Emerging Methods for Early Detection of Forest Fires

PROJECT REPORT

Submitted by

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1. INTRODUCTION

1.1 PROJECT OVERVIEW

Forest fires are occurring throughout the year with an increasing strength in the summer and autumn periods.These events are mainly caused by the actions of humans, but different nature and biota phenomena, like lightning strikes or ad-lib combustion of dried leaves or sawdust, can also be credited for their occurrence. Regardless of the reasons for the ignition of the forest fires, they normally cause withering damage to both nature and humans.

Forest fires are also considered as a main contributor to the air pollution, due to the fact that during every fire huge amounts of gasses and particle matter are released in the atmosphere. To fight forest fires, different solutions were employed throughout the years. They were primarily aimed at the early detection of the fires. The simplest of these solutions is the formation of a network of observance posts - both cheap and easy to accomplish, but also time-consuming for the involved people.

The constant evolution of the info and communication applied science has led to the debut of a new generation of solutions for early detection and even prevention of forest fires. ICT-based networks of cameras and sensors and even satellite-based solutions were developed and used in the last decades. These solutions have greatly decreased the direct involvement of humans in the forest fire detection process, but have also proven to be expensive and hard to maintain.

1.2 PURPOSE

Detection of forest fire and smoke in wild land areas is done through remote sensing based methods such as satellites, high-resolution static cameras fixed on the ground, and unmanned aerial vehicles Optical/thermal cameras deployed on the observation towers together with the other sensors such as smoke, temperature, and humidity sensors might detect the hazards in the closed environment rather than in the open environment as these sensors need vicinity to the fire or smoke.

The information obtained through these sensors is not appropriate. Distance covered by these methods could be limited, and to cover a large area, more sensors have to be deployed that might incur expenses. Through the deployment of UAV, large areas could be covered, and the images with high spatial and temporal resolutions could be captured properly.

2. LITERATURE SURVEY

2.1 EXISTING PROBLEM

Over the last few years, climate change and human-caused factors have had a significant impact on the environment. Some of these events include heat waves,droughts, dust storms, floods, hurricanes, and wildfires. Wildfires have extreme consequences on local and global ecosystems and cause serious damages to infrastructure, injuries, and losses in human lives; therefore, fire detection and the accurate monitoring of the disturbance type, size, and impact over large areas is becoming increasingly important. To this end, strong efforts have been made to avoid or mitigate such consequences by early fire detection or fire risk mapping.

Traditionally, forest fires were mainly detected by human observation from fire lookout towers and involved only primitive tools, such as the Osborne fire Finder; however, this approach is inefficient, as it is prone to human error and fatigue.

On the other hand, conventional sensors for the detection of heat, smoke, flame, and gas typically take time for the particles to reach the point of sensors and activate them. In addition, the range of such sensors is relatively small, hence, a large number of sensors need to be installed to cover large areas

2.2 REFERENCES

1. Astana, M.A.; Apion the, C.; Mermoz, S.; Bouvet, A.; Le Toan, T.; Heuristic, M. Detection of windrows and insect outbreaks by L-band SAR: A case study in the Bavarian Forest National Park. Remote Send. Environ. 2018, 209, 700– 711.

2. Pradon, B.; Suliman, M.D.H.B.; Sawing, M.A.B. Forest fire susceptibility and risk mapping using remote sensing and geographical information systems (GIS). Disaster Prey. Manag. Into. J. 2007, 16.

3. Gaur, A.; Singh, A.; Kumar, A.; Kuliakan, K.S.; Lola, S.; Kapoor, K.; Srivastava, V.; Kumar, A.; Madhyapradesa, S.C. Fire sensing technologies: A review. IEEE Send. J. 2019, 19, 3191–3202.

4. Kabuki, R.; Frizz i, S.; Bouchouicha, M.; Chennai, F.; Moreau, E. Video smoke detection review: State of the art of smoke detection in visible and IR range. In Proceedings of the 2017 International Conference on Smart, Monitored and Controlled Cities (SM2C), Kerkennah-Sfax, Tunisia, 17 February 2017; pp. 81–86.

5. Allison, R.S.; Johnston, J.M.; Craig, G.; Jennings, S. Airborne optical and thermal remote sensing for wildfire detection and monitoring. Sensors 2016, 16, 1310.

6. Cappellini, Y.; Mattii, L.; Me-cocci, A. An Intelligent System for Automatic Fire Detection in Forests. In Recent Issues in Pattern Analysis and Recognition; Springer: Berlin/Heidelberg, Germany, 1989; pp. 563–570.

7. Chen, T.H.; Wu, P.H.; Chiou, Y.C. An early fire-detection method based on image processing. In Proceedings of the 2004 International Conference on Image Processing (ICIP 04), Singapore, 24–27 October 2004; Volume 3, pp. 1707–1710.

2.2 PROBLEM STATEMENT DEFINITION

Forest fires are a major environmental issue, creating economic and ecological damage while endangering human lives. There are typically about

100,000 wildfires in the United States every year. Over 9 million acres of land have been destroyed due to treacherous wildfires. It is difficult to predict and detect Forest Fire in a sparsely populated forest area and it is more difficult if the prediction is done using ground-based methods like Camera or Video-Based approach. Satellites can be an important source of data before and also during the Fire due to its reliability and efficiency. The various real-time forest fire detection and prediction approaches, with the goal of informing the local fire authorities

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 create a shared understanding of user needs, and aid in decision making.

