GUJARAT TECHNOLOGICAL UNIVERSITY

Chandkheda, Ahmedabad
Affiliated

Sarvajanik College of Engineering & Technology

A
Project Report
On

Forest

Under the course of

DESIGN ENGINEERING – 2B (2160001

B. E. III, Semester – VI
(Computer Engineering)

Submitted by:

Group: 6

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Prof. (Dr.) Pariza Kamboj
Head of the Department

Prof. Jayesh Chaudhary
(Faculty Guide)

Academic year
(2021-2022)

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CERTIFICATE

This is to certify that the students namely, **Mr. Smit Babariya(190420107002), Sahil Khunt (190420107004), Kartik Jetani(190420107018), Pritesh Mangukiya (190420107030), Kramik Nakrani(190420107035), Kirtan Sakariya(190420107063)** of ***B. E. III*** *(Computer Engineering) Semester VI have successfully completed the* course work and related tasks for the course of Design Engineering 2B **(2160001)** during the academic term ending in the month of April/May 2022.

Date: 07-04-2022

Place: Surat

Prof. Jayesh Chaudhary
(Faculty Guide)

Prof.(Dr.) Pariza Kamboj
Head of the Department

Contents

1. Introduction

1.1 Design Thinking

Design Thinking is an iterative process in which we seek to understand the user, challenge assumptions, and redefine problems in an attempt to identify alternative strategies and solutions that might not be instantly apparent with our initial level of understanding. At the same time, Design Thinking provides a solution-based approach to solving problems. It is a way of thinking and working as well as a collection of hands-on methods.

1.2 Phases of Design Thinking

- Empathise – with your users
- Define – your users' needs, their problem, and your insights
- Ideate – by challenging assumptions and creating ideas for innovative solutions
- Prototype – to start creating solutions
- Test – solutions

1.3 Why we choose Forest Fire domain?

Nowadays, forest fires often cause serious threats to the environment and produce real emergency situations and natural disasters. The response time of emergency corps greatly affects the consequences and losses caused by them, so the enhancement of forest fire prevention and detection systems can be considered a main goal for conserving the environment. With respect to this, the real-time monitoring of certain environmental variables may make the forest fire prevention, detection, and fighting more efficient.

2. Reverse Engineering

App/SW Name	Design Goals	Used Components / Techniques/ Algorithm	Features	Constraints	Any other Analysis
GWIS(Global Wildfire Information System)	maintain and further develop the global wildfire information system providing harmonized fire information . e.g. fire danger , active fires , burned areas etc. networking of major national and regional fire information provides by organizing an annual convening key international organizations and initiatives. develop methods for the global assessment of wildfire risk and implementation of this assessment at the global state.	MODIS JRC , VIRS , GEOS , Earth Observation Satellites.	provides data for the for the fire danger forecast a day in advance . GWIS aims to provide comprehensive view of fire effect and fire Regimes at the global level.	accuracy is not very high . it's tally depends on satellites.	GWIS analyses the impact of wildfires in terms of fire emissions , damage to human infrastructure and the environment.

HWSN (Hierarchical Wireless Sensor Network)	to strengthen the disaster response capacity , early warning systems. improve in real time exchange of data at all stages and levels to forest monitoring scheme.	fire detectors , WSN based ZigBee , GPRS , Ethernet communicati on modules.	no need for a preinstalled communicatio n network time synchronizatio n dual functionality not being based on cameras. integration with the operation centre .	cost is very high . false alarms problems. network issues.	HWSNs fire detection performanc e is very high. HWSN project include all the key factors in forest fire fighting operations :-satellite operators , forest services agencies , technologie s provider , authorities etc.
forest fire detection using image processing	improve real time fire detection through image classification. to develop spatial wavelet transform to monitor the translucency of smoke .	arduino device , neural-network , image dataset , camera , wire-less network communicati on , ML algorithm.	it's vey cost effective. require low maintenance. accuracy is very high.	false classification require large dataset. training is costly.	it's easy to maintain. training model is only one time .

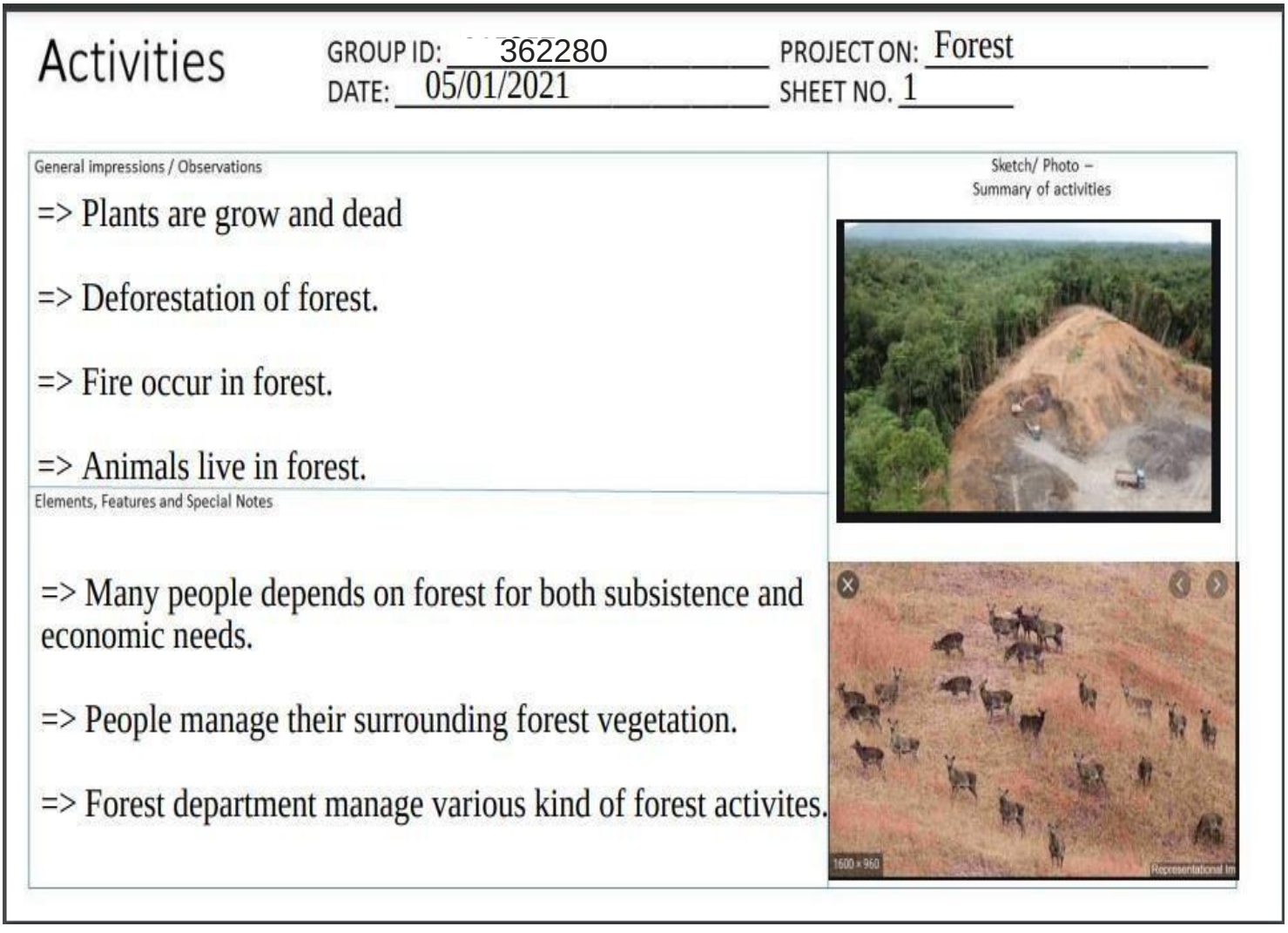
3. Observations

3.1 A-E-I-O-U framework

AEIOU is an investigative tool to help interpret observations gathered by ethnographic practices in the field. It is an Observation tool. Its two primary functions are to code data, and to develop building blocks of models that will ultimately address the objectives and issues of a client.

