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**1.INTRODUCTION**

**1.1 PROJECT OVERVIEW**

Crop damage caused by animal attacks is one of the major threats in reducing the crop yield. Due to the expansion of cultivated land into previous wildlife habitat, crop raiding is becoming one of the most conflicts antagonizing human wildlife relationships. Crops in farms are many times ravaged by local animals like buffaloes, cows, goats, birds etc. this leads to huge losses for the farmers. The important thing is to prevent the animals which moves from the forest into the agricultural land, has become one of the rising factor that affects agriculture. 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. The system will provide a complete technical solution to the destruction of crops by animals using internet of things to prevent crops from animals. Agriculture is the backbone of the economy but because of animal attacks, climate changes in agricultural lands there will be huge loss of crops. 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. The microcontroller now alert the animal to scare away from the field as well as sends SMS to the farmer so that he may about the issue and come to the spot in case the animal don’t turn away by the alarm. This ensures complete safety of crop from animals thus protecting farmer loss.

**1.2 PROJECT PURPOSE**

Our main purpose of the project is to develop intruder alert to the farm, to avoid losses due to animal and fire. These intruder alert protect the crop that damaging that indirectly increase yield of the crop. The develop system will not harmful and injurious to animal as well as human beings. Theme of project is to design a intelligent security system for farm protecting by using embedded system. The current methods used to counter this problem include the use of electrified welded mesh fences (usually 30cm in the ground), chemicals or organic substances and gas cannons. Other traditional methods applied by farmers include the use of Hellikites, Ballons, Shot/Gas guns, String & stone, etc. These solutions are often cruel and ineffective. They also require a vast amount of installation and maintenance cost and some of the methods have environmental pollution effect on both humans and animals. On the other hand, the chemical products used to prevent these animal attacks have an application cost per hectare and their effectiveness is dependent on weather condition, as rain may cause a dilution effect. Technology assistance at various stages of agricultural processes can significantly enhance the crop yield. Sensor networks express a substantial improvement over traditional invasive methods of monitoring. Our proposed method is based on an animal friendly ultrasounds generator, which does not produce physical or biological harm to the animals nor sounds audible to humans.

**2.LITERATURE SURVEY**

**2.1 EXISTING PROBLEM**

The animals enter into the agricultural land because of the lack of water resources in the forest areas and deforestation. The existing system mainly provide the surveillance functionality. Also these system don’t provide protection from wild animals, especially in such an application area. The also need to take actions based on the type of animal that tries to enter the area, as different methods are adopted to prevent different animals from entering restricted areas. The other commonly used method by farmer in order to prevent the crop vandalization by animals include building physical barriers, use of electric fences and manual surveillance and various such exhaustive and dangerous method**.** Sometimes people also lost theirlives while they try to banish the animals out of their place. This system mainly consists of sensing part and monitoring part. The animal intrusion detection system is incredibly essential in numerous fields like villages close to forests, roads through forests and agricultural fields. Attacks from animals are common all over these fields. The system implemented is the bird and animal intrusions are being detected by the use of wireless sensors and buzzers which produce acoustic sounds. With the technology of sensor, RFID, and GPS, many researches are recently being carried out on monitoring animal behavior and interactions with the environment. Video based surveillance systems generally employ one or more cameras connected to a set of monitors.

**2.2 REFERENCES**

1. International Journal of Innovative Technology and Exploring Engineering (IJITEE) ISSN: 2278-3075, Volume-9, Issue-1, November 2019.

2. International Journal of Pure and Applied Mathematics Volume 119No.12 2018,14327-14335ISSN:1314-3395(on-line version)url:http://www.ijpam.eu Special issue.

3. Smart crop protection system from wild animals and birds using IoT ISSN: 2454-132X Impact Factor: 6.078 Volume 7, Issue 4 - V7I4-1724.

4.Mr.Pranav shitap, Mr.Jayesh redij, Mr.Shikhar Singh, Mr.Duvresh Zagade, Dr.Sharada Chougule. Department of ELECTRONICS AND TELECOMMUNICATION ENGINEERING, Finolex Academy of Management and technology, ratangiri , India.

5. Mr.P.Venkateswara Rao, Mr.Ch Shiva Krishna ,MR M Samba Siva ReddyLBRCE,LBRCE,LBRCE.

6. N.Penchalaiah, D.Pavithra, B.Bhargavi, D.P.Madhurai, K.EliyaasShaik, S.MD.sohaib.Assitant Professor, Department of CSE,AITS, Rajampet, India UG Student, Department of CSE, AITS, Rajampet, India.

7. Mohit Korche,Sarthak Tokse, ShubhamShirbhate, Vaibhav Thakre,S. P. Jolhe(HOD).Students, Final Year, Dept.of.Electrical Engineering, Government College of Engineering, Nagpur head of dept., Electrical Engineering, Government College of Engineering, Nagpur.

