A PROJECT REPORT

ON

"GESTURE COPTER"

Submitted to

UNIVERSITY OF MUMBAI

In Partial Fulfilment of the Requirement for the Award of

BACHELOR'S DEGREE IN
COMPUTER ENGINEERING

BY

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UNDER THE GUIDANCE OF
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Plot No. 2 3, Sector - 16, Near Thana Naka,
Khandagaon, New Panvel - 410206

2019-2020

AFFILIATED TO

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CERTIFICATE

This is certify that the project entitled

"GESTURE COPTER"

submitted by

ANSARI MOHAMMED SANAN	**16CO19**
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is a record of bonafide work carried out by them, in the partial fulfilment of the requirement for the award of Degree of Bachelor of Engineering (Computer Engineering) at ***Anjuman-I-Islam's Kalsekar Technical Campus, Navi Mumbai*** under the University of MUMBAI. This work is done during year 2019-2020, under our guidance.

Date: / /

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At last we must express our sincere heartfelt gratitude to all the staff members of Computer Engineering Department who helped me directly or indirectly during this course of work.

ANSARI MOHAMMED SANAN
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Project I Approval for Bachelor of Engineering

This project entitled ***GESTURE COPTER¨*** by ***ANSARI MOHAMMED SANAN, NADEEM HUSAIN, SHAHID KHOT*** is approved for the degree of ***Bachelor of Engineering in Department of Computer Engineering.***

Examiners

1. .....
2. .....

Supervisors

1. .....
2. .....

Chairman

.....

Declaration

I declare that this written submission represents my ideas in my own words and where others ideas or words have been included, I have adequately cited and referenced the original sources. I also declare that I have adhered to all principles of academic honesty and integrity and have not misrepresented or fabricated or falsified any idea/data/fact/source in my submission. I understand that any violation of the above will be cause for disciplinary action by the Institute and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been taken when needed.

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ABSTRACT

The major objective of this propose system is to design a copter which can controlled by hand gesture. The movement of the quadcopter base on the movement of the user hand gesture. The first step is to designing quadcopter with electronic components which will give us accurate flight characteristic.This system based on android technology are designed for trying to control the quadcopter by hand gesture. This paper presents movement of quadcopter based system on hand gesture which will help user who don't know how to control the copter using remote controller.

Quadcopter is basically a drone which is a form of the helicopters. Copter will move in several direction on the basis of user instruction. We implemented face detection for the authentication purpose so that unauthorized user could not access the drone. Drone will not move from its original position until any command is given with hand gesture.

Keywords: Quadopter, Android, Hand Gesture,Drone,Face detection,Authentication.

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Chapter 1

Introduction

Drone is one of the type of helicopter which having stability. Drone is complex flying machine due to its movement. Drone will move in several direction on the basis of user hand gesture. User found difficulty to use drone by the remote controller. This drone made for the user who want to easily operate drone without remote controller. This drone made with four rotors and with the camera for recording the live scenario. A pair of rotors rotate in clockwise direction and another pair of rotors rotate in anticlockwise direction based on the hand gesture direction.The use of this system in major field is military,movie making,rescue,surveillance and weather monitoring,traffic monitoring,firefighting and some other important areas. This system implemented face recognition for the authentication so that unauthorized user cannot access the system. Face recognition is for the authentication purpose. Only authentic user can access the system.

1.1 Purpose

This proposed system is remote less drone which move base on the hand gesture command after the face recognition authentication. This proposed system designed in a way which reduced the cost economically.The accuracy of face recognition is 87 percentage till now and the accuracy of hand gesture recognition is 80 percentage till now. Development process of the face recognition for the authentication and hand gesture recognition is in progress. Our aim is to achieve more accuracy so that user can get good experience by providing interaction between system and user.

1.2 Project Scope

Due to this project any military officer can operate drone without any previous experience.In Movie shooting there are many points at which shot from one location is required, our wireframe technology will be useful their.Their will be no data in drone so no one can catch the real user of drone.This proposed system is remote less drone which move base on the hand gesture command after the face recognition

authentication. This proposed system designed in a way which reduced the cost economically .

1.3 Project Goals and Objectives

1.3.1 Goals

a. Gesture recognition technology helps you to communicate or control any other devices via your hand gestures. From this technology, you can control the drone simply by moving your hands.

b. Allowing people to control the drone with their hand gesture.

c. Hand gesture is used to control the movement of the drone and an on board camera is used for streaming the aerial view of the place.

d. This proposed system designed in a way which reduced the cost economically.

1.3.2 Objectives

a. The objective of this project is to show how the hand gesture work for the movement of the drone.This can help to improve the user experience with drone.

b. To build the quad copter(drone).

c. To understand the process of Hand Gesture recognition.

d. To learn and apply operations and techniques to capture the live scenario.

e. To understand the process of Face Authentication for the security.

1.4 Organization of Report

The report is organized as follows :
Chapter 1 :- It describes the fundamental terms used in this project.It describes the Goal,Objectives and scope of this project.
Chapter 2 :- describes the review of the relevant various techniques in the literature systems. It describes the pros and cons of each technique with how to overcome those cons using new technology.
Chapter 3 :- The project planning includes members and capabilities of this project ,roles and responsibilities of each member,Budget of Project and Project timeline.
Chapter 4 :- describes Functional and Nonfunctional Requirements of project.Along with this it also explain features of system and constraints of system.
Chapter 5 :- includes Design Information with Class Diagram, Sequence Diagram , Component Diagram and System Architecture.
Chapter 6 :- Implementation of each module is explained.
Chapter 7 :- shows final Test Cases and Test Results.
Chapter 8 :- includes Screenshot of outputs and Conclusion and
Chapter 9 :- Future Scope of Project is described.

Chapter 2

Literature Survey

2.1 Real Time Face Authentication.

The First Step is face recognition for the authentication. In Face Recognition first step is Face Detection. First,the camera capture the image of the user. Face Detection is done using haarcascade classifier. Haarcascade features are similar to convolution kernels which are used to detect the user face. After capturing user image from the camera it detect the face of the user and then identify the user is authentic or not.

2.1.1 Advantages of Paper

a. The system is good for portability. The portability allows the user to carry the device anywhere and can use at any time.

b. A power bank of capacity 16,000 mAh is used for making the model portable and it can be recharged.

2.1.2 Disadvantages of Paper

a. If Multiple hand will shown in video then Algorithm cannot detect correct hand.

b. No face recognition of person captured in image only face detection is done.

2.1.3 How to overcome the problems mentioned in Paper

a. By using CNN we will detect face from multiple angle.

2.2 Design of control system based on hand gesture recognition.

The interaction between human and machine can be done by the hand gesture. User can interact with the computer by two ways;1) Using data glove 2) Computer vision but in this system we implemented computer vision to create the communication between the human and machine. Drone will move on the basis of user hand gesture instruction.

2.2.1 Advantages of Paper

a. Allowing people to control the drone with their hand gesture.

b. Hand gesture is used to control the movement of the drone and an on board camera is used for streaming the aerial view of the place.

c. This proposed system designed in a way which reduced the cost economically.

2.2.2 Disadvantages of Paper

a. If Multiple hand will shown in video then Algorithm cannot detect correct hand.

2.2.3 How to overcome the problems mentioned in Paper

a. Due to face Authentication we will take gesture only of correct user.

2.3 A Smart Drone

Description: Drone is one of the type of helicopter which having stability. Drone is complex flying machine due to its movement. Drone will move in several direction on the basis of user hand gesture. User found difficulty to use drone by the remote controller. This drone made for the user who want to easily operate drone without remote controller. This drone made with four rotors and with the camera for recording the live scenario. A pair of rotors rotate in clockwise direction and another pair of rotors rotate in anticlockwise direction based on the hand gesture direction.The use of this system in major field is military,movie making,rescue,surveillance and weather monitoring ,traffic monitoring,firefighting and some other important areas.

2.3.1 Advantages of Paper

a. Drone is one of the type of helicopter which having stability

2.3.2 Disadvantages of Paper

a. Because all processing will be done in drone it will consume more power and hence it cannot be fly for longer period of time.

2.3.3 How to overcome the problems mentioned in Paper

a. We will do all processing in our device it will consume less power can be able to fly for longer period of time.

2.4 Technical Review

CNN stands for Convolution Neural Neetwork.This technology is use to Face recognition and Hand gesture recognition.A Haarcascade-Feature is just similar to a kernel in Convolution Neural Network(CNN).The values of the kernel are calculated by training. Analysis of the face base on the accurate detection of the human face. In the user face authentication frontal face image is very important criteria.Haarcascade is computer computer vision technique which is use for the face detection.

2.4.1 Advantages of Technology

a. In the frontal face detection it capture the user face. Frontal face detection is depend on the accuracy of detection of the user face.Frontal face detection is for the user face authentication purpose.Haarcascade is computer technique by this technique face can be detected.

b. This technology give the high accuracy.

c. The process of recognizing a face takes a second or less — and this is incredibly beneficial for the user.

d. The facial recognition technology is quite easily integrated so it's a perfect choice.

