

IoT BASED CROP PROTECTION SYSTEM FOR AGRICULTURE

PROJECT REPORT

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1. INTRODUCTION

1.1 Project Overview

The title of our project is “IOT BASED SMART CROP PROTECTION SYSTEM FOR AGRICULTURE”. The overview of our project is to safeguard the farm from climatic changes like soil erosion, landslide and birds, animals etc.. So that we making a cloud based project and placing IOT based sensor. Over which it will produce sound and notification. From which we can protect our farm. And it will provide better yield for us.

1.2 Purpose

The main purpose of our project is to protect the farm from climatic changes, animals, birds, pests and to make the crop to grow better and provide better yield.

2. LITERATURE SURVEY

2.1 Existing problem

1.“Food” is the important thing which is needed for everyone to survive in this world. For that, farmers are doing their own part in an effective manner, during

which they have to face some problems such as:

2. There are increasing pressures from climate change, soil erosion and biodiversity loss and from consumers’ changing tastes in food and concerns about how it is produced.

3. And the natural world that farming works with – plants, pests and diseases –continues to pose its own challenges beyond that, they have to

4. Stay resilient against global economic factors.

5. Inspire young people to stay in rural areas and become future farmers

6. The effects of climate change affect farmers’ ability to grow the food we all need. Increasingly volatile weather and more extreme events –like floods and droughts –change growing seasons, limit the availability of water, allow weeds, pests, and fungi to thrive, and can reduce crop productivity.

2.2 References

[1] ISSN No:-2456-2165 Volume 4, Issue 2 Feb – 2019: "Solar's Energy: - A safe and reliable, eco-friendly and sustainable Clean Energy Option for Future India: - A Review."

[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: 244/55-5709 “ Design and Implementation of advanced security system for farm protection from wild animals.

2.3 Problem Statement

1. Agriculture is one of the area which required urgent attention and advancement for high yield and efficient utilisation of resources.

2. In this paper an approach smart crop monitoring is presented through Internet of Things (IOT).

3. A Level 4 framework is proposed namely sensing devices, sensor data level, base station level, edge computing and cloud data level for smart crop monitoring.

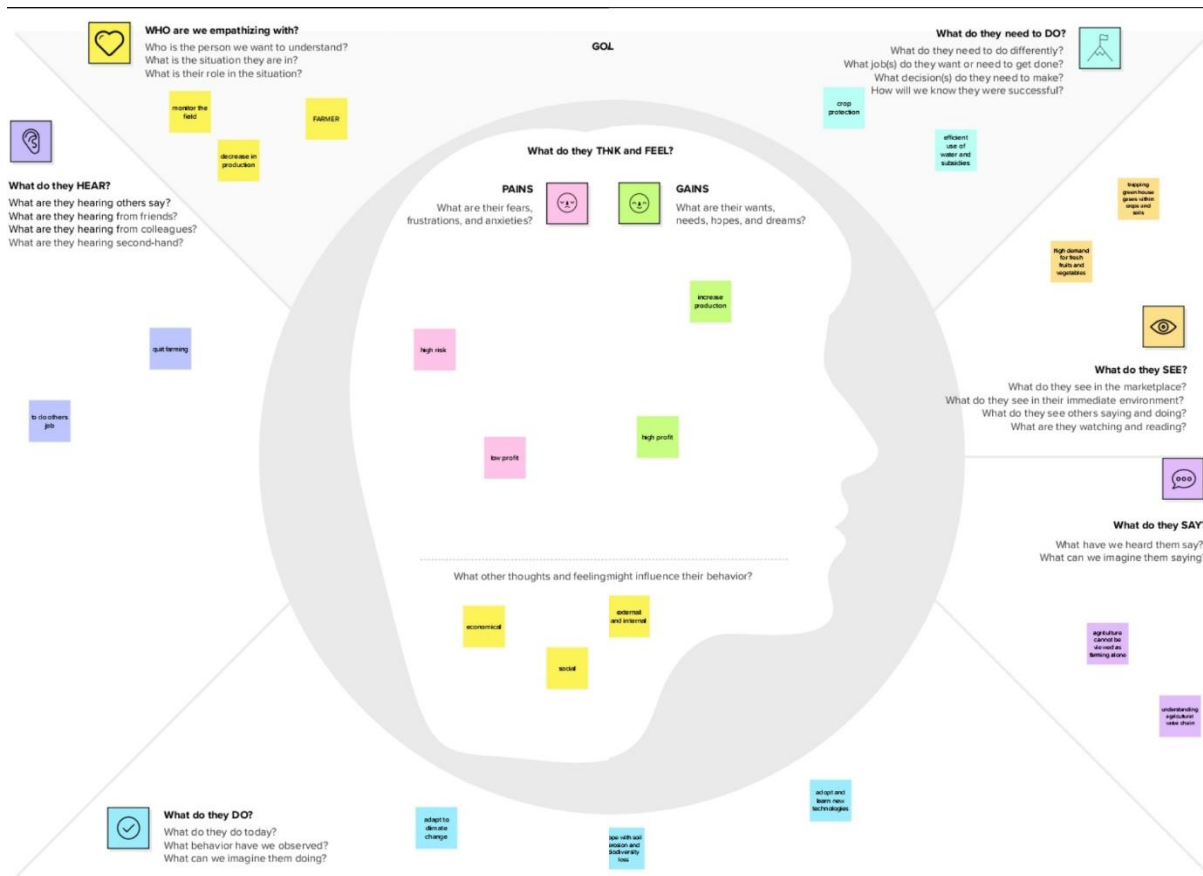
4. In this Project, Farm is going to get protected from humidity, Temperature and Animals with the help of IOT cloud module.