**2.3 PROBLEM STATEMENT DEFINITION**

Animal and bird Detection in boundaries is very vital. It is critical to have a system tomonitor the animal’s intrusion and report it to the farmers and forest officers. Damage of crops caused by animals and birds is one of the major threats in reducing crop yield. Crops are mainly damaged by local animals like buffaloes, cows, pigs, goats, birds,etc. This leads to huge losses for the farmers. Agriculture farming is the main source of livelihood for many people in different parts of the world. Unfortunately farmers are still reliant on traditional methods that evolved hundreds of years ago. Due to this, crops yields are becoming low. Also, several reasons contribute to the low yield of crops animal intrusion is also one among them. Wild animals are special challenge for farmers throughout the world in recent years. Some wild animals like monkey, elephant, deer, wild bears and tigers etc., cause serious damage to crops by running over the feld and trampling over the crops. It causes fnancial problem for the farmers. Farmers with large area of agricultural land fnd it very tedious to irrigate their land manually. In forest zone and agricultural field human animal conflict is a major problem. Due to those attacks people lose their crops, livestock, property, and sometimes their lives. So this zone is tobe monitored continuously to prevent entry of wild animals. With regard to this problem, we have made an effort to develop the system which will monitor the field. The system will detect intrusion around the field using camera that will capture the image of the intruder and sends notification to farm owner and forest officials using Message.

**3.IDEATION & PROPOSED SOLUTION**

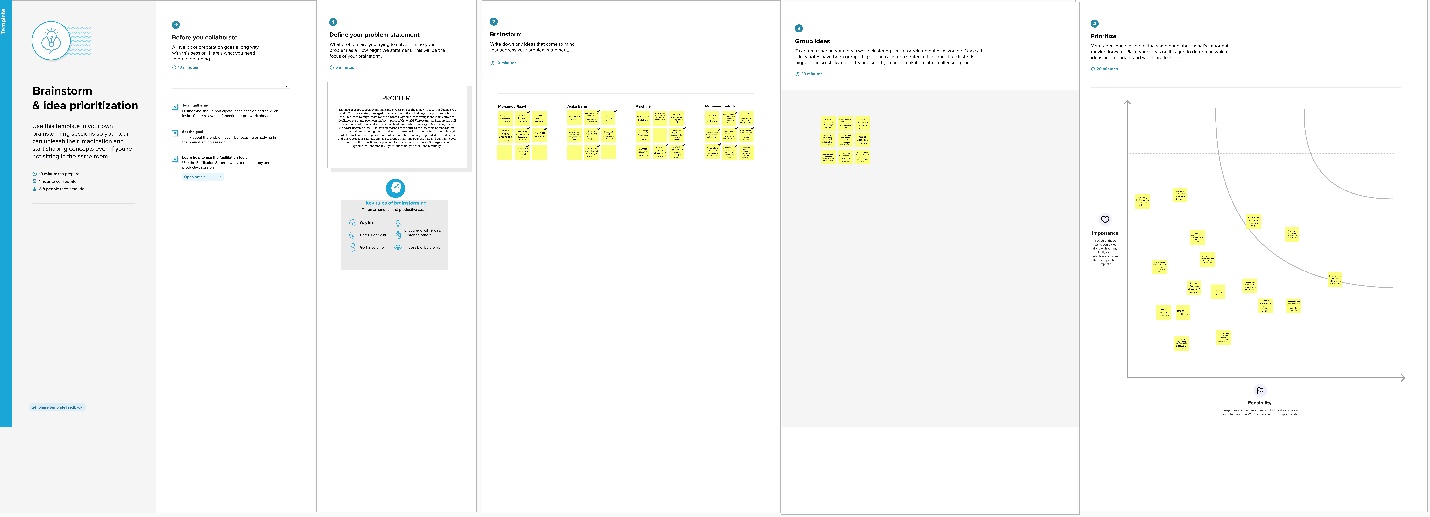
**3.1 EMPATHY MAP CANVAS**

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.

**IOT BASED SMART CROP PROTECTION FOR AGRICULTURE**

**3.2 IDEATION & BRAINSTORMING**

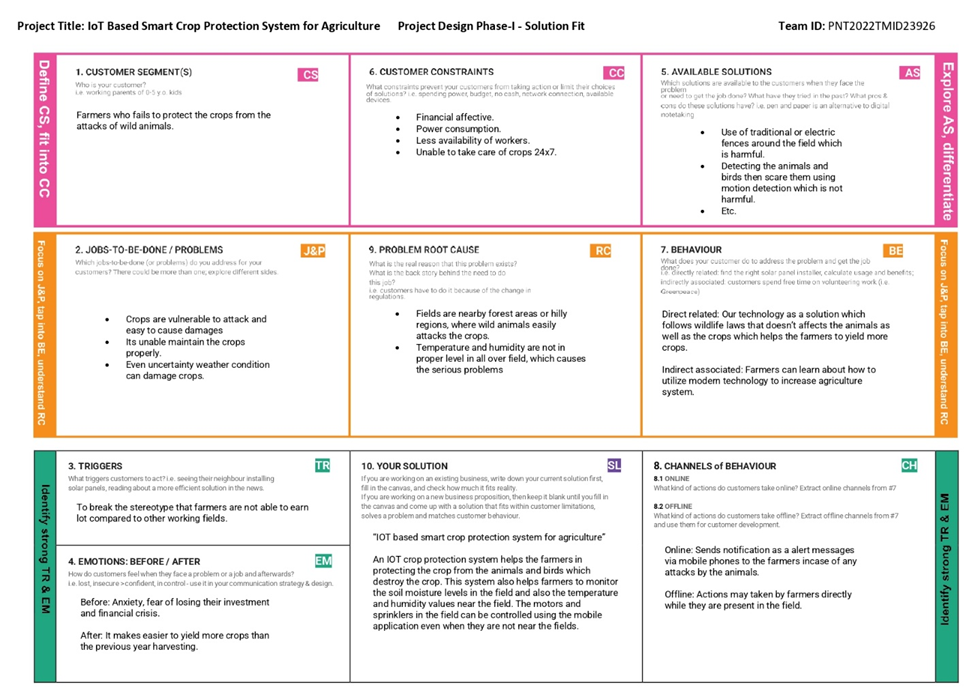
Brainstorming provides a free and open environment that encourages everyone within a team to participate in the creative thinking process that leads to problem solving. Prioritizing volume over value, out-of-the-box ideas are welcome and built upon, and all participants are encouraged to collaborate, helping each other develop a rich amount of creative solutions.