2.4.2 Reasons to use this Technology

a. CNNs are used for image classification and recognition because of its high accuracy.

b. This technology systems provide very good accuracy and formatting capabilities.

c. The CNN follows a hierarchical model which works on building a network, like a funnel, and finally gives out a fully-connected layer where all the neurons are connected to each other and the output is processed.

Chapter 3

Project Planning

3.1 Members and Capabilities

Table 3.1: Table of Capabilities

SR. No	Name of Member	Capabilities
1	SANAN ANSARI	Machine Learning, Backend Developer
2	NADEEM HUSAIN	ANDROID APP DEVELOPER
3	SHAHID KHOT	Machine Learning, Python

Work Breakdown Structure

a. All of the members are equally important in developing the project.

b. We work on a different part of the project based on one's capability.

c. Firstly we came up with documentation, And based on the documentation we set our goal and created a blueprint.

d. We then started going hands-on with the project to develop it according to the flow as decided earlier.

3.2 Roles and Responsibilities

Table 3.2: Table of Responsibilities

SR. No	Name of Member	Role	Responsibilities
1	SANAN ANSARI	Backend	Face Recognition module
2	NADEEM HUSAIN	Frontend	Frontend Developing,Drone
3	SHAHID KHOT	Team Leader	Hand Recognition module

3.3 Assumptions and Constraints

a. People who are using this app having low vision.

b. User of this app should have give command through hand gesture.

c. The time taken to move the drone is between 2 to 4 secs.

d. The system can detect face upto 1m distance from camera and text upto 1-2m away from camera.

3.4 Project Management Approach

a. Planning of project.

b. Defining the scope of the project.

c. Estimation of time and It's management.

d. Creating Gantt Charts and properly assigning tasks to members.

e. Reporting the progress of project with the guide.

3.5 Ground Rules for the Project

a. Properly planning and gathering relevant information is very important.

b. Developing a Blueprint of the project and work accordingly.

c. All the members should report to the guide whenever required

d. Setting up small goals every week.

e. Achieving the small goal within that span of time.

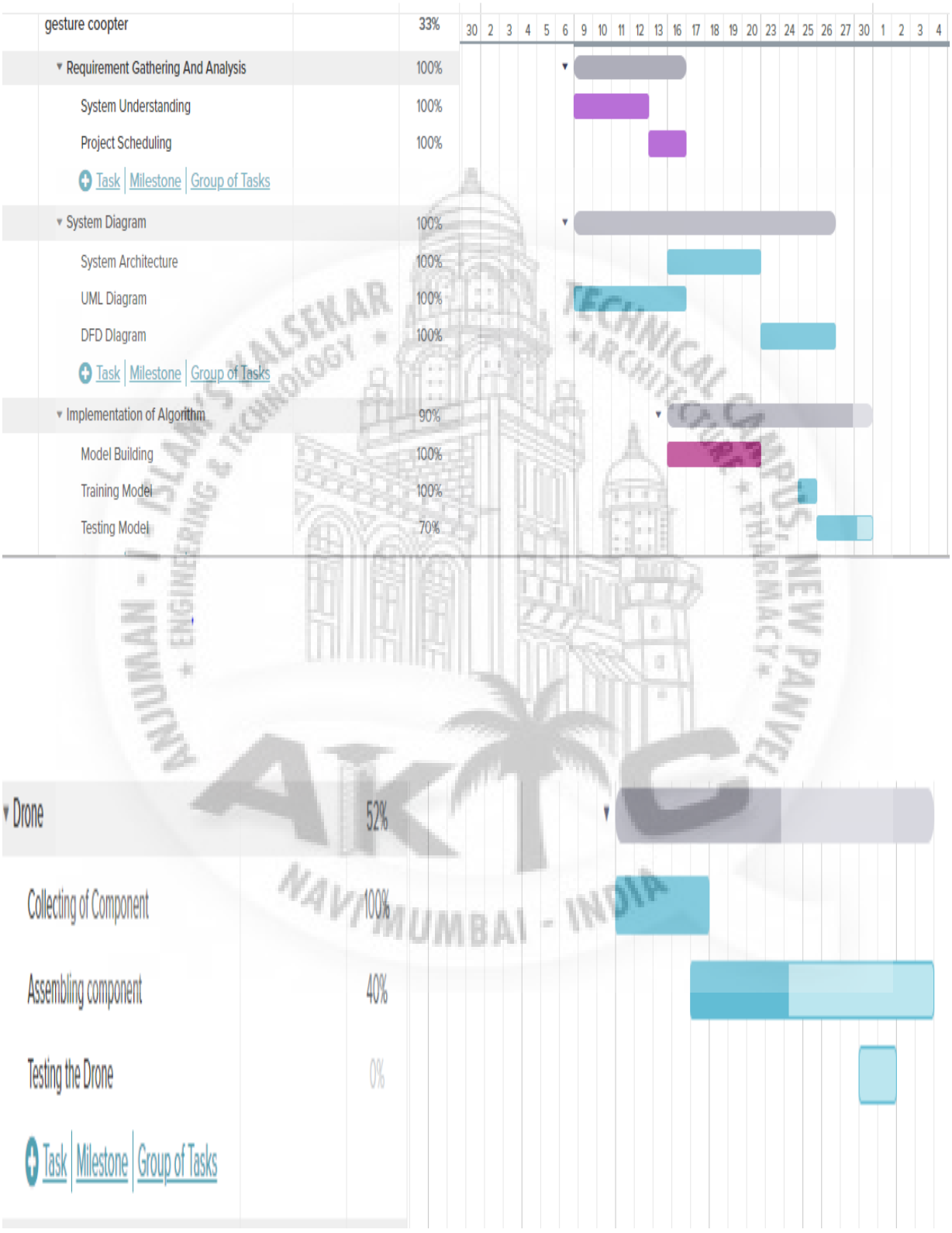
f. Keeping tracks of the progress towards project.

3.6 Project Budget

a. It is a light project.

b. Cost of the project is very low and efficient.

3.7 Project Timeline



Chapter 4

Software Requirements Specification

4.1 Overall Description

4.1.1 Product Perspective

The product is an open source. It is a app based system.This app is use to show the live scenario. This system is an independent from any other third party system.This system is made for people who can easily use the drone through their hand gesture.In Face recognition, faces that are recognized for the security purpose so that unauthorize user cannot access the drone.Drone will be move based on the user hand gesture

4.1.2 Product Features

There are three major features in this system.
Face Recognition model is use to detect the face of the authorize user.
Hand gesture recognition is use to detect the hand of the user.Through hand gesture user is able to move the drone in X-Y direction. classifies between the known and unknown hand.
Drone is one of the type of helicopter which having stability. Drone is complex flying machine due to its movement. Drone will move in several direction on the basis of user hand gesture. User found difficulty to use drone by the remote controller. This drone made for the user who want to easily operate drone without remote controller. This drone made with four rotors and with the camera for recording the live scenario. A pair of rotors rotate in clockwise direction and another pair of rotors rotate in anticlockwise direction based on the hand gesture direction.

4.1.3 User Classes and Characteristics

This is project is a social project.The user can easily move the drone in X-Y direction.That is visually.Also the user who want to make the video in film

4.1.4 Operating Environment

This system can operate on any environment.
Hardware specifications:

a. processor pentium4 or above.

b. Ram:2GB or Above

c. Hard-disk:40GB or Above

Operating System:

a. Windows: 7 or above.

Software:

a. Python: 3.6 or Above

b. OpenCv: 3.3.1 or Above

c. pyttsx3: 2.87

d. Web-browser:chrome,Mozilla,Internet Explorer

e. Android Studio

4.1.5 Design and Implementation Constraints

This system focuses one of the features at time. It is not able to provide two or more services at a time.At any instant only one of the services is accessible.Suppose, While using face recognition one cannot use hand gesture recognition.

4.2 System Features

Face Authentication is the process in which after capturing and training the image of the user system will give the message user is authentic or not.. The paper[2] based on the real time face authentication. Face recognition and authentication technology are very challenging. Face authentication provide the security and identify between the authentic and non authentic user.
Face Recognition classifies between the known and unknown faces.Also able distinguish among the known faces and gives out the name that are saved in the databases. Hand gesture recognition is use to give the direction to the drone.

4.2.1 System Feature

Face recognition provides detection and recognition of texts that are present on any background.

Description and Priority

This is one of the main feature of the system .The Face recognition is use to find out authentic user.Through the hand gesture user can move the drone in X-Y direction.

Stimulus/Response Sequences

Stimulus:User open the camera.
Response:camera capture the face of the user.
Stimulus:After recognition of the user face.
Response:There will be pop up about user is authentic or not.
Stimulus:If the user is authentic that means user is ready to give the direction.
Response:The live scenario will be show on the device.

Functional Requirements

REQ-1: Authorization from external camera module
REQ-2: Access to the Disk for saving the resources like video.

4.2.2 System Feature

Hand gesture recognition provides detection and recognition of the user hand.

Description and Priority

This is one of the main feature of the system .This helps in detection of hand gesture. It firstly, detect the hand gesture of the use then the drone will move according to the direction given by the user.