5. The Agricultural Farm is been monitored with the help of MIT app and then data will be collected and stored in its cloud.

6. It will monitor and sense the humidity level and movement of animals and will send the message as notification to the user.

3. IDEATION & PROPOSED SOLUTION

3.1 Empathy map canvas



3.2 Ideation and Brainstorming

What do they think and feel?

As its name may imply, smart farming is the use of technology in animal agriculture, and its something that's been around since the Industrial Revolution. The biggest difference between then and now, though? "Motorized devices are being replaced with IOT".

What do they hear?

Smart farming is about using the new technologies which have arisen at the dawn of the Fourth Industrial Revolution in the area of Agriculture and cattle production to increase quality and quantity by making maximum use of resources and minimizing the environmental impact.

What do they see?

Smart farming is a management concept focused on providing the agriculture industry with the infrastructure to leverage advanced technology - including Big Data, the cloud and the Internet of Things (IOT) - for tracking, monitoring, Automating and Analysing operations.

What do they say and do?

1. The aim of this technology is to make the most of all the Data collected by various tools, by converting them into real sources of information in order to define ways of simplifying agricultural work. It also allows for accurate and Predictive analysis of all situations that may affect the farms, Such as weather conditions (temperature, humidity etc..) and sanitary. For Example: This makes it easier to organize the supply of energy, water, livestock feed and fertilizer.

2. In its most advanced form, Smart farming facilitates the exchange of information between different farms, Creating a real network of connected farms accessible from a smart phone to the computer.

3.2 PROBLEM SOLUTION

S.NO	PARAMETERS	DESCRIPTION
1	Problem Statement (Problem to be solved)	Increase the crop production and save the crops from the animals and birds
2	Idea/Solution description	Using modern technologies to monitor temperature ,soil moisture and to save crops
3	Novelty/Uniqueness	IoT sensors can measure soil temperature, volumetric water content, photosynthetic radiation, soil water potential and soil oxygen levels.
4	Social Impact / Customer Satisfaction	Smart farming systems reduce waste, improve productivity and enable management of a greater number of resources through remote sensing.
5	Business Model (Revenue Model)	By protecting the crops productivity increases, the customer satisfaction also increases and it leads need for many applications so the revenue also increases.
6	Scalability of the Solution	It is scalable because of the adaptability of a system to increase the capacity

3.3 PROBLEM SOLUTION FIT

Define CS, fit into CL	1. CUSTOMER SEGMENT(S) CS Who is your customer? eg. working parents of 0-5 y.o. kids		6. CUSTOMER LIMITATIONS EG. BUDGET, DEVICES CL What limits your customers to act when problem occurs? Spending power, budget, no cash in the pocket? Network connection? Available devices?		5. AVAILABLE SOLUTIONS PLUSES & MINUSES AS Which solutions are available to the customer when he/she is facing the problem? What had he/she tried in the past? Pluses & minuses?		Explore AS, differentiate
	2. PROBLEMS / PAINS + ITS FREQUENCY PR Which problem do you solve for your customer? There could be more than one, explore different sides. eg. existing solar solutions for private houses are not considered a good investment (1). How often does this problem occur?		9. PROBLEM ROOT / CAUSE RC What is the root of every problem from the list? eg. People think that solar panels are bad investment right now, because they are too expensive (1.1), and possible changes to the law might influence the return of investment significantly and diminish the benefits (1.2).		7. BEHAVIOR + ITS INTENSITY BE What does your customer do about / around / directly or indirectly related to the problem? eg. directly related: tries different "green energy" calculators in search for the best deal (1.1), usually chooses for 100% green provider (1.2). indirectly related: volunteering work (Greenpeace etc) How often does this related behavior happen?		
Identify strong TR & EM	3. TRIGGERS TO ACT TR What triggers customer to act? eg. seeing their neighbor installing solar panels (1.1), reading about innovative, more beautiful and efficient solution (1.2)		10. YOUR SOLUTION SL If you are working on existing business - write down existing solution first, fill in the canvas and check how much does it fit 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.		8. CHANNELS of BEHAVIOR CH ONLINE Extract channels from Behavior block		Extract online & offline CH of BE
	4. EMOTIONS BEFORE / AFTER EM Which emotions do people feel before/after this problem is solved? Use it in your communication strategy. eg. frustration, blocking (can't afford it) > boost, feeling smart, be an example for others (made a smart purchase)				OFFLINE Extract channels from Behavior block and use for customer development		