**3.3 PROPOSED SOLUTION**

|  |  |  |
| --- | --- | --- |
| S.No. | Parameter | Description |
|  | Problem Statement (Problem to be solved) | Protecting the crops from wild animals and also monitor the soil moisture levels in the field. |
|  | Idea / Solution description | Monitoring the crops using IOT based technology by24x7.Detecting animals and scared them away. The motors and sprinklers in the field can be controlled using the mobile application. |
|  | Novelty / Uniqueness | Accessibility due to the alarm system, being helpful to farmers. Scalability. |
|  | Social Impact / Customer Satisfaction | User friendly. It’s increase rate of good yield of crops. |
|  | Business Model (Revenue Model) | Cost efficient. It’s reduce the anxiety and fear of losing crops meanwhile it’s help to increase the profit comparing to previous year. |
|  | Scalability of the Solution | In future it can be enhanced by sending message directly to the fire department in case there is a mass wild animals attacks the fields. The controlling and monitoring of the soil moisture level can be automated by taking care of the crops in case of low moisture level, without notify farmers |

**3.4 PROPOSED SOLUTION FIT**

Project Title: IoT Based Smart Crop Protection System for Agriculture Team ID: PNT2022TMID23926

**4.REQUIREMENT ANALYSIS**

**4.1 FUNCTIONAL REQUIREMENT**

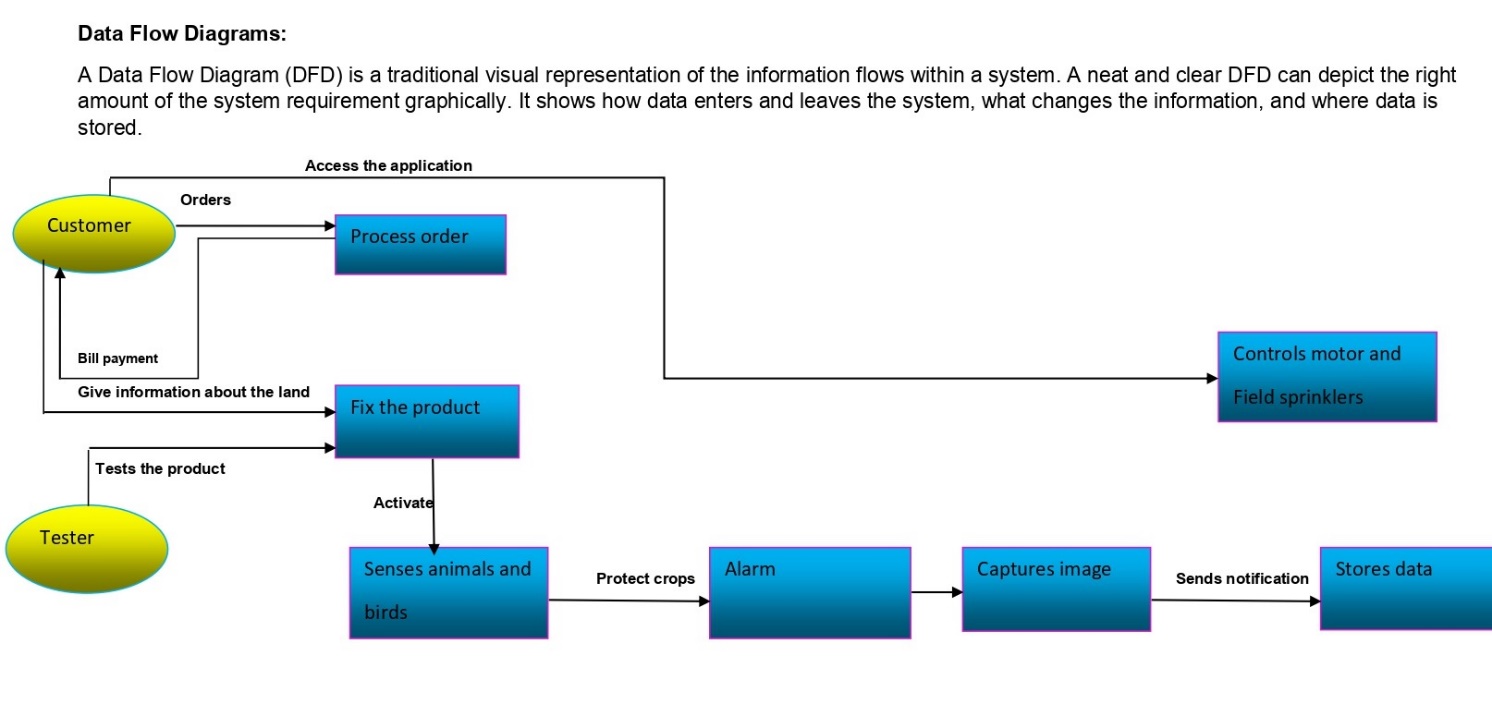
|  |  |  |
| --- | --- | --- |
| FR No. | Functional Requirement (Epic) | Sub Requirement (Story / Sub-Task) |
| FR-1 | User Registration | Install the application. Signing up with the google account or gmail. Creating a profile. Read carefully. understand the guidelines clearly. |
| FR-2 | User Confirmation | If sign up using gmail then confirmation via Email otherwise using google account then Confirmation via OTP using phone number. |
| FR-3 | User Visibility | Sensor sense the animals comes near to the field. Activate the sounds alarm to scare them away. Sends alert message to the farmers to notify what happens here using the cloud service. |
| FR-4 | Accessing datasets | Data’s are obtained by Cloudant DB. If any animal or bird is detected the image will be captured and stored in the IBM Cloud object storage. The image will be retrieved from Object storage and displayed in the application. |
| FR-5 | Interface sensor | Connect the sensor and the application. When animals enter the field the alarm is generated also it’s not harmful for animals it’s only scares them away. |
| FR-6 | Mobile application | It is used to control motors and field sprinklers. It is used to sends alarm notification to admin and farmer when there is wild animals attack. |

