A PROJECT REPORT

ON

"EMOMUSIC-AN EMOTION BASED MUSIC PLAYER"

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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DEPARTMENT OF COMPUTER ENGINEERING
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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

"EmoMusic-An Emotion Based Music Player"

submitted by

RAWAL HASIB IBRAHIM	**16CO45**
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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: / /

PROF. ABDUL SALAM SHAIKH	**PROF. KALPANA BODKE**
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RAWAL HASIB IBRAHIM
MOHD ZEESHAN MOHD ABBAS
KHAN ZEESHAN KADEER

Project I Approval for Bachelor of Engineering

This project entitled ***ËmoMusic-An Emotion Based Music Player¨*** by ***RAWAL HASIB IBRAHIM*** 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

When we talk about the human emotion the human face act as a very important in terms of finding an individual's mood or emotion. There are various emotions such as happy, sad, angry, etc which can be identified with help of facial expressions. till now if the user wants to make the playlist they have to go through the list of the music then select the songs based on their emotions but it takes consumes more time and it becomes a very tedious and upheld task for the user. Previously many algorithms have been proposed for generating the songs automatically. but the conventional algorithms which are in use are required various external hardware or sensors like electroencephalogram for capturing and identifying the human emotion via human brain it makes the complete process very slow and less accurate. existing systems are not user-friendly they have the complex architecture however This proposed system based on extracted facial expression is user-friendly any user can use it anywhere any time. also proposed system eliminate the task of manually creating the playlists of songs based on the emotions it automatically generates the different playlist

It saves much more time and efforts of users who are music lover. Thus the proposed system (Emo-music) aims to minimize the computational time as compared to existing algorithms for getting the results it also reduces the overall cost of the designed system, thereby given features will automatically increase the overall accuracy of the proposed system. The proposed system (Emo-music) tested on both utilize-dependent and utilize-independent datasets. Visages are captured utilizing an inbuilt camera. The precision or Accuracy of the emotion detection algorithm utilized in the system is around 80-95%. Thus, it yields better precision compared to the algorithms utilized in the literature survey.

Keywords: Android,Human Face, Emotional Features, PlayList ,User Independent Dataset,User Dependent Dataset, Emotion detection, Inbuilt Camera,Emotion Recognition , Face Recognition,Songsextraction,web scrapping,youtube-dl.

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Chapter 1

Introduction

The initiation of Music Information Retrieval and Audio Emotion Apperception in traditional music players is utilized to engender the playlist of musical compositions predicated on users' moods or expressions. Facial expressions of everyone play a very consequential role in terms of defining their mood or feelings.

Project Emo-Music player (an emotion predicated music player) is a novel approach that avails the utilize(user) to automatically play different songs that suit his mood. Proposed system will first capture an image of the user using inbuilt camera then it detects the emotion of the user using CNN algorithm then the output of this algorithm will be given as input to the songs extraction module then it extracts the songs and generates the playlists automatically based on the detected emotion, however proposed system will preserve the overall time and efforts.

1.1 Purpose

The main concept of this project is to automatically play songs based on the emotions of the user.It aims to provide user-preferred music with emotion awareness. In existing system user want to manually select the songs, randomly played songs may not match to the mood of the user, user has to classify the songs into various emotions and then for playing the songs user has to manually select a particular emotion. These difficulties can be avoided by using Emo-Music (Emotion based music player). The emotions are recognized using a machine learning method. according to the emotion, the music will be played online.

1.2 Project Scope

Emotion Based Music player is a useful application for music listeners with a smart phone and an Internet connection. The application is accessible by anyone user doesn't require to creates a profile on the system. The application is designed to meet the following needs of the users as described below

a. user has to open the website

b. Capturing emotion using camera or upload an image from database

c. get the the immediate playlist online based on their mood

d. user can listen the songs online it doesn't require external storage.

e. Personalized play-list

f. Recommendations

g. User have different option of play/pause/next for playing the songs.

1.3 Project Goals and Objectives

1.3.1 Goals

a. Provide a solution for music listeners to listen music based on their emotion which can be recognized from thier Mobile or Desktop Camera.

b. Allowing people to use the system to identify their moods.reduce the upheld task of user of manually segregating the songs and generate playlists

c. It can also be used as music thearapy.

d. It can be used to identifying the mood of disabled persons who cant express their feelings they can use it and listen songs based on their emotions.

e. Target Large Audience and provide Benefits to them.

