor pumps from the mobile application itself. All the sensor parameters are stored in the IBM Cloudant DB.

Project Flow:

1. The device will detect the animals and birds using the Clarifai service
2. If any animal or bird is detected the image will be captured and stored in the IBM Cloud object storage.
3. It also generates an alarm and avoid animals from destroying the crop
4. The image URL will be stored in the IBM Cloudant DB service
5. The device will also monitor the soil moisture levels, temperature, and humidity values and send them to the IBM IoT Platform
6. The image will be retrieved from Object storage and displayed in the web application.

7. A web application is developed to visualize the soil moisture, temperature, and humidity values

8. Users can also control the motors through web applications.

To develop this project successfully we have to complete all the tasks as given bellow:

a. Create and configure IBM Cloud Services

b. Create IBM Watson IoT Platform

c. Create a device & configure the IBM IoT Platform

d. Create Node-RED service

e. Create a database in Cloudant DB to store location data

f. Create a cloud object storage service and create a bucket to store the images

● Develop a python script to publish the sensor parameters like Temperature, Humidity, and Soil Moisture to the IBM IoT platform and detect the animals and birds in video streaming using Clarifai.

● Develop a web Application using Node-RED Service.

● Display the image in the Node-RED web UI and also display the temperature, humidity, and soil moisture levels. Integrate the buttons in the UI to control the Motors.

● Connecting IoT devices to the Watson IoT platform and exchanging the sensor data.

● Gain knowledge of storing images in IBM Object Storage and retrieving images

● Creating a Web Application through which the user interacts with the device.

1.2 PURPOSE

The smart agriculture model aim to monitoring the fields and control the irrigation process. It is low cost and efficient system. It includes

ESP32,cloud, nodered, MIT app inverter, sensors like DHT22,soil moisture sensor.

2.LITERATURE SURVEY

1. Ramaprasad S, S .Sunil Kumar, B S Sivaprasad Lebaka

"Intelligent Crop Monitoring and Protection System in Agricultural fields Using IoT" IoT is gaining an important place in research across the nook and corner of this world especially in area of modern wireless communications. One of main areas where IoT based research is going on and new products are launching on everyday basis to make the activities smarter and efficient towards better production of crops in agricultural sectors. IoT is an integration of wireless sensors with agricultural mobile apps and cloud platforms helps in collecting vital information pertaining to the pertaining to the environmental conditions temperature, rainfall, humidity, wind speed, pest infestation, soil humus content or nutrients, besides others linked with a farmland, can be used to improve and automate farming techniques, take informed decisions to improve quality and quantity, and minimize risks and wastes. To supervise above mentioned parameter we have used some of the smart devices like sensors and also internet, through internet all devices are connected and controlled.

Requirements

- Arduino Microcontroller
- Sensors
- DHT11 sensor and IR sensor.
- Soil Moisture Sensor
- Motor Pump
- Wi-Fi Module

Advantage

- This system uses intelligent irrigation system to get good
- Intelligent irrigation system will increase the crop quality and increases the productivity by the use of sensors like, soil moisture, air temperature, humidity and water level of the tank.
- This concept of irrigation system reduces the manpower to water the crops especially during night time because in villages power will be available during night time.
- This is system can be used for multiple crops using multiple moisture sensors using single MCU, which can monitor various parameters of different crops
- In our system we are using PIR sensor to detect the Human, Intruder or any animal, if any intruder coming to the agriculture filed
- It uses optimal usage of water in-turn it saves the water and also power consumption.

2. Prof K.A. Patil, N.R. Kale

proposes about a model for "Smart Agriculture using IOT" Climate changes and rainfall has been erratic over decade. Due to this, climate-smart methods called smart agriculture is adopted by many farmers. In the existing system, village farmers may have planted the same crop for centuries, but over period, weather patterns and soil conditions and epidemics of pests and disease have been changed. By using the proposed system approach, which senses the local agricultural parameters, identify the location of sensor, transfer the data crop fields and crop monitoring. The Received updated information allows the farmers to cope with and even benefit from these changes. The Complete real-time and historical environmental information is

expected to help to achieve efficient management/monitoring and utilization of resources.

Existing System

Threshold values for climatic conditions like humidity, temperature, moisture can be fixed based on the environmental conditions of that particular region. The system also senses the invasion of animals which is a primary reason for reduction in crops. This system generates irrigation schedule based on the sensed real time data from field and data from the weather repository.

Hardware Requirements

- Raspberry Pi
- Arduino UNO R3
- Sensor for particular usage(soil, temperature, moisture)

Software Requirements

- Arduino
- Cloud application
- Data base of record

Advantages

By comparing the previous year record of cropping, farmer enhance the soil quality and quantity Management of cropping are efficiently done through these process.

3. P. Rekha et al “IOT BASED SMART CROP PROTECTION SYSTEM FROM ANIMALS"

Proposed a system for preventing agricultural land from animal and automated irrigation system. By using arduino, GSM module, IR sensor and soil moisture sensor, senses the environmental data and send to

arduino. This system makes the use of IR sensor for detection of animals and soil moisture sensor to find the moisture of soil and automatically control the water pump for auto irrigation system. But this system does not utilize advanced technologies for alerting the farmer and detection of animals in farm

Hardware Requirements

1.Raspberry pi 3 B+

- Broadcom BCM2837B0, Cortex (ARMv8) 64-bit SoC @ 1.4GHz
- 1GB LPDDR2 SDRAM
- Extended 40-pin GPIO header
- Full-size HDMI
- CSI camera port for connecting a Raspberry Pi camera
- Micro SD port for loading your operating system and storing data
- 5V/2.5A DC power input
- Power-over-Ethernet

2 Big Dome PIR Motion Detector Module

- Supply Voltage DC 5V
- Quiescent Current: 65uA
- Level output: High 3.3 V /Low 0V
- Operation Temp: -15-+70 degrees
- Using pyroelectric PIR sensor, Fresnel
- 3-5 m sensing range
- 110 degree angle sensor

3.5MP Raspberry Pi 3 Model B Camera

- Resolution: 5 MP
- Interface Type: CSI(Camera Serial Interface)

- Supported Video Formats: 1080p @ 30fps, 720p @ 60fps and 640x480p 60/90 video

4. Buzzer

5. Flashlight (PoE) support (requires separate PoE HAT)

Methodology

Developing a Smart Crop Protection System from Animals, some steps need to be followed to achieve this successful task. The steps are definable as follows:

- Motion detection
- Image capturing
- Image processing
- Alert generation

Advantage

- The designed system produces the sound to scare the animals, so that animals will automatically ran away.
- The main aim is to prevent the loss of crops and to protect the area from intruders and wild animals which poses a major threat to the agriculture areas.
- The GSM module is used to make a call to the farmer to alert him. Therefore, the designed system is affordable and useful to the farmers.
- The designed system won't be harmful to animals and persons and it protects the farm areas.
- The system is capable to protect the farm in day and night with IOT
  monitoring

4 Gogul Dev N S, Sreenesh K S, Binu P K "IoT Based Automated Crop Protection System"

The destruction of crops by wild animals is one of the main problem faced by farmers. Thus this project carries the solution to prevent the animals from entering the crop field. Hence we have designed an IoT based system which is cost efficient and consumes less energy. Since the system uses ultrasound frequencies to prevent the animals from entering the crop field, it won't disturb the people living in the nearby area. Such a system will help the farmers to protect the fields and also save them from critical financial losses.