- A – Activities
- E – Environment
- I – Interactions
- O – Objects
- U – Users

Activity



Activities

GROUP ID: 362280 PROJECT ON: Forest

DATE: 05/01/2021 SHEET NO. 1

General impressions / Observations

=> Plants are grow and dead

=> Deforestation of forest.

=> Fire occur in forest.

=> Animals live in forest.

Sketch/ Photo – Summary of activities

Elements, Features and Special Notes

=> Many people depends on forest for both subsistence and economic needs.

=> People manage their surrounding forest vegetation.

=> Forest department manage various kind of forest activites.

Environment

Environment

GROUP ID: 362280 PROJECT ON: Forest

DATE: 05/01/2021 SHEET NO. 2

General impressions / Observations
(Style, materials & atmosphere)

=> Clean and Silent atmosphere.

=> Comfortable habitats for wildlife.

=> Home of many people and biodiversity species

Floor plan

Elements, Features and Special Notes

=> Our responsiblity to saving the natural environment of the forest.

=> Forest are contribute to fight against climate change.

Scene

Interactions

Interaction

GROUP ID: 362280 PROJECT ON: Foresth

DATE: 05/01/2021 SHEET NO. 3

General impressions / Observations
(Who is interacting with whom, what?)

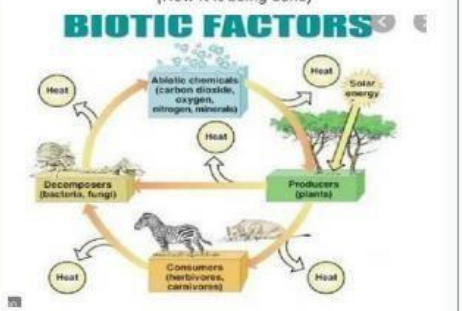
=> Forest – Environment

=> Biotic interaction

=> People – Forest

=> Forest - animals

Scene of interaction
(How it is being done)



Elements, Features and Special Notes

=> Interaction between forest biodiversity and people's use of forest resources.

=>Deep interaction between Environment, Forest and Wildlife.

Objects

Objects

GROUP ID: 362280 PROJECT ON: Forest
DATE: 05/01/2021 SHEET NO. 4

General impressions / Observations
(How components are involved?)

=> Plants => People

=> Animals

=> Biodiversity species

=> Forest department

Inventory of Key Objects
(Prepare a list here of 'THE THINGS' involved)

Elements, Features and Special Notes
(How objects are relating to the activities?)

=> Protection of environment in order to promote sustainable development.

=> We should organize foresty programs.

=> Forest department forest activity.

Users

Users

GROUP ID: 362280 PROJECT ON: Forest
DATE: 05/01/2021 SHEET NO. 5

General impressions of people
(Who is present? Roles & responsibilities?)

=> Forest department prevent forest fire.

=> NGO workers planting plants.

=> Wildlife specialist inspect the behaviour of animals, plants etc.

Scene of users in context

Inventory of people
(List of identified people involved)

=> Forest department => Forest mangment groups

=> NGO workers

=> Wildlife specialist

4. Mind mapping

A Mind Map is an easy way to brainstorm thoughts organically without worrying about order and structure. It allows you to visually structure your ideas to help with analysis and recall.

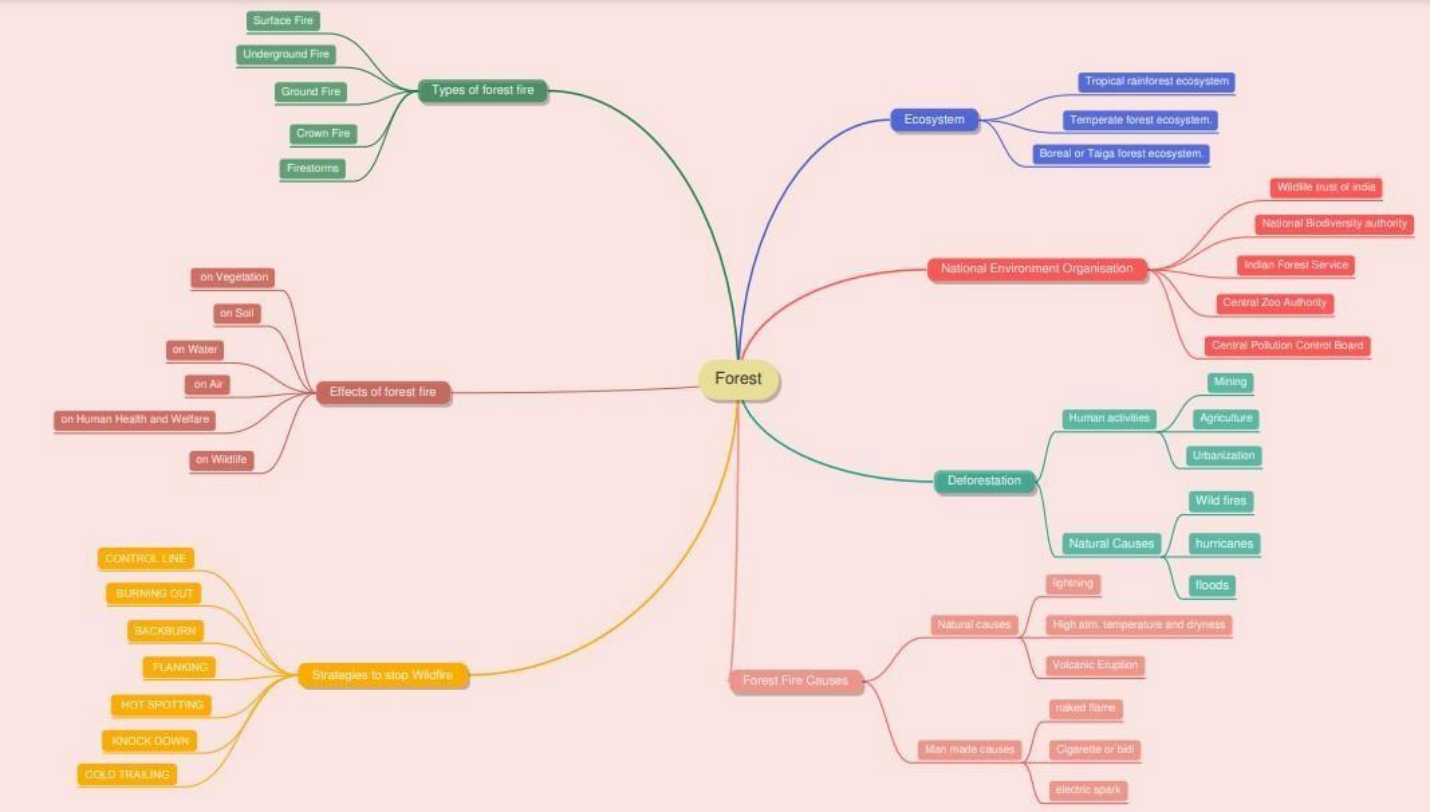


Figure 1 Mind mapping

5. Empathy mapping canvas

Empathy maps should be used throughout any User experience process to establish common ground among team members and to understand and prioritize user needs. In user-centered design, empathy maps are best used from the very beginning of the design process.