1.3.2 Objectives

a. The objective of this project is to show how machine learning can help to recognized emotion.

b. To study Applications of Machine Learning.

c. To understand the process of Emotion recognition and Song Extraction.

d. To learn and apply operations and techniques on image like image processing,image detection and recognition.

e. To learn how the facial expression can be use to identfy the different moods.

Figure 1.1: Different Emotions

1.4 Organization of Report

The report is organized as follows : The introduction is given in Chapter 1.It describes the fundamental terms used in this project.It describes the Goal,Objectives and scope of this project. The 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.

The project planning includes members and capabilities of this project ,roles and responsibilities of each member,Budget of Project and Project timeline is describe in Chapter 3. The Chapter 4 describes Functional and Nonfunctional Requirements of project.Along with this it also explain features of system and constraints of system.

The Chapter 5 includes Design Information with Class Diagram, Sequence Diagram , Component Diagram and System Architecture. Implementation of each module is explained in Chapter 6. Chapter 7 shows final Test Cases and Test Results. Chapter 8 includes Screenshot of outputs and Conclusion and Future Scope of Project is described in Chapter 9.

Chapter 2

Literature Survey

2.1 Smart Music Player Integrating Facial Emotion Recognition and Music Recommendation

Songs, as a medium of expression, have always been a popular choice to depict and understand human emotions. Reliable emotion based classification systems can go a long way in helping us parse their meaning. However, research in the field of emotion-based music classification has not yielded optimal results. In this paper, we present an affective cross-platform music player, EMP, which recommends music based on the real-time mood of the user [1].

2.1.1 Advantages of Paper

a. It recognized the four moods successfully

b. It also recommend songs

2.1.2 Disadvantages of Paper

a. It Can Only recommend Songs for Happy and Calm Emotion.

b. it doesnt recognized all seven moods

2.1.3 How to overcome the problems mentioned in Paper

a. It can Classify all seven types of emotion.

b. Songs Can be recommended to all seven types of emotion.

2.2 Facial Expression Based Music Player

Conventional method of playing music depending upon the mood of a person requires human interaction. Migrating to the computer vision technology will enable automation of such system. To achieve this goal, an algorithm is used to classify

the human expressions and play a music track as according to the present emotion detected. It reduces the effort and time required in manually searching a song from the list based on the present state of mind of a person. The expressions of a person are detected by extracting the facial features using the PCA algorithm and Euclidean Distance classifier. An inbuilt camera is used to capture the facial expressions of a person which reduces the designing cost of the system as compared to other methods[2]

2.2.1 Advantages of Paper

a. all emotions are recognized

2.2.2 Disadvantages of Paper

a. playlist is made manually

b. all time user get the same playlist

c. it consume more space its a complex system

2.2.3 How to overcome the problems mentioned in Paper

a. playlist generate automatically

b. it doesnt require any external storage

c. more efficient easy to use

2.3 NAIVE BAYES Classifiers For Emotion Classification Based on Lyrics

There is a constantly growing interest in evaluating music information retrieval (MIR) systems that can provide effective management of the music resources. The crucial characteristic of music is its emotion, which reflect the human's perception. To do the automatic classification of Chinese music emotions more effective, we use the lyrics of music to analysis and classify music based on emotion. There are many algorithms to achieve text classification, and one of the most popular algorithms is Naive Bayes algorithm. Although it is simple, it can classify text effectively. In this paper, we crawl the music lyrics and their labels from a popular website named Baidu music and make our four different datasets. We also train four classifiers with different datasets and report their performance. We evaluate the classifiers trained by four different datasets, and the final accuracy we get is approximately 68 percent[3].

2.3.1 Advantages of Paper

a. all songs are classified according to mood

2.3.2 Disadvantages of Paper

a. It takes more time for emotion classification of the song.

b. The scope of the project is limited to song classification only.

c. No emotion recognition is provided.

2.3.3 How to overcome the problems mentioned in Paper

a. It can classify on the basis of genre.

b. It takes less time to generate playlist.

c. Emotion recognition is provided.