Requirements

- Pir Sensor And Camera
- Raspberry Pi
- Ultrasound Speakers
- Ultrasound Detector
- Frequency Generator

2.1 EXISTING PROBLEM

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 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 TensorFlow 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

1. IoT Based Automated Crop Protection System | IEEE Conference Publication | IEEE Xplore

2. IOT Based Crop Protection System TECHNOLOGY, IEEE PAPER, IEEE PROJECT (engpaper.com)

3. Smart Crop Protection System from Wild Animals Using IoT | IEEE Conference Publication | IEEE Xplore

4. IoT solutions for crop protection against wild animal attacks | IEEE Conference Publication | IEEE Xplore

5. IoT solutions for crop protection against wild animal attacks | IEEE Conference Publication | IEEE Xplore

2.3 PROBLEM STATEMENT DEFINITION

Crops in the farms are many times devastated by the wild as well as domestic animals and low productivity of crops is one of the reasons for this. It is not possible to stay 24 hours in the farm to sentinel the crops. In the existing system, village farmers may have planted the same crop for centuries, but over period, weather patterns and soil conditions and epidemics of pests and disease have been changed. Threshold values for climatic conditions like humidity, temperature, moisture can be fixed based on the environmental conditions of that particular region. The system also senses the invasion of animals which is a primary reason for reduction in crops.

3. IDEATION AND PROPOSED SOLUTION

3.1 EMPATHY MAP CANVAS

Empathy Map Canvas:

An empathy map is a simple, easy-to-digest visual that captures knowledge about a user's behaviours and attitudes. It is a useful tool to helps teams better understand their users. Creating an effective solution requires understanding the true problem and the person who is experiencing it. The exercise of creating the map helps participants consider things from the user's perspective along with his or her goals and challenges.

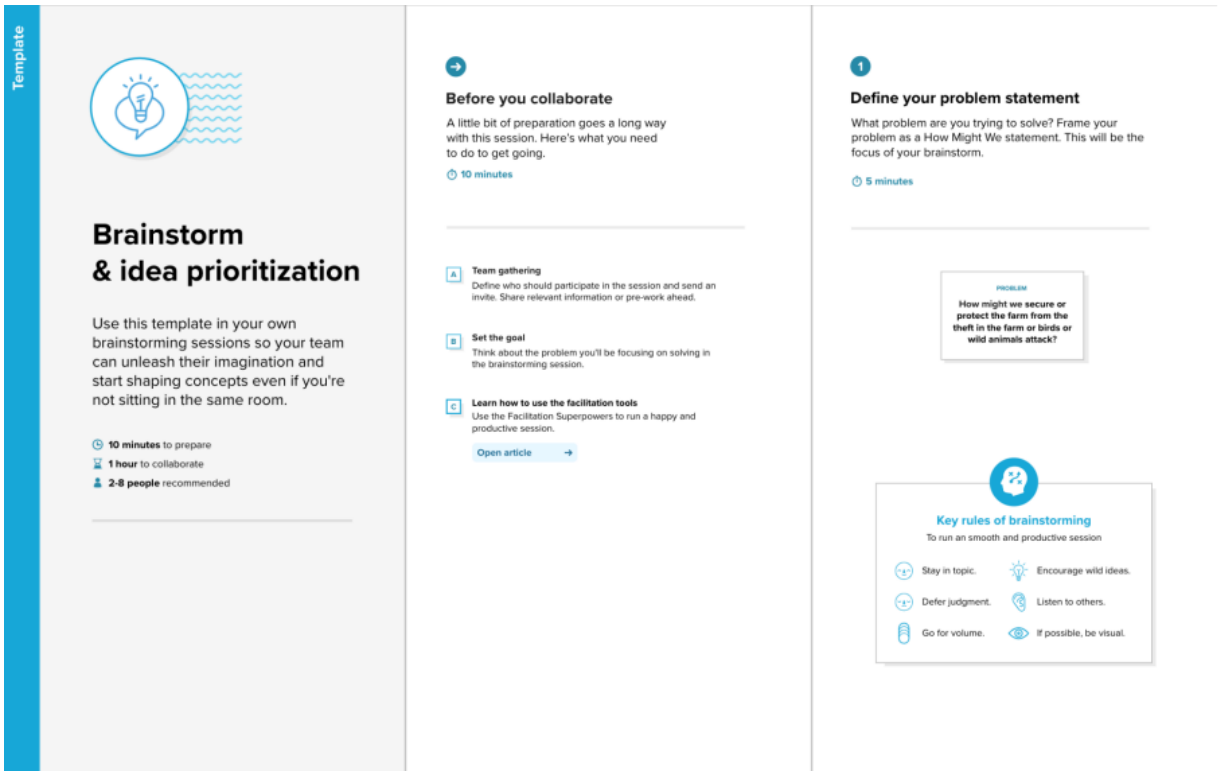
3.2 IDEATION AND BRAINSTORMING

Brainstorm & Idea Prioritization Template:

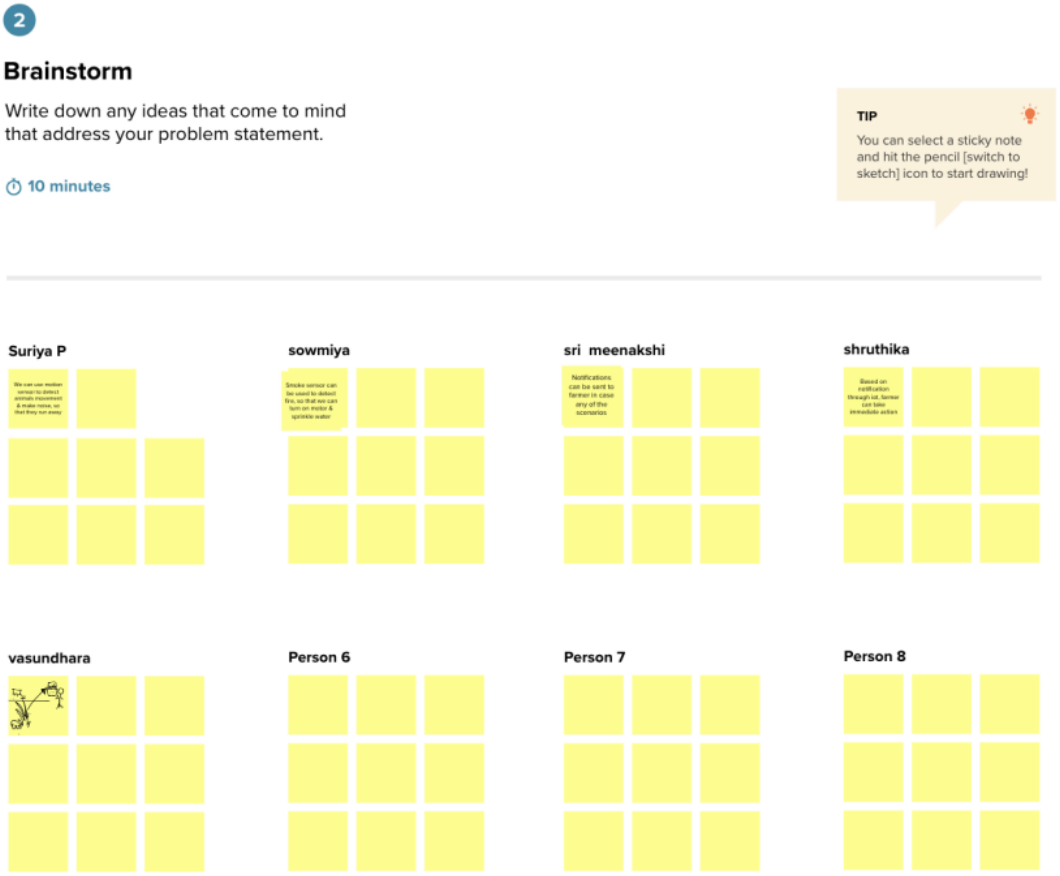
Brainstorming provides a free and open environment that encourages everyone within a team to participate in the creative thinking process that leads to problem solving. Prioritizing volume over value, out-of-the-box ideas are welcome and built upon, and all participants are encouraged to collaborate, helping each other develop a rich amount of creative solutions. Use this template in your own brainstorming sessions so your team can unleash their imagination and start shaping concepts even if you're not sitting in the same room.