Design For Forest **Design By** 362280

Date 09/02/2021

USER

- Forest people
- Animals
- Plants

STAKEHOLDERS

- Forest department
- NGO workers
- Wildlife specialist

ACTIVITIES

- Deforestation
- Forestation
- Farming
- Forest fire

STORY BOARDING

HAPPY

- Miyawaki is a Japanese botanist and ecologist, who has been planting forests along the cost line of japan to protect it from tsunamis and soil erosion. He has spent his entire life promoting native forests and has already planted over 40 million trees in more than 15

HAPPY

- Chipko movement started in 1970's, was a non violent movement aimed to protection and conservation of trees and forests from being destroyed. In this movement villagers used to hug the trees and protect them from wood cutters from cutting them.

SAD

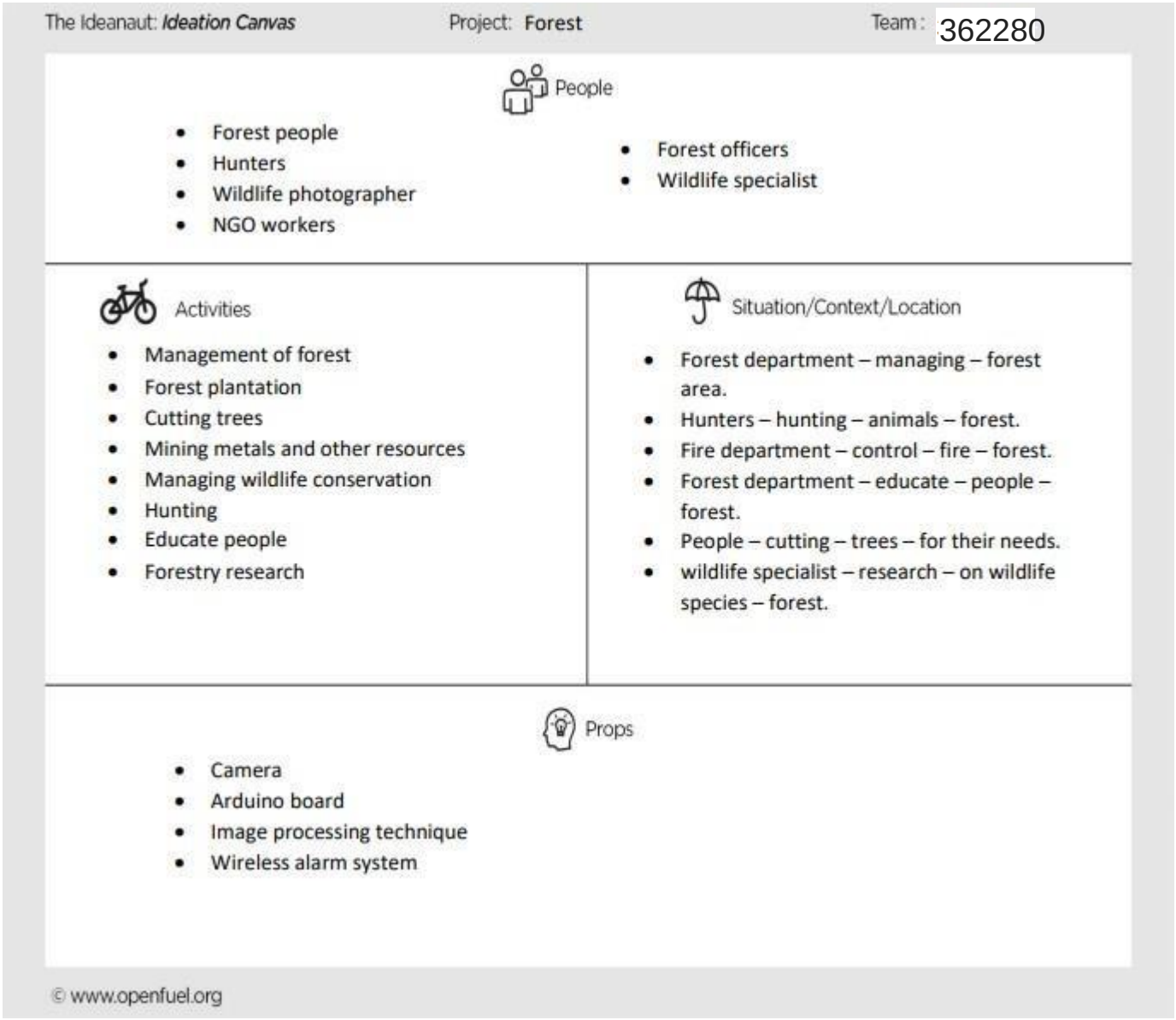
- Nichole Jolly, a nurse at a hospital in California. Jolly's car was trapped in wildfire. Flames of fire surrounded her car, filling it with smoke. A lack of oxygen along with ash and hot embers getting into her eyes made it hard to escape after some time she die.

SAD

- Some year ago, extremely heavy rainfall has led to flood-like situation in forest part of Kerala. A major landslide has been reported from Idukki district in which at least 13 people have been killed and several others are feared trapped.

6. Ideation Canvas

Ideation Canvas is the creative process of generating, developing, and communicating new ideas, where an idea is understood as a basic element of thought that can be visual, concrete, or abstract. Ideation comprises all stages of a thought cycle, from innovation, to development, to actualization.



7. Product Development Canvas

Product Development Canvas

Team/Date/Version: Team Id : 362280/ 21/04/2021

Purpose

What is the purpose of this concept you're developing? Does it solve a problem, or it enhances a certain experience ?

Is it serving a need or it is trying to create a new need or tap an untapped need?

=> Prevent risk of forest fire.

=> Fire risk assesment.

=> Localization of fire.

Product Experience

Define what your customer should feel like when he uses your product/service? What emotions, feelings would define his experience? Feeling of comfort, convenience, or feeling of buying more with less(cost conscious) or feeling of greater security,safety etc.

=> Better performance

=> Accurate prediction

Product Functions

Functions are a products answer to user problems/need. They do something that user wants. They are often verbs in nature. Every function is powered by many features. Multitasking is a function. Browser tabs is a feature that powers the multitasking feature. A function can have one or more features powering it. Functions are very generic in nature, features are often more specific. Functions can be similar to product experience. Safety (product function) provides a feeling of safety (product experience)

=> Detect fire using image processing.