**4.2 NON FUNCTIONAL REQUIREMENT**

|  |  |  |
| --- | --- | --- |
| **FR No.** | **Non-Functional Requirement** | **Description** |
| NFR-1 | **Usability** | This project contributes to the farm protection using the smart modern technology “IOT” to increase its quality and quantity. Mobile support users able to interact easily using their mobile phones. |
| NFR-2 | **Security** | The goal of this work is to provide a repelling and monitoring system for crop protection against animal attacks. Data requires secure access to must register and communicate securely on devices and authorized users of the system who exchange information must be able to do**.** |
| NFR-3 | **Reliability** | Farmers able to protect his land using this technology. It has a capacity to recognize the wild animals near the field and doesn't give a false caution signal. Increase the food quality reduce the resource damages. |
| NFR-4 | **Performance** | Animal friendly ultrasounds generates, which does not produce physical or biological harm to the animals nor sounds audible to humans so the performance not degraded.Must provide acceptable response times to users regardless of the volume of data that is stored and the analytics that occurs in background. |
| NFR-5 | **Availability** | Agriculture fences are quite an effective while protecting wild animals. IoT solutions and domains demand highly available systems for 24x7 operations. Alarm system are available when farmer can’t able to come to the field at a time. This project have a backup plan also. So availability of this project is high. |
| NFR-6 | **Scalability** | System must handle expanding load and data retention needs that are based on the upscaling of the solution scope**.** It can be enhanced by sending message directly to the fire department in case there is a mass wild animals attacks the fields. It will be safe for human beings also. The controlling and monitoring of the soil moisture level can be automated by taking care of the crops in case of low moisture level, without notifying the farmers. |

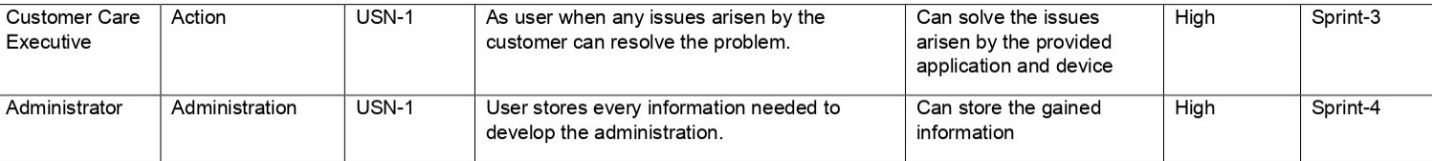
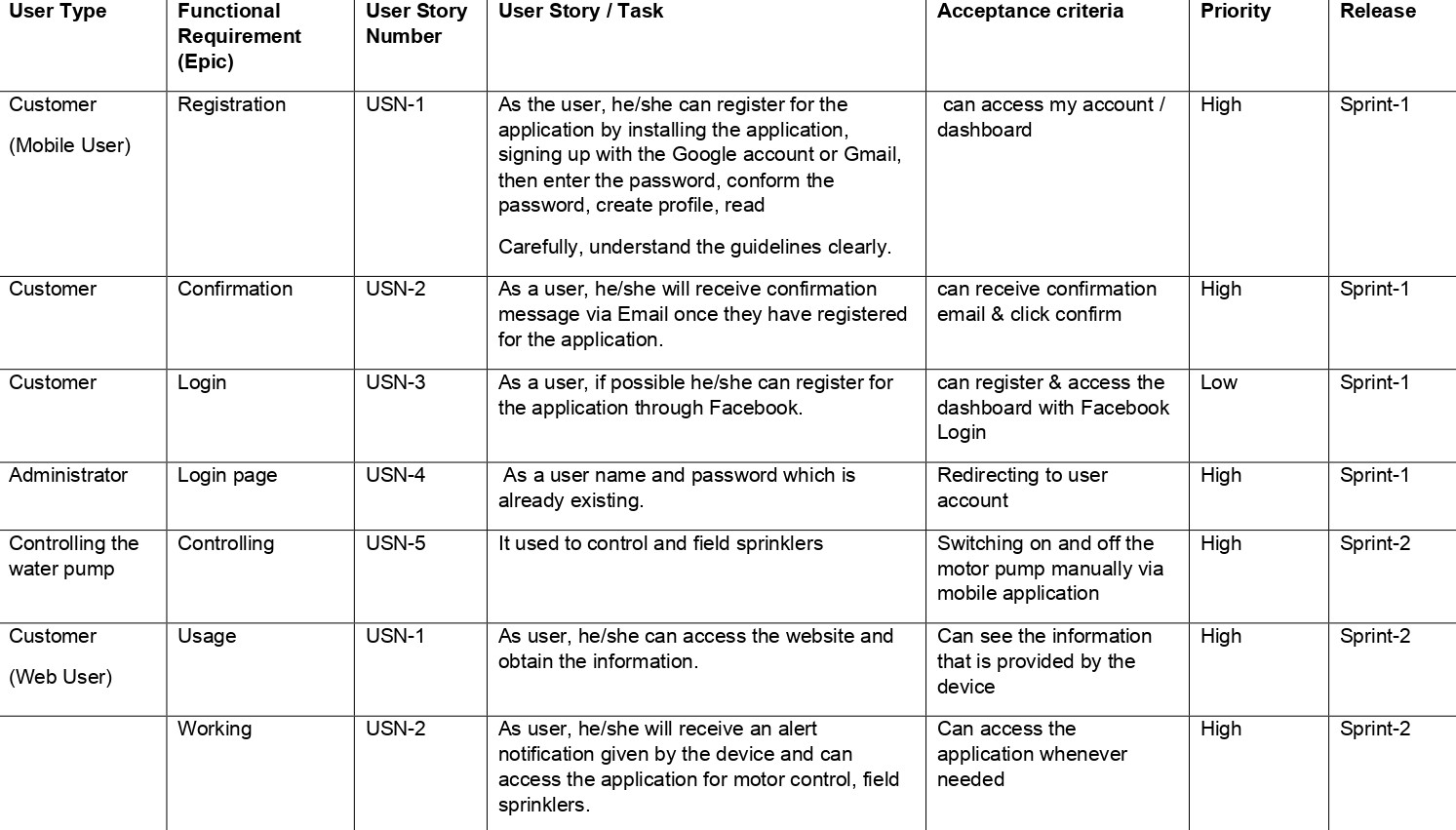
**5.PROJECT DESIGN**