2.4 Technical Review

CNN stands for Convolutional Neural Network or ConvNet. The name Convolutional Neural Network indicates that the network employs a mathematical operation called Convolution. Convolution is a specialized kind of linear operation. Convolutional networks are simply neural networks that use convolution in place of general matrix multiplication in at least one of their layer.It is a is a class of Deep Neural Network, most commonly applied to analyzing visual imagery. They are also known as shift or Invariant Artificial Neural Networks (SIANN), based on their shared-weights architecture and Translation Invariance characteristics.

2.4.1 Advantages of Technology

a. CNN Technolog is used to recognize any kind of image and video just like an Human Visual System can do.

b. A CNN with 1-D convolutions was used on time series in the frequency domain (spectral residual) by an unsupervised model to detect anomalies in the time domain.

c. CNNs can be naturally tailored to analyze a sufficiently large collection of time and data representing one-week-long human physical activity streams augmented by the rich clinical data.

d. CNNs have been used in Computer Go for correctly predicted the professional move in 55%of positions, equalling the accuracy of a 6 dan human player.

2.4.2 Reasons to use this Technology

a. convolution can be thought as “looking at a function’s surroundings to make better/accurate predictions of its outcome.

b. CNNs are also being used in astrophysics to interpret radio telescope data to predict the likely visual image to represent the data.

c. CNN provides better and faster results in terms of emotion recoginition with minimum

Chapter 3

Project Planning

3.1 Members and Capabilities

Table 3.1: Table of Capabilities

SR. No	Name of Member	Capabilities
1	MOHD ZEESHAN MOHD ABBAS	Machine Learning, Backend Developer
2	RAWAL HASIB IBRAHIM	Frontend Developer,Python,UI
3	KHAN ZEESHAN KADEER	UI Design

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	Mohd zeeshan Mohd Abbas	Team Leader	emotion recognition module,integration
2	Rawal Hasib Ibrahim	frontend	Frontend development,song extraction module
3	Khan Zeeshan Kadeer	designing	ui designing

3.3 Assumptions and Constraints

a. People who are using this web-app should have web-cam.

b. User of this web-app should have internet connection.

c. User of this web-app can capture or upload their picture.

d. The time taken to recognize user emotion is between 3 to 4 secs and for playlist genration it takes 10-30 sec depends on the internet speed.

e. 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.

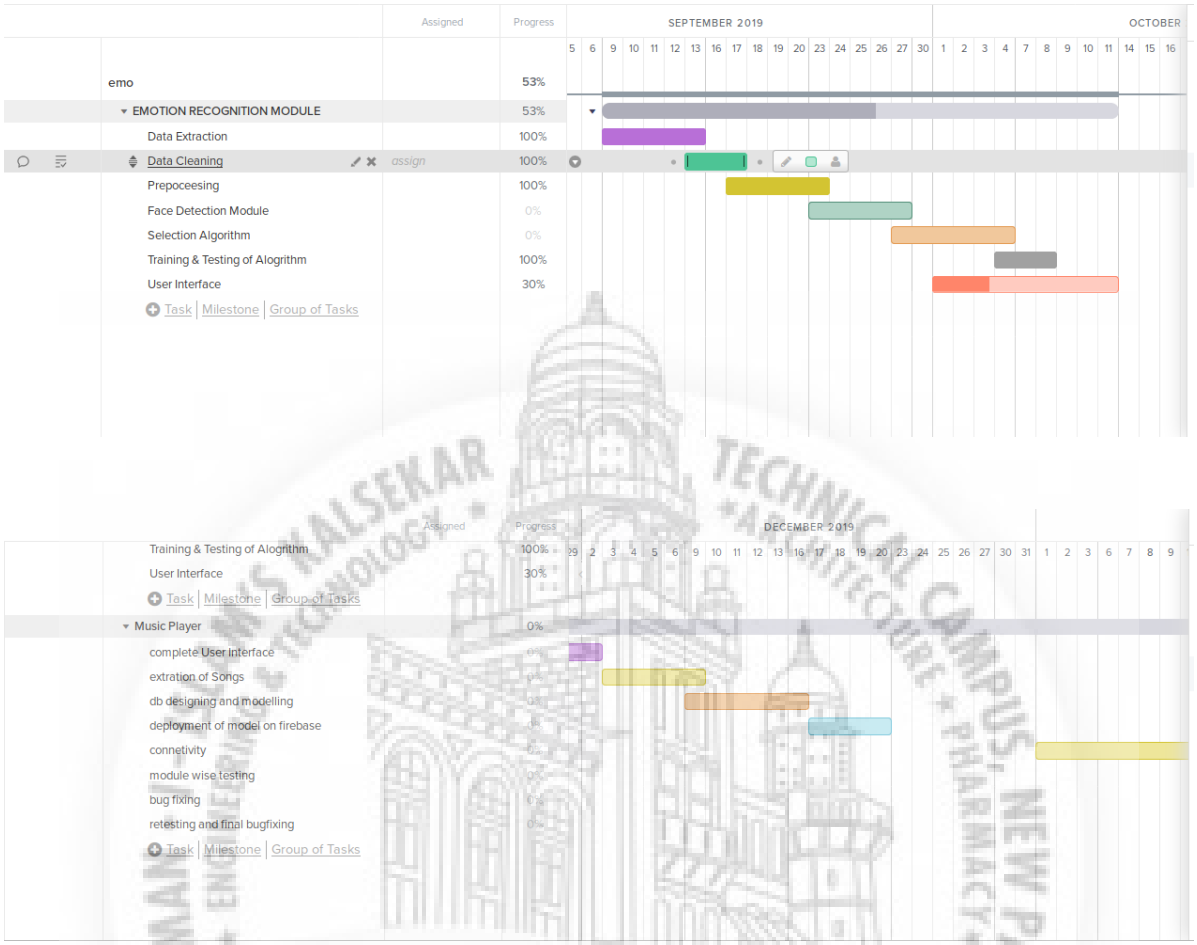
f. Keeping tracks of the progress towards project.