Reference: https://www.mural.co/templates/empathy-map-canvas

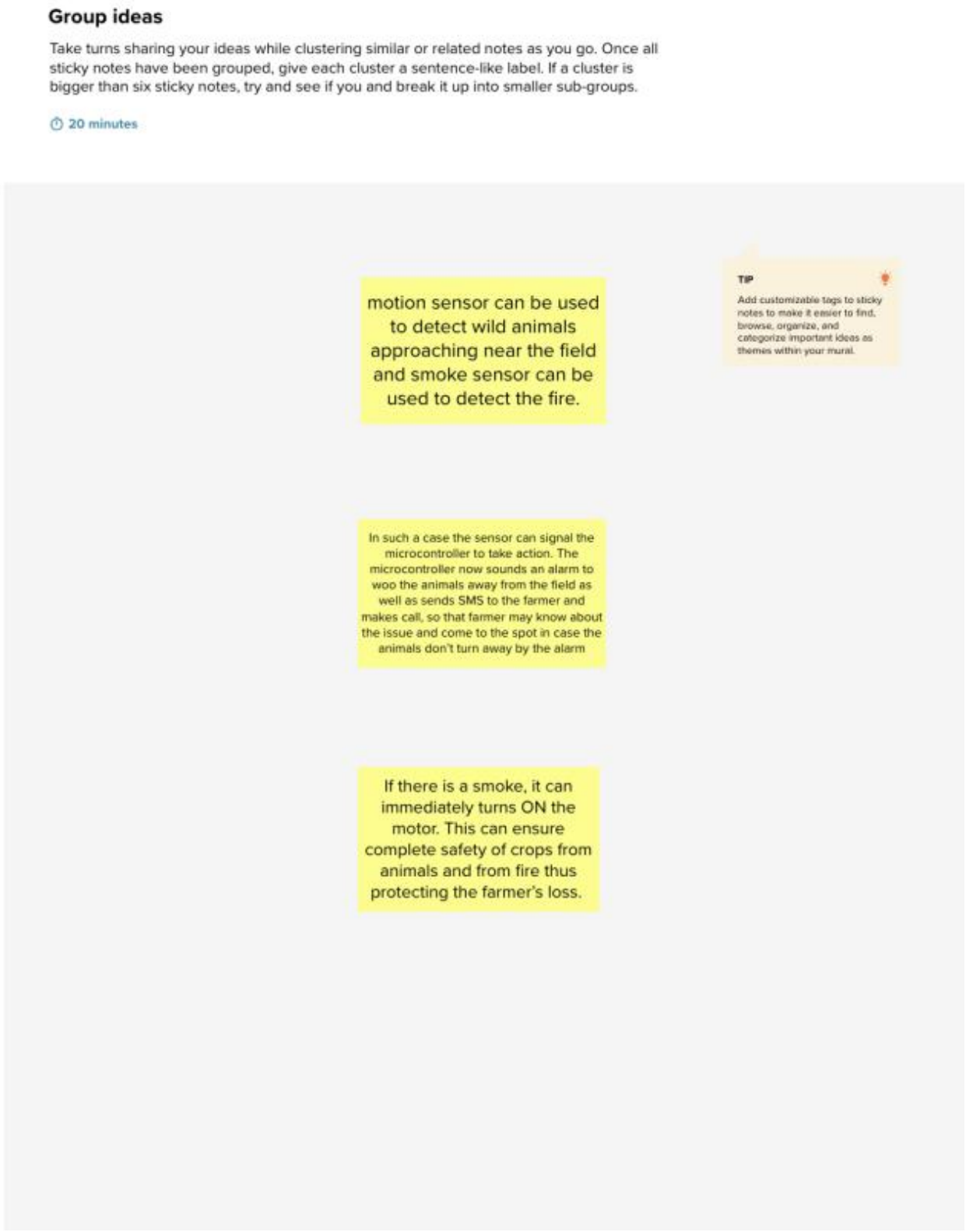
Step-1: Team Gathering, Collaboration and Select the Problem Statement



Step-2: Brainstorm, Idea Listing and Grouping



Step-3: Idea Prioritization

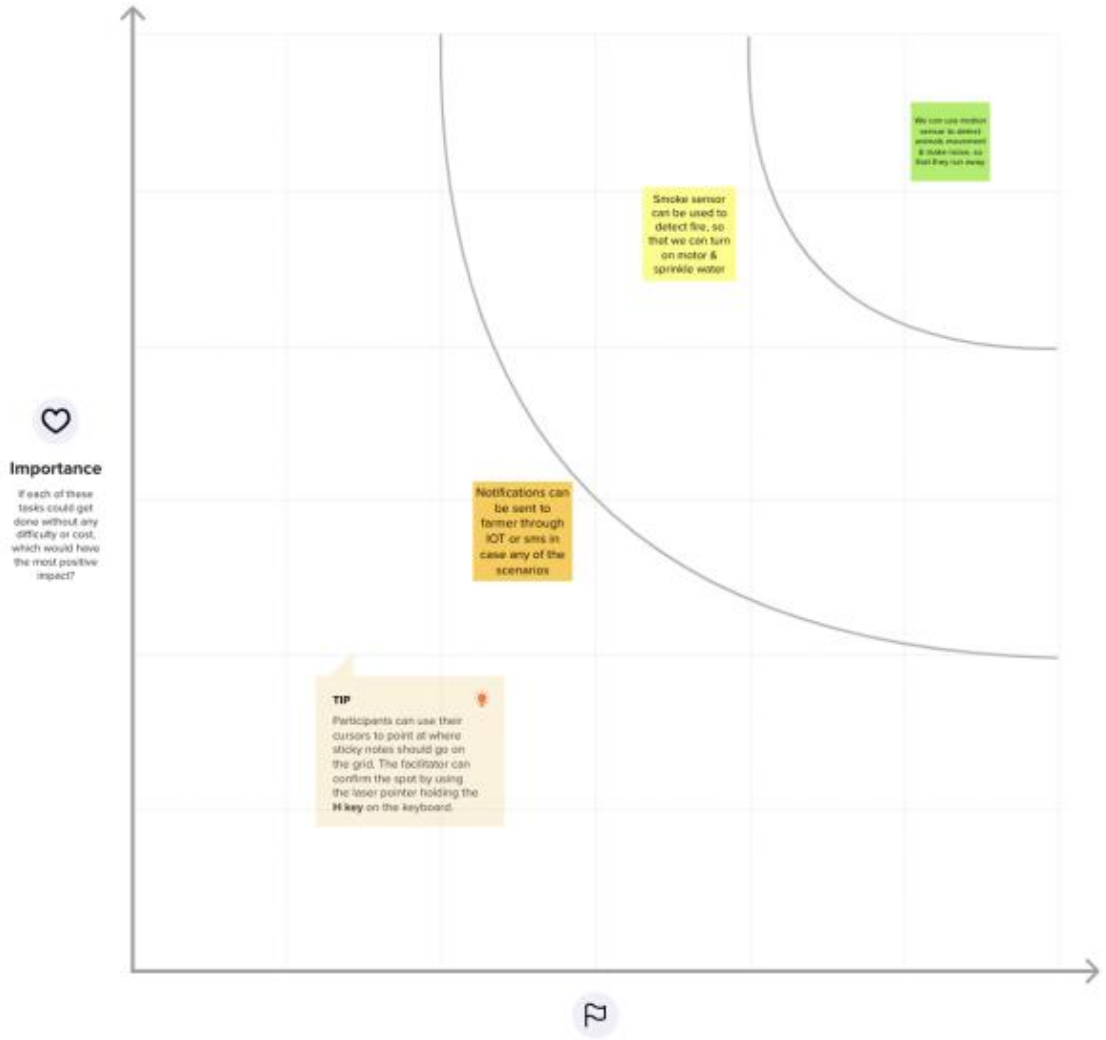


4

Prioritize

Your team should all be on the same page about what's important moving forward. Place your ideas on this grid to determine which ideas are important and which are feasible.