4. REQUIREMENT ANALYSIS

4.1 FUNCTIONAL REQUIREMENT

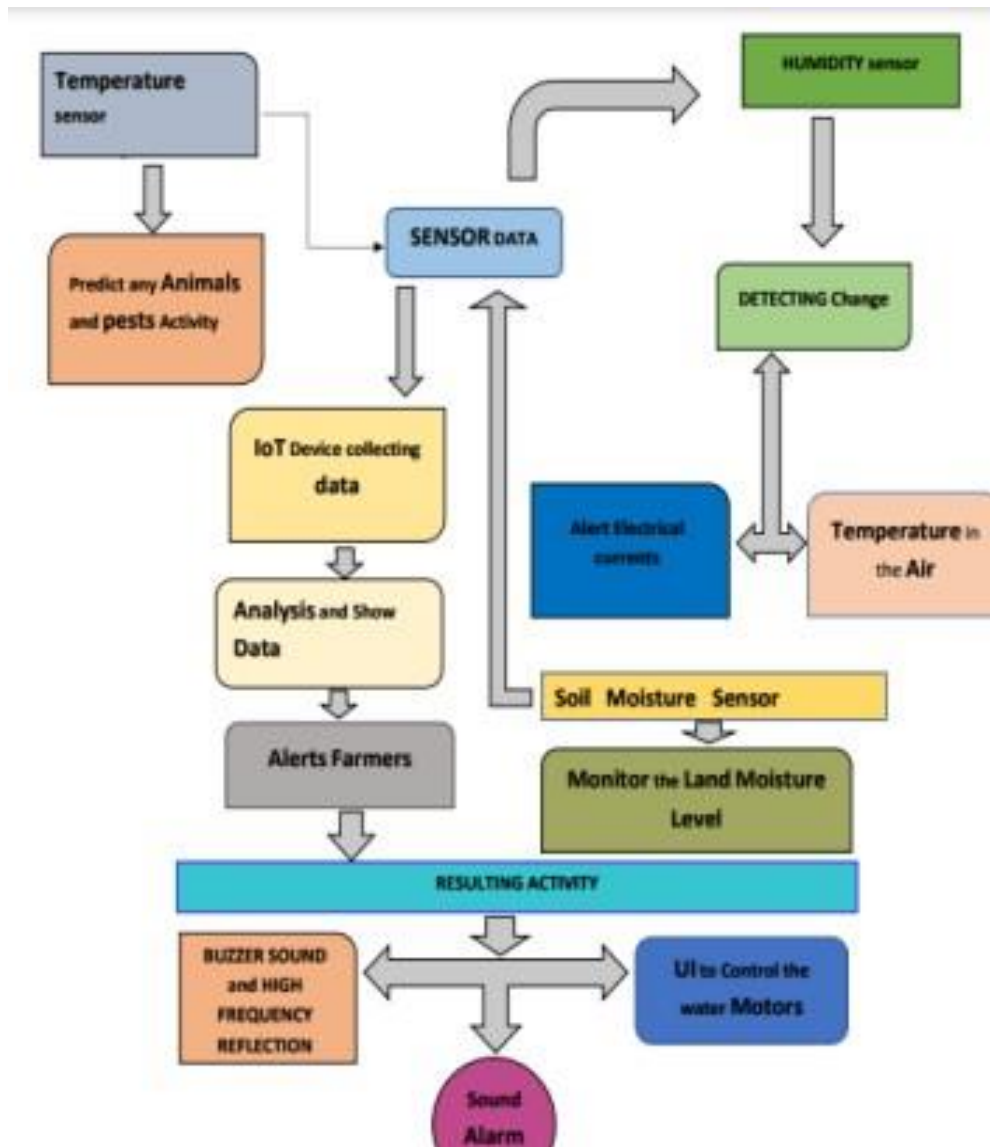
FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Install the app. Signing up with Gmail or phone number Creating a profile. Understand the guidelines.
FR-2	User Confirmation	Email or phone number verification required via OTP.
FR-3	Accessing datasets	Data's are obtained by cloudant DB.
FR-4	Interface sensor	Connect the sensor and the application When animals enter the field , the alarm is generated.
FR-5	Mobile application	It is used to control motors and field sprinklers.