**5.1 DATA FLOW DIAGRAM**



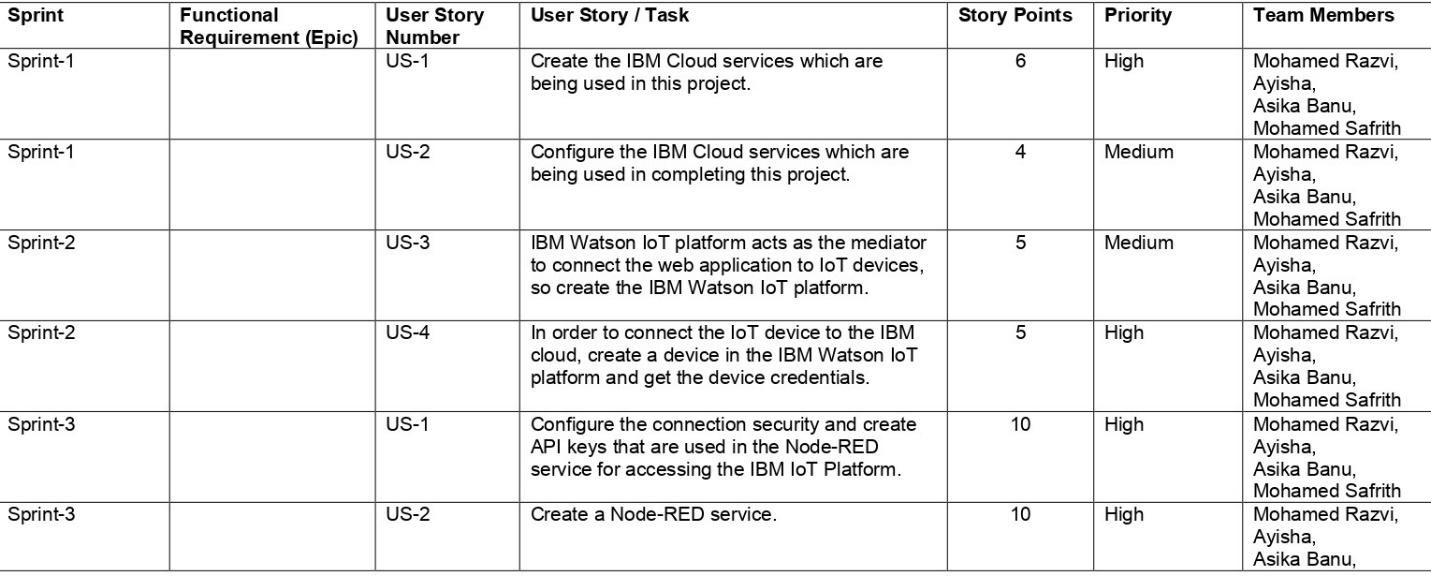
**5.2 SOLUTION & TECHNICAL ARCHITECTURE**