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 web-app based system implementing client-server model.This web-app provide a service to the people. This system is an independent from any other third party system. The main outcome is a playlist based on emotion .In emotion recognition, emotions are labelled on the captured picture of user.based on that recognized emotion tag playlist will be generated.any one can use this web-app for fun purpose or if someone who loves to listen music there is no need of signing in or registration before using the website.

4.1.2 Product Features

There are three major features in this system. face detection will detect the faceeither by capturing the image using cam or upload it from dataset. Emotion Recognition recognized the emotion from the seven emotions. the song extraction featurewill generate the playlist dynamically based on the recognized emotion

4.1.3 User Classes and Characteristics

This is project is a social project.The Users of this system are can be of any one one of any age.

4.1.4 Operating Environment

This system can operate on any environment.
Hardware specifications:

a. processor pentium 4 or above.

b. Ram:2GB or Above

c. Hard-disk:5GB 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

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.no one can use the playlist module directly.

4.2 System Features

There are three major features in this system. face detection will detect the face either by capturing the image using cam or upload it from dataset. Emotion Recognition recognized the emotion from the seven emotions. the song extraction feature will generate the playlist dynamically based on the recognized emotion.

4.2.1 Face detection and Emotion recognition Feature

face detection and emotion recognition will detect face that are present on any background and detect and recognized emotion.

Description and Priority

This is one of the main feature of the system .This helps in extraction of face from the background. It firstly, detect the face from background.then it detect the emotion and recognized it.

Stimulus/Response Sequences

Stimulus:User clicks the image .
Response:Image is clicked and saved.
Stimulus:Clicks on submit button.
Response:A window appear with detected face with emotion tag..
Stimulus:cicks on the confirm button. response:play list will be generate.

Functional Requirements

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

4.2.2 Song extraction and playlist generation Feature

song extraction and playlist generation.

Description and Priority

This is one of the main feature of the system .This helps to generate playlist based on the user confirm emotion tag .

Stimulus/Response Sequences

Stimulus:User clicks the confirm emotion button.
Response:playlist page will open which contain the extracted songs based on the emotion tag.
Stimulus:Clicks on play button.
Response:song will be played.
Stimulus:clicks on stop button.
Response:song will be stopped.
Stimulus:clicks on next song.
Response: next song will be played.