4.2 NON FUNCTIONAL REQUIREMENT

FR No.	Non-Functional Requirement	Description
NFR-1	Usability	This project's contributes the farm protection through the smart protection system.
NFR-2	Security	It was created to protect the crops from animals.
NFR-3	Reliability	Farmers are able to safeguard their lands by help of this technology. They will also benefits from higher crop yields, which will improve our economic situation.
NFR-4	Performance	When animals attempt to enter the field, IOT devices and sensors alert the farmer via message.
NFR-5	Availability	We can defend the crops against wild animals by creating and implementing resilient hardware and software.
NFR-6	Scalability	This system's integration of computer vision algorithms with IBM cloudant services makes it more efficient to retrieve photos at scale, enhancing scalability.

5. PROJECT DESIGN

5.1 DATA FLOW



5.2 Solution & Technical Architecture

S.No	Component	Description	Technology
1.	User Interface	How user interacts with application e.g. Web UI, Mobile App, Chatbot etc.	HTML, CSS, JavaScript / Angular Js / React Js etc.
2.	Application Logic-1	Logic for a process in the application	Python
3.	Application Logic-2	Logic for a process in the application	IBM Watson/node red
4.	Application Logic-3	Logic for a process in the application	IBM Watson/node red
5.	Database	Data Type, Configurations etc.	MySQL, NoSQL, etc.

6.	Cloud Database	Database Service on Cloud	IBM Cloudant.
7.	Temperature sensor	Monitor the temperature	TMP36
8.	Humidity sensor	Monitor the humidity	DHT11
9.	Soil moisture sensor	Measure the amount of water in the soil	Soil moisture sensor
10.	Weather monitoring	Monitor the weather	Temperature sensor

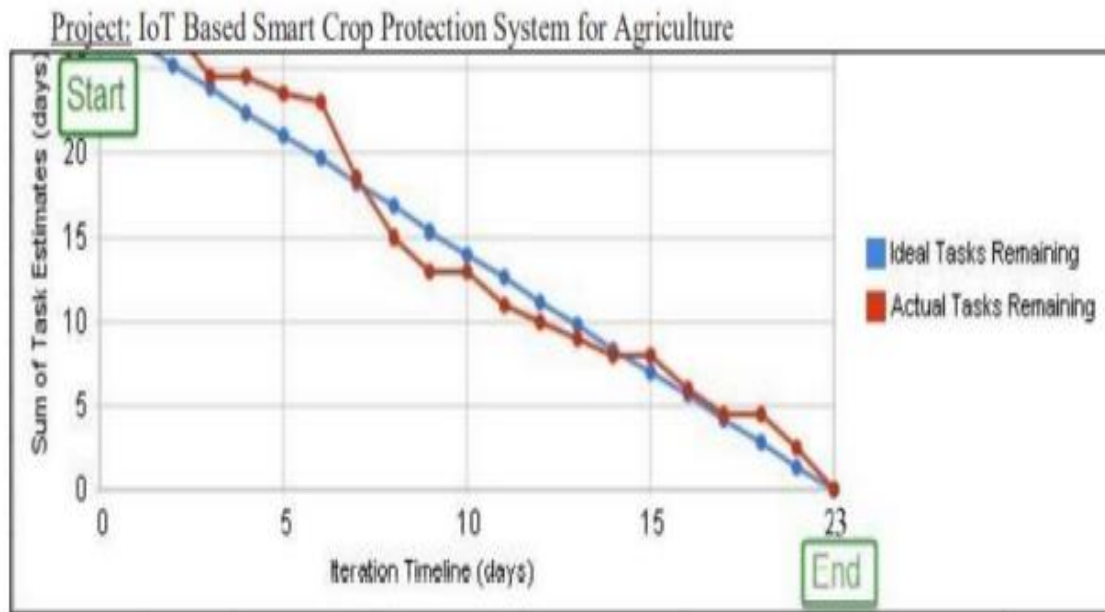
S.No	Characteristics	Description	Technology
1.	Open-Source Frameworks	Clarifai, Node- red	Software
2.	Security Implementations	Sensitive and private data must be protected from their protection until the decision-making and storage stages.	Encryption process
3.	Scalable Architecture	Scalability is a major concern for IOT platform it has been shown that different architectural choices of IOT platform affect system capability and that automatic real time decision making is feasible in an environment composed of dozens of thousand.	Software
4.	Availability	Automatic adjustment of farming equipment made possible by linking information like crops/weather and temperature, humidity etc.	Software
5.	Performance	The ideas of implementing integrated sensors with sensing soil and environmental or ambient parameters in farming will be more efficient for overall monitoring.	Software