Stimulus/Response Sequences

Stimulus:If the user is authentic user give the direction to the drone.
Response:Drone will be move.

Functional Requirements

REQ-1: Authorization from external camera module
REQ-2: Access to the Disk for saving the resources like vedio.
REQ-3: Access to database.

4.3 External Interface Requirements

4.3.1 User Interfaces

It is very light web-app or app, so the GUI is very simple.Home pages provides two button to provide two different services to the users. The first button is use to face authentication and another one is use to save the captured video.

4.3.2 Hardware Interfaces

This web-app or app requires permission of some of the hardware commodities. One need to give camera access in-order to capture the pic. One should also give storage access to save the images and the video files.

4.3.3 Software Interfaces

This software uses different libraries.Numpy library is use to compute and evaluate the images. Opencv is used to deal with the computer vision part.Haarcascade is used to recognize face. Hand gesture recognition is used to interact with drone. Database(SQL) is maintained to store the images of known person faces. And also use it to match while performing the task.OS support also needed to manage the audio files.

4.3.4 Communications Interfaces

Since this is a light web-app, there is no such large communication in the system. Only Databases access, that also done locally.Also https standard is used in-order to gain the access the camera from the server.

4.4 Nonfunctional Requirements

4.4.1 Performance Requirements

Performance of overall system is very efficient and well optimize. From the time taken to capture and process it everything is well organized.While processing an hand gesture it take same time for other operations.

4.4.2 Safety Requirements

This system does not contain any critical data. Still it provide. The databases that are accessed are locally executed.In case of any updates in libraries used can lead to the failure in systems.

4.4.3 Security Requirements

Images of known persons are well compressed before storing.None of them are given access to database.All the libraries used are certified and standard.Also camera access is until the process is done completely.After that is released.

Chapter 5

System Design

5.1 System Requirements Definition

5.1.1 Functional requirements

The basic functions that the system must provide and focus on the needs and goals of the end users are :-

a. Face Authentication.

b. A smart hand gesture quadcopter.

c. Hand gesture recognition.

d. Wireframe model.

e. Blutooth.

Use-case Diagram

A use case diagram at its simplest is a representation of a user's interaction with the drone that shows the relationship between the user and the different use cases in which the user is involved.In our system User will interact with use cases like Face Authentication,Capture video,Hand gesture recognition.

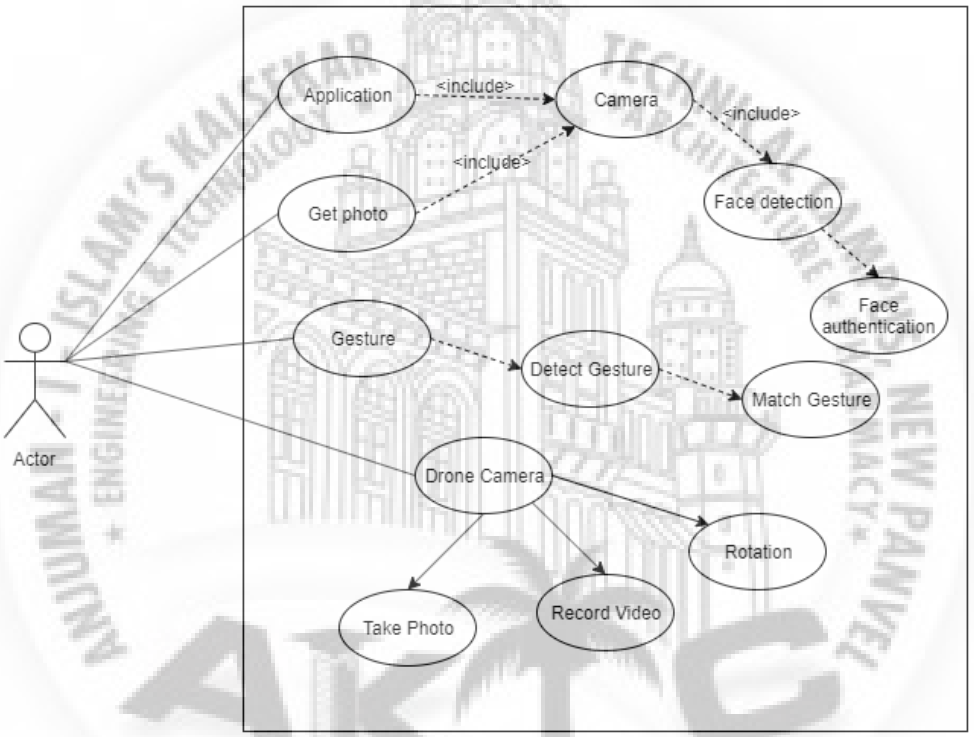


Figure 5.1: Use Case Diagram

Data-flow Diagram

A data-flow diagram is a way of representing a flow of a data of a process or a system. The DFD also provides information about the outputs and inputs of each entity and the process itself.Given below is Level 0 Level 1 and Level 2 DFD of system.