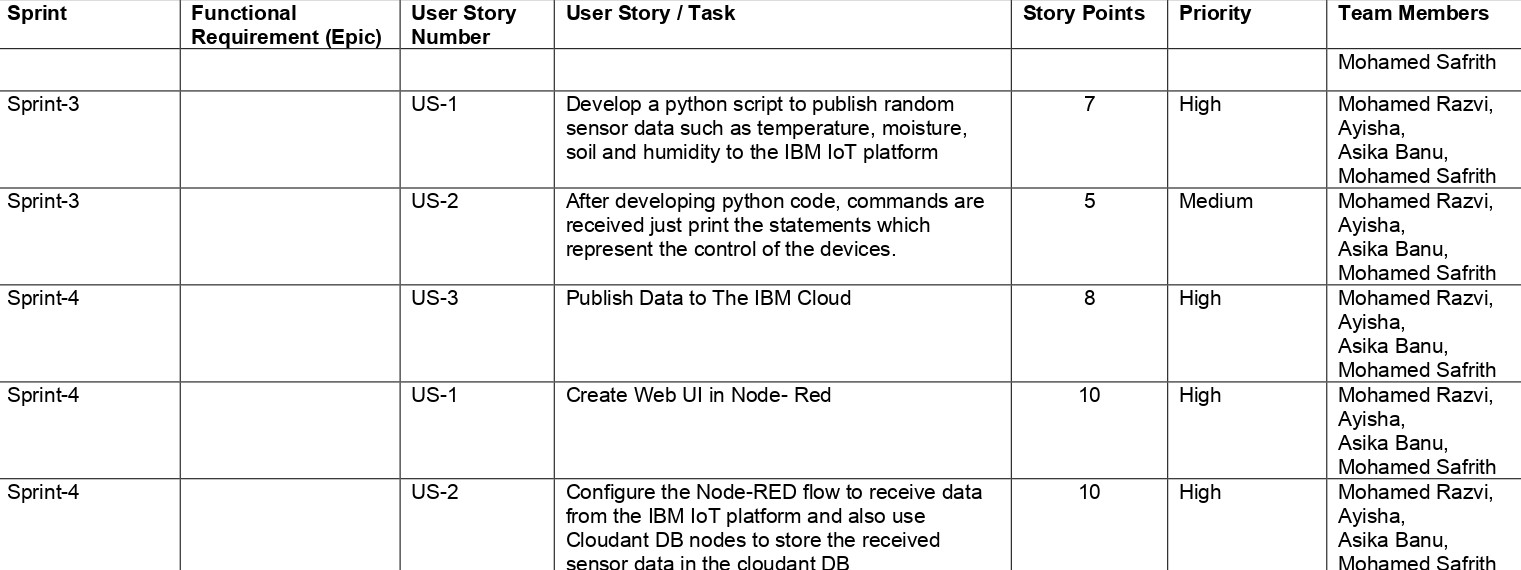


**5.3 USER STORIES**

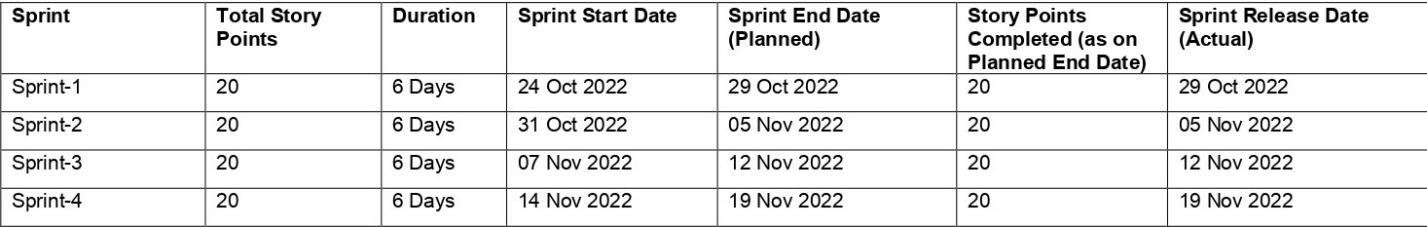
**6.PROJECT PLANNING & SCHEDULING**

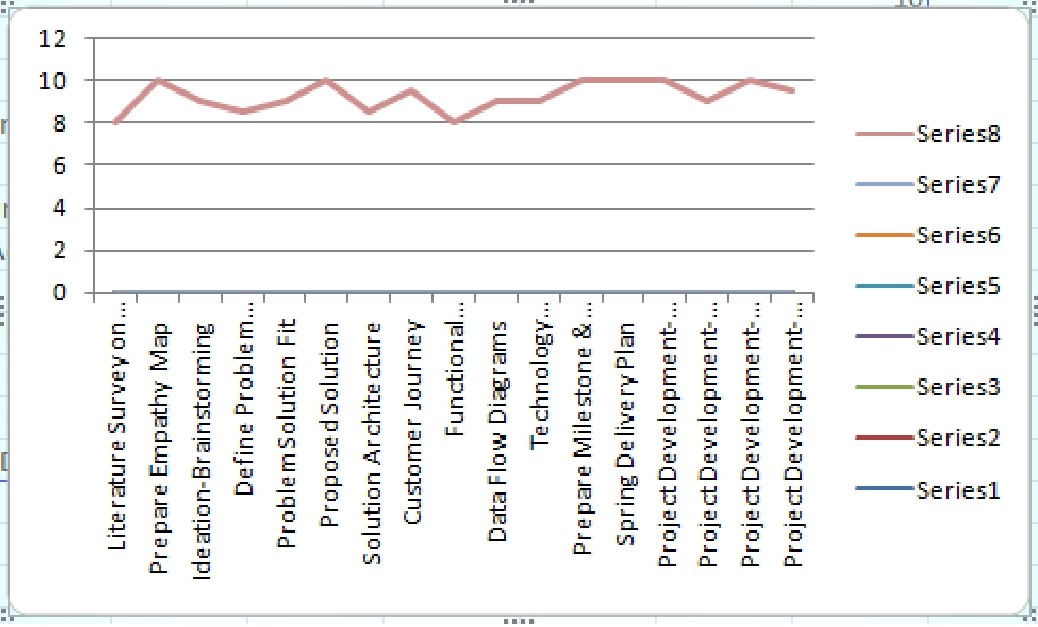
**6.1 SPRINT PLANNING & ESTIMATION**

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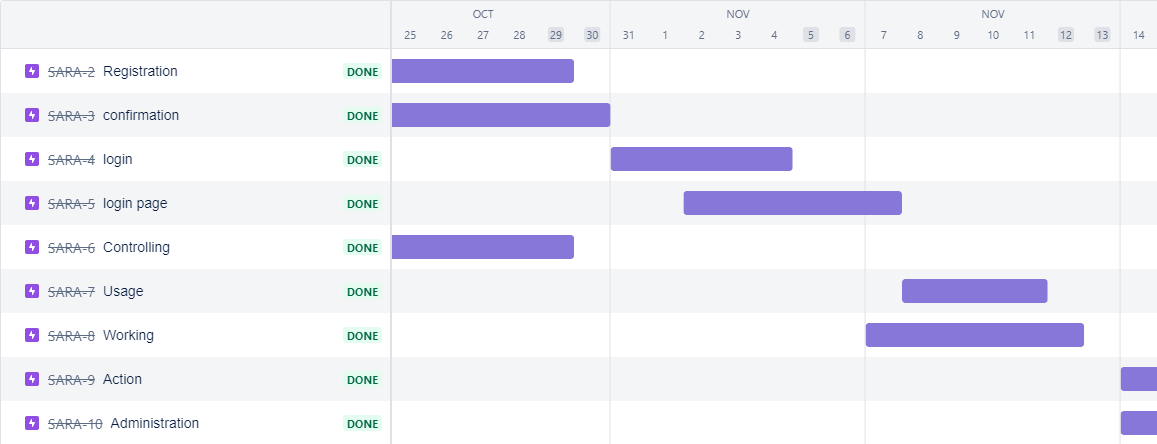


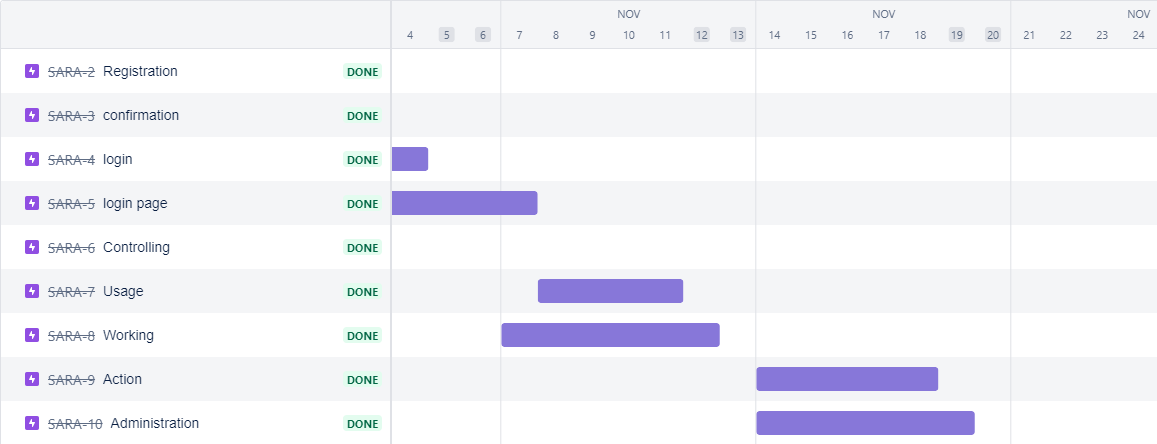
**6.2 SPRINT DELIVERABLE SCHEDULE**





**6.3 REPORTS FROM JIRA**





**7.Simulated program to get the random values.jpg**

import cv2

import numpy as np

import wiotp.sdk.device

import playsound

import random

import time

import datetime

import ibm\_boto3

from ibm\_botocore.client import Config,ClientError

#Cloudant DB

from cloudant.client import Cloudant

from cloudant.error import CloudantException

from cloudant.result import Result,ResultByKey

from clarifai\_grpc.channel.clarifai\_channel import ClarifaiChannel

from clarifai\_grpc.grpc.api import service\_pb2\_grpc