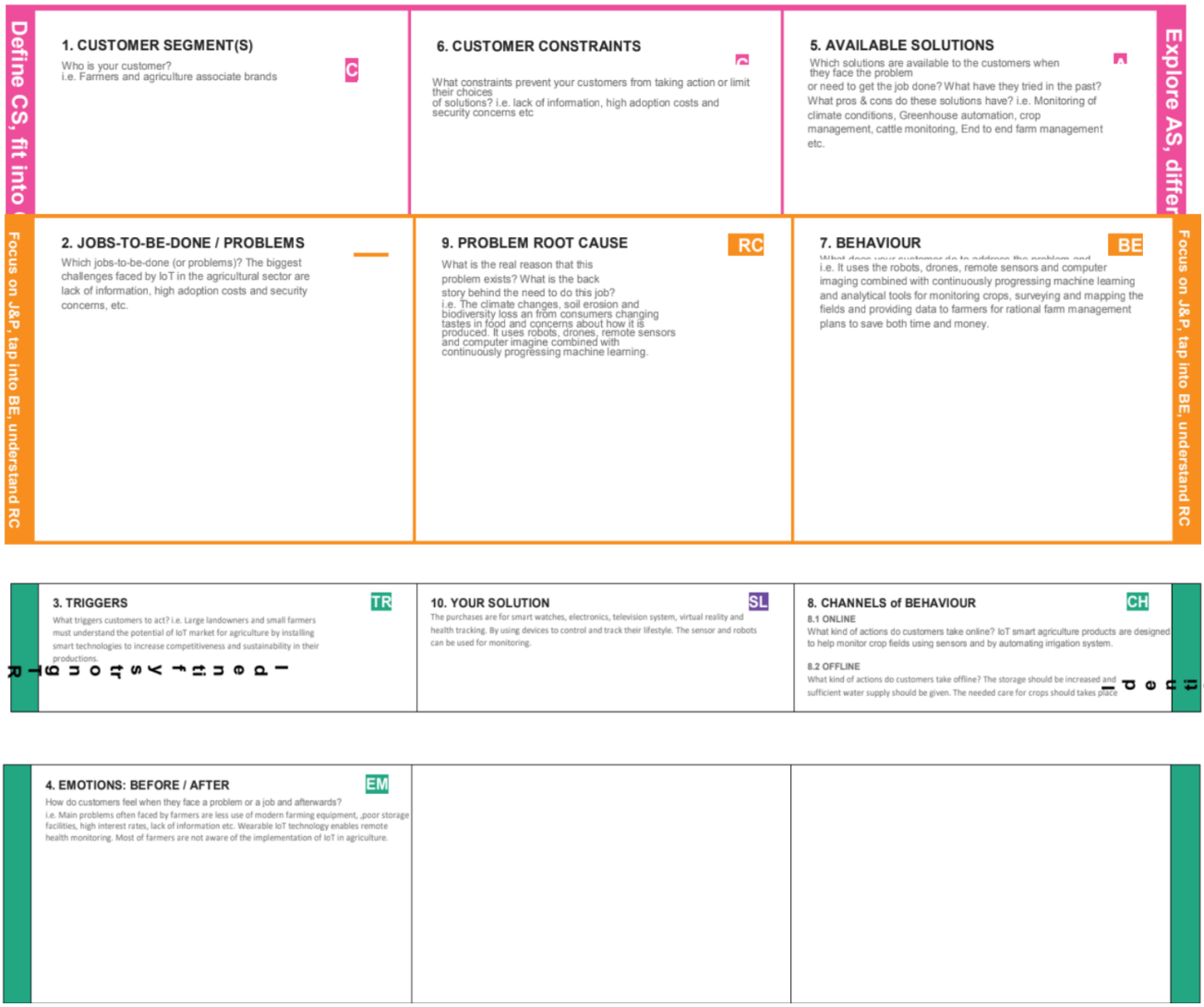
20 minutes



3.3 PROPOSED SOLUTION

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	In recent decades, the livelihood of many farming communities in the country has come under threat from the attacks of wild animals on crops. Heard of stray animals often enter to fields and destroy the crops which result in loss of crops for farmers. The currently available systems use a different type of methods like using loud noises, alarming conditions to prevent the animals from entering or destroying the crop field. In some systems, the animals are only detected using PIR sensors and notification is sent to the farmers. These systems are not reliable with different types of animals.
2.	Idea / Solution description	The protection from wild animal attack is done by placing sensors in the living unsafe areas. In our proposed work, PIR sensor is used.
3.	Novelty / Uniqueness	This project will be more helpful for farmers.Can be monitored and controlled from everywhere by using smart phones & WiFi once the set up is done . System can be done even in urban areas
4.	Social Impact / Customer Satisfaction	Agriculture is the major component of a developing country like India. The fundamental aim of agriculture is to lift stronger and more fruitful crops and plants and to help them for their growth by improving the soil and supplying the water. Now a days many people prefer organic products through which it would not harm the human ecosystem.
5.	Business Model (Revenue Model	IoT-based crop monitoring systems help to reduce the demand for pesticides, the costs involved, and the harmful impact of these chemicals on the farmer's health and environment. Better predictability and management: With the help of real-time farming monitoring and data analytics, predicting accurate harvest dates and ensuring the safety of crop production have become much easier for the farmers. Moreover, farmers have better control over the agricultural process.
6.	Business Model (Revenue Model)	To extend or shrink the database management for crops and to provide cent percent efficient product in terms of both hardware and softwarecomponents.

3.4 PROBLEM SOLUTION FIT



4. REQUIREMENT ANALYSIS

4.1 FUNCTIONAL REQUIREMENT

FR No	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	Data Collecting	Smart farming based IOT Extract Data from Sources
FR-2	Data Supervision and Management	Transform data into proper format Effective Environmental Indicators Performance Evalution of Proposed system Mobile App for Farming Staffs
FR-3	Feature Selection	Wrapper feature selection approach to analyze the environment indicators,which selects the effective indicators on the farming system
FR-4	Analysis of Agricultural data	Effective environmental indicators
FR-5	Performance evalution of proposed algorithm	Dashboard For Farming Staffs and Mobile Apps