Functional Requirements

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

4.3 External Interface Requirements

4.3.1 User Interfaces

It is very light web-app, so the GUI is very simple.Home pages provides one single button to provide service to the users. button is of capturing the image then after emotion recognition is done then another button will appear in next page for approving the mood once user confirmed it the playlist will appear in next window. Those windows consist of field taking image as an input and performing task on that and giving result.

4.3.2 Hardware Interfaces

This web-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 audio 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. ml model is used to recognize emotion And also use it to match while performing the task.

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 image it take same time for other operations.for emotion recognition it require 3-5 seconds to convert.and for playlist generation it takes 5-15 sec.

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

captured Images 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. Capture Image - Application should be able to capture image as per user instruction.

b. Upload Image - Application should be able to upload image as per user instruction.

c. Emotion Recognition - Application must be able to recognize Emotion in an captured Image.

d. Emotion Confirmation - application must confirmed the recognized emotion of captured image by user.

e. Extract playlist - Application must extract the playlist from web dynamically based on the recognized emotion.

f. Playlist control - Application must provide the basic features to user to pause/-play/next song etc.

Use-case Diagram

A use case diagram at its simplest is a representation of a user's interaction with the system 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 Get Photo,Approved mood,Playlist, Input,turn off/on etc.

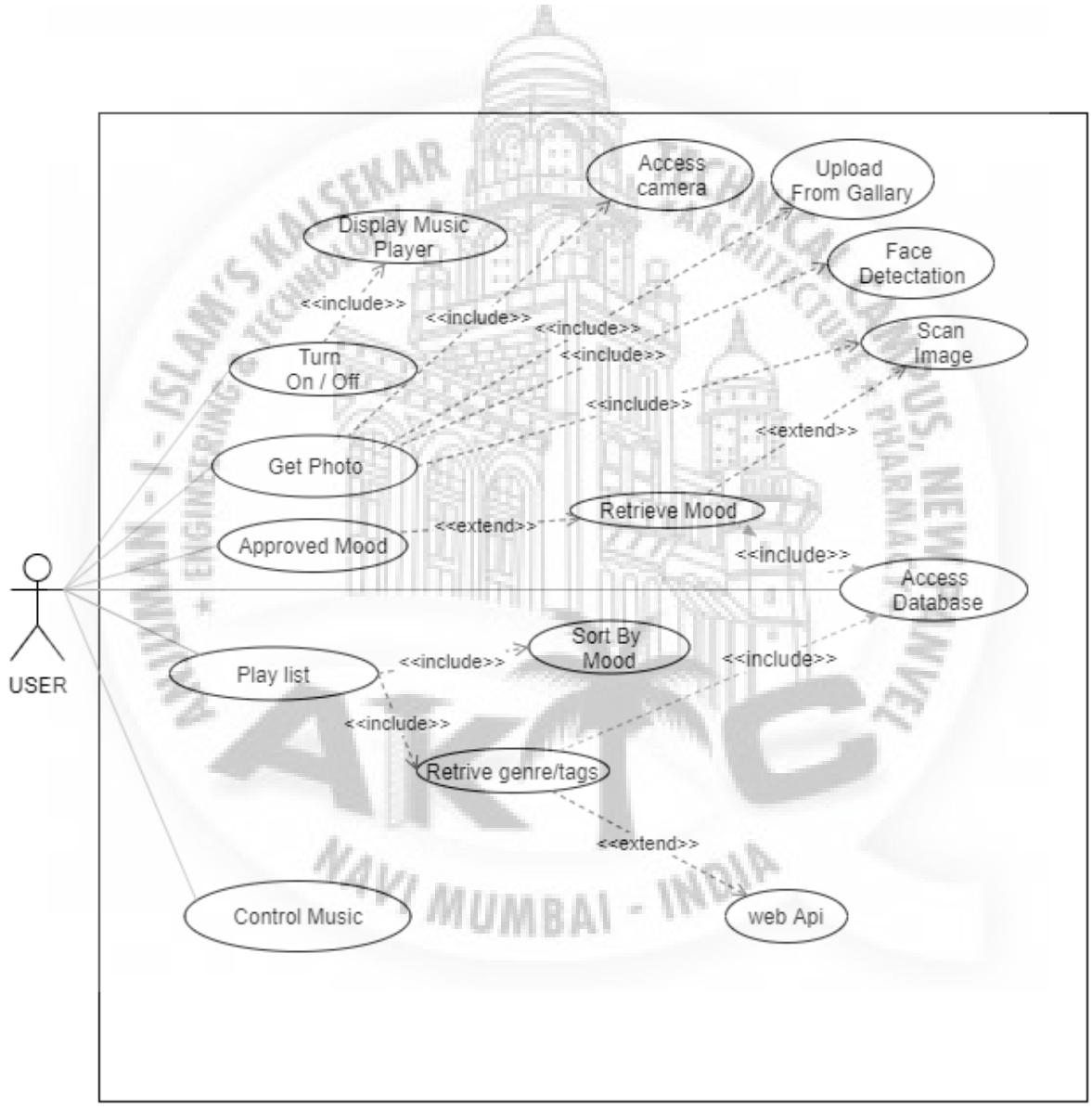


Figure 5.1: Use Case Diagram

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.