6. PROJECT PALNNING AND SCHEDULING

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points (40)	Priority (Low to High)	Team Members
Sprint-1	Registration	USN-1	As a user, I can register for the required dataset by entering my email, password, and confirming my password	3	High	Sakthipraba g s
Sprint-1		USN-2	As a user, I will receive confirmation email and the SMS once I have registered for the application	2	High	Srisabari k v
Sprint-2	Cloud services	USN-3	As a user, I can register for the application through Facebook or any social media	1	Low	Soniyasri m
Sprint-4		USN-4	As a user, I can register for the application through Gmail/web service	2	medium	Sridhar n
Sprint-3	Login	USN-5	As a user, I can log into the application network by entering email & password	4	high	Sakthipraba g s
Sprint-2	Pre processing	USN-6	As a farmer, the user must be able to find the system easy to access so pre-processes and other task must be perfect.	3	High	Soniyasri m
Sprint-1	Collecting Dataset	USN-7	To collect various sources of animal threats and keep developing a dataset.	3	medium	Srisabari k v
Sprint-4	Integrating	USN-8	To integrate the available dataset and keep improving the accuracy of finding animals	2	High	Sakthipraba g s

Sprint-3		USN-9	To find and use appropriate compiler to run and test the data so that we can implement our program	1	Low	Sridhar n
Sprint-2		USN-10	Request Saveetha Engineering College to deploy the project in our campus and test	1	Low	Soniyasri m
Sprint-1	Training	USN-11	As programmer, we need to train our data perfectly so that the program runs smoothly	3	High	Sakthipraba g s
Sprint-3		USN-12	Train the data using out available services and IBM dataset from server and improve that	2	Medium	Srisabari k v
Sprint-4	Coding	USN-13	To modify the code according to our program and improve the efficiency of that code	4	High	Sridhar n
Sprint-2		USN-13	To improve performance	1	Low	Srisabari k v
Sprint-2	Record	USN-5	To record the data and plot the graph to show the characteristics officially	4	High	Sakthipraba g s
Sprint-1	Planning	USN-4	Plan the programming language and feasibility	3	Medium	Soniyasri m
Sprint-4		USN-14	Demonstrate the working and improve accuracy overall	2	Low	Srisabari k v

BURNDOWN CHART



7. CODING AND SOLUTIONING

```
import wiotp.sdk.device
import time
import random

myConfig={
    "identity": {
        "orgId": "c0b4co",
        "typeId": "NodeMCU",
        "deviceId": "12345"},
    "auth": {
        "token": "12345678"
    }
}

def myCommandCallback(cmd):
    print("Message received from IBM IoT Platform: %s" % cmd.data['command'])
    m=cmd.data['command']
    if(m=="motoron"):
        print("Motor is switched on")
    elif(m=="motoroff"):
        print("Motor is switched off")
    print(" ")

client = wiotp.sdk.device.DeviceClient(config=myConfig, logHandlers=None)
client.connect()

while True:
    temp=random.randint(-20,125)
    hum=random.randint(0,100)
    moist=random.randint(0,14)
    animal=random.randint(0,1)
    if(animal>0.5):
```

```
    an="animal is present"
```

```
else:
```

```
    an="animal is not present"
```

```
myData={'temperature':temp, 'humidity':hum, 'Moisture':moist,"animal status":an}
```

```
client.publishEvent(eventId="status", msgFormat="json", data=myData, qos=0, onPublish=None)
```