stub=service\_pb2\_grpc.V2Stub(ClarifaiChannel.get\_grpc\_channel())

from clarifai\_grpc.grpc.api import service\_pb2, resources\_pb2

from clarifai\_grpc.grpc.api.status import status\_code\_pb2

q#This is how you authenticate

metadata = (('authorization','Key b9aab187e98644b888b78a07666596b3'),)#clarifi service credential

COS\_ENDPOINT ="https://s3.jp-tok.cloud-object-storage.appdomain.cloud"

COS\_API\_KEY\_ID ="45fzEYtBNsQbtWsCjrW7n2uPDEBOgN9gwpgFt7YCXTZs"

COS\_AUTH\_ENDPOINT ="https://iam.cloud.ibm.com/identity/token"

COS\_RESOURCE\_CRN ="crn:v1:bluemix:public:cloud-object-storage:global:a/ec016f381f194a7f8706d57699e2ed1c:f1af8719-0e6c-40df-b257-b47d3feac809:bucket:zxcv"

clientdb=Cloudant("apikey-v2-2yzpnn7m83wrebmxq5idlywg9n6lbat8p9vep1hquydq","f8926422c5bab5f0da0a4cbeda3cf0e1",url= "https://apikey-v2-2yzpnn7m83wrebmxq5idlywg9n6lbat8p9vep1hquydq:f8926422c5bab5f0da0a4cbeda3cf0e1@30c7c015-07db-4943-8393-c2a2da703e99-bluemix.cloudantnosqldb.appdomain.cloud")

clientdb.connect()