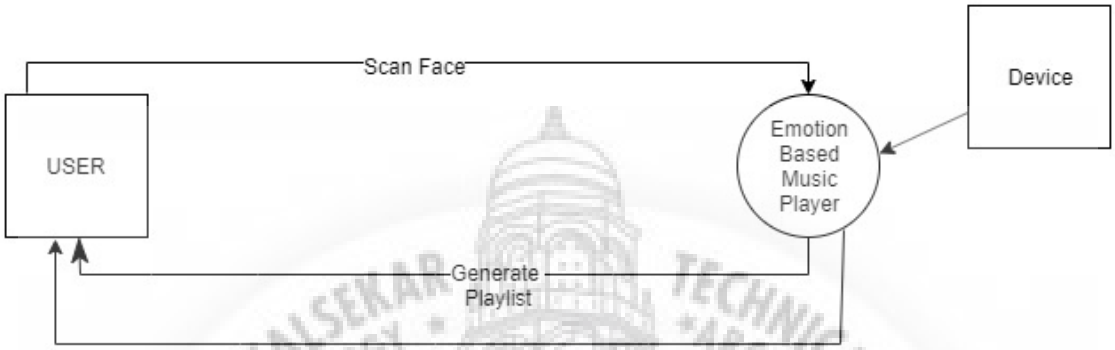


Figure 5.2: DFD level 0

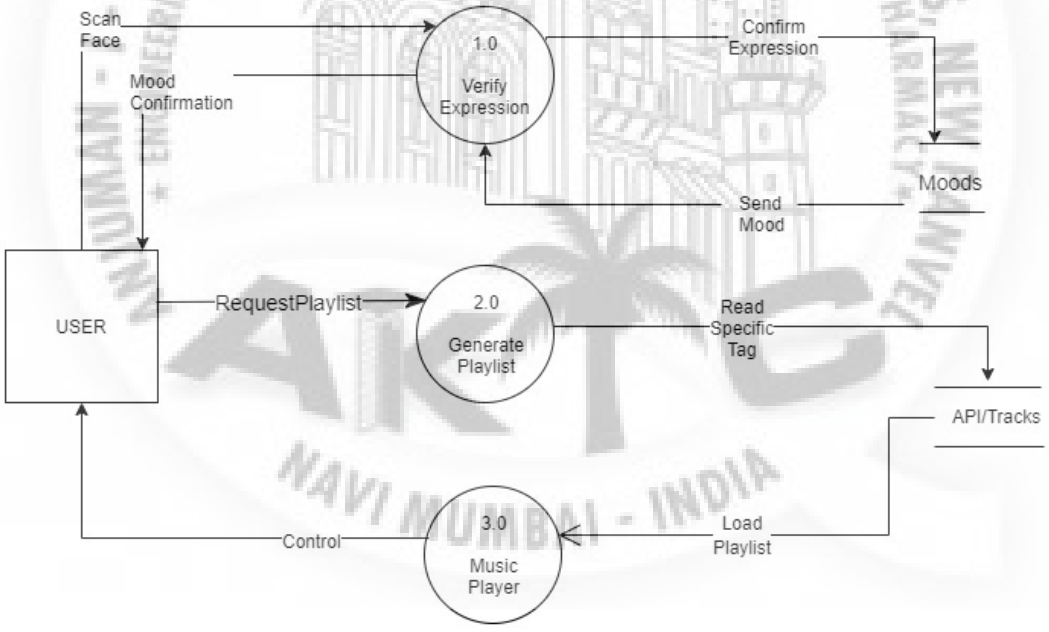


Figure 5.3: DFD level 1

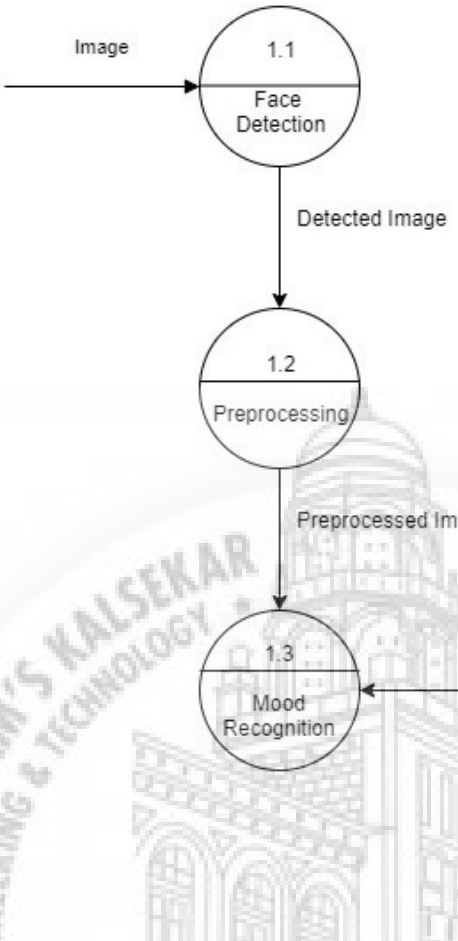


Figure 5.4: DFD level 2 for Verify Expression

Figure 5.5: DFD level 2 for Generating Playlist

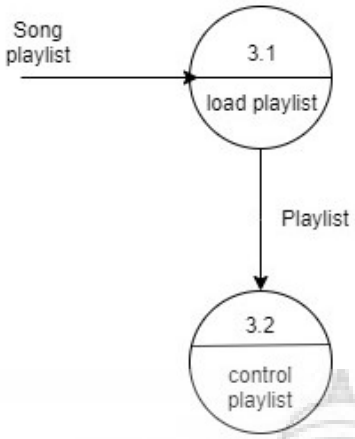


Figure 5.6: DFD level 2 for Music Player

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 audio is of relatively small in size.Also the images are well compressed.

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.