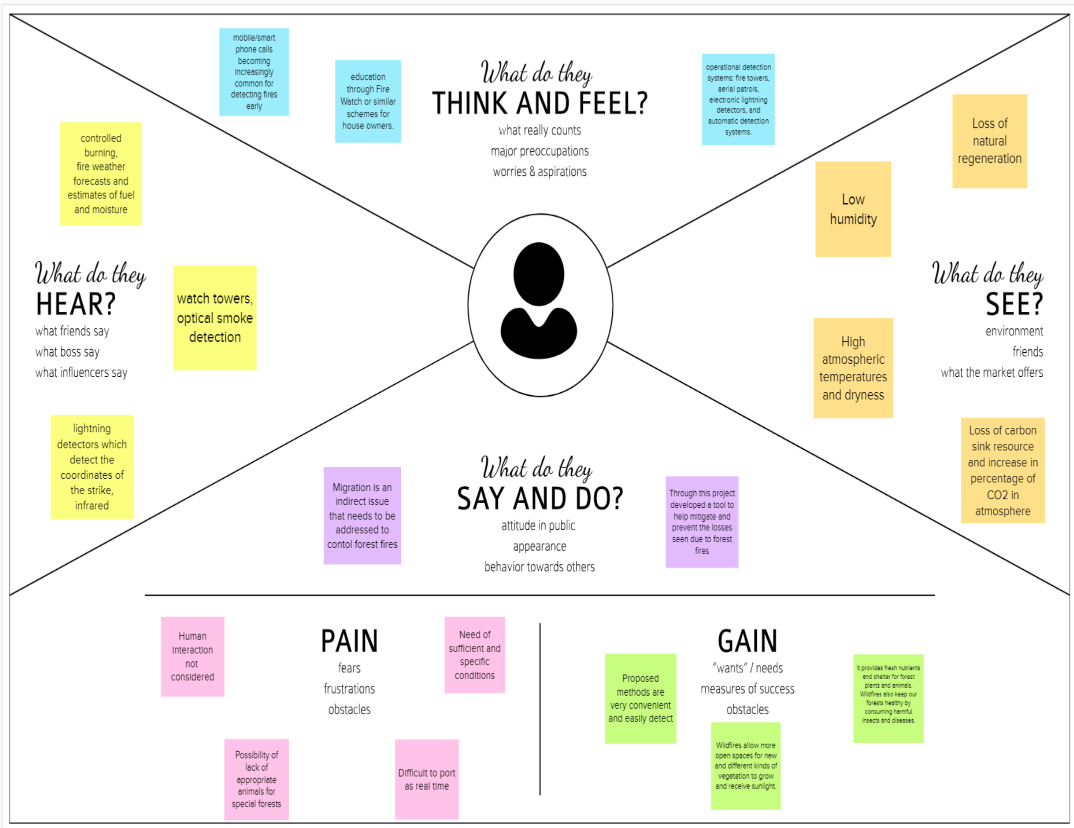
Edit this template
Right-click to unlock

Empathy Map Canvas

Gain insight and understanding on solving customer problems.

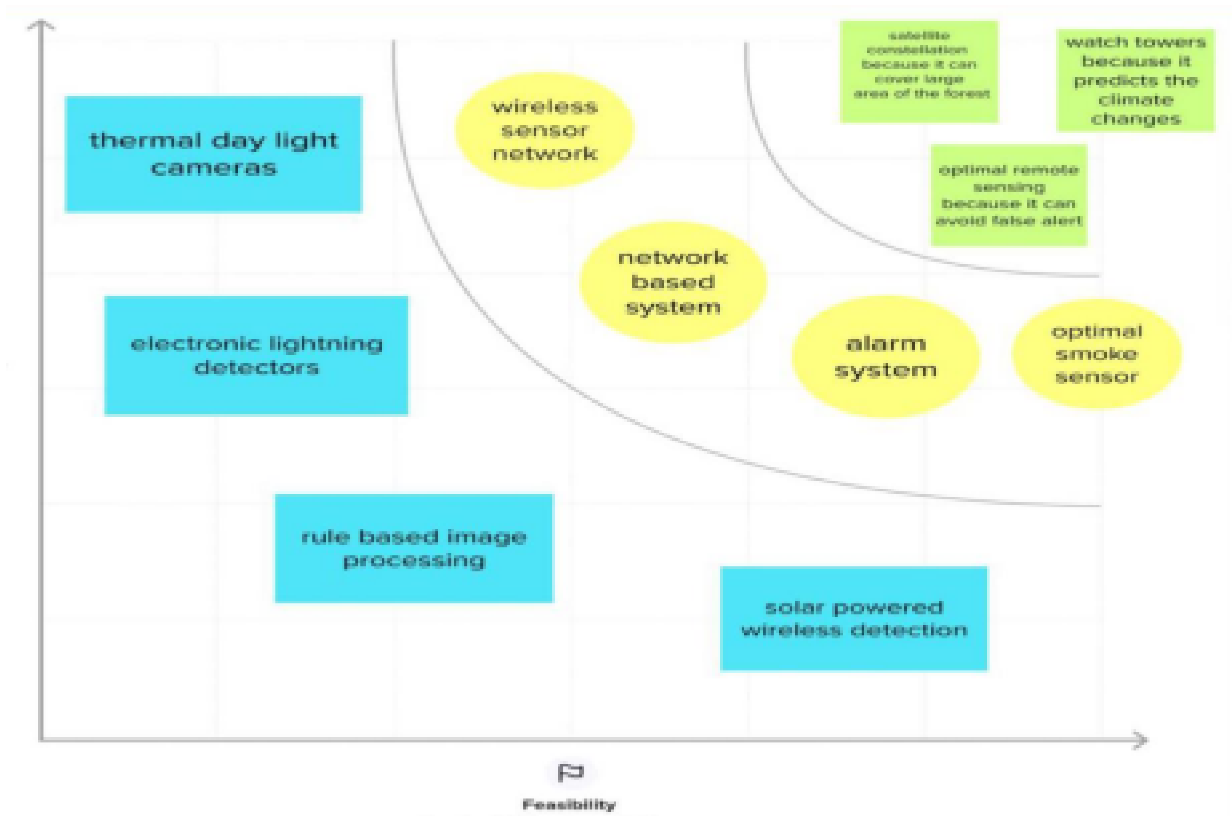
1

Build empathy and keep your focus on the user by putting yourself in their shoes.



Share your feedback

3.2 IDEATION & BRAINSTORMING



3.3 PROPOSED SOLUTION

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	Forest and urban fires are still a serious problem for many countries in the world. The (UAVs), which constantly patrol over potentially threatened fire areas. The UAVs also utilize the benefits from Artificial intelligence (AI) and are equipped with on board processing capabilities.
2.	Idea / Solution description	Recent advances in computer vision, machine learning, and remote sensing technologies offer new tools for detecting and monitoring forest fires, while the development of new materials and microelectronics have allowed sensors to be more efficient in identifying active forest fires.
3.	Novelty / Uniqueness	Permanent monitoring, data collection and processing. Terrestrial-based early detection systems consist of either individual sensors (fixed, PTZ, or 360◦ cameras) or networks of ground sensors.
4.	Social Impact / Customer Satisfaction	Growing public alarm at the problem of large scale forest fires, is evident from an assessment of their past and present repercussions on the population in general.