4.2 NON FUNCTIONAL REQUIREMENTS

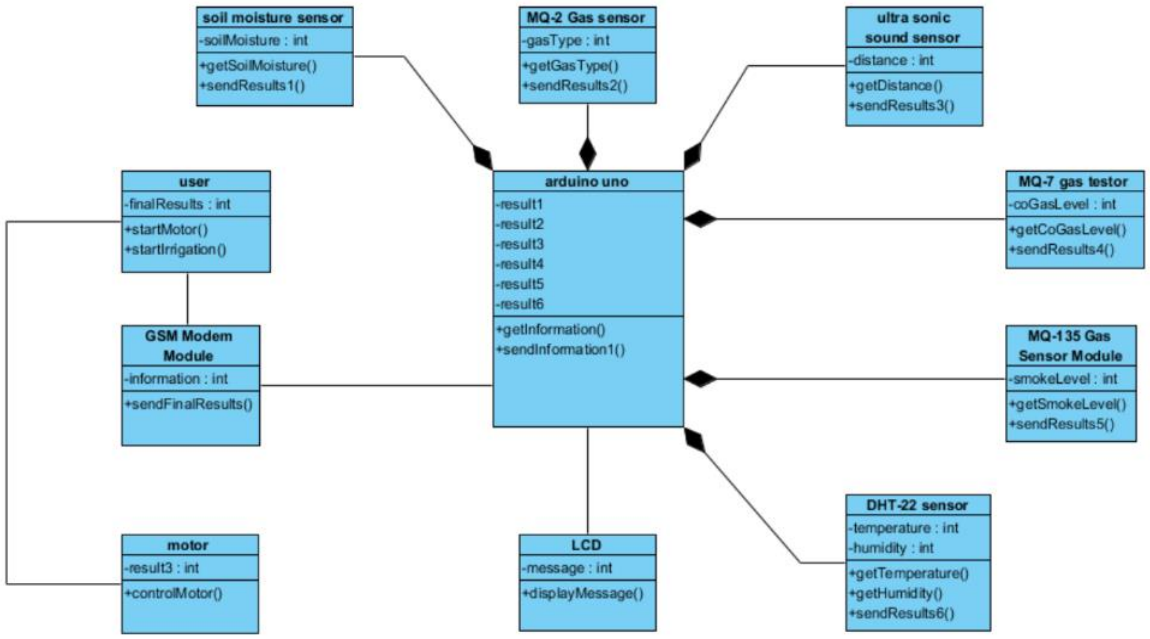
- Scalability
- Availability
- Security and Maintenance

5. PROJECT DESIGN

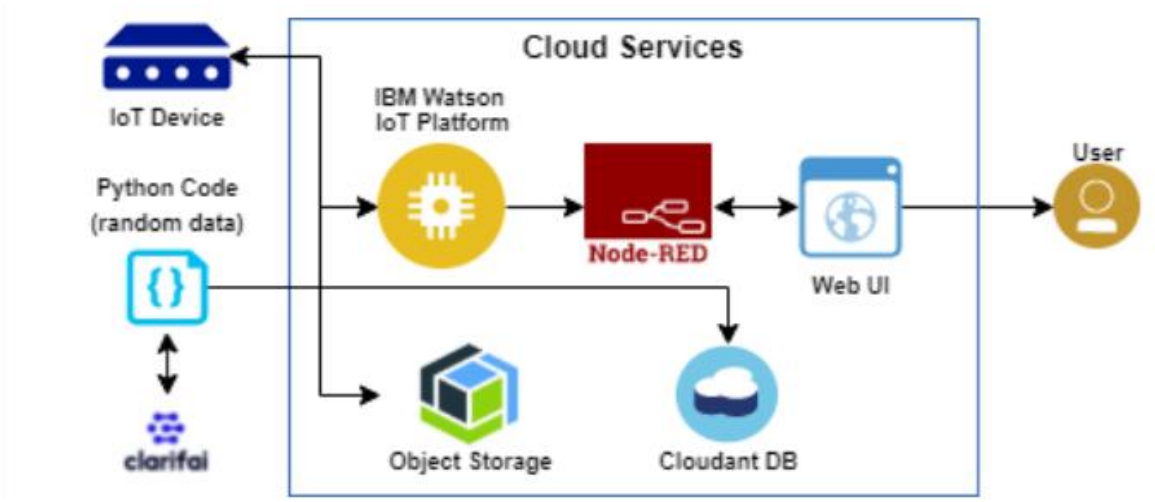
5.1 DATA FLOW DIAGRAM

Data Flow Diagrams:

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.



5.2 SOLUTION AND TECHNICAL ARCHITECTURE



5.3 USER STORIES

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
customer (farmer user)	Data Collecting	USN-1	Smart farming based IOT	Sensing of Agriculture data and storing	High	Sprint-1
		USN-2	Extract Data from Sources	Management of data through expert and investigation methods	High	Sprint-1
	Data Supervision and Management	USN-3	Transform data into proper format	Investigation of Agricultural environmental indicators	Medium	Sprint-2
Customer (Farming Staffs)		USN-4	Effective Environmental Indicators	Analysis of Crop Productivity and Drought Prediction	Medium	Sprint-3
		USN-5	Performance Evalution of Proposed system	Access to Dashboard For Farming staffs	High	Sprint-3
		USN-6	Mobile App for Farming Staffs			

6. PROJECT PLANNING AND SCHEDULING

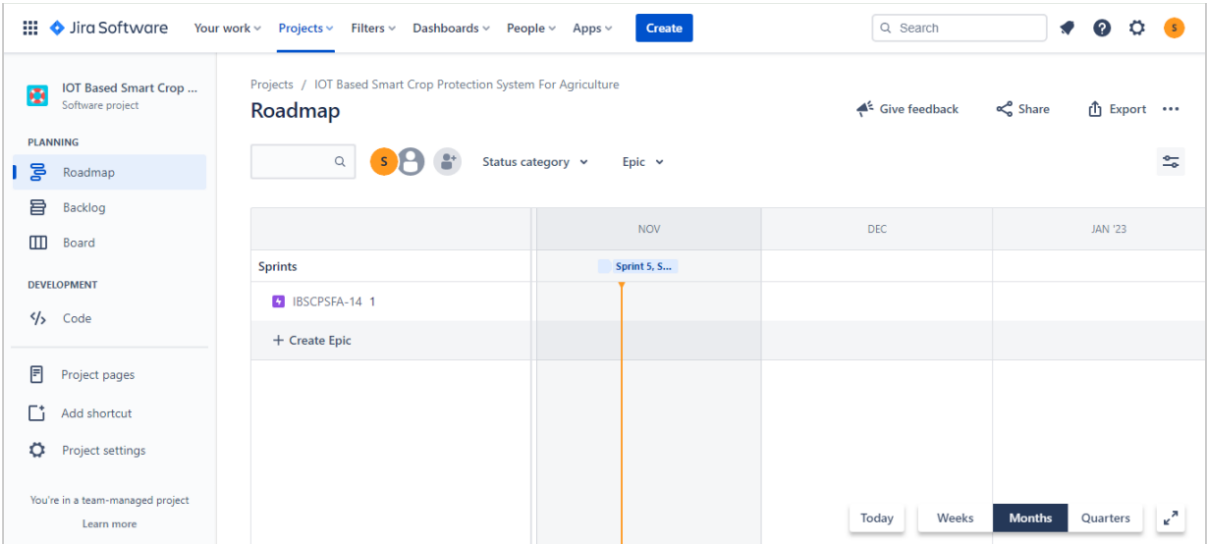
6.1 Sprint planning and Estimation

Sprint	Functional Requirement (Epic)	User story number	user story/Task	Story Points	Priority	Team member
Sprint 1	Regsitration	USN-1	How user interacts with application	2	High	1
Sprint 1	login	USN-2	As a user, I can log into the application by entering mail and password	2	Medium	
Sprint 2	soil sensors	USN-3	To detect a soil moisture	1	Medium	1
Sprint 3	monitoring	USN-4	Develop a python script to detect a temperature, humidity etc	1	Medium	1
Sprint 4	PIR sensors	USN-5	To detect a animal in that agriculture		High	1
Sprint 5	Evalution of proposed system Mobile	USN-6	Transform data into proper effective		High	1
	App for farming staffs		environment indicator performace evalution of proposed system mobile app for farming staffs			