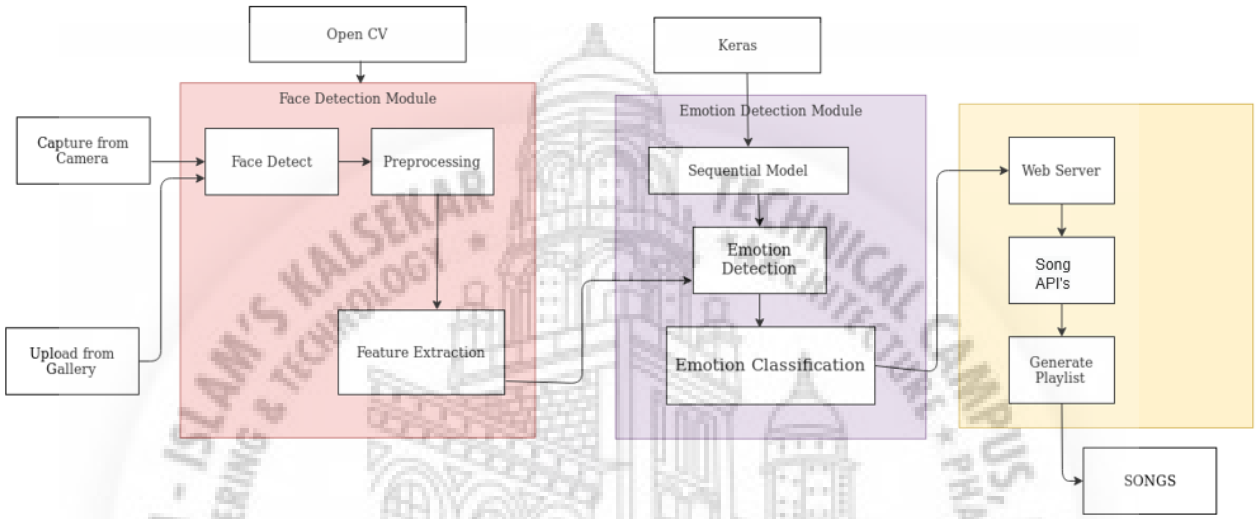


Figure 5.7: System Architecture

5.3 Sub-system Development

This system consist of Three modules Face Detection,Emotion recognition and Song extraction.The input to the Face detection module is an image from camera or user can upload it from gallary output will be given to emotion recoginition module then based on the recognized emotion or the output emotion tag songs will be exracted by song extraction module and generate playlist for the user.

5.3.1 Face Detection

Face detection is a computer vision technology that helps to locate/visualize human faces in digital images. This technique is a specific use case of object detection technology that deals with detecting instances of semantic objects of a certain class (such as humans, buildings or cars) in digital images and videos. Face detection is performed by using Haar classifiers and OpenCV.

Face Detection moduler Diagram

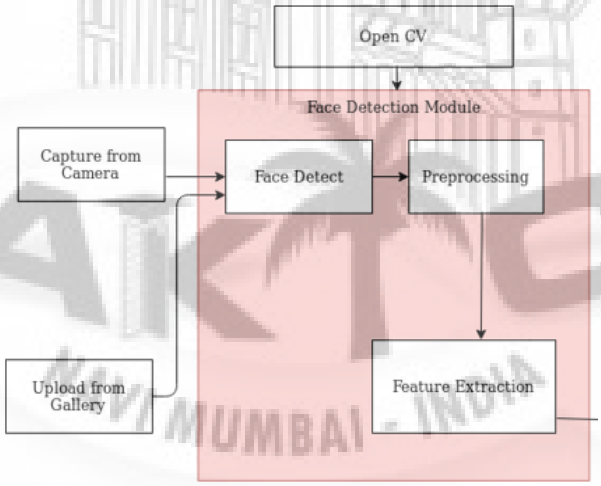


Figure 5.8: Face Detection Module

5.3.2 Emotion Recognition

Emotion recognition is the process of identifying human emotion, most typically from facial expressions as well as from verbal expressions. For Emotion recognition we'll use convolutional neural network .A convolutional neural network (CNN) is a type of artificial neural network used in image recognition and processing that is specifically designed to process pixel data. ... CNN have their "neurons" arranged more like those of the frontal lobe, the area responsible for processing visual stimuli in humans and other animals.

Emotion recognition flow Diagram

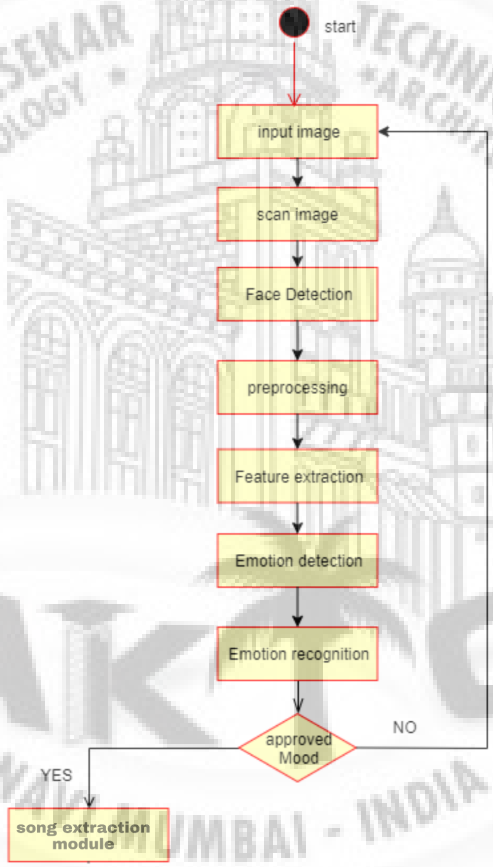


Figure 5.9: flow chart diagram for emotion recognition

5.3.3 Song Extraction

Given module take input as extraction emotion tag and based on that it extract the songs from the youtube using youtubedl free library provided by python and generate playlist for user also provide normal music player operations to user.

Song Extraction Flow Diagram