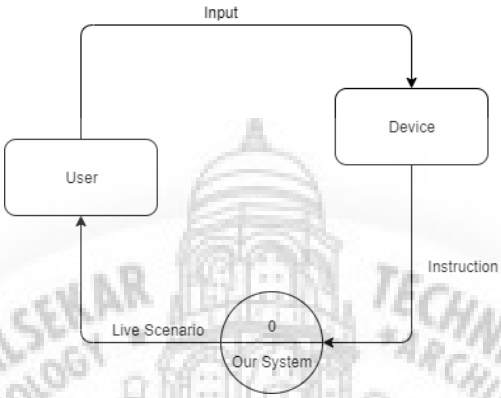


Figure 5.2: DFD level 0

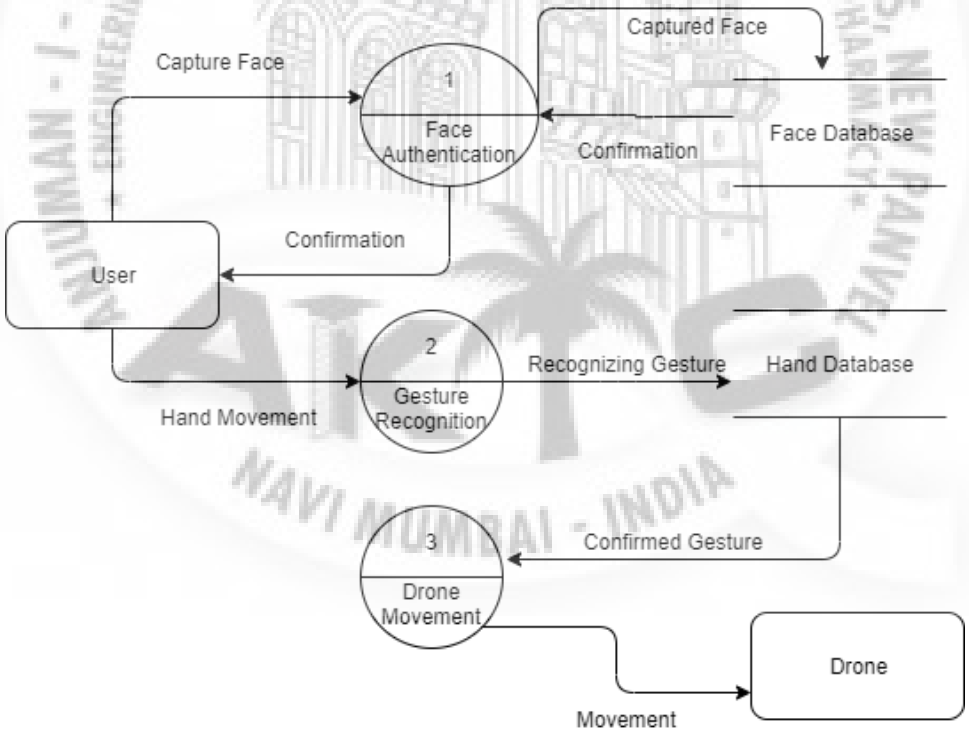


Figure 5.3: DFD level 1

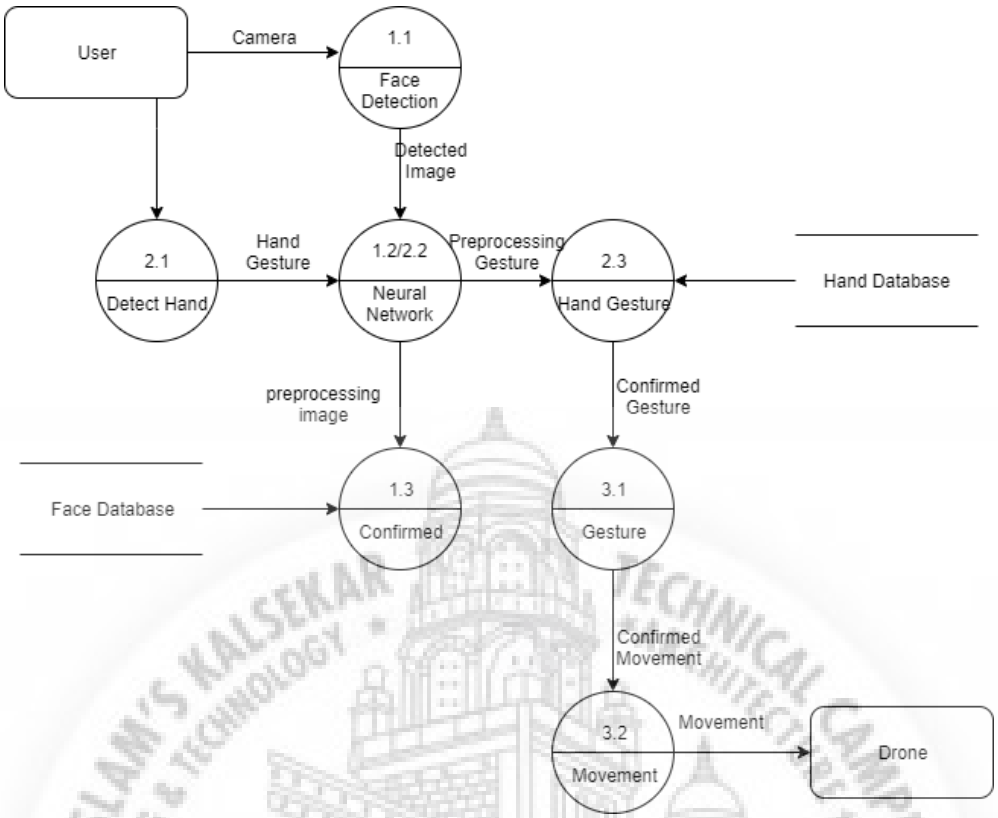


Figure 5.4: DFD level 2

5.1.2 System requirements (non-functional requirements)

These are non-functional system properties such as availability, performance and safety etc. They define functions of a system, services and operational constraints in detail.

a. Usability - Application implementation is feasible using technologies that are accessible to the end-users.

b. Portability - The interfaces are compatible with Android.

c. Space Efficiency -Saved video is of relatively small in size.

d. Performance Efficiency -Application is able to perform well in a proper time constraint.

e. Multi User System -Application is able to consider the presence of more than one user in the same environment. All the features of the system operates properly for all users and provides proper transparency.

f. Time Efficiency - Time taken for the executing of system is less.

5.2 System Architecture Design

A system architecture is the conceptual model that defines the structure, behavior, and more views of a system. An architecture description is a formal description and representation of a system, organized in a way that supports reasoning about the structures and behaviors of the system.

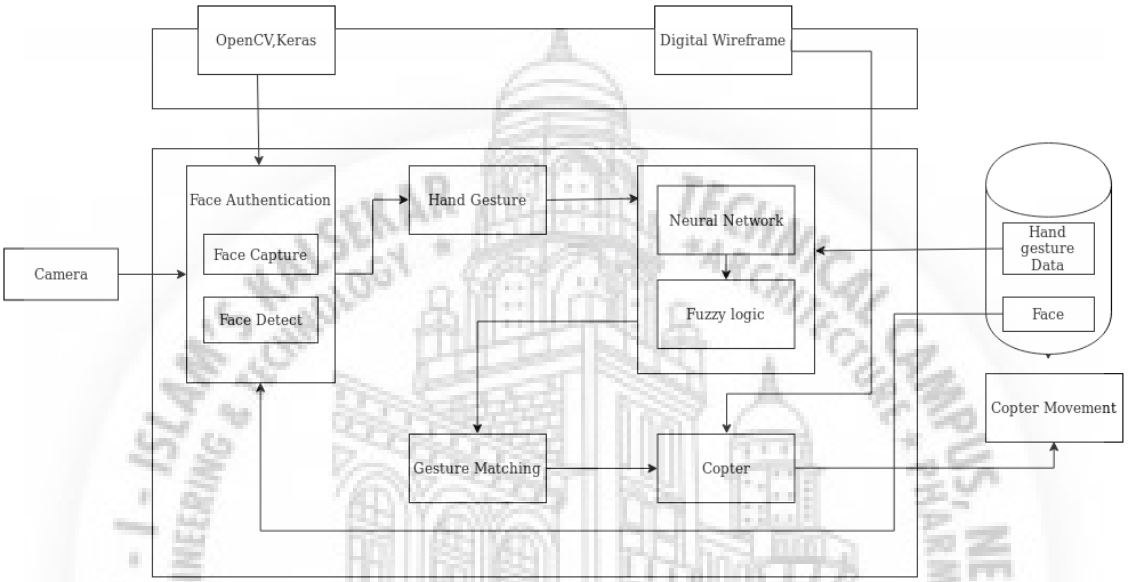


Figure 5.5: System Architecture

5.3 Sub-system Development

This system consist of two modules Hand Gesture recognition and Face recognition.First camera capture the face of the user for the authentication.If the user is the authentic then use is allow to control the drone otherwise user cannot.The next module is hand gesture recognition through which user can give the direction to the drone.

5.3.1 Face Recognition

The First Step is face recognition for the authentication. In Face Recognition first step is Face Detection. First,the camera capture the image of the user. Face Detection is done using haarcascade classifier. Haarcascade features are similar to convolution kernels which are used to detect the user face. After capturing user image from the camera it detect the face of the user and then identify the user is authentic or not.This is the process used to detect different edges using kernels. A Haarcascade-Feature is just similar to a kernel in Convolution Neural Network(CNN).

5.3.2 Hand Gesture Recognition

The interaction between human and machine can be done by the hand gesture. User can interact with the computer by two ways;1) Using data glove 2) Computer vision but in this system we implemented computer vision to create the communication between the human and machine. Drone will move on the basis of user hand gesture instruction.

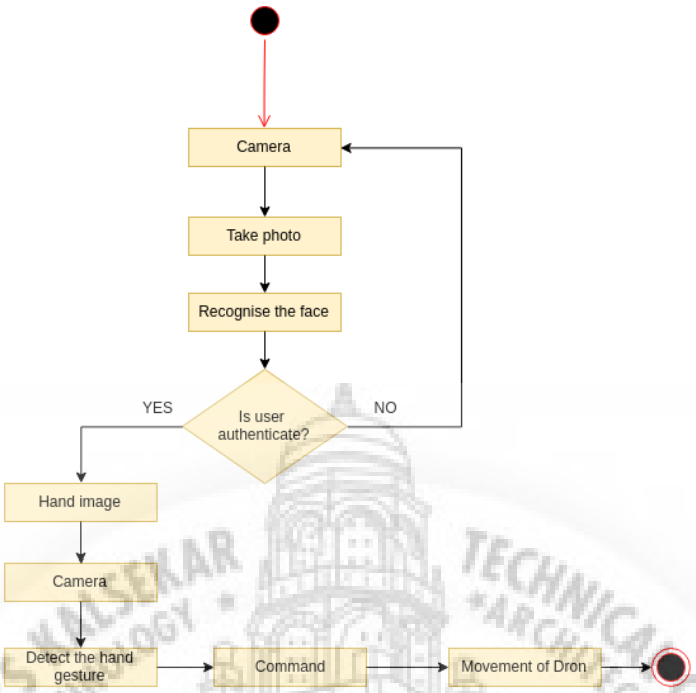


Figure 5.6: Flow Chart

5.4 Systems Integration

System integration (SI) is an engineering process or phase concerned with joining different subsystems or components as one large system. It ensures that each integrated subsystem functions as required. SI is also used to add value to a system through new functionalities provided by connecting functions of different systems.

5.4.1 Class Diagram

In software engineering, a class diagram in the Unified Modeling Language is a type of static structure diagram that describes the structure of a system by showing the system's classes, their attributes, operations, and the relationships among objects.Our System consist of four Classes Image,Face,Text and Text to Speech.