5.	Business Model (Revenue Model)	Forest sector has strong importance for economic, social and environmental issues. The Portuguese forestry sector is of great importance for the added value creation, for the jobs creation.
6.	Scalability of the Solution	There are several factors that affect the evolution of a wildland fire. It is well known that wind is one of the key parameters to understand forest fire propagation. Intuitively, the meteorological wind speed tends to drive the main direction of forest fire spread.

3.4 PROPOSED SOLUTION FIT

Project Title:-Emerging Methods For Early Detection Of Forest Fires

Project Design Phase-I - Solution Fit Template

Team ID PNT2022TMID23

Define CS, fit into CC

1. CUSTOMER SEGMENT(S) CS

Who is your customer? i.e. working parents of 0-5 y.o. kids

officers who wants to monitor the entire forest using the sensor 24/7

6. CUSTOMER CONSTRAINTS CC

What constraints prevent your customers from taking action or limit their choices of solutions? i.e. spending power, budget, no cash, network connection, available devices.

Requires large amount of storage to store the data.

5. AVAILABLE SOLUTIONS AS

Which solutions are available to the customers when they face the problem or need to get the job done? What have they tried in the past? What pros & cons do these solutions have? i.e. pen and paper is an alternative to digital notetaking

- Camp responsibly.
- Remote technologies.
- Check weather and drought condition.

Explore AS, differentiate

Focus on J&P, tap into BE, understand RC

2. JOBS-TO-BE-DONE / PROBLEMS J&P

Which problem do you solve for your customer? There could be more than one, explore different sides eg. existing solar solution for private houses are not considered a good investment (1).

Permanent monitoring and data collection secure manner.

9. PROBLEM ROOT CAUSE RC

What is the real reason that this problem exists? What is the back story behind the need to do this job? i.e. customers have to do it because of the change in regulations.

- Natural causes- Many forest fires start from natural causes such as lightning which sets trees on fire.
- Manmade causes-fire is caused when a source of the fire like naked flame, cigarette or electric sparks or source of ignition comes into contact with inflammable material.

7. BEHAVIOUR BE

What does your customer do to address the problem and get the job done?

The manner in which fuel ignites, flame develops and fire spreads. In wildland this behavior is influenced by weather and topography interact.

Focus on J&P, tap into BE, understand RC

3. TRIGGERS TR

what triggers customers to act? i.e. seeing their neighbour installing solar panels, reading about a more efficient solution in the news.

As forest officers can't be aware of the upcoming situations this detection is necessary to avoid disasters.

4. EMOTIONS: BEFORE / AFTER EM

How do customers feel when they face a problem or a job and afterwards?

Insecurity of disconnection -->Control of device makes them confident

10. YOUR SOLUTION SL

If you are working on an existing business, write down your current solution first, fill in the canvas, and check how much it fits reality.

Satellite image processing methods, Optical sensors and Digital Camera-based methods are used to detection of forest fires.

8. CHANNELS of BEHAVIOUR CH

8.1 ONLINE

8.2 OFFLINE

ONLINE

Forest offices will access the security servicein online mode(Web Service)

OFFLINE

Forest police will access the security servicein offline mode(call using telephone).

4. REQUIREMENT ANALYSIS

4.1 FUNCTIONAL REQUIREMENT

FR. NO.	Functional Requirement	Sub Requirement (Story / Sub-Task)
FR-1	Camera Setting	To analyze the fire prone areas and to set the surveillance camera to collect and observe the region continuously for early detection.
FR-2	Data Model	Data model is defined to predict the forest fire
FR-3	Data Prediction	Scientists create computer models to predict wildfire potential under a range of potential climate futures. Using different projections of temperature and downfall, scientists predict where and when wildfires are likely to occur

