A REPORT OF PROJECT

AT

NALAIYA THIRAN PROJECT BASED LEARNING ON

PROFESSIONAL READINESS FOR INNOVATION EMPLOYMENT AND ENTERPRENEURSHIP

(HX8001)

IOT BASED SMART CROP PROTECTION SYSTEM FOR AGRICULTURE

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BONAFIDE CERTIFICATE

This is to certify that the project entitled "**IoT Based Smart Crop Protection System for Agriculture**" is a bonafide record of **Nalaiya thiran project based learning on a Professional Readiness for innovation employment and entrepreneurship** done by the students of "**Muthuraj S, Kenywod A C, Samdencil S** " under my guidance and supervision.

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CONTENT

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1.INTRODUCTION:

1.1Project Overview :

This project is based on Internet Of Things (IoT), that can measure soil moisture, Humidity and temperature conditions for agriculture and crop protection using Watson IoT services. IoT is network that connects physical objects or things embedded with electronics, software and sensors through network connectivity that collects and transfers data using cloud for communication Data is transferred through internet without human to human or human to computer interaction.

In this project we have not used any hardware. Instead of real soil moisture, Humidity and Temperature data obtained from sensors we make use of IBM IoT Simulator which can transmit these parameters as required.

1.2 Purpose :

An intelligent crop protection system helps the farmers in protecting the crop from the animals and birds which destroy the crop.

This system also helps farmers to monitor the soil moisture levels in the field and also the temperature and humidity values near the field. The motors and sprinklers in the field can be controlled using the mobile application.

2. LITERATURE SURVEY

2.1Existing Problem

● Agriculture is a field which forms the basis of our economy. Yet it faces a lot of problems in terms of availability of resources, Irrigation, increasing rate of pesticides, Climatic disasters, Insects which ruin the crops and makes a huge loss this sector.

● In agriculture water is needed for the crops for their growth. If the soil gets dry it is necessary to supply water. But sometimes if the farmer doesn't visit the field it is not possible to know the condition of the soil.

● Sometimes over supply of water or less supply of water affects the growth of crops.

● Sometimes if the weather/temperature changes suddenly it is necessary to take certain actions.

● Specific crops grow better in specific conditions, they may get damaged due to bad weather.

2.2 References :

●https://smartinternz.com/assets/docs/Smart%20Home%20Automation%20using%20IBM%20cloud%20Service s%20(1).pdf

●https://smartinternz.com/assets/docs/Smart%20Home%20Automation%20using%20IBM%20cloud%20Service s%20(1).pdf

● https://openweathermap.org/

●https://smartinternz.com/assets/docs/Sending%20Http%20request%20to%20Open%20weather%20map%20 website%20to%20get%20the%20weather%20forecast.pdf

● https://www.youtube.com/watch?v=cicTw4SEdxk

●https://smartinternz.com/assets/docs/Smart%20Home%20Automation%20using%20IBM%20cloud%20Service s%20(1).pdf

● https://github.com/rachuriharish23/ibmsubscribe

2.3 Problem Statement Definition:

● Smart Crop Protection System based on IoT can monitor soil moisture and climatic conditions to grow and yield a good crop.

● The farmer can also get the real time weather forecasting data by using external platforms like Open Weather API.

● Farmer is provide a mobile app using which he can monitor the temperature, humidity and soil moisture parameters along with weather forecasting details.

● Based on all the parameters he can water his crop by controlling the motors usingthe mobile application.

● Even if the farmer is not present near his crop he can water his crop by controlling the motors using the mobile application from anywhere.

● Here we are using the Online IoT simulator for getting the Temperature, Humidity and Soil Moisture values.

3. IDEATION & PROPOSED SOLUTION:

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.

3.2 Ideation & Brain Storming

What do they think and feel?

As its name may imply, smart farming is the use of technology in animal agriculture, and it's 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 areas of agriculture and cattle production to increase production quantity and quality, 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 agricultural industry with the infrastructure to leverage advanced technology – including big data, the cloud and the internet of things (IoT) – for tracking, monitoring, automating and analyzing operations.

What do they say and do?

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 then 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 or economic situations, for example. This makes it easier to organize the supply of energy, water, livestock feed and fertilizer. 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 smartphone.

3.3 Proposed Solution

1. • Problem Statement (Problem to be solved) • Crops are not irrigated properly due to insufficient labour forces. • Improper maintenance of crops against various environmental factors such as temperature climate, topography and soil quality which results in crop destruction. • Requires protecting crops from Wild animals attacks, birds and pests.

2. • Idea / Solution description • Moisture sensor is interfaced with Arduino Microcontroller to measure the moisture level in soil and relay is used to turn ON and OFF the motor pump for managing the excess water level. It will be updated to authorities through IOT. • Temperature sensor connected to microcontroller is used to monitor the temperature in the field. • Image processing techniques with IOT is followed for crop protection against animal attacks.