=> Give warning through alarm system.

Product Features

Product features are specific. One or more features will power a function. Antilock Brakes, Airbags are fetures that power the safety function. Browser tabs, Apple's home button to multitask between apps are features powering the multitasking function.Each feature will have many components/sub components powering it. Sometimes a very popular component becomes a featurein itself. Like car stero is a major components and a feature at the sametime powering the in car entertainment function powering entertainment as a product experience.

=> Early warning

=> Reliable detection

=> Immediate response

=> Motion planning

People

Who is the key customer segment who will use this product /sevrice or the end product of the concept you're pusuing?

Write here about them, describe them a little.

=> Forest People

=> Forest officers

=> Government organization.

=> Fire department.

Components

Components build up the features. For a airbag it will comprise a list of component like bags, triggers etc. that go into making it. For a tabbed browser it will comprise of various chunks of code that will make the tabs work. In cases where the feature is a major component, you could list here the auxilliary components that are required to make the major component work.You can also list new adjustments and innovations you're planning here at the component level.

=> camera

=> Arduino/ Rasberry Pi

=> Image Processing Model

=> Wireless alarm system

Once you're finished with your feature set, test with the customer /user if the features, functions are useful. Speak to the customer/user.

=> Good Performance

=> Accurate in early detection

=> Low Maintenance

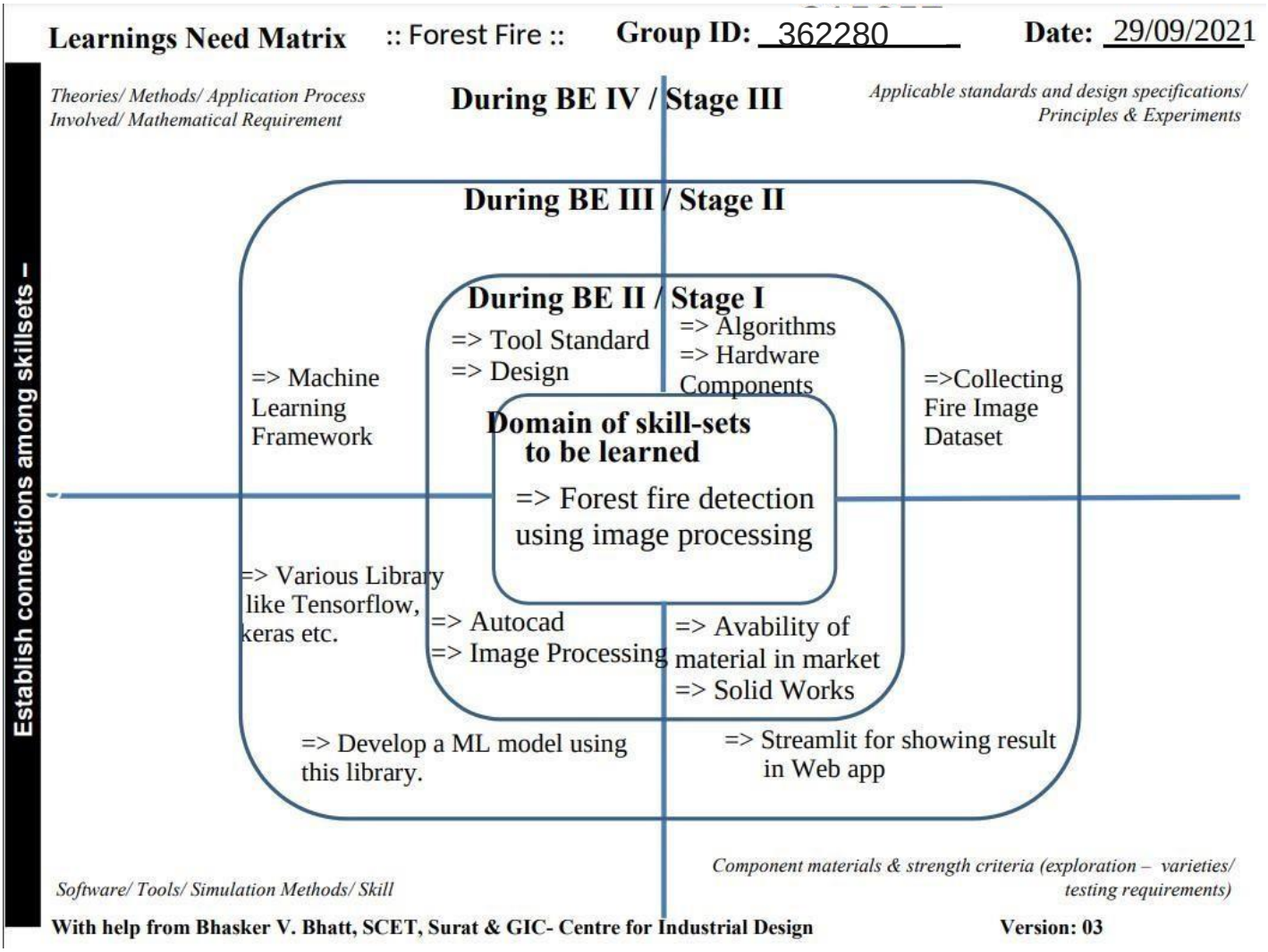
=> Mr.Jimesh Korat

Reject, Redesign, Retain

Post customer validation, reject, those functions or features that the customers didnt find useful. Redesign those that were partially useful and retain those met the bar. Iterate with this until all functions/features ar eaccepted.

=> Retain

8. LNM Canvas


Learnings Need Matrix
:: Forest Fire ::
Group ID: 362280
Date: 29/09/2021
Establish connections among skillsets –
Theories/ Methods/ Application Process Involved/ Mathematical Requirement
During BE IV / Stage III
Applicable standards and design specifications/ Principles & Experiments
During BE III / Stage II
During BE II / Stage I
=> Tool Standard
=> Design
=> Algorithms
=> Hardware Components
=> Machine Learning Framework
=>Collecting Fire Image Dataset
Domain of skill-sets to be learned
=> Forest fire detection using image processing
=> Various Library like Tensorflow, keras etc.
=> Autocad
=> Image Processing
=> Avability of material in market
=> Solid Works
=> Develop a ML model using this library.
=> Streamlit for showing result in Web app
Software/ Tools/ Simulation Methods/ Skill
Component materials & strength criteria (exploration – varieties/ testing requirements)
With help from Bhasker V. Bhatt, SCET, Surat & GIC- Centre for Industrial Design
Version: 03

9. INTELLECTUAL PROPERTY RIGHTS (IPR)

PART 1: PATENT SEARCH TECHNIQUE USED				
	PATENT-1	PATENT-2	PATENT-3	PATENT-4
PATENT SEARCH DATABASE USED	worldwide.espacenet.com	worldwide.espacenet.com	patents.google.com	patents.google.com
KEYWORDS USED FOR SEARCH	Forest fire detection	Forest fire detection	Forest fire detection	Forest fire detection
SEARCH STRING USED	Forest fire detection	Forest fire detection	Forest fire detection	Forest fire detection
NUMBER OF RESULTS/HITS GETTING	10718	10718	8080	8080