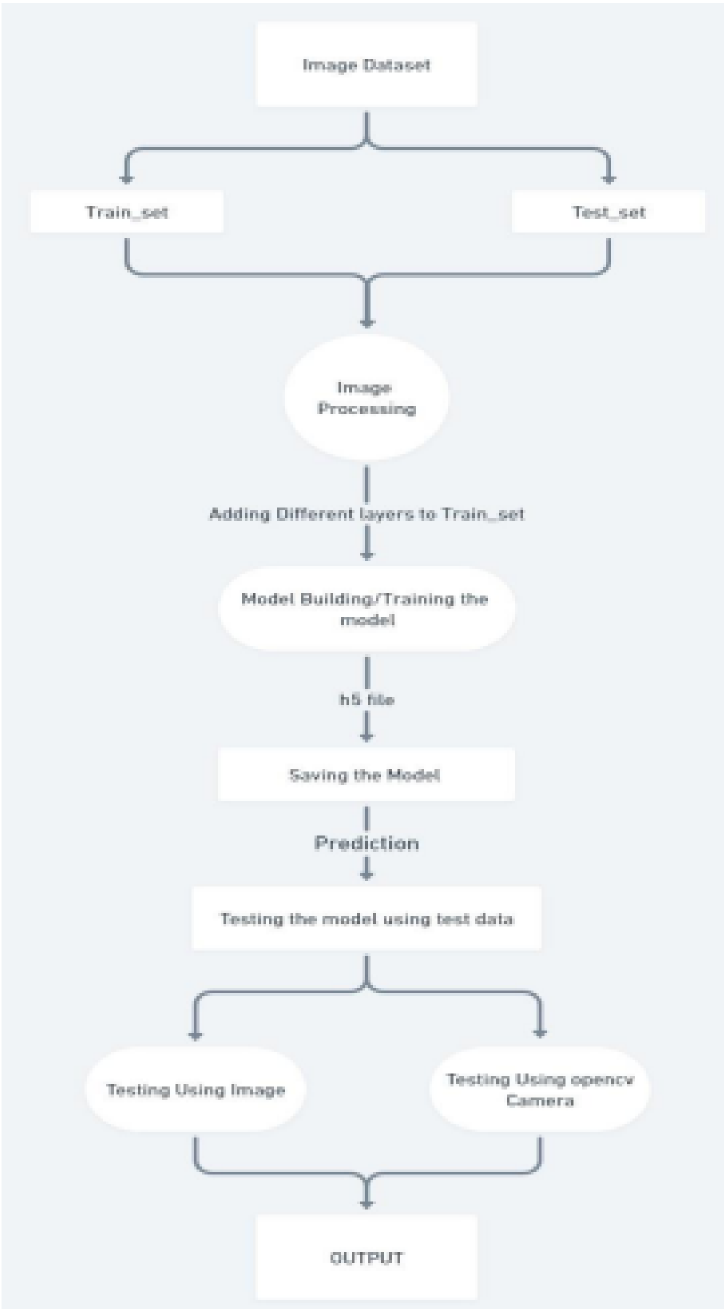
4.2 NON FUNCTIONAL REQUIREMENTS

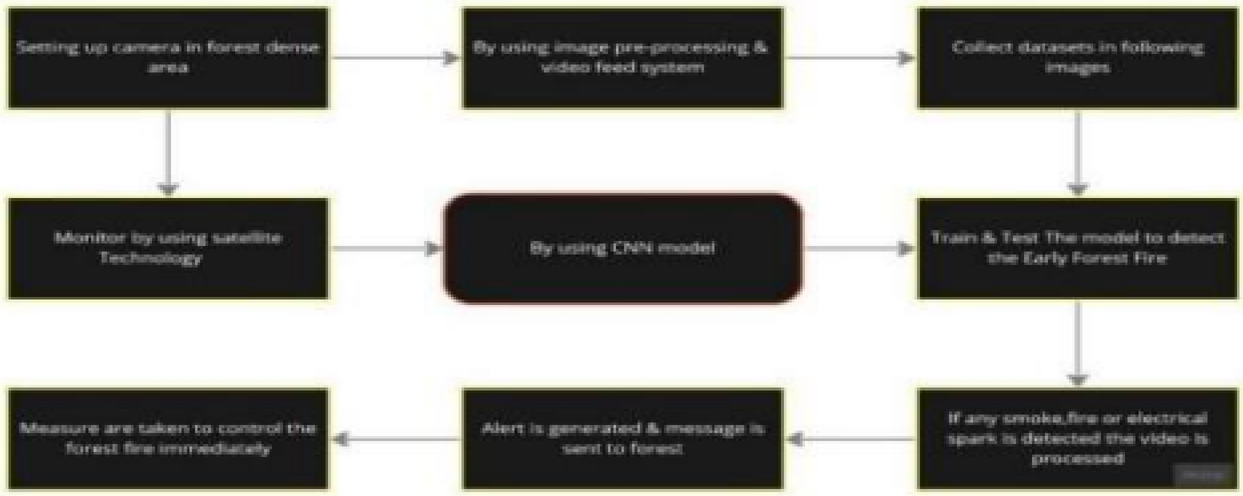
FR. NO.	Non-Functional Requirement	Description
NFR-1	Usability	Many methods have been proposed to detect forest fires, such as camera-based systems, WSN-based systems, and machine learning coating-based systems, with both positive and negative aspects and performance figures of detection.
NFR-2	Protection	We have designed this project to secure the forest from wildfires.

NFR-3	Performance	In the event of a fire, the primary objective of using drones is to gather situational consciousness, which can be used to direct the efforts of the firefighters in locating and controlling hot spots. Just like urban fires, forest fires require monitoring so that firefighters know what they are dealing with.

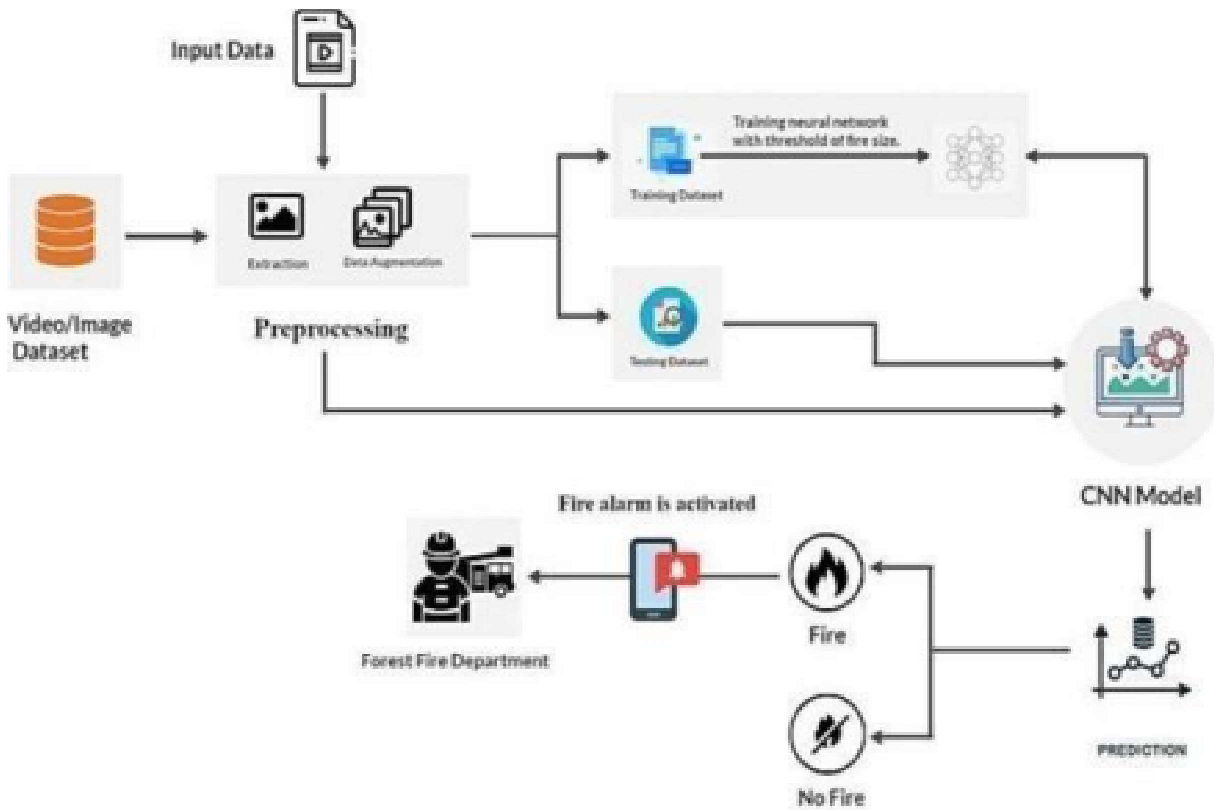
5. PROJECT DESIGN

5.1 DATA FLOW DIAGRAMS





5.2 SOLUTIONS & TECHNICAL ARCHITECTURE



5.3 USER STORIES

A user story is an informal, general explanation of a software feature written from the perspective of the end user or customer. The purpose of a user story is to articulate how a piece of work will deliver a particular value back to the customer

REGISTRATION

Registration is the process by which a company files required documents with the Securities and Exchange Commission (SEC), detailing the particulars of a proposed public offering. The registration typically has two parts: the prospectus and private filings.