#create resource

cos = ibm\_boto3.resource("s3",

      ibm\_api\_key\_id=COS\_API\_KEY\_ID,

      ibm\_service\_instance\_id=COS\_RESOURCE\_CRN,

      ibm\_auth\_endpoint=COS\_AUTH\_ENDPOINT,

      config=Config(signature\_version="oauth"),

      endpoint\_url=COS\_ENDPOINT

)

def multi\_part\_upload(bucket\_name, item\_name, file\_path):

 try:

     print("Starting file transfer for {0} to bucket:{1}\n".format(item\_name, bucket\_name))

     part\_size = 1024 \* 1024 \* 5

     file\_threshold = 1024\* 1024 \* 15

     transfer\_config=ibm\_boto3.s3.transfer.TransferConfig(multipart\_threshold=file\_threshold, multipart\_chunksize=part\_size)

     with open(file\_path, "rb") as file\_data:

         cos.Object(bucket\_name, item\_name).upload\_fileobj(Fileobj=file\_data, Config=transfer\_config)

         print ("Transfer for {0} Complete!\n".format(item\_name))

 except ClientError as be:

     print ("CLIENT ERROR: {0}\n".format(be))

 except Exception as e:

     print("Unable to complete multi-part upload: {0}".format(e))

def myCommandCallback(cmd):

     print("Command received: %s" % cmd.data)

     command=cmd.data['command']

     print(command)

     if(command=='lighton'):

         print('lighton')

     elif(command=='lightoff'):

         print('lightoff')

     elif(command=='motoron'):

         print('motoron')

     elif(command=='motoroff'):

         print('motoroff')

myConfig = {

 "identity": {

 "orgId":"qxm592",

 "typeId": "abcd",

 "deviceId": "123"

 },

 "auth": {

 "token":"12345678"

 }

}

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

client.connect()

database\_name="sample1"

my\_database = clientdb.create\_database(database\_name)

if my\_database.exists():

     print(f"'{database\_name}' successfully created.")

     cap=cv2.VideoCapture("dog.mp4")

if(cap.isOpened()==True):

     print('File opened')

else:

     print ('File not found')

while(cap.isOpened()):

 ret, frame = cap.read()

 gray =cv2.cvtColor(frame ,cv2.COLOR\_BGR2GRAY)

 imS=cv2.resize(frame,(960,540))

 cv2.imwrite('ex.jpg',imS)

 with open("ex.jpg","rb") as f:

     file\_bytes = f.read()#8287916f82c05e6ae6b8d2f2214dcf12

 request = service\_pb2.PostModelOutputsRequest(model\_id='visual-classifier', inputs=[resources\_pb2.Input(data=resources\_pb2.Data(image=resources\_pb2.Image(base64=file\_bytes)))])

 response = stub.PostModelOutputs(request, metadata=metadata)

 if response.status.code != status\_code\_pb2.SUCCESS:

     raise Exception("Request failed, status code :" + str(response.status.code))

 detect=False

 for concept in response.outputs[0].data.regions[0].data.concepts:

     if(concept.value>0.97):

         if(concept.name=="fashion"):

          print("Alert! Alert! animal detected")

          playsound.playsound('alert.mp3')

          picname=datetime.datetime.now().strftime("%y-%m-%d-%H-%M")

          cv2.imrite(picname+'.jpg',frame)

          multi\_part\_upload('adalin' ,picname+'.jpg',picname+'.jpg')

          json\_document={"link":COS\_ENDPOINT+'/'+'adalin'+'/'+picname+'.jpg'}

          new\_document = my\_database.create\_document(json\_document)

          if new\_document.exists():

             print (f"Document successfully created.")

          time.sleep(5)

          detect =True

     moist=random.randint(0,100)

     temp=random.randint(0,100)

     humidity =random.randint(0,100)

     myData={'Animal': detect,'moisture':moist,'humidity':humidity}

     print(myData)

     if(humidity!=None):

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

        print("Publish Ok..")

     client.commandCallback = myCommandCallback

     cv2.imshow('frame',imS)

     if cv2.waitKey(1) & 0xFF == ord('q'):

        break

client.disconnect()

cap.release()

cv2.destroyAllWindows()

**10. ADVANTAGES AND DISADVANTAGES**

**ADVANTAGES**

* 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.
* For the development of crop protection system awareness is needed regarding the product among the people.
* The crop can be protected effectively to get high yield.
* The ultrasound produced only redirect the animals and does not produce much adverse effects on them. The conflicts between the humans and the animals can be prevented.

**DISADVANTAGES**

* 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.
* For using Internet of things it is really cost effective.it consumes lot of power resources while implementing using IOT devices.

**11. CONCLUSION**

* Agriculture are gradually being replaced and enhanced by more sophisticated and accurate digital and electronic device.
* A high percentage of agriculture revenue is lost to power loss, incorrect methods of practicing.
* Internet of Things has enabled the agriculture crop monitoring easy and efficient to enhance the productivity of the crop and hence profits for the farmer.
* This system is of great help to farmers whose irrigation pumps are far from home and workplace.
* This system is used in a remote area and the farmers have several advantages.

**12. FUTURE SCOPE**

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. If the Mass Wild Animals attacking the fields like group of elephants or wild buffalos it will directly alert to the nearby fire and safety department.