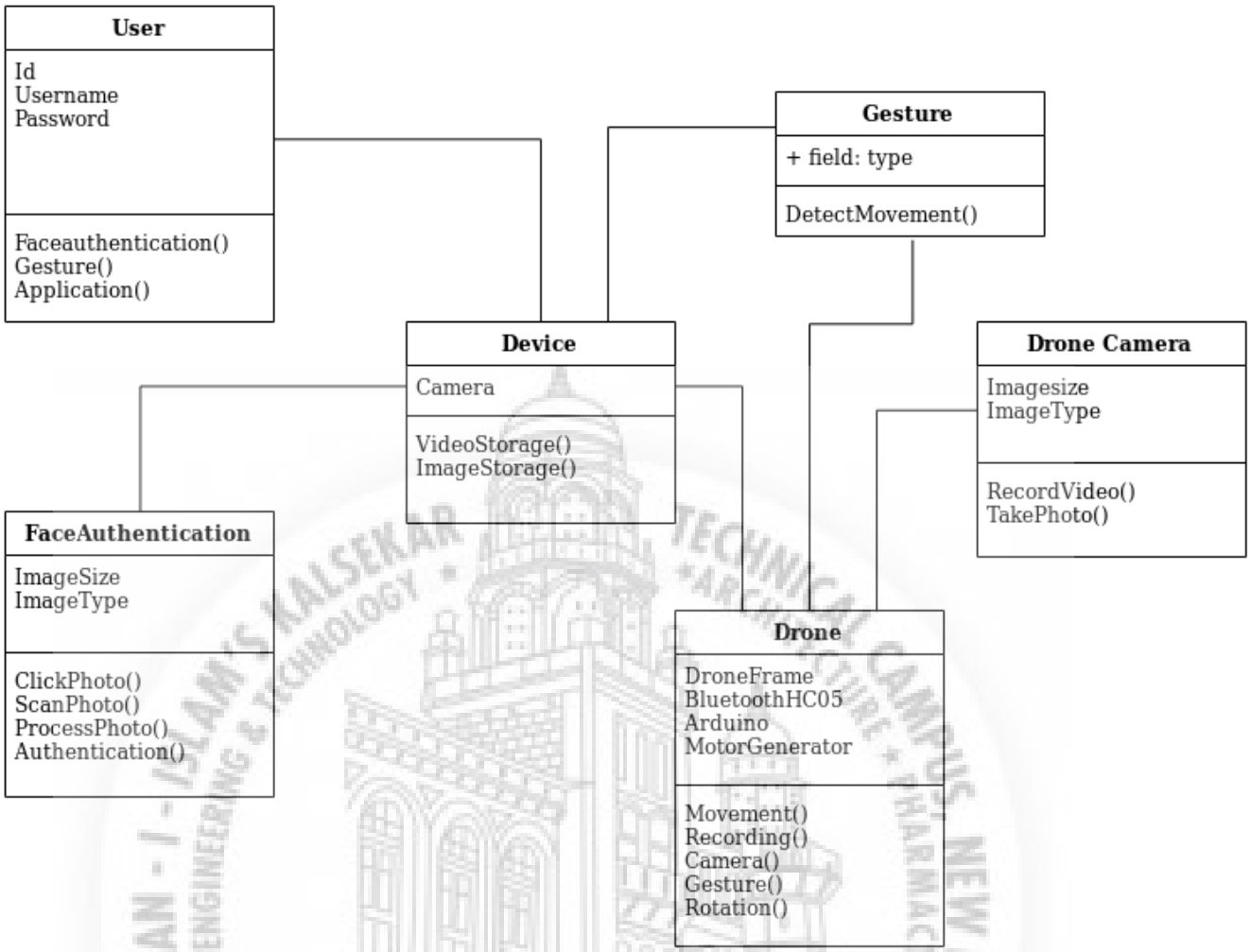


Figure 5.7: Class Diagram

5.4.2 Sequence Diagram

A sequence diagram shows object interactions arranged in time sequence. It depicts the objects and classes involved in the scenario and the sequence of messages exchanged between the objects needed to carry out the functionality of the scenario.

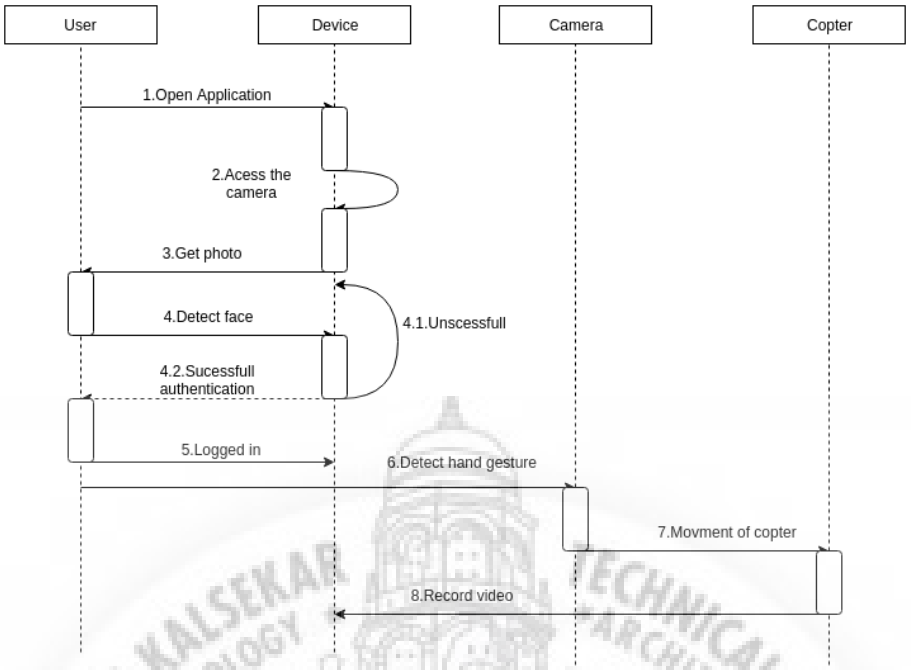


Figure 5.8: Sequence Diagram

Chapter 6

Implementation

6.1 Text Recognition Module

This module is implemented using Python programming language and Flask framework.Following are the python packages used : Flask , pandas , numpy , base64 , PIL , io , pytesseract , gtts , speech_recognition,pyttsx3.

This module takes an input image from camera using java script getuserMedia api.The input image is in the form of base64 using base64 library of python it is decoded and saved in the png format.That saved image further goes for text detection and recognition using google cloud vision api and the recognize text is converted into speech using google text to speech library of python.

main.py

```
from flask import Flask
from flask import render_template ,Markup
from flask import request ,redirect
import cv2
import os
from os import walk
import numpy as np
import mouse
import subprocess
import pyautogui
import pickle
app = Flask(__name__)

@app.route("/")
def main_page():
  return render_template("Frontend.html")

@app.route("/custom/", methods=['POST'])
def custom():
  return render_template("custom.html")



@app.route("/forward/", methods=['GET','POST'])
def move_forward():
  return render_template("forward.html")
```

```
27
28 '''@app.route("/capture/")
29 def Capture():
30   return render_template("capture.html")'''
31 @app.route("/confirm/", methods=['POST'])
32 def confirmed():
33   names = input("Please Enter your name here:-  ")
34   if not os.path.exists("face/images/"+names):
35     os.makedirs("face/images/"+names)
36   directory = 'face/images/'
37   x=0
38   cap = cv2.VideoCapture(0)
39   while True:
40     ret, frame = cap.read()
41     count = {'photo': len(os.listdir(directory+names)),}
42     cv2.putText(frame, "IMAGE COUNT", (10, 100), cv2.FONT_HERSHEY_PLAIN, 1,
         (0,255,255), 1)
43     cv2.putText(frame, "Images : "+str(count['photo']), (10, 120), cv2.
         FONT_HERSHEY_PLAIN, 1, (0,255,255), 1)
44     cv2.namedWindow("Frame", cv2.WND_PROP_FULLSCREEN)
45     cv2.setWindowProperty("Frame",cv2.WND_PROP_FULLSCREEN,cv2.WINDOW_FULLSCREEN)
46     cv2.imshow("Frame", frame)
47     if int(count['photo']) == 25:
48       cap.release()
49       cv2.destroyAllWindows()
50       subprocess.call(['python','face-train.py'],shell=True)
51       return redirect('http://127.0.0.1:5000/forward/')
52     interrupt = cv2.waitKey(3)
53     if interrupt & 0xFF == ord('s'):
54       cv2.imwrite(directory+names+'/'+str(x)+'.jpg', frame)
55       x+=1
56     if interrupt & 0xFF == 27:
57       break
58   cap.release()
59   cv2.destroyAllWindows()
60   return "Try again"
61
62 @app.route("/face/", methods=['POST'])
63 def new():
64   time=0
65   face_cascade = cv2.CascadeClassifier('haarcascade_frontalface_alt2.xml')
66   recognizer = cv2.face.LBPHFaceRecognizer_create()
67   recognizer.read("trainer.yml")
68   labels = {"person_name":1}
69   name=''
70   with open("label.pickle","rb") as f:
71     og_labels = pickle.load(f)
72     labels = {v:k for k,v in og_labels.items()}
73   cap = cv2.VideoCapture(0)
74   while(True):
75     time+=1
76     if time == 200:
77       break
78     ret, frame = cap.read()
79     gray = cv2.cvtColor(frame, cv2.COLOR_BGR2GRAY)
80     faces = face_cascade.detectMultiScale(gray,scaleFactor=1.5,minNeighbors=5)
81     for(x,y,w,h) in faces:
82       roi_gray = gray[y:y+h,x:x+h]
83       roi_color = frame[y:y+h,x:x+w]
84       id_,conf =recognizer.predict(roi_gray)
85       if conf >= 45 and conf <= 85:
```

```
            font = cv2.FONT_HERSHEY_SIMPLEX
            name = labels[id_]
            color = (255,255,255)
            stroke = 2
            cv2.putText(frame, str(name), (x,y),cv2.FONT_HERSHEY_SIMPLEX, 1, 255)
        img_item = "my-image.png"
        cv2.imwrite(img_item, roi_gray)
        color = (255,0,0)
        stroke = 2
        end_cord_x = x+w
        end_cord_y = y+h
        cv2.rectangle(frame,(x,y),(end_cord_x, end_cord_y),color, stroke )
      cv2.imshow('frame',frame)
      if cv2.waitKey(20) & 0xFF == ord('q'):
        break
  cap.release()
  cv2.destroyAllWindows()
  usernamelst = []
  for (dirpath, dirnames, filenames) in walk('face/images'):
    usernamelst.extend(dirnames)
    print(f)
  if name in usernamelst:
    return render_template("checking.html",value=name)
  elif name == '':
    return "Sorry you are not authorized"
@app.route("/hand/", methods=['POST'])
def Hand_gesture():
  cap = cv2.VideoCapture(0)
  hand_cascade = cv2.CascadeClassifier('newhand.xml')
  while(True):
      ret, frame = cap.read()
      gray = cv2.cvtColor(frame, cv2.COLOR_BGR2GRAY)
      hands = hand_cascade.detectMultiScale(gray, 1.5, 2)
      contour = hands
      contour = np.array(contour)
      #cv2.putText(img=frame, text=Show your Hand', org=(int(100 / 2 - 20), int
          (100 / 2)),fontFace=cv2.FONT_HERSHEY_DUPLEX, fontScale=1,color=(0,
          255, 0))
      for (x, y, w, h) in hands:
          cv2.rectangle(frame, (x, y), (x + w, y + h), (0, 255, 0), 2)
          #pyautogui.moveTo((x+(w//2)),(y+(h//2)),duration=0)
          cv2.line(frame, (x, y), (x + w//2, y + h//2), (0,255,0))
          center = (x+w//2, y+h//2)
          radius = 2
          cv2.circle(frame, center, radius, (255, 0, 255), 2)
          mouse.move(x+w//2, y+h//2)
      cv2.namedWindow("Frame", cv2.WND_PROP_FULLSCREEN)
      cv2.setWindowProperty("Frame",cv2.WND_PROP_FULLSCREEN,cv2.
          WINDOW_FULLSCREEN)

      cv2.imshow('Frame', frame)
      k = cv2.waitKey(30) & 0xff
      if k == 27:
          break


  cap.release()
  cv2.destroyAllWindows()
  return 'You are now logout'

if __name__ == '__main__':
```

```
144   app.run(host='127.0.0.1',debug=True)
```