PART 2: BASIC DATA OF PATENTED INVENTION/BIBLIOGRAPHIC DATA				
	PATENT-1	PATENT-2	PATENT-3	PATENT-4
TITLE OF INVENTION	Fire detection parameter generation apparatus and fire detection divice having the same.	A Control System for Forest Fire using Unmanned Aerial Vehicle	Method and system for automatic forest fire recognition	Forest fire early-warning system powered by microbiological fuel cell and realizing method thereof
PATENT NO.	KR102135171B1	KR102155286B1	EP0984413A3	CN105788141A
DATE OF APPLICATION	11-04-2009	14-09-2020	09-06-2003	20-07-2016
NAME OF INVENTOR/S	KIM DONG YEOB; KIM KI DAE; WOO CHOONG SHIK; YI JONG HYUK	Kim, Ki-Dae; Kim, In-seop; woochungsik; Lee Byung-doo	Thomas Behnke Hartwig Dr. Hetzheim jörg Dr. Knollenberg Ekkehard Dr. Kührt Herbert Prof. Jahn	Luo Zhicong Xu Yong Wang Yuzhu Su Jiancong Zhang Zengxiang Yang Zhihong Yu Jie Yu Yijie Liu Hu

PART 3: TECHNICAL PART OF PATENTED INVENTION				
	PATENT-1	PATENT-2	PATENT-3	PATENT-4
BRIEF ABOUT INVENTION	According to the present invention, disclosed are a forest fire parameter generating device and a forest fire detection generating device including the same. The forest fire parameter generating device designates a forest fire occurrence area as a sample area with respect to images of each of N number of frames adjacent to a training forest fire image collected by a forest fire image collection unit, and uses a parameter generation unit generating a forest fire characteristic parameter for all or part of pixels belonging to the designated sample area, so as to derive forest fire parameters by analysing existing fire forest observation data.	According to the present invention, a surveillance vehicle that constantly monitors a forest fire vulnerable area, a caustic detection vehicle that periodically detects caustics in the forest fire vulnerable area, the monitoring information of the monitoring vehicle and the caustic information of the caustic detection vehicle are transmitted, and the monitoring A night forest fire response system using an unmanned aerial vehicle to establish a night-fighting strategy by searching for information on the fire and tail lights of a forest fire in the event of a night forest fire, including the central control unit that controls the flight operation of the aircraft and the caustics detection vehicle, is disclosed.	a)Taking a reference image of a scene and determining the horizon b) normalizing the recorded reference image and marking the image area below the horizon, c) Performing a non-linear filtering to suppress possible movements in the recorded reference image, d) Intermediate storage of the reference images obtained, e) taking at least one current image of the scene to be examined, f) making an image matching of the current image to the reference image, g) normalizing the recorded image analogous to process step b), h) Formation of thresholds proportional to the normalized standard deviation, i) Compare the current image with the corresponding reference image and generate a binarized difference image with the aid of the thresholds according to method step h), j) applying a cluster search algorithm to the binarized differential image according to method step i) to find connected areas, k) Forming probabilities for evaluating the clusters found on the basis of characteristic features and eliminating clusters below a probability threshold and l) Triggering an alarm if the smoke probability for at least one cluster exceeds a predetermined threshold.	The invention relates to a forest fire early-warning system powered by a microbiological fuel cell and a realizing method thereof. The forest fire early-warning system comprises a GSM transmission system which is connected with a plurality of ZigBee coordinators. Each ZigBee coordinator is connected with a plurality of acquisition terminal nodes. The acquisition terminal nodes are arranged in a forest in a star-shaped topological structure for acquiring temperature, humidity, smoke concentration, pressure and illumination strength data of the forest. The GSM transmission system is furthermore connected with a centralized controller. The centralized controller is connected with a remotely arranged PC. The forest fire early-warning system further comprises the microbiological fuel cell which is connected with the acquisition terminal nodes, the Zigbee coordinator and the GSM transmission system for supplying electric power to the acquisition terminal nodes, the ZigBee coordinator and the GSM transmission system. The invention further relates to a realizing method of the forest fire early-warning system powered by the microbiological fuel cell. According to the forest fire early-warning system and the realizing method thereof, non-interrupted energy supplying to the system can be realized without an artificial power supply, and furthermore a significant meaning in continuous real-time detection and early-warning on the forest fire is realized.
HOW MUCH THIS INVENTION IS RELATED WITH YOUR PROJECT?	It will be used to decide sample area.	It is used to detect fire at night time.	Comparing current image with reference image and derive binary difference.	GSM transmission system connected with the central Controller.
KEY LEARNING POINTS	Parameter generation technique	About that vehicle that detects the fire	Detecting fire from collected images of forest fire	GSM transmission system

10. Pre Design Calculation

10.1 Ergonomics:

(write down the analysis by considering applicable ergonomics in report and highlight the modification in pdc based on ergonomics)

1. Physical:
   - For computational cost side our system use less memory and computational power. This proves it's computational cost and memory ergonomics.

2. Cognitive:
   - As it is portable and to simple to use so it simplifies the work of the users too.
   - It's web interface module provide better visual of the system makesit more cognitively ergonomic.

3. Organizational:
   - Because of availability of an node system to monitor the data provided by the module, it makes easy for the organization like forest department)to maintain the data.

10.2 Aesthetics:

(write down the description of your product by considering applicable aesthetics)

1. Colour :
   - Mixtuer of black, white and red provide better UI of the web page.

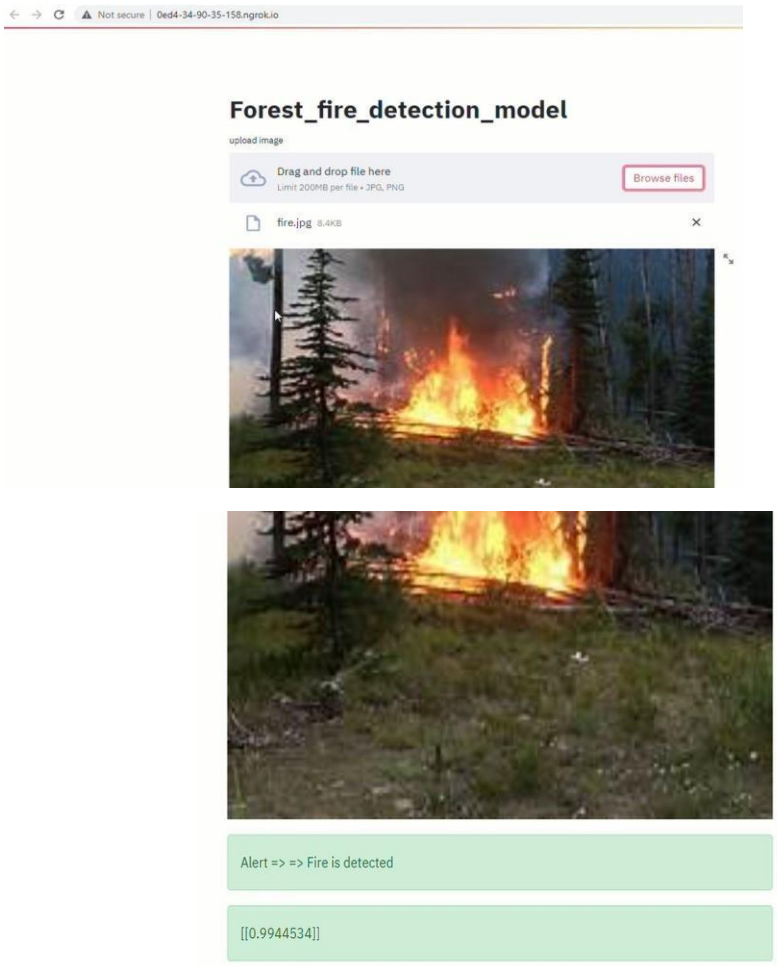
2. Size :

- Node can be vary accordings to the type of the hardware.
- Web interface is automaticlay update i[3]t's size with different size of hardware.