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

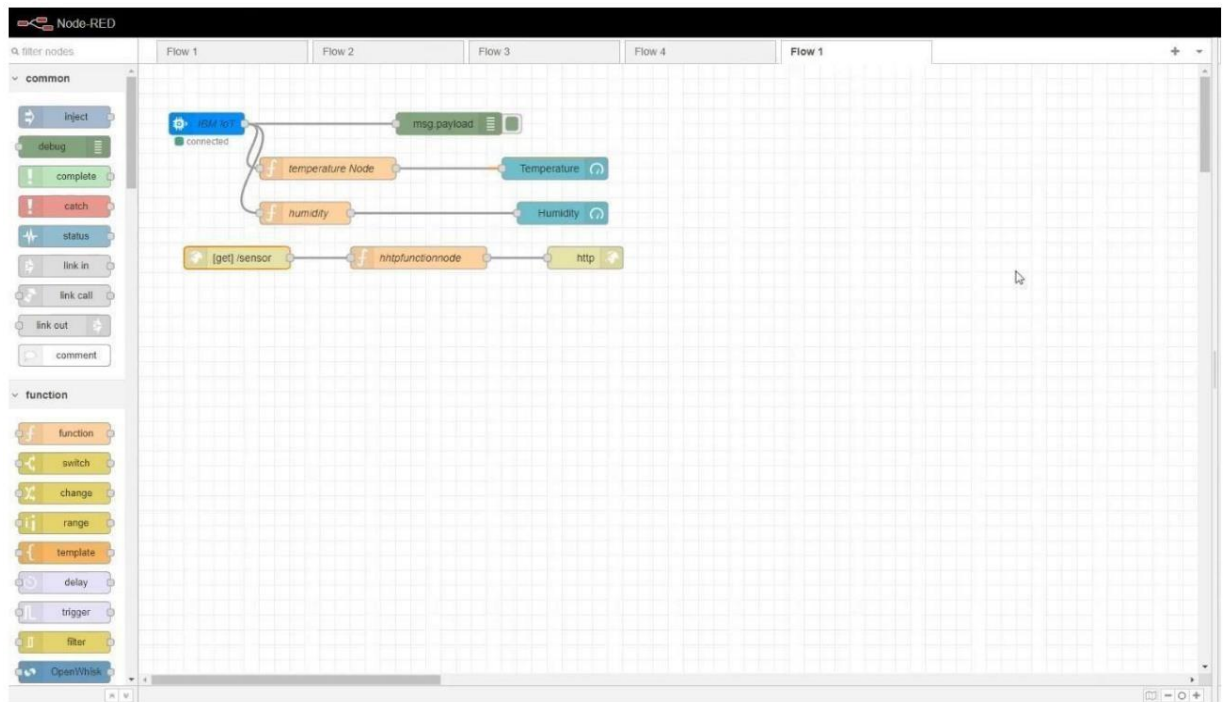
```
client.commandCallback = myCommandCallback
```

```
time.sleep(2)
```

```
client.disconnect()
```


8. TESTING

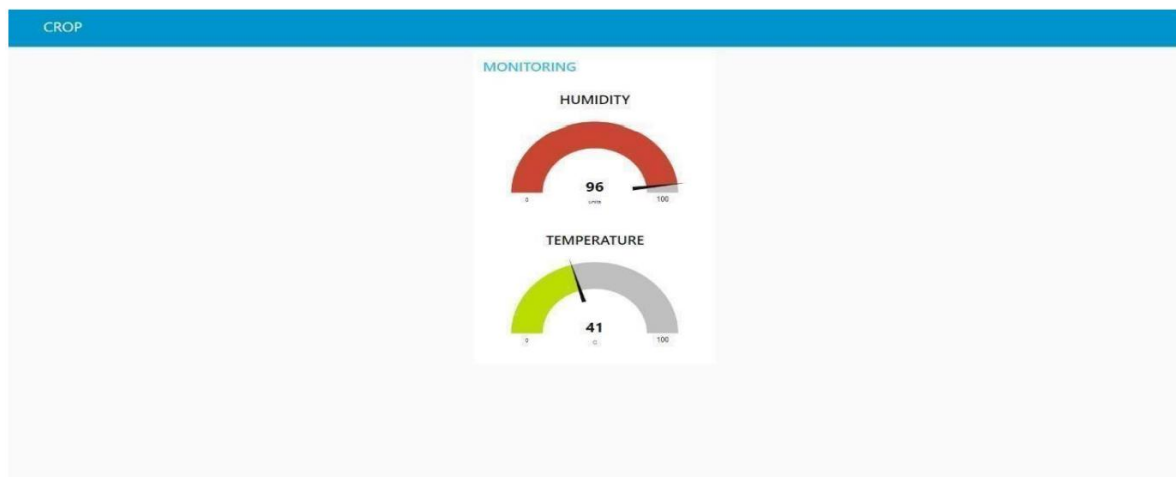
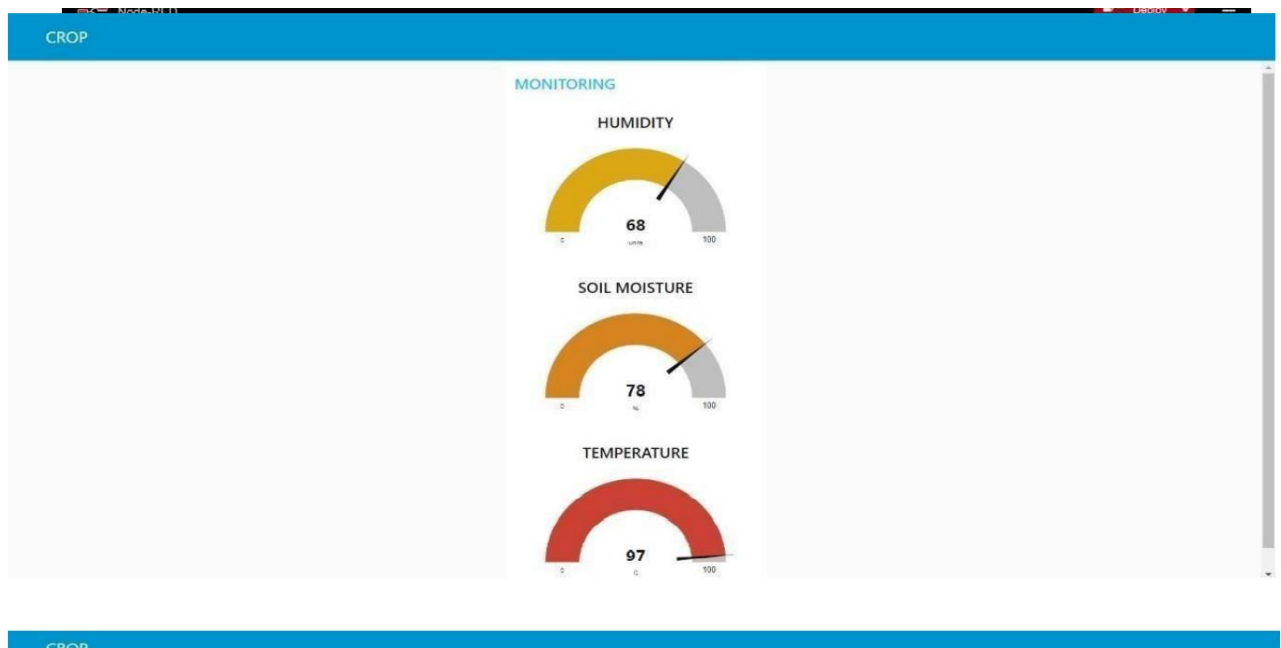
8.1 TEST CASES