3. Novelty / Uniqueness • Automatic crop maintenance and protection using embedded and IOT technology.

4. Social Impact / Customer Satisfaction • This proposed system provides many facilities which helps the farmers to maintain the crop field without much loss.

5. Business Model (Revenue Model) • This prototype can be developed as product with minimum cost with high performance . 6. Scalability of the Solution • This can be developed to a scalable product by using sensors and transmitting the data through Wireless Sensor Network and Analysing the data in cloud and operations is performed using robots .

3.4 Problem Solution Fit

Problem-solution fit is a term used to describe the point validating that the base problem resulting in a business idea really exists and the proposed solution actually **solves that problem**. The problem-solution fit is when you- Validate that the problem exists: When you validate your problem hypothesis using real-world data and feedback.

4. REQUIREMENT ANALYSIS

4.1 Functional Requirement

Following are the functional requirements of the proposed solution.

• FR-1 User Registration,Registration through Form Registration through Gmail Registration through LinkedIN

• FR-2 User Confirmation ,Confirmation via Email Confirmation via OTP

• FR-3 Tracking Expense Helpful insights about money management

• FR-4 Alert Message Give alert mail if the amount exceeds the budget limit

• FR-5 Category This application shall allow users to add categories of their expenses

4.2 Non Functional requirement

Following are the non-functional requirements of the proposed solution.

• NFR-1 Usability You will able to allocate money to different priorities and also help you to cut down on unnecessary spending

• NFR-2 Security More security of the customer data and bank account details.

• NFR-3 Reliability Used to manage his/her expense so that the user is the path of financial stability. It is categorized by week, month, and year and also helps to see more expenses made. Helps to define their own categories.

• NFR-4 Performance The types of expense are categories along with an option .Throughput of the system is increased due to light weight database support.

• NFR-5 Availability Able to track business expense and monitor important for maintaining healthy cash flow.

NFR-6 Scalability The ability to appropriately handle increasing demands.

5. PROJECT DESIGN

5.1 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 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.

5.3 Solution Architecture Diagram:

Solution architecture provides the ground for software development projects by tailoring IT solutions to specific business needs and defining their functional requirements and stages of implementation. It is comprised of many subprocesses that draw guidance from various enterprise architecture viewpoints.

To better understand the role of solution architecture in the context of software development, you first need to think about what a solution is. Even though this might seem quite basic, it illustrates why solution architecture is one of the most important processes when re-designing your IT landscape. At its core, a solution is a way to describe an answer to a problem. In the corporate world, this means evaluating client needs or problems and addressing them with systems that replace or improve the existing system.

In solution architecture, the client needs are expanded to business needs that in one way or another are related to technology. These needs usually crystallize through re-assessing existing systems and finding out how they benefit or harm the organization in the long run. Sometimes, these evaluations are run by business analysts who also provide a definition of the problem. In the next step, solution architects take this problem and start crafting a description of solutions that appropriately address this need.

Thus, solution architecture translates technical business needs into practical IT solutions while establishing rules and instructions for proper implementation and delivery. It also considers all external factors that could have an impact on the development process. This way, digital projects are less likely to fail and there is a consensus between EA teams and development teams. SA can be seen as a support system that provides structure and reduces the scope of complexity when developing and rolling out new systems and applications.

6.1 Sprint Planning & Estimation :

Sprint planning requires some level of estimation. The team needs to define what can or cannot be done in the sprint: estimated effort vs capacity. Estimation is often confused with commitments. Estimates are by their very nature forecasts based on the knowledge at hand.

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	8	6 Days	24 Oct 2022	29 Oct 2022	8	29 Oct 2022
Sprint-2	5	6 Days	31 Oct 2022	05 Nov 2022	5	05 Nov 2022
Sprint-3	8	6 Days	07 Nov 2022	12 Nov 2022	8	12 Nov 2022
Sprint-4	8	6 Days	14 Nov 2022	19 Nov 2022	8	19 Nov 2022

7. Coding And Solutioning :

7.1 Features

Feature 1: Detect the Temperature

Feature 2: Detect the Humidity

Feature 3: Detect the Moisture

Feature 4: Detect the Animals

Codes:

PYTHON CODE TO IBM:

```
import time

import sys

import ibmiotf.application

import ibmiotf.device

import random
```

```
#Provide your IBM Watson Device Credentials

organization = "iritj7"

deviceType = "abcd"

deviceId = "12345"

authMethod = "token"

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")

elif status == "lightoff":

print ("led is off")

else :

print ("please send proper command")

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()
```

```
# Connect and send a datapoint "hello" with value "world" into the cloud as an

event of type "greeting" 10 times

deviceCli.connect()

while True:

 #Get Sensor Data from DHT11


temp=random.randint(90,110)

Humid=random.randint(60,100)

Moist=random.randint(20,100)

Animal_dect=random.randint(1,20)


data = { 'temp' : temp, 'Humid': Humid, 'Moist' : Moist, 'Animal_dect' :

Animal_dect }

#print data

def myOnPublishCallback():

print ("Published Temperature = %s C" % temp, "Humidity = %s %%"

% Humid, "to IBM Watson", "Published Moisture= %s" % Moist, "Published

Animal detection = " , Animal_dect)

success = deviceCli.publishEvent("IoTSensor", "json", data, qos=0,

on_publish=myOnPublishCallback)

if not success:

print("Not connected to IoTF")

time.sleep(10)
```

deviceCli.commandCallback = myCommandCallback

Disconnect the device and application from the cloud

deviceCli.disconnect()