3. Style :

- It;s easy to install at any local or cloud system.

4. Appearance :



5. Form/Shape :

It is basically in web application form.

10.3 Design for cost:

(write down the description of your product by considering applicable costing)

1. Design for (Manufacturing cost -Labour, material and overhead cost):
   Manufacturing cost includes all the modules cost:
   Modules are:

Software resembles COCOMO Model, therefore calculations are

done accordingly,

Lines of Code:

- 175-200 lines in fire detection module + 30-40lines in deployment module (streamlit) = 210-240 lines.

- Constants values are:

  Optimizer = ADAM , Loss = BinaryCrossEntroppy, Accuracy = Metrics And ImageSize = (180,180)

- T_{dev} (Development Time) = b1 x (Effort)^b2 Months
  $= 2.2 \times (0.77315)^{0.38} = 2$Months

- Tensorflow is free to use library and for web interface streamlit appIs free. So, The total cost of development is 0Rs.

- Cost of Development = 0Rs.

2. Delivery cost:

Delivery cost includes the Hardware Part and the Software Part is vary hardware type and the cost of various local or cloud system.

3. Cost of operation and maintenance:

' The cost of operation and maintenance is based on the size and geomatery of the forest. For a large system the cost is not very highfor this system.

10.4 Design for environment:

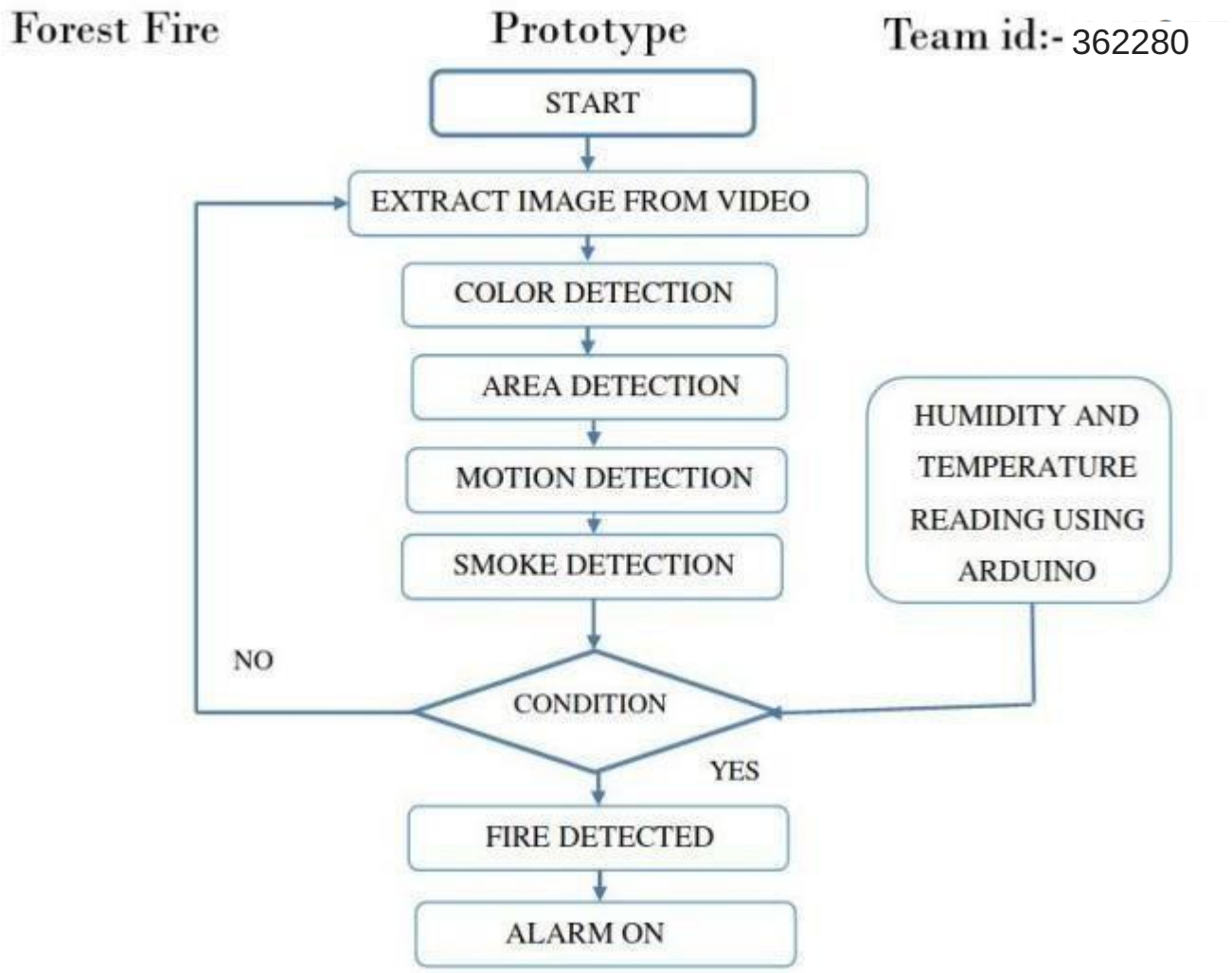
(refer the given ppt for DFE rule and describe in detail if applicable)

- This system is save the environment. It is help to prevent to forest fire.So, it's very environmently freindly in terms of saving trees.

- If we use renewable energy resources to run the computation system of our forest fire detection system then it's not create any environmental Impact.

- This system is carbon-neutral.
- No damage to environment is done during the process of developmentand it wont be done even during its operation too.

11.Prototype



COLOR DETECTION ::

~ This section covers the detail of the proposed fire pixel classification algorithm. ~ Rule based color model approach has been followed due to its simplicity & effectiveness. ~ For good fire detection system it should not miss any fire alarm.

AREA DETECTION ::

~ Area detection method is used to detect dispersion of fire pixel area in the sequential frames. ~ In this method, we took two sequential images which comes out from color detector then we check dispersion in minimum and maximum coordinate of X and Y axis, acquired from color detector.

MOTION DETECTION ::

~ Motion detection is used to detect any occurrences of movement in a sample video.