SOCIALIST

Collect the data

As a user 1, As an Socialist ,it is necessary to collect the data of the forest which includes temperature , humidity, wind and rain of the forest .

As a user 2, Identify algorithms that can be used for prediction.

As a user 3, Identify the accuracy of each algorithm.

As a user 4, Evaluate the Dataset.

As a user 5, Identify accuracy,precision,recall of each Algorithm.

As a user 6, Outputs from each algorithm are obtained.

User Type	Functional Requirement	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Socialist	Collect the data	USN-1	As an Socialalist, it is necessary to collect the data of the forest which includes temperature, humidity, wind and rain of the forest	It is necessary to collect the right data else the prediction may become wrong	High	Sprint-1
		USN-2	Identify algorithms that can be used For reduction	To collect the algorithm to identify the accuracy level of each algorithm	Medium	Sprint-2

		USN-3	Identify the accuracy of each algorithms	Accuracy of each algorithm calculated so that it is easy to obtain the most accurate output	High	Sprint-2
		USN-4	Evaluate the Dataset	Data is evaluated before processing	Medium	Sprint-1
		USN-5	Identify accuracy, precision of the model	These values a important for obtaining the prediction on model	High	Sprint-3
		USN-6	Outputs from each algorithm are obtained	It is highly used to predict the effect and to take precautionary measures.	High	Sprint-4

6.PROJECT PLANNING & SCHEDULING

6.1 SPRINT PLANNING & ESTIMATES

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Image processing	USN-1	Processing the image to find the fire	1	Medium	R.Nandhini, R.Revathi, S.Dhivya

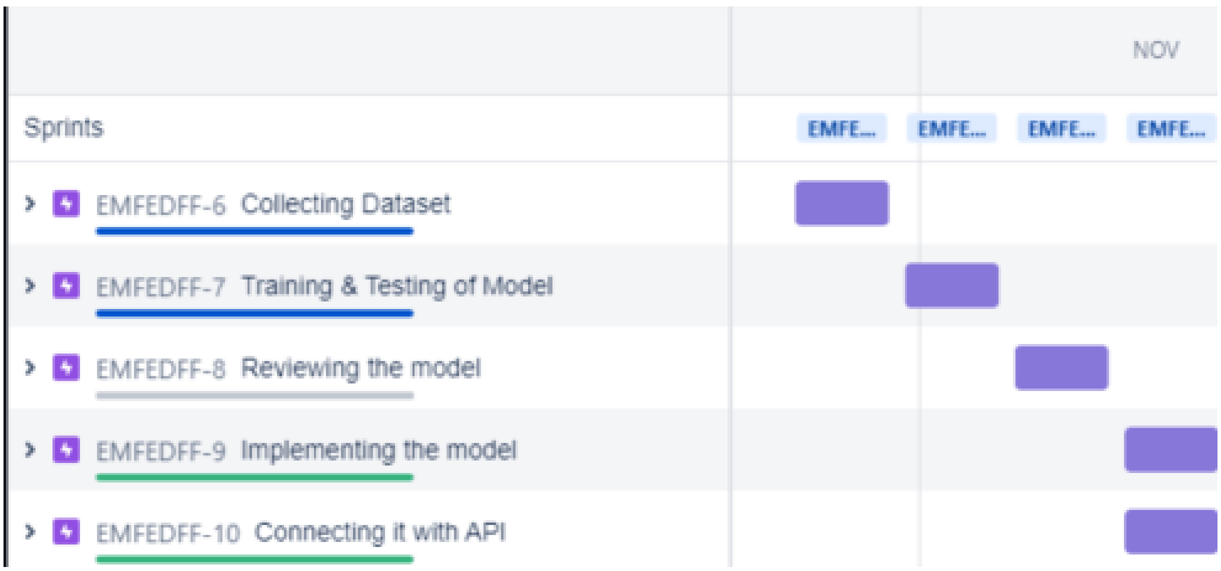
			is detected or not			
Sprint-1		USN-2	The output would have to give high accuracy.	2	High	R.Nandhini, R.Revathi, S.Dhivya S.Mahalakshmi
Sprint-2	Video Processing	USN-3	The videos will be split into frames to detect the fire	3	High	R.Nandhini, R.Revathi, S.Dhivya S.Mahalakshmi
Sprint-3	Alerting	USN-4	After the fire is detected the alert message have to be sent	2	High	R.Nandhini, R.Revathi, S.Dhivya S.Mahalakshmi
Sprint-4	Locating Tracking	USN-5	The exact location of the fire will be predicted and sent along with the alert message	2	High	R.Nandhini, R.Revathi, S.Dhivya S.Mahalakshmi

6.2 SPRINT DELIVERY SCHEDULE

Sprint	**Total Story Points**	**Duration**	**Sprint Start Date**	**Sprint End Date**	**Story Point Completed (as on Planned End Date)**	**Sprint Release Date (Actual)**
1	20	6 days	24 Oct 2022	29 Oct 2022	20	5 Oct 2022
2	20	6 days	31 Oct 2022	05 Nov 2022	20	05 Nov 2022

3	20	6 days	07 Nov 2022	12 Nov 2022	20	12 Nov 2022
4	20	6 days	14 Nov 2022	19 Nov 2022	20	19 ov 2022