9. RESULTS

1.The problem of crop vandalization by wild animals and firehas become a major social problem in current time.

2.It requires urgent attention as no effective solution exists tilldate for this problem. Thus this project carries a great social relevance as it aims to address this problem. This project will help farmers in protecting their orchards and fields and savethem from significant financial losses and will save them from the unproductive efforts that they endure for the protection their fields. This will also help them in achieving better cropyields thus leading to their economic wellbeing.



10. ADVANTAGES AND DISADVANTAGES

Advantage:

Controllable food supply. you might have droughts or floods, but if you are growing the crops and breeding them to be hardier, you have a better chance of not starving. It allows farmers to maximize yields using minimum resources such as water, fertilizers.

Disadvantage:

The main disadvantage is the time it can take to process the information. in order to keep feeding people as the population grows you have to radically change the environment of the planet.

11. CONCLUSION

A IoT Web Application is built for smart agricultural system using Watson IoT platform, Watson simulator, IBM cloud and Node-RED.

12. FUTURE SCOPE

I In the future, there will be very large scope, 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 using wireless networks such as laser wireless sensors and by sensing this laser or sensor's security system will be activated.

13.APPENDIX SOURCE

CODE

```
import wiotp.sdk.device
import time
import random

myConfig={
    "identity": {
        "orgId": "c0b4co",
        "typeId": "NodeMCU",
        "deviceId": "12345"},
    "auth": {
        "token": "12345678"
    }
}

def myCommandCallback(cmd):
    print("Message received from IBM IoT Platform: %s" % cmd.data['command'])
    m=cmd.data['command']
    if(m=="motoron"):
        print("Motor is switched on")
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    print(" ")

client = wiotp.sdk.device.DeviceClient(config=myConfig, logHandlers=None)
client.connect()

while True:
    temp=random.randint(-20,125)
    hum=random.randint(0,100)
    moist=random.randint(0,14)
```

```
animal=random.randint(0,1)
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```
if(animal>0.5):
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    an="animal is present"
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else:
```

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    an="animal is not present"
```