SMOKE DETECTION ::

~ The smoke pixels do not show chrominance characteristics like fire pixels. ~ At the beginning, when the temperature of the smoke is low, it is expected that the smoke will show color from the range of white-bluish to white.

~ Toward the start of the fire, the smoke's temperature increases & it gets color from the range of black-grayish to black.

Code:

Forest_fire_detection_system.py

```
# -*- coding: utf-8 -*-
"""Forest_Fire_detection_system.ipynb

Automatically generated by Colaboratory.

Original file is located at
    https://colab.research.google.com/drive/1DO38VqW_kvN_EzVsliaaSWWejjJ2mNf7
"""

import numpy as np
import pandas as pd
import tensorflow as tf
from tensorflow.keras.preprocessing.image import ImageDataGenerator
import matplotlib.pyplot as plt

from google.colab import drive
drive.mount('/content/gdrive')

#!ls gdrive/MyDrive

data_dir = 'gdrive/MyDrive/train'
```

```
batch_size = 64
img_height = 180
img_width = 180

train_ds = tf.keras.preprocessing.image_dataset_from_directory(
  data_dir,
  validation_split=0.2,
  subset="training",
  seed=123,
  image_size=(img_height, img_width),
  batch_size=batch_size)

val_ds = tf.keras.preprocessing.image_dataset_from_directory(
  data_dir,
  validation_split=0.2,
  subset="validation",
  seed=123,
  image_size=(img_height, img_width),
  batch_size=batch_size)

class_names = val_ds.class_names
print(class_names)

import matplotlib.pyplot as plt

plt.figure(figsize=(10, 10))
for images, labels in train_ds.take(1):
  for i in range(9):
    ax = plt.subplot(3, 3, i + 1)
    plt.imshow(images[i].numpy().astype("uint8"))
    plt.title(class_names[labels[i]])
    plt.axis("off")

for image_batch, labels_batch in train_ds:
  print(image_batch.shape)
  print(labels_batch.shape)
  break

normalization_layer = tf.keras.layers.experimental.preprocessing.Rescaling(1./255)

normalized_ds = train_ds.map(lambda x, y: (normalization_layer(x), y))
image_batch, labels_batch = next(iter(normalized_ds))
first_image = image_batch[0]
```

```
print(np.min(first_image), np.max(first_image))

AUTOTUNE = tf.data.AUTOTUNE

train_ds = train_ds.cache().prefetch(buffer_size=AUTOTUNE)
val_ds = val_ds.cache().prefetch(buffer_size=AUTOTUNE)

model = tf.keras.models.Sequential()
model.add(tf.keras.layers.Conv2D(filters=128, kernel_size=7, activation='relu',
input_shape=[180,180,3]))
model.add(tf.keras.layers.MaxPool2D(pool_size=2, strides=2))
model.add(tf.keras.layers.Conv2D(filters=64, kernel_size=3, activation='relu'))
model.add(tf.keras.layers.MaxPool2D(pool_size=2, strides=2))
model.add(tf.keras.layers.Conv2D(filters=32, kernel_size=3, activation='relu'))
model.add(tf.keras.layers.MaxPool2D(pool_size=2, strides=2))
model.add(tf.keras.layers.Flatten())
model.add(tf.keras.layers.Dense(units=256, activation='relu'))
model.add(tf.keras.layers.Dense(units=1, activation='sigmoid'))

model.compile(optimizer = 'adam', loss = 'binary_crossentropy', metrics = ['accuracy'])

model.summary()

history = model.fit(
  train_ds,
  validation_data=val_ds,
  epochs=5)

tf.keras.models.save_model(model, 'Forest_fire_detection_model.hdf5')
```

Deployment module:

```
# -*- coding: utf-8 -*-
"""deployment_module.ipynb

Automatically generated by Colaboratory.

Original file is located at
    https://colab.research.google.com/drive/1UTZWDg9Lz0cdslYkvp1FY_-7PlRh9pep
```

```
"""

! pip install streamlit

# Commented out IPython magic to ensure Python compatibility.
# %%writefile app.py
#
# import streamlit as st
# import tensorflow as tf
#
# st.set_option('deprecation.showfileUploaderEncoding', False)
#
# def load_model():
#   model  =  tf.keras.models.load_model('/content/Forest_fire_detection_model.hdf5')
#   return model
#
# model = load_model()
# st.write("""
#         # Forest_fire_detection_system
#         """)
#
# file = st.file_uploader("upload image", type=["jpg", "png"])
# import cv2
# from PIL import Image, ImageOps
# import numpy as np
#
# def import_and_predict(image_data, model):
#
#   size = (180,180)
#   image = ImageOps.fit(image_data, size, Image.ANTIALIAS)
#   img = np.asarray(image)
#   img_reshape = img[np.newaxis,...]
#   prediction = model.predict(img_reshape)
#
#   return prediction
#
# if file is None:
#   st.text("Please upload an image file")
# else:
#   image = Image.open(file)
#   st.image(image, use_column_width=True)
#   predictions = import_and_predict(image, model)
#   if predictions > 0.97:
#     st.success("Alert => => Fire is detected")
```

```
#   else:
#     st.success("No fire")
#   st.success(predictions)

! pip install pyngrok

!ngrok authtoken 1xu1kz4r7KBBQdE3to1K8lPq6iA_3DBskKJnvrwwFTUx8wX3h

!ngrok

!streamlit run app.py&>/dev/null&

!pgrep streamlit

from pyngrok import ngrok

url = ngrok.connect(addr='8501')

url
```

Output

Alert => => Fire is detected

[[0.9944534]]

12. Conclusion

~ This project, Fire Detection System has been developed using Image Processing. This system has the ability to apply image processing techniques to detect fire.

~ This system has high efficiency as it has incorporated techniques of Area detection, Color detection, Motion detection, and Smoke detection as well as Humidity and Temperature detection.

13. Contineous assessment card for internal evalution

GUJARAT TECHNOLOGICAL UNIVERSITY

Centre for Industrial Design (Open Design School)

DESIGN ENGINEERING

CONTINUOUS ASSESSMENT CARD

COLLEGE NAME: **Sarvajanik College of Engineering & Technology** COLLEGE CODE: **042**	
SUBJECT NAME: **Design Engineering-2B**	
SUBJECT CODE: **2160001**	SEMESTER: **6**
BRANCH: **Computer Engineering-Shift 1**	ACADEMIC YEAR: **2021-22**

TEAM NAME:	TEAM ID: **362280**
PROJECT TITLE/DOMAIN: **Forest Fire Detection**	

SR. NO.	TEAM MEMBER'S NAME	ENROLLMENT NO.
1	**Sahil Khunt**	**190420107004**
2	**Smit Babariya**	**190420107002**
3	**Kartik Jetani**	**190420107018**
4	**Pritesh Mangukiya**	**190420107030**
5	**Kramik Nakrani**	**190420107035**
6	**Kirtan Sakariya**	**190420107063**

INTERNAL GUIDE NAME: **Prof. Jayesh Chaudhari**
INTERNAL GUIDE SIGN:

Head of Department College Seal

MONTHLY ASSESSMENT - I (Observation, Empathy and Define Phase)
(DATE : 29 / 09 / 21)

1. Why students/team have taken above mentioned domain? (Please specify the reason)

   (Note: For more content or information, one may attach additional pages to this card.)