NODE RED CODE:

TEMPERATURE:

msg.payload=msg.payload.”temp”

return msg;

HUMIDITY:

msg.payload=msg.payload.”Humid”

return msg;

MOISTURE:

msg.payload=msg.payload.”Moist”

return msg;

ANIMAL DETECTION:

msg.payload=msg.payload.”Animal_dect”

return msg;

8. TESTING:

8.1 TESTING :

• PYTHON CODE TO IBM

• IoT SENSOR OUTPUT

• IBM CLOUD TO NODE RED OUTPUT

8.2 User Acceptance Testing:

8.1 Purpose of Document

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

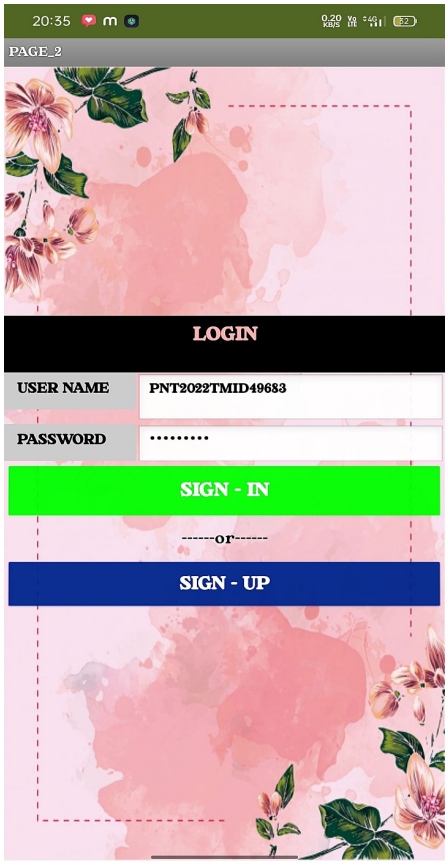
8.2 Defect Analysis

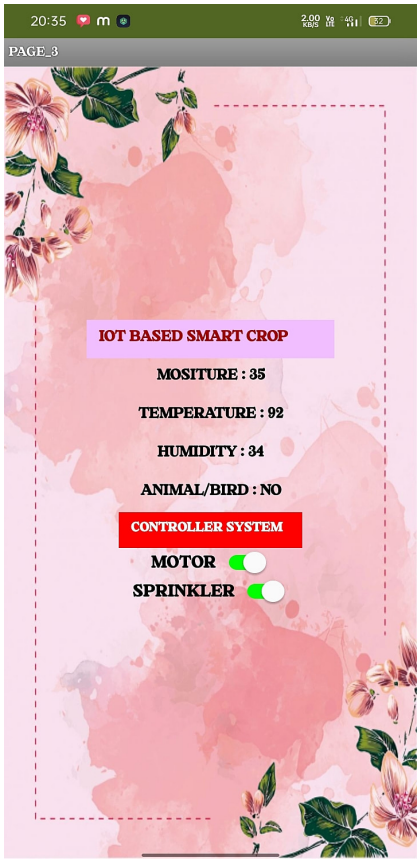
This report shows the number of resolved or closed bugs at each severity level, and how they were resolved

8.3 Test Case Analysis

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

9 RESULT





ADVANTAGES :

• Farmers can monitor the health of farm animals closely, even if they are physically distant.

• Smart farming systems reduce waste, improve productivity and enable management of a greater number of resources through remote sensing.

• High reliance.

• Enhanced Security.

DISADVANTAGES:

• Farms are located in remote areas and are far from access to the internet.

• A farmer needs to have access to crop data reliably at any time from any location, so connection issues would cause an advanced monitoring system to be useless.

• High Cost

• Equipment needed to implement IoT in agriculture is expensive.

APPLICATIONS:

• Monitoring the crop field with the help of sensors (light , humidity, temperature, soil moisture, etc.)

• Automating the irrigation system

• Soil Moisture Monitoring (including conductivity)

CONCLUSION:

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.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 save them 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 crop yields thus leading to their economic well being.

FUTURE SCOPE:

Study and analysis of the developed Crop protection systems for its cost effectiveness with the development of Arduino based variable frequency Ultrasonic bird deterrent circuit. outline of the crop damage caused by a particular Wild animal if the behavioural features of the With the reduced cost in the smart phones.

APPENDIX:

SOURCE CODE

The source code has been uploaded in git hub.

GITHUB LINK - IBM-EPBL/IBM-Project-43689-1660718769: IoT Based Smart Crop Protection System for Agriculture (github.com)