6.2 SPRINT DELIVERY SCHEDULE

Sprint	Total Story Points	Duration	Sprint Start date	Sprint End date(Planned)	Story points completed(as on planned end date	Sprint Release date(Actual)
Sprint-1	10	9 days	9 NOV 2022	18 NOV 2022	**10**	18 NOV 2022
Sprint-2	10	8 days	10 NOV 2022	18 NOV 2022		
Sprint-3	10	7 days	11 NOV 2022	18 NOV 2022		
Sprint-4	10	7 days	11 NOV 2022	18 NOV 2022		
Sprint-5	10	7 days	11 NOV 2022	18 NOV 2022		

6.3 REPORTS FROM JIRA



7. CODING AND SOLUTIONING

7.1 FEATURE 1

```
#include <WiFi.h>//library for wifi
#include <PubSubClient.h>//library for MQtt
#include "DHT.h"// Library for dht11
#define DHTPIN 15 // what pin we're connected to
#define DHTTYPE DHT22 // define type of sensor DHT 11
DHT dht (DHTPIN, DHTTYPE);// creating the instance by passing
pin and typr of dht connected
void callback(char* subscribetopic, byte* payload, unsigned int
payloadLength);
//-------credentials of IBM Accounts------
#define ORG "ii5wx2"//IBM ORGANITION ID
#define DEVICE_TYPE "abcd"//Device type mentioned in ibm
watson IOT Platform
#define DEVICE_ID "1234"//Device ID mentioned in ibm watson
IOT Platform
#define TOKEN "12345678" //Token
String data3;
float h, t;
//-------- Customise the above values --------
char server[] = ORG ".messaging.internetofthings.ibmcloud.com";//
Server Name
char publishTopic[] = "iot-2/evt/Data/fmt/json";// topic name and type
of event perform and
format in which data to be send
char subscribetopic[] = "iot-2/cmd/command/fmt/String";// cmd
REPRESENT command type AND COMMAND
IS TEST OF FORMAT STRING
char authMethod[] = "use-token-auth";// authentication method
char token[] = TOKEN;
char clientId[] = "d:" ORG ":" DEVICE_TYPE ":"
DEVICE_ID;//client id
//-------------------------------------
WiFiClient wifiClient; // creating the instance for wificlient
```

```
PubSubClient client(server, 1883, callback ,wifiClient); //calling the predefined client id by
passing parameter like server id,portand wificredential
void setup()// configureing the ESP32
{
Serial.begin(115200);
dht.begin();
Serial.println();
wificonnect();
mqttconnect();
}
void loop()// Recursive Function
{
h = dht.readHumidity();
t = dht.readTemperature();
int s=random(100);
Serial.print("temp:");
Serial.println(t);
Serial.print("Humid:");
Serial.println(h);
Serial.print("Moisture:");
Serial.println(s);
PublishData(t, h,s);
delay(1000);
if (!client.loop()) {
mqttconnect();
}
}
/*.....retrieving to Cloud.....*/
void PublishData(float temp, float humid,int Moisture) {
mqttconnect();//function call for connecting to ibm
/*
creating the String in in form JSon to update the data to ibm cloud
*/
String payload = "{\"temp\":";
payload += temp;
payload += "," "\"Humid\":";
```

```
payload += humid;
payload += "," "\"Moisture\":";
payload += Moisture;
payload += "}";
Serial.print("Sending payload: ");
Serial.println(payload);
if (client.publish(publishTopic, (char*) payload.c_str())) {
Serial.println("Publish ok");// if it sucessfully upload data on the
cloud then it will print
publish ok in Serial monitor or else it will print publish failed
} else {
Serial.println("Publish failed");
}
}
void mqttconnect() {
if (!client.connected()) {
Serial.print("Reconnecting client to ");
Serial.println(server);
while (!!!client.connect(clientId, authMethod, token)) {
Serial.print(".");
delay(500);
}
initManagedDevice();
Serial.println();
}
}
void wificonnect() //function defination for wificonnect
{
Serial.println();
Serial.print("Connecting to ");
WiFi.begin("Wokwi-GUEST", "", 6);//passing the wifi credentials to
establish the connection
while (WiFi.status() != WL_CONNECTED) {
delay(500);
Serial.print(".");
}
Serial.println("");
```

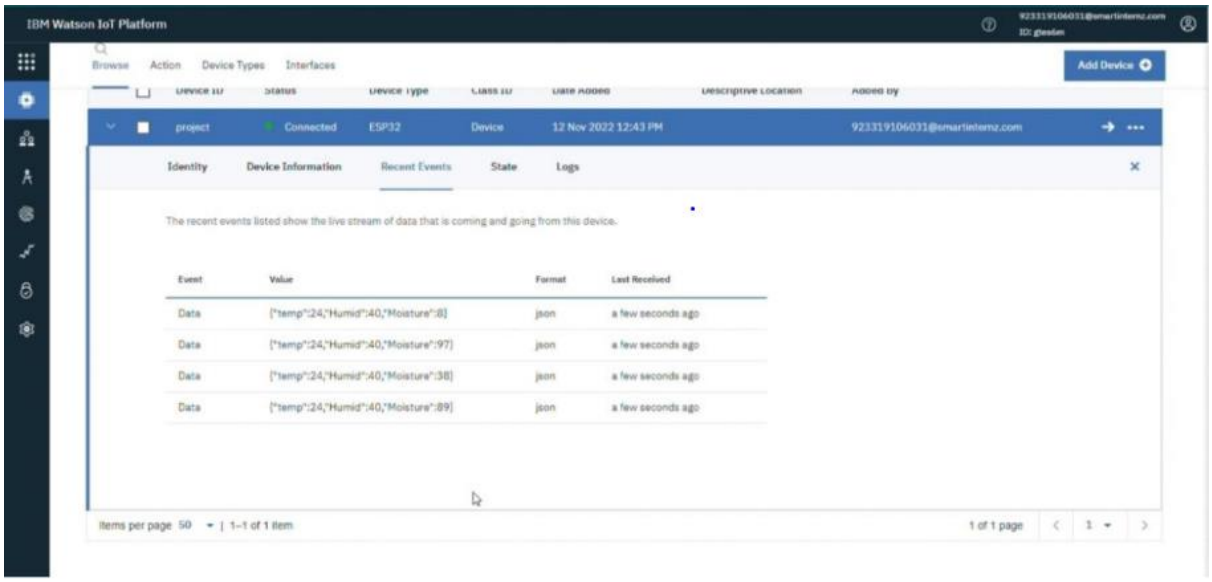
```
Serial.println("WiFi connected");
Serial.println("IP address: ");
Serial.println(WiFi.localIP());
}
void initManagedDevice() {
if (client.subscribe(subscribetopic)) {
Serial.println((subscribetopic));
Serial.println("subscribe to cmd OK");
} else {
Serial.println("subscribe to cmd FAILED");
}
}
void callback(char* subscribetopic, byte* payload, unsigned int
payloadLength)
{
Serial.print("callback invoked for topic: ");
Serial.println(subscribetopic);
for (int i = 0; i < payloadLength; i++) {
//Serial.print((char)payload[i]);
data3 += (char)payload[i];
}
Serial.println("data: "+ data3);
if(data3=="lighton")
{
Serial.println(data3);
}
else
{
Serial.println(data3);
}
data3="";

}
```