   We have selected fire detection domain because forest fire is the very big problem in today's world. We took this domain because it is good if we stop this fire as early as possible when it is at the small stage. It is easy to stop it in early stage as compared to that of a larger scale.

2. How frequently student team has gone for observation on field, mention with date, place, time etc.? Which are the key observations that they have noticed?

   As of now, looking at the current scenario, it is advisable not to go if it is not necessery. So, we are assuming most of our every thing as per datasets we got.

3. A. How many interactions/interviews team members have done?

   No, we dit not have any interactions/ interview looking a current pandemic. It is not decision to go out and meet any one as of now.

   B. Who are the user and various stakeholders on domain? Describe their persona (Name, age, occupation/education, roles and responsibility etc.)

   In our project(Forest fire detection) there are various stakeholders that we took. People that effect from fire is our user & our hardware and alarm detection method is the stakeholders.

   C. List out the questions asked by team while having observation and interview?

   We had an online interview, and we asked them all about why this forest fire starts and what exactly happens when this fire spreads all over the forest. & we also asked for solutions from their point of view so that we can think of it.

4. What is something special/random/unusual (i.e. activity, environment, interaction, object or user) team have observed at the domain? Please elaborate the conditions with photographs if available.

We have seen that once the fire in forest starts, it spreads very quickly all over the forest. It will nto cause only in lost of trees but it also affects the wildlife that lives in the forest. It is quite easy to stop the fire at the early stage, but once it is getting started spreading all over the forest, it will be very very difficult to stop that fire. So it is nice step to find solution so that we can stop it at early stage.

5. Enlist any five major problems observed by your team in the respective domain. Mention any one for which you have empathize user the most and which might become your problem statement. Give reasons of selection of particular problem/issue based on empathy.

1] It is very hard to detect fire which is at low level.

2] It is not easy to go very close to fire because it is very hot.

3] We can detect the fire from some distance.

4] Oxygen level reduces quite a bit nearer to the fire & carbon dioxide increases.

=> So these are the major problems we observes at this domain.

=> No.1 is our problem statement. Because once it is not detected at small scale, it will not take much time to turn into the large scale.

6. Define your "PROBLEM DEFINITION" for the project as per below format. Which might be refine till end of Ideation phase if you wish.

SUGESTIONS BY INTERNAL GUIDE:

AEIOU CANVAS SUGGESTIONS:
EMPATHY CANVAS SUGGESTIONS:
MIND MAPPING SUGGESTIONS:
GENERAL SUGESTIONS:
Overall Mark (Out of 05):

GUIDE SIGNATURE:
Date:

MONTHLY ASSESSMENT – II (Ideation and Product Development Phase)
(DATE : 29 / 09 / 21)

1. Explain briefly Ideation thought process and efforts of your team to reach ideas for listed problems.

   In the ideation stage , aim is to generate a large quantity of ideas that ptentially inspire newer , better ideas , our team can filter and nerrow down into the best most practical and most innovative idea in forest fire detection domein.

2. Enlist any five effective ideas to address the probable listed problems with reason.

   1) Remote access to fire detection using mobile tech.

   2) Fire detection using machine learning algorithms.

   3) Unoptimized supply using strong data management system.

   4) Transform unstructured data into structured data using ML.

   5) Fire detection using images and AI and DL.

3. Explain the most effective possible solution proposed for the problem.

   Increased automation.

   It will help us to save the forest from the heavy fire using fire detection.

4. Explain the features, functions and working principles/technology/pattern of your proposed solution.

   Machine learning algorithm have remarkable progress in image recognization tasks.

   Various method from CNN to variational auto encoders have forward at a rapid pace.

   Machine learning and artificial intelligence methods automatially recognising complex pattern in imaging data and monitoring of fire detection.

5. Enlist major advantages and disadvantages (atleast three) of the proposed solution.

ADAVANTAGES:

1) Reduction in human error. 2) Helping in repetitive work. 3) Faster predictin.

DISADVANTAGES:

1) High cost of creation. 2) Required more data. 3) Take much time to implement.

6. Briefly mention refinement on PDC based on User/Stakeholder's feedback on your concept.

User / stackholder feedback on our solution is easy access and less time consuming and over algorithms use more computation.

SUGESTIONS BY GUIDE:

IDEATION CANVAS SUGGESTIONS:
PRODUCT DEVELOPMENT CANVAS SUGGESTIONS:
LEARNING NEEDS MATRIX SUGGESTIONS (in case of 4th sem and onwards):
GENERAL SUGGESTIONS:
Overall Mark, considering assessment I (Out of 05):

GUIDE SIGNATURE:
Date:

MONTHLY ASSESSMENT -III (Detail Design, Prototype and Test phase)

(This assessment shall be done by another guide of department or interdepartmentally along with guide) **(DATE : 29 / 09 / 21)**

1. Which theoretical subjects/concepts are involved with your project? How it is useful to your project?

   Our project use image processing and convolution neural network concept that is helpful to detect the forest fire images.

2. Which software/design tool/Skills you have learned/applied during the project? Explain the features of it.

   We use proto.io software suring out project design. It includes very good feature , various user interface and inbuilt templates in it using this software. It is very easy to design our product. It is less time consuming software.

3. Explain the prototype/model prepared by the student/team.

   In this project, we built a machine learning model with deployment. In this model , we include options for user to either take the photo using camera or already captured image to upload. so the user can use this service effectively and also can detect the fire spreaded in forests which is major problem of current time.

4. What are the materials, technology, things have utilized to make the prototype/model?
   Design software, artficial intelligence and machine learning concept are being used to make prototype or model.

5. How many Iterations have you done to reach final solution? Explain modification/revise parameters/characteristics for each iteration.
   We have make 3-4 interation to reach the final results. In each iteration we modified our design of software , concept according to user's feedback.

6. What is the scope of the project? How you are planning to implement it in future?
   We know, in recent times amazon forest caught fire and it continued for long time. We lost to much part of forest and it was not good at all. so we can detect the fire using this model and can save our forest from burning out.

SUGESTIONS BY EVALUATOR:

PROTOTYPE/MODEL SUGGESTIONS:
GENERAL SUGESTIONS:
Overall Mark, considering assessment I & II (Out of 10):

Department/Interdepartmental Evaluator name and sign:
Guide sign:
Date:

FINAL ASSESSMENT AT THE END OF SEMESTER

EVALUATOR MEMBERS DETAILS:

NAME	INSTITUTE & DEPARTMENT	SIGN.
1.		
2.		
3.		

ASSESSMENT SUMMARY:

CONTINUOUS ASSESSMENT SUMMARY:	MARKS OBTAINED
MONTHLY ASSESSMENT - I	
MONTHLY ASSESSMENT - II	
MONTHLY ASSESSMENT - III	
TOTAL (Out of 20)	
FINAL EVALUATION/VIVA MARKS (Out of 80)	
TOTAL (Out of 100)	
EXAMINER COMMENTS/SUGGESTIONS:	

DATE:

INTERNAL GUIDE SIGN **HOD SIGN** **COLLEGE SEAL**