6.3 REPORT FROM JIRA



7 CODING & SOLUTIONING

7.1 FEATURE 1

(a) Sending Alert Messages

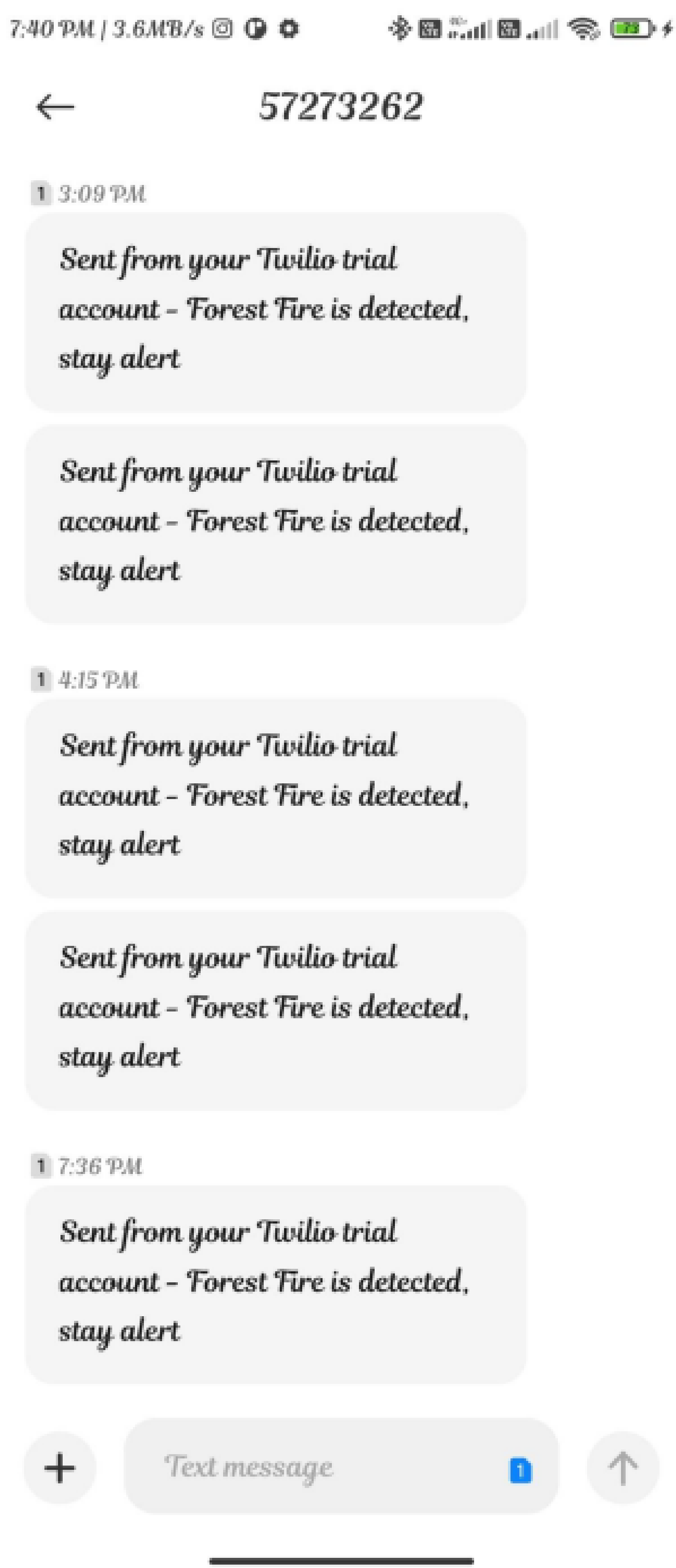
- ➢ When camera captures the video it sends to the CNN model as a frames
- ➢ The predictions are made continuously to protect the forest
- ➢ If the model detects the fire in the frame. Then, model sends a alert message to the forest zone officer

SENDING ALERT MESSAGES

In [21]:

```
model = load_model(r'forest2.h5')
video = cv2.VideoCapture(r"C:\Users\sanjay\Downloads\pexels-arnav-kainthola-7543653.mp4")
name = ['forest','with fire']

while(1):
    success, frame = video.read()
    cv2.imwrite("image.jpg",frame)
    img = load_img("image.jpg")
    x  = img_to_array(img)
    res = cv2.resize(x, dsize=(128, 128), interpolation=cv2.INTER_CUBIC)
    x = np.expand_dims(res,axis=0)
    pred=model.predict(x)
    p=int(pred[0][0])
    int(p)
    cv2.putText(frame, "predicted  class = " +str(name[p]), (100,100), cv2.FONT_HERSHEY_SIMPLEX, 1, (0,0,0), 1)


   # pred=model.predict(x)
    if p==0:
        account_sid = 'AC5923cf8d29ec11edffab37a3997f3602'
        auth_token = '4bb6b8876615238ab70cd5a44b34584e'
        client = Client(account_sid, auth_token)

        message = client.messages \
        .create(
         body='Forest Fire is detected, stay alert',
         from_='+14793363560',
         to='+918838487815')

        print(message.sid)

        print('Fire Detected')
        print ('SMS sent!')
        break
    else:
        print("no danger")
```

```
1/1 [==============================] - 0s 110ms/step
SM4e06f6ab06c6cb9554b56910fee7db47
Fire Detected
SMS sent!
```


7:40 PM | 3.6MB/s
57273262
3:09 PM
Sent from your Twilio trial account - Forest Fire is detected, stay alert
Sent from your Twilio trial account - Forest Fire is detected, stay alert
4:15 PM
Sent from your Twilio trial account - Forest Fire is detected, stay alert
Sent from your Twilio trial account - Forest Fire is detected, stay alert
7:36 PM
Sent from your Twilio trial account - Forest Fire is detected, stay alert
Text message