face.py

```
'use strict';

import  numpy as np
import cv2
import pickle
face_cascade = cv2.CascadeClassifier('haarcascade_frontalface_alt2.xml')
recognizer = cv2.face.LBPHFaceRecognizer_create()
recognizer.read("trainer.yml")

labels = {"person_name":1}

with open("label.pickle","rb") as f:
  og_labels = pickle.load(f)
  labels = {v:k for k,v in og_labels.items()}

cap = cv2.VideoCapture(0)

while(True):
  ret, frame = cap.read()
  gray = cv2.cvtColor(frame, cv2.COLOR_BGR2GRAY)

  faces = face_cascade.detectMultiScale(gray,scaleFactor=1.5,minNeighbors=5)
  for(x,y,w,h) in faces:
    #print(x,y,w,h)
    roi_gray = gray[y:y+h,x:x+h]
    roi_color = frame[y:y+h,x:x+w]

    id_,conf =recognizer.predict(roi_gray)
    if conf >= 45 and conf <= 85:
      print(id_)
      print(labels[id_])
      font = cv2.FONT_HERSHEY_SIMPLEX
      name = labels[id_]
      color = (255,255,255)
      stroke = 2
      cv2.putText(frame,str(name), (x,y),cv2.FONT_HERSHEY_SIMPLEX, 1, 255)

    img_item = "my-image.png"
    cv2.imwrite(img_item,roi_gray)

    color = (255,0,0)
    stroke = 2
    end_cord_x = x+w
    end_cord_y = y+h
    cv2.rectangle(frame,(x,y),(end_cord_x,end_cord_y),color,stroke )

  cv2.imshow('frame',frame)

  if cv2.waitKey(20) & 0xFF == ord('q'):
    break

cap.release()
cv2.destroyAllWindows()
```

frontend.html

```
<!DOCTYPE html>
<html>
  <head>
  <style>
body {
  background-image: url('download.png');
}
h1{
  text-align: center;
  margin-top: 220px;
}
form,p {
  text-align: center;
}
.end {
  margin-top: 200px;
}
button {
  background-color: #4ceb34;
  text-align: center;
  padding: 20px;
  display: inline-block;
  font-size: 16px;
  margin: 4px 2px;
  cursor: pointer;
  border-radius: 4px;
}
</style>
  </head>
  <body>
    <h1 style="text-decoration: underline;">Welcome to GestureCopter</h1>
    <p>First authenticate yourself</p>
    <form action="/forward/" method="post">
    <button name="forwardBtn" type="submit">Start</button>
  </form>
  <b><p class="end" style="text-decoration: underline;">Created by Sanan,Shahid,
      Nadeem</p></b>
  </body>
</html>
```

forward.html

```
<!DOCTYPE html>
<html>
  <head>
  <style>
body {
  background-image: url('download.png');
}
h1{
  text-align: center;
  margin-top: 220px;
}
p{
  text-align: center;
}
form {
  text-align: center;
  display: inline-block;
  margin-left: 270px;
```

```
}
.end {
  margin-top: 200px;
}
button {
  background-color: #4ceb34;
  text-align: center;
  padding: 20px;
  display: inline-block;
  font-size: 16px;
  margin: 4px 2px;
  cursor: pointer;
  border-radius: 4px;
}
</style>
  </head>
  <body>
    <h1 style="text-decoration: underline;">Welcome to GestureCopter</h1>
    <p>Choose authentication Type</p>
    <form action="/custom/" method="post">
    <button name="login" type="submit">Custom</button>
  </form>
  <form action="/face/" method="post">
    <button name="login" type="submit">Face auth</button>
  </form>
  <b><p class="end" style="text-decoration: underline;">Created by Sanan, Shahid,
      Nadeem</p></b>
  </body>
</html>
```

custom.html

```
<!DOCTYPE html>
<html>
  <head>
  <style>
body {
  background-image: url('download.png');
}
h1{
  text-align: center;
  margin-top: 220px;
}
form,p {
  text-align: center;
}
.end {
  margin-top: 200px;
}
button {
  background-color: #4ceb34;
  text-align: center;
  padding: 5px;
  display: inline-block;
  font-size: 16px;
  margin: 4px 2px;
  cursor: pointer;
  border-radius: 4px;
}
</style>
```

```
  </head>
  <body>
<script type="text/javascript">
  function validate(){
    var name=document.myform.user.value;
    var Password=document.myform.pass.value;
    if((name=='Copter')||(Password=='Gesture')){
      return true;
    }
    else{
      alert('Wrong Username and Password');
      return false;
    }
  }
</script>

    <h1 style="text-decoration: underline;">Welcome to GestureCopter</h1>
    <p>Enter Username and password.</p>
    <p>Note: You have to enter your name into your terminal</p>
    <form name="myform" action="/confirm/" method="post" onsubmit="return
        validate();">
    <label>Username:</label>
    <input type="name" name="user" id="uu">
    <label>Password:</label>
    <input type="Password" name="pass" id="pp">
    <button name="login" type="submit">confirm</button>
  </form>
  <b><p class="end" style="text-decoration: underline;">Created by Sanan, Shahid,
      Nadeem</p></b>
  </body>
</html>
```

confirm.html

```
<!DOCTYPE html>
<html>
  <head>
  <style>
body {
  background-image: url('download.png');
}
h1{
  text-align: center;
  margin-top: 220px;
}
form,p,h3 {
  text-align: center;
}
.end {
  margin-top: 200px;
}
button {
  background-color: #4ceb34;
  text-align: center;
  padding: 5px;
  display: inline-block;
  font-size: 16px;
  margin: 4px 2px;
  cursor: pointer;
  border-radius: 4px;
```

```
}
</style>
  </head>
  <body>
    <h1>Welcome to GestureCopter</h1>

    <form action="/capture/">
    <label>Enter Your name::</label><input type="name" name="username">
     </form>
  <p class="end">Created by Sanan,Shahid,Nadeem</p>
  </body>
</html>
```

checking.html

```
<!DOCTYPE html>
<html>
  <head>
  <style>
body {
  background-image: url('download.png');
}
h1{
  text-align: center;
  margin-top: 220px;
}
p{
  text-align: center;
}
form {
  text-align: center;
  display: inline-block;
  margin-left: 450px;
}
.end {
  margin-top: 200px;
}
button {
  background-color: #4ceb34;
  text-align: center;
  padding: 20px;
  display: inline-block;
  font-size: 16px;
  margin: 4px 2px;
  cursor: pointer;
  border-radius: 4px;
}
</style>
  </head>
  <body>
    <h1 style="text-decoration: underline;">Welcome to GestureCopter</h1>
    <p>Welcome {{value}}</p>
  <form action="/hand/" method="post">
    <button name="login" type="submit">Hand</button>
  </form>
  <b><p class="end" style="text-decoration: underline;">Created by Sanan,Shahid,
      Nadeem</p></b>
  </body>
</html>
```

result.html

```
<head>
<title> Text Recognition</title>
<style>
h1{
   color:black;
   text-align: center;
   font-size: 40px;
}
div{
   border:1px solid black;
   border-width: 2px;
   padding: 20px;
   width: 700px;
   text-align: center;
   margin-left: 550px;
   margin-right: 500px;
   margin-top:200px;
   font-size: 30px;
}
</style>
</head>

<body>

<div class="results">
  <h1>Recognized Text</h1>
  <h4>{{text}}</h4>


</div>
</body>
</html>
```

6.2 Module 2

This module is implemented using Python programming language and Flask framework.Following are the python packages used : Flask, pandas, numpy, base64, PIL, io, pytesseract, gtts, speech_recognition, pyttsx3, opencv, LBPH.