```
myData={'temperature':temp, 'humidity':hum, 'Moisture':moist,"animal status":an}
```

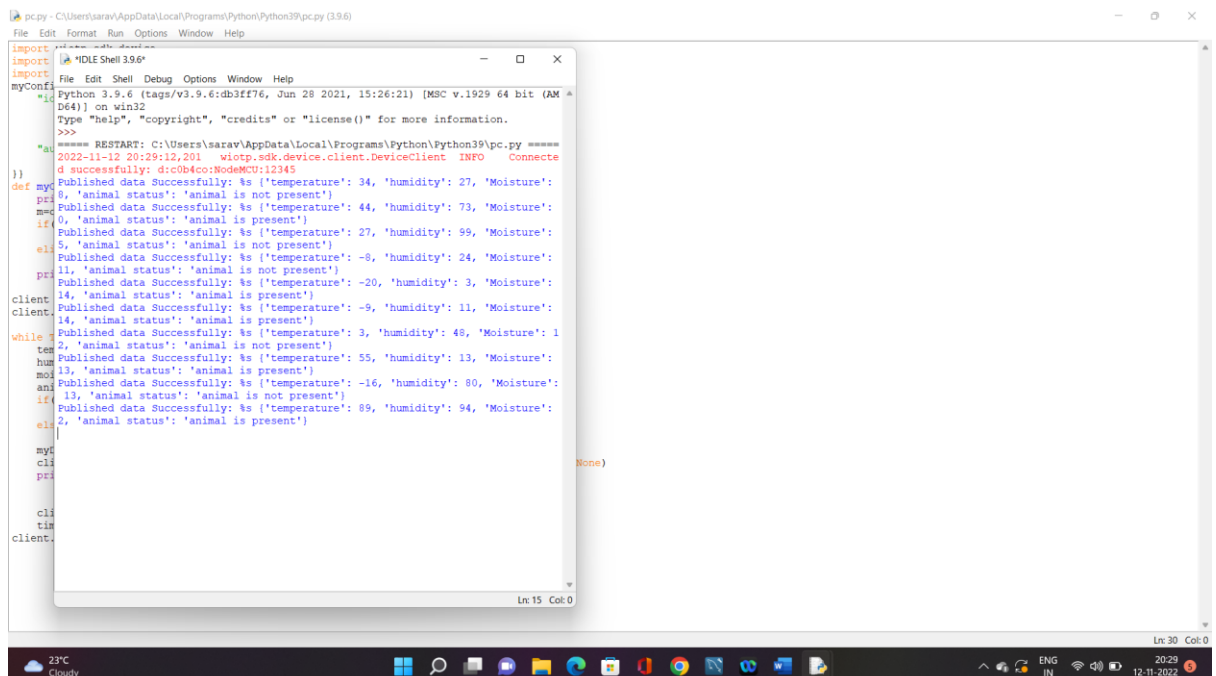
```
client.publishEvent(eventId="status", msgFormat="json", data=myData, qos=0, onPublish=None)
```

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

```
client.commandCallback = myCommandCallback
```

```
time.sleep(2)
```

```
client.disconnect()
```



```
pc.py - C:\Users\sarav\AppData\Local\Programs\Python\Python39\pc.py (3.9.6)
File Edit Format Run Options Window Help
import random
import time
import paho.mqtt.client as mqtt
myConf = {
    'broker': '192.168.1.100',
    'port': 1883,
    'topic': 'sensors/temperature',
    'qos': 0,
    'keepalive': 60,
    'username': 'sensors',
    'password': 'sensors'
}
client = mqtt.Client()
client.username_pw_set('sensors', 'sensors')
client.connect(myConf['broker'], myConf['port'], myConf['keepalive'])
client.publishEvent(eventId="status", msgFormat="json", data=myData, qos=0, onPublish=None)
print("Published data Successfully: %s", myData)

client.commandCallback = myCommandCallback

time.sleep(2)

client.disconnect()
```

Python 3.9.6 (tags/v3.9.6:db3ff76, Jun 28 2021, 15:26:21) [MSC v.1929 64 bit (AMD64)] on win32
Type "help", "copyright", "credits" or "license()" for more information.
>>>
===== RESTART: C:\Users\sarav\AppData\Local\Programs\Python\Python39\pc.py =====
2022-11-12 20:29:12.201 wiotp.sdk.device.client.DeviceClient INFO Connected successfully: d1c0b4c0cNodeMCU:12345
Published data Successfully: %s {'temperature': 34, 'humidity': 27, 'Moisture': 8, 'animal status': 'animal is not present'}
Published data Successfully: %s {'temperature': 44, 'humidity': 73, 'Moisture': 0, 'animal status': 'animal is present'}
Published data Successfully: %s {'temperature': 27, 'humidity': 99, 'Moisture': 5, 'animal status': 'animal is not present'}
Published data Successfully: %s {'temperature': -8, 'humidity': 24, 'Moisture': 11, 'animal status': 'animal is not present'}
Published data Successfully: %s {'temperature': -20, 'humidity': 3, 'Moisture': 14, 'animal status': 'animal is present'}
Published data Successfully: %s {'temperature': -9, 'humidity': 11, 'Moisture': 14, 'animal status': 'animal is present'}
Published data Successfully: %s {'temperature': 3, 'humidity': 46, 'Moisture': 12, 'animal status': 'animal is not present'}
Published data Successfully: %s {'temperature': 55, 'humidity': 13, 'Moisture': 13, 'animal status': 'animal is present'}
Published data Successfully: %s {'temperature': -16, 'humidity': 80, 'Moisture': 13, 'animal status': 'animal is not present'}
Published data Successfully: %s {'temperature': 89, 'humidity': 94, 'Moisture': 2, 'animal status': 'animal is present'}
None)

<https://github.com/IBM-EPBL/IBM-Project-35901-1660290184>