7.2 FEATURE 2

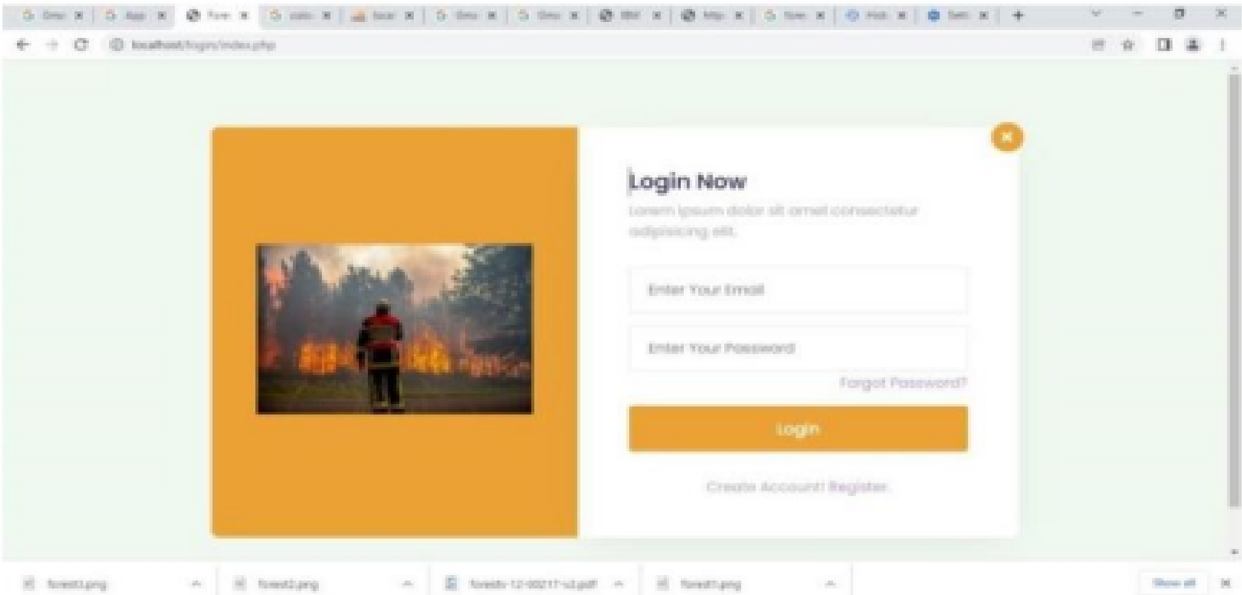
(a) Alarming Alert

- When the model senses the fires, it alerts by alarming by producing sound
- It is achieved by using playsound library
- To install playsound library type the command in command box: **’pip install playsound’**

```
In [20]: import cv2
         #import facevec
         import numpy as np
         import smtplib
         from tensorflow.keras.utils import load_img,img_to_array
         from keras.models  import load_model
         from twilio.rest import Client
         from playsound import playsound
```

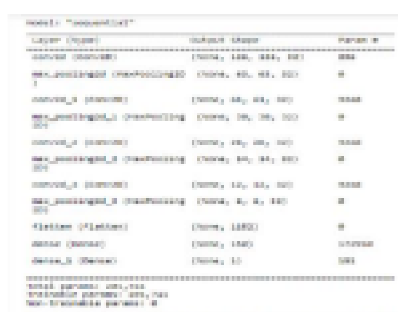
```
In [21]: model = load_model(r'forest2.h5')
         video = cv2.VideoCapture(r"C:\Users\sanjay\Downloads\pexels-arnav-kainthola-7543653.mp4")
         name = ['forest','with fire']

         while(1):
             success, frame = video.read()
             cv2.imwrite("image.jpg",frame)
             img = load_img("image.jpg")
             x  = img_to_array(img)
             res = cv2.resize(x, dsize=(128, 128), interpolation=cv2.INTER_CUBIC)
             x = np.expand_dims(res,axis=0)
             pred=model.predict(x)
             p=int(pred[0][0])
             int(p)
             cv2.putText(frame, "predicted  class = " +str(name[p]), (100,100), cv2.FONT_HERSHEY_SIMPLEX, 1, (0,0,0), 1)
            # pred=model.predict(x)
             if p==0:
                 account_sid = 'AC5923cf8d29ec11edffab37a3997f3602'
                 auth_token = '4bb6b8876615238ab70c45a44b34584e'
                 client = Client(account_sid, auth_token)

                 message = client.messages \
                 .create(
                  body='Forest Fire is detected, stay alert',
                  from_='+14793363560',
                  to='+918838487815')
                 playsound("C:\Users\sanjay\Downloads\4WY2LZB-message-alert.mp3")
                 print(message.sid)

                 print('Fire Detected')
                 print ('SMS sent!')
                 break
```

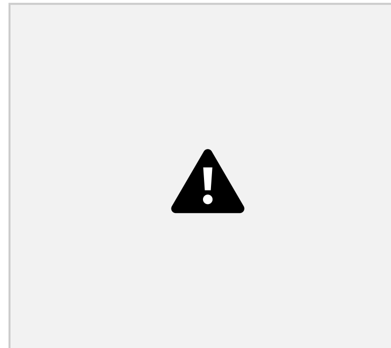
8.TESTING

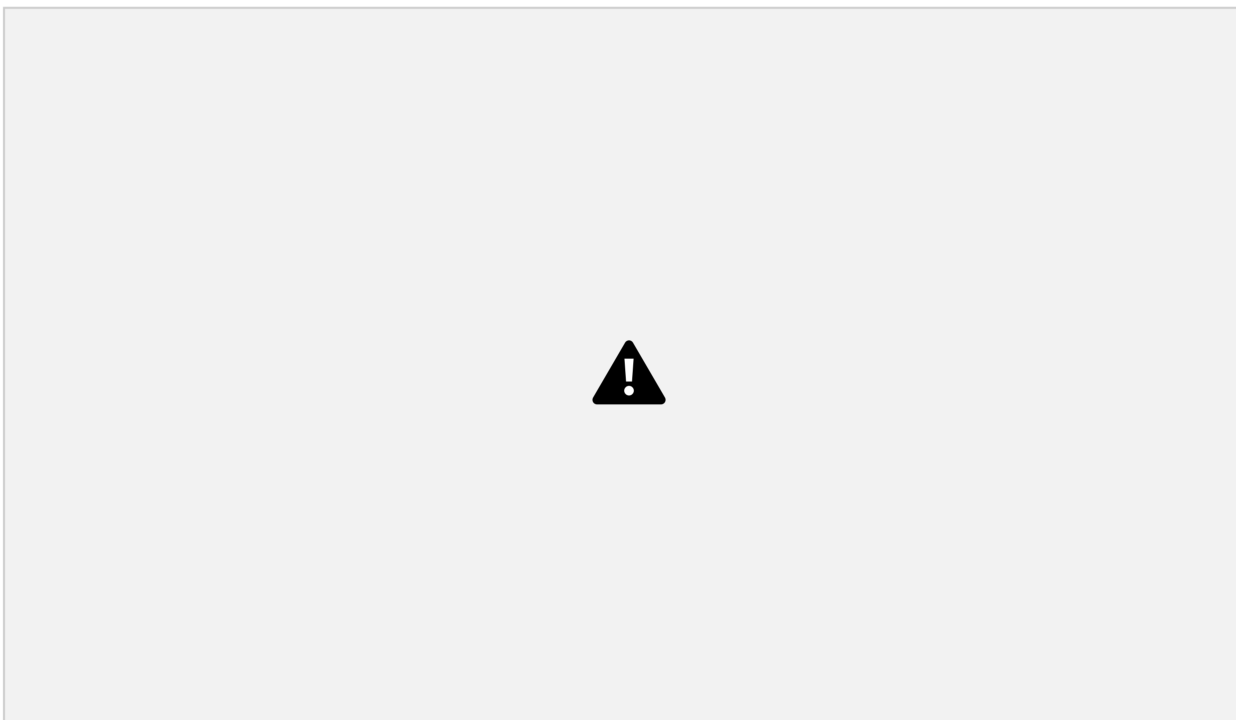


9.RESULTS

9.1 PERFORMANCE METRICS

S.No.	Parameter	Values	Screenshot
1.	Model Summary	Total params: 201,741 Trainable params: 201,741 Non-trainable params: 0	

2.	Accuracy	Training Accuracy – 92.28 Validation Accuracy -92.28	
3.	Confidence Score (Only Yolo Projects)	Class Detected – No Danger Confidence Score – 93.067	



10. ADVANTAGES & DISADVANTAGES

- ➢ The proposed system detects the forest fire at a faster rate compared to existing system. It has enhanced data collection features.
- ➢ The major aspect is that it reduces false alarm and also has accuracy due to various sensors present.
- ➢ It minimize the human effort as it works automatically. This is very low-cost due to which it can be easily accessed.
- ➢ The main objective of our project is to receive an alert message through an app to the respective user.