This module takes an input image from camera using java script getuserMedia api.The input image is in the form of base64 using base64 library of python it is decoded and saved in the png format.That saved image further goes for face detection and recognition using LBPH face recognizer and the recognize text is converted into speech using google text to speech library of python.

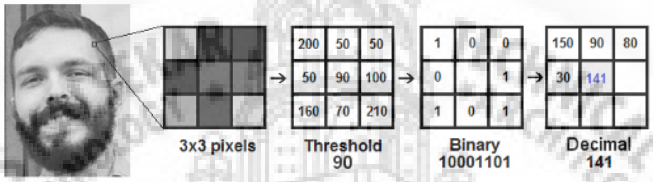


Figure 6.1: Face Recognition

collect-face.py

```
import cv2
import numpy as np
import os

if not os.path.exists("face/images/user-name"):
        os.makedirs("face/images/user-name")
    directory = 'face/images'
    x=0
    cap = cv2.VideoCapture(0)
    while True:
        ret, frame = cap.read()
        cv2.imshow("frame1",frame)
        count = {'photo': len(os.listdir(directory+"/user1")),}
        cv2.putText(frame, "IMAGE COUNT", (10, 100), cv2.FONT_HERSHEY_PLAIN, 1,
            (0,255,255), 1)
        cv2.putText(frame, "Images : "+str(count['photo']), (10, 120), cv2.
            FONT_HERSHEY_PLAIN, 1, (0,255,255), 1)
        cv2.namedWindow("Frame", cv2.WND_PROP_FULLSCREEN)
        cv2.setWindowProperty("Frame",cv2.WND_PROP_FULLSCREEN,cv2.
            WINDOW_FULLSCREEN)
        cv2.imshow("Frame", frame)
        if int(count['photo']) == 25:
            break
        interrupt = cv2.waitKey(3)
        if interrupt & 0xFF == ord('s'):
            cv2.imwrite(directory+'/user1/'+str(x)+'.jpg', frame)
            x+=1
        if interrupt & 0xFF == 27:
            break
    cap.release()
    cv2.destroyAllWindows()
```

face-train.py

```
import cv2

import os
import numpy as np
from PIL import Image
import pickle

base_dir = os.path.dirname(os.path.abspath(__file__))
image_dir = os.path.join(base_dir,"face/images")

face_cascade = cv2.CascadeClassifier('haarcascade_frontalface_alt2.xml')

recognizer = cv2.face.LBPHFaceRecognizer_create()


current_ids = 0
labels_ids = {}
y_labels = []
x_train = []


for root , dirs , files in os.walk(image_dir):
  for file in files:
    if file.endswith("png") or file.endswith("jpg"):
      path = os.path.join(root,file)
      label = os.path.basename(os.path.dirname(path)).replace(" ","_").lower()
      #print(label, path)
      if label in labels_ids:
        pass
      else:
        labels_ids[label]=current_ids
        current_ids += 1
      id_ = labels_ids[label]
      #print(labels_ids)

      #y_labels.append(label)
      #x_train.append(path)
      pil_image = Image.open(path).convert("L")
      size =(550,550)
      final_image = pil_image.resize(size,Image.ANTIALIAS)
      image_array = np.array(final_image,"uint8")
      #print(image_array)
      faces = face_cascade.detectMultiScale(image_array,scaleFactor=1.5,
          minNeighbors=5)

      for (x,y,w,h) in faces:
        roi = image_array[y:y+h,x:x+w]
        x_train.append(roi)
        y_labels.append(id_)


print(y_labels)
#print(x_train)
with open("label.pickle","wb") as f:
  pickle.dump(labels_ids,f)


recognizer.train(x_train,np.array(y_labels))
recognizer.save("trainer.yml")
```

face.py

```
import  numpy as np
import cv2
import pickle
face_cascade = cv2.CascadeClassifier('haarcascade_frontalface_alt2.xml')
recognizer = cv2.face.LBPHFaceRecognizer_create()
recognizer.read("trainer.yml")

labels = {"person_name":1}

with open("label.pickle","rb") as f:
  og_labels = pickle.load(f)
  labels = {v:k for k,v in og_labels.items()}

cap = cv2.VideoCapture(0)

while(True):
  ret, frame = cap.read()
  gray = cv2.cvtColor(frame, cv2.COLOR_BGR2GRAY)

  faces = face_cascade.detectMultiScale(gray, scaleFactor=1.5, minNeighbors=5)
  for(x,y,w,h) in faces:
    #print(x,y,w,h)
    roi_gray = gray[y:y+h,x:x+h]
    roi_color = frame[y:y+h,x:x+w]

    id_,conf =recognizer.predict(roi_gray)
    if conf >= 45 and conf <= 85:
      print(id_)
      print(labels[id_])
      font = cv2.FONT_HERSHEY_SIMPLEX
      name = labels[id_]
      color = (255,255,255)
      stroke = 2
      cv2.putText(frame, str(name), (x,y),cv2.FONT_HERSHEY_SIMPLEX, 1, 255)

    img_item = "my-image.png"
    cv2.imwrite(img_item, roi_gray)

    color = (255,0,0)
    stroke = 2
    end_cord_x = x+w
    end_cord_y = y+h
    cv2.rectangle(frame,(x,y),(end_cord_x,end_cord_y),color,stroke )

  cv2.imshow('frame',frame)

  if cv2.waitKey(20) & 0xFF == ord('q'):
    break

cap.release()
cv2.destroyAllWindows()
```

Chapter 7

System Testing

System testing is a level of software testing where a complete and integrated software is tested. The purpose of this test is to evaluate the system's compliance with the specified requirements.

7.1 Test Cases and Test Results

Test ID	Test Case Title	Test Condition	System Behavior	Expected Result
T01	Face Authentication	Detect Face	Face Recognized Successfully	Face Output of the recognized Face
T02	Recognize Hand Gesture	Input Hand Gesture	Hand gesture are recognized	single face should recognize
T03	Save video	capture video	Capture through camera	Store in the device.
T04	Movement of drone	Input Hand gesture	Move in X-Y direction	Movement of drone

7.2 Test Cases

Title: Face Authentication
Description: A System should be able to successfully authenticate user.

Precondition: The user camera must detect the face. *Assumption:* web camera or android mobile is being used.

Test Steps:

1. Open an application
2. Provide instruction to an web-app to open camera.
3. Provide instruction to detect face.
4. Recognize face.
5. Show the pop up user is authentic or not.

Expected Result: A application that detect the face.
Actual Result: Face Authentication successfully.

Title: Recognize hand gesture
Description: The drone should be move base on hand gesture.

Precondition: the user must show the hand gesture.
Assumption: a supported camera is being used.

Test Steps:

1. Open an application
2. If the user is authentic then user can move the drone.
3. Camera will detect the hand gesture.
4. Base on the hand gesture the drone will move in X-Y direction.

Expected Result: Movement of the drone base on the hand gesture.
Actual Result: Movement of the drone.