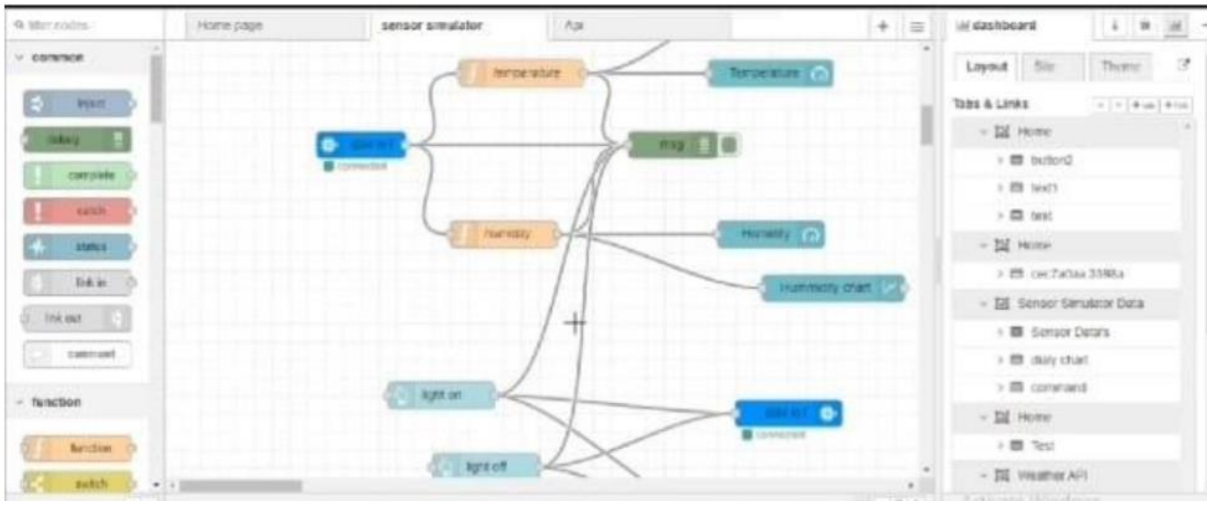
8. TESTING

8.1 TEST CASES

Simulating with Watson IOT:

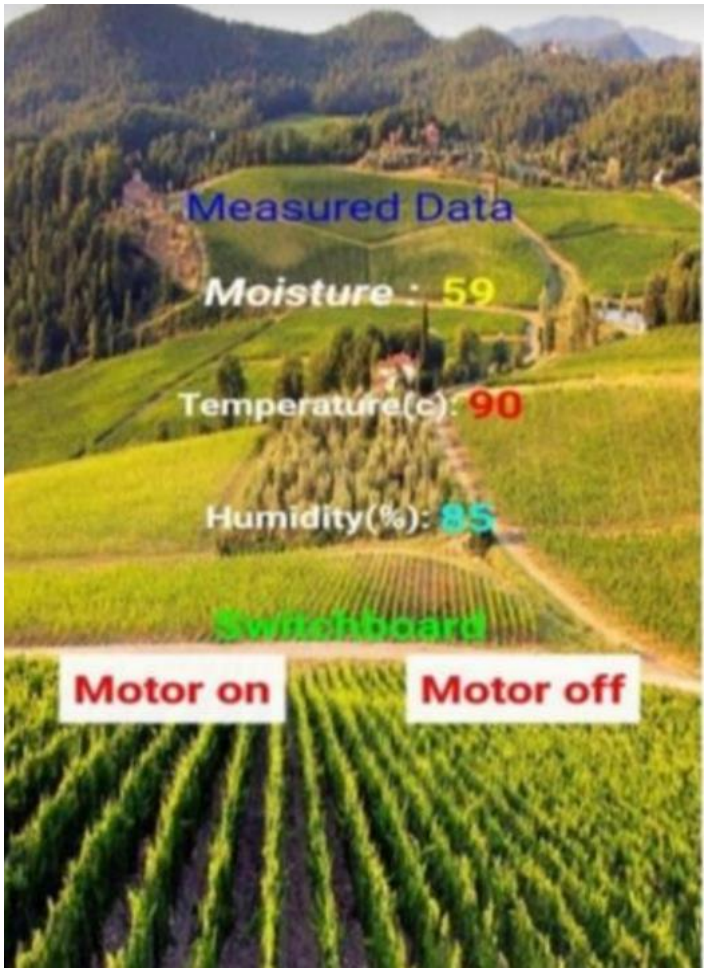


Web application using node red:



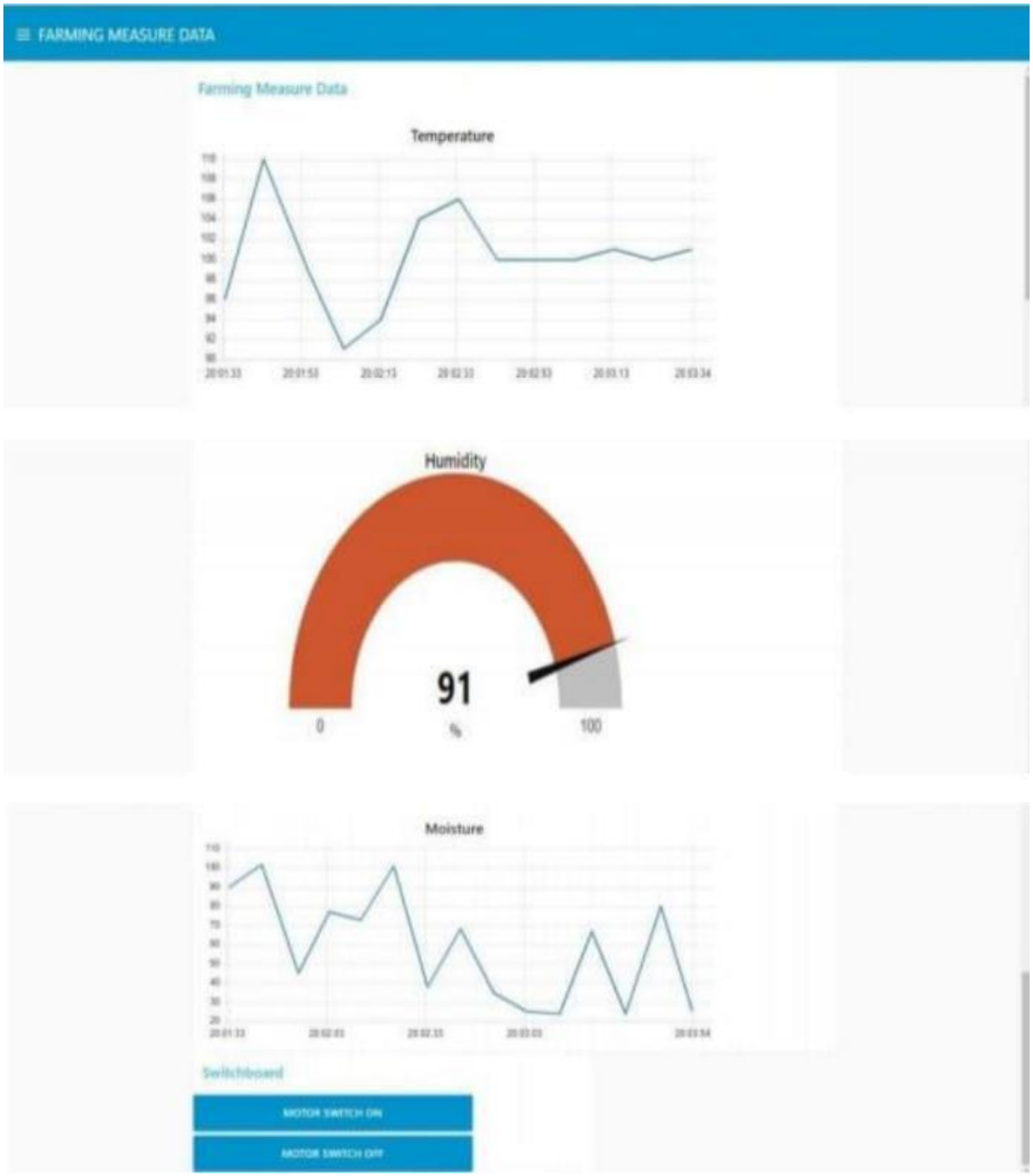
Web application using MIT App inverter:

8.2 USER ACCEPTANCE TESTING



9.RESULTS

9.1 PERFORMANCE METRIX



10. ADVANTAGES AND DISADVANTAGES

ADVANTAGES

- Intelligent irrigation system will increase the crop quality and increases the productivity by the use of sensors like, soil moisture, air temperature, humidity and water level of the tank.
- The main aim is to prevent the loss of crops and to protect the area from intruders and wild animals which poses a major threat to the agriculture areas.
- The designed system won't be harmful to animals and persons and it protects the farm areas.
- The system is capable to protect the farm in day and night with IOT monitoring

DISADVANTAGES

- 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.
- 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. CONCULSION

The problem of crop vandalization by wild animals and fire has become a major social problem in current time. It requires urgent attention as no effective solution exists till date for this problem. Farmers can benefit greatly from an IoT-based smart agriculture system. As a result of the lack of irrigation, agriculture suffers. Climate factors such as humidity, temperature, and moisture can be adjusted dependent on the local environmental variables. This technology also detects animal invasions, which are a major cause of crop loss. This technology aids in the scheduling of irrigation based on present data from the field and records from a climate source. It helps in deciding the farmer to whether to do irrigation or not to do. Continuous internet connectivity is required for continuous monitoring of data from sensors. This also can be overcome by using GSM unit as an alternative of mobile app. By GSM, SMS can be sent to farmers phone.

12. FUTURE SCOPE

In the current project we have implemented the project that can protect and maintain the the crop. In this project the farmer monitor and control the field remotely. In future we can add or update few more things to this project

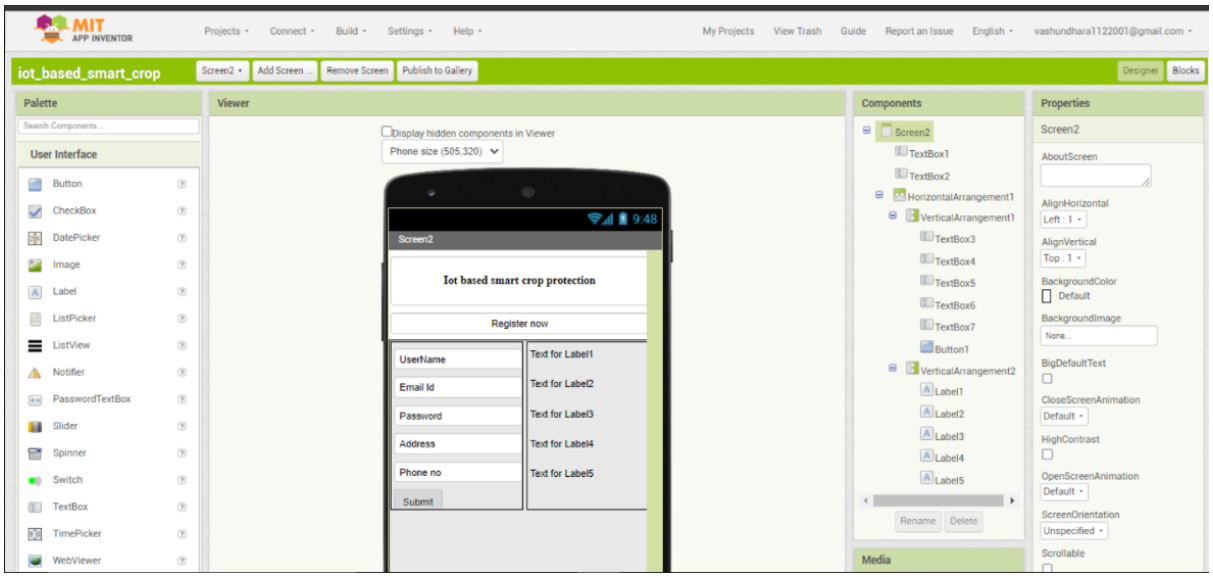
i. We can create few more models of the same project so that the farmer can have information of a entire.

ii. We can update this 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 one time investment. We can add solar fencing technology to this project.

iii. We can use GSM technology to this project so that the farmers can get the information directly to his home through SMS. This helps the farmer to get information if there is a internet issues.

13. APPENDIX

SOURCE CODE



TO DETECT A SOIL MOISTURE

code:

```
#include <WiFi.h>//library for wifi

#include <PubSubClient.h>//library for MQtt

#include "DHT.h"// Library for dht11

#define DHTPIN 15 // what pin we're connected to

#define DHTTYPE DHT22 // define type of sensor DHT 11
```

DHT dht (DHTPIN, DHTTYPE);// creating the instance by passing pin and typr of dht connected

void callback(char* subscribetopic, byte* payload, unsigned int payloadLength);

//-------credentials of IBM Accounts------

#define ORG "ii5wx2"//IBM ORGANITION I#define DEVICE_TYPE "abcd"//Device type mentioned in ibm watson IOT Platform

To detect a temperature,humidity etc

code:

```
import time

import ibmiotf.application

import ibmiotf.device

import random


#Provide your IBM Watson Device Credentials

organization = "ii5wx2"

deviceType = "abcd"
```

```
deviceId = "1234"

authMethod = "use-token-auth"

authToken = "12345678"

# Initialize GPIO


def myCommandCallback(cmd):

print("Command received%s" % cmd.data['command'])

status=cmd.data['command']

if status=="lighton":

print ("led is on")

else :

print ("led is off")

try:

deviceOptions = {"org": organization, "type": deviceType, "id": deviceId, "auth-method": authMethod, "auth-

token": authToken}
```

```
deviceCli = ibmiotf.device.Client(deviceOptions)

#.....................................

except Exception as e:

print("Caught exception connecting device: %s" % str(e))

sys.exit()
```

To detect a animal in agriculture by using PIR sensors

code:

```
#define LED 9 // choose the pin for the RELAY

#define BUZZER 13

int ldr=0;

int PIR=4;

int val;

void setup()

{
```

```
Serial.begin(9600);
pinMode(LED, OUTPUT); // declare lamp as output
pinMode(PIR,INPUT);
pinMode(BUZZER,OUTPUT);
}
void loop()
{
ldr = analogRead(A1);
val=digitalRead(PIR);
Serial.print("pir value = ");
Serial.println(val);
Serial.print("ldr value = ");
Serial.println(ldr);
if((ldr<=200)&& (val==HIGH))
{
digitalWrite(LED,HIGH);
```

```
digitalWrite(BUZZER,LOW);


}
else if((ldr>=200)&& (val==HIGH))
{
digitalWrite(BUZZER,HIGH);
digitalWrite(LED,LOW);
}
else {
digitalWrite(LED,LOW);
digitalWrite(BUZZER,LOW);
}
delay(300);
}
```

GITHUB & PROJECT DEMO LINK

GITHUB LINK:

https://github.com/IBM-EPBL/IBM-Project-30185-1660141533

PROJECT DEMO LINK:

https://drive.google.com/file/d/1J2AG5v1xj2ycwtBgQdGFdC6gqUc2LUcI/view?usp=drivesdk