DISADVANTAGE:

- ➢ The electrical interference diminishes the potency of radio receiver.
- ➢ The main drawback is that it has less coverage range areas.
- ➢ The accuracy is low because to the limited quantity/quality of photos, in the dataset, but this may easily be increased by changing the dataset.

11.CONCLUSION

This type of system is the first of its kind to ensure no further damage is then to forests when there is fire breakout and instantly a message is sent to the user through the App. Immediate response or early warning to a fire breakout is mostly the only ways to avoid losses and biology, cultural heritage damages to a great extent. Therefore the most important goals in fire surveillance are quick and authentic detection of fire. It is so much easier to suppress fire while it is in its early stages. info about progress of fire is highly valuable for managing fire during all its stages. Based on this data the firefighting staff can be guided on target to block fire before it reaches cultural heritage sites and to suppress it quickly by utilizing required fire fighting equipment and vehicles. With further research and invention, this project can be implemented in various forest areas so that we can save our forests and maintain great environs.

12.FUTURE SCOPE

This project is far from complete and there is a lot of room for betterment. Some of the betterment that can be made to this project are as follows:

➢ Additional pump can be added so that it automatically sends water when there is a fire breakout. Also industrial sensors can be used for better ranging and accuracy. ➢ This project has endless potential and can always be enhanced to become better. enforcing this concept in the real world will benefit several industries and reduce the workload on many workers, enhancing overall work efficiency.

SOURCE CODE

```
In [ ]:import keras
from keras.preprocessing.image import ImageDataGenerator
#Define the parameters/arguments for ImageDataGenerator class
train_datagen=ImageDataGenerator(rescale=1./255,shear_range=0.2,rotati
on_range=180,zoo
test_datagen=ImageDataGenerator(rescale=1./255)
x_train=train_datagen.flow_from_directory(r"C:\Users\sanjay\OneDrive\D
esktop\Dataset\T batch_size=32,class_mode='binary')
x_test=test_datagen.flow_from_directory(r"C:\Users\sanjay\OneDrive\Des
ktop\Dataset\Tes batch_size=32,class_mode='binary')


#To define linear initialization import Sequential
from keras.models import Sequential
#To add layers import Dense
from keras.layers import Dense
#To create Convolution kernel import Convolution2D
from keras.layers import Convolution2D
#import Max Pooling layer
from keras.layers import MaxPooling2D
#import Flatten layer
from keras.layers import Flatten
import warnings
warnings.filterwarnings('ignore')
#initializing the model
model=Sequential()
#add convolutional layer
model.add(Convolution2D(32,(3,3),input_shape=(128,128,3),acti
vation='relu')) #add maxpooling layer
model.add(MaxPooling2D(pool_size=(2,2)))
#add flatten layer
model.add(Flatten())
#add hidden layer
model.add(Dense(150,activation='relu'))
#add output layer
model.add(Dense(1,activation='sigmoid'))
#configure the learning process
model.compile(loss='binary_crossentropy',optimizer="adam",metric
s=["accuracy"]) #Training the model
model.fit_generator(x_train,steps_per_epoch=14,epochs=10,
validation_data=x_test,validation_steps=4)
model.save("forest2.h5")
```

```
#import load_model from keras.model
from keras.models import load_model
 #import image class from keras
from tensorflow.keras.preprocessing import image
#import numpy
import numpy as np
#import cv2
import cv2

model = load_model("forest2.h5")
img=image.load_img(r"C:\Users\sanjay\OneDrive\Desktop\Dataset\Test_se
t\Forest with fir x=image.img_to_array(img)
res      =      cv2.resize(x,      dsize=(128,      128),
interpolation=cv2.INTER_CUBIC) #expand the image shape
x=np.expand_dims(res,axis=0)

pred=model.predict(x)
pred=int(pred[0][0])
pred
(int)

if (pred==0):
 print("forest with fire")
else:
 print("forest without fire")

model = load_model(r'forest2.h5')
video                                                                 =
cv2.VideoCapture(r"C:\Users\sanjay\Downloads\pexels-arnav-kainthola-7
543653.mp name = ['forest','with fire']

while(1):
 success, frame = video.read()
 cv2.imwrite("image.jpg",frame)
 img = load_img("image.jpg")
 x = img_to_array(img)
     res      =      cv2.resize(x,      dsize=(128,      128),
interpolation=cv2.INTER_CUBIC)                   x          =
np.expand_dims(res,axis=0)
 pred=model.predict(x)
 p=int(pred[0][0])
 int(p)
  cv2.putText(frame,  "predicted  class  =  "  +str(name[p]),  (100,100),
cv2.FONT_HERSHE  # pred=model.predict(x)
 if p==0:
 account_sid = 'AC5923cf8d29ec11edffab37a3997f3602'
 auth_token = '4bb6b8876615238ab70c45a44b34584e'
 client = Client(account_sid, auth_token)
 message = client.messages \
```

```
 .create(
 body='Forest Fire is detected, stay alert',
 from_='+14793363560',
 to='+918838487815')

playsound("C:\Users\sanjay\Downloads\4WY2LZB-message-alert.
mp3")  print(message.sid)

 print('Fire Detected')
 print ('SMS sent!')
 break
 else:
 print("no danger")
 #break
 cv2.imshow("image",frame)

 if cv2.waitKey(1) & 0xFF == ord('a'):
 break
video.release()
cv2.destroyAllWindows()
```

GITHUB :

https://github.com/IBM-EPBL/IBM-Project-42922-1660711354

DEMO VIDEO:

https://drive.google.com/file/d/1KnZtAbcn9slOI4AL7RtD5hUXM_sUWTwm/view?usp=sharing