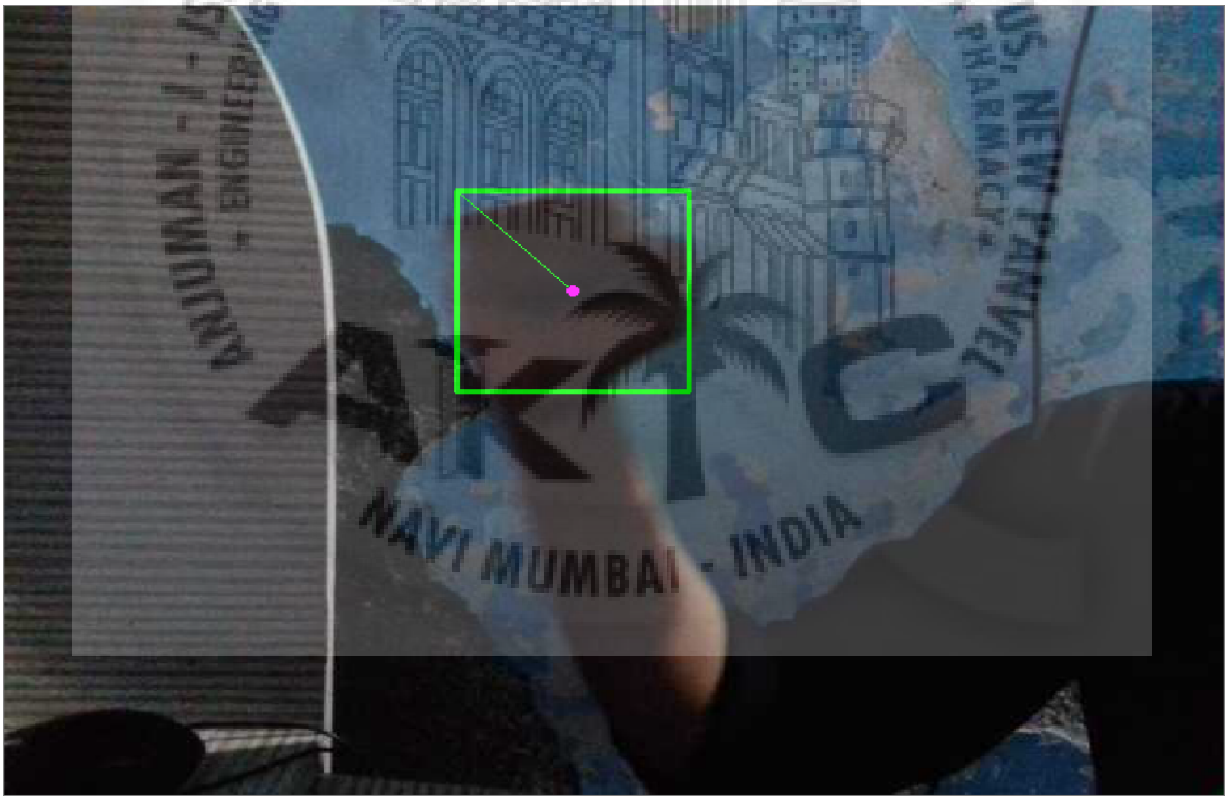
7.2.1 Software Quality Attributes

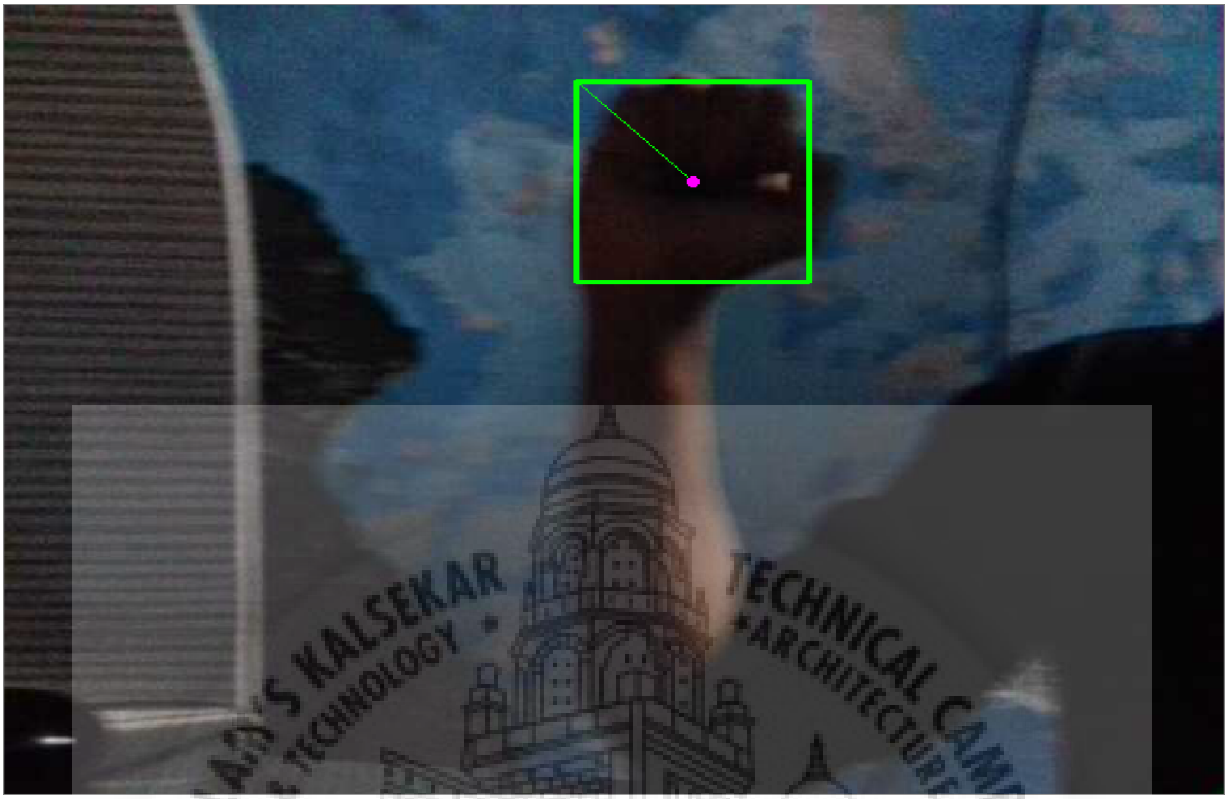
Availability-1 : The system shall be available to users all the time.
Availability-2 : The system shall always have something to function and always pop up error messages in case of component failure.
Efficiency-1 : The drone should be move on the basis of hand gesture.
Efficiency-2 : The system shall provide the right tools to support all its features.

Chapter 8

Screenshots of Project

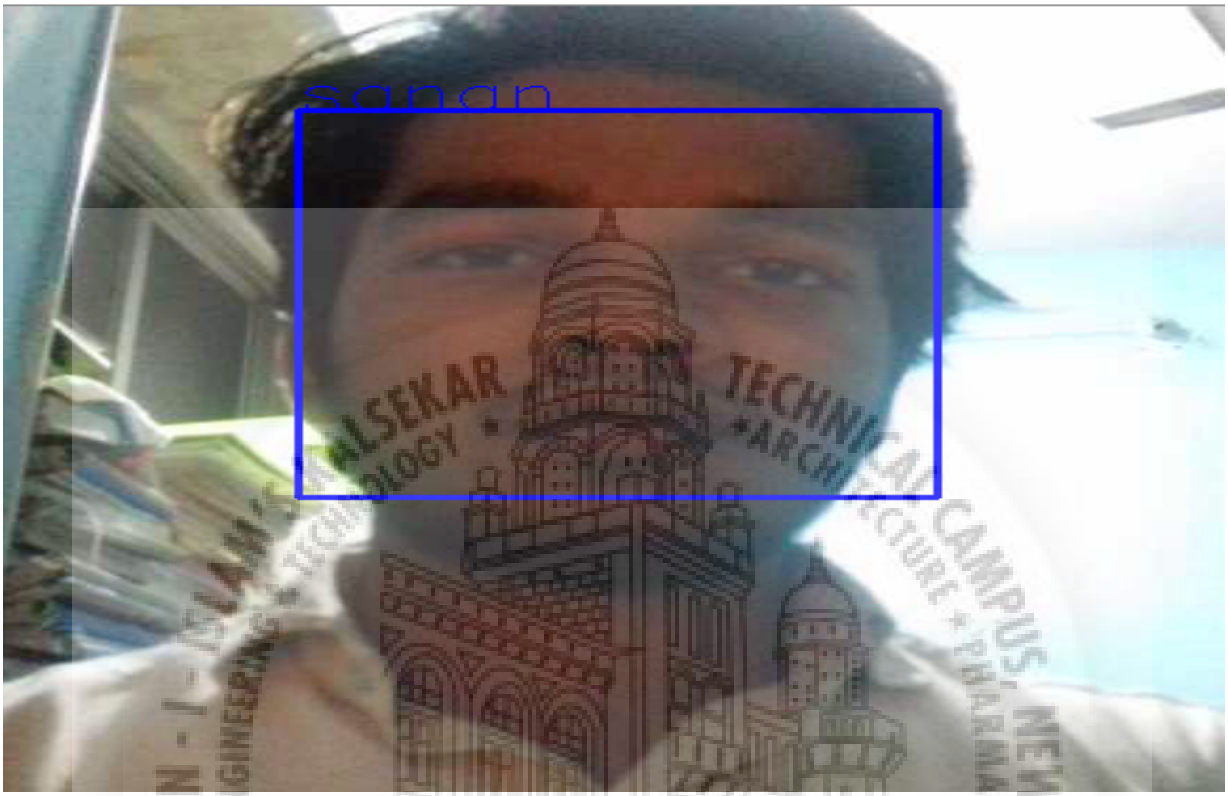
8.1 Hand Gesture





8.2 Drone

8.3 Face Recognition



Chapter 9

Conclusion and Future Scope

9.1 Conclusion

This proposed system is remote less drone which move base on the hand gesture command after the face recognition authentication. This proposed system designed in a way which reduced the cost economically . The accuracy of face recognition is 87 percentage till now and the accuracy of hand gesture recognition is 80 percentage till now. Development process of the face recognition for the authentication and hand gesture recognition is in progress. Our aim is to achieve more accuracy so that user can get good experience by providing interaction between system and user.

9.2 Future Scope

- The proposed system can be improved by addition of various components like location tracking which will send the current location of the drone. By adding the dongle in the proposed system will increase the range. Wire frame will be use to provide the more stability to the drone.

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Achievements

1. Paper Publication

   (a) *Gesture Copter*; Ansari mohammed Sanan, Husain Nadeem, Shahid khot, "ICONIC RESEARCH AND ENGINEERING JOURNALS 2020" , 9th March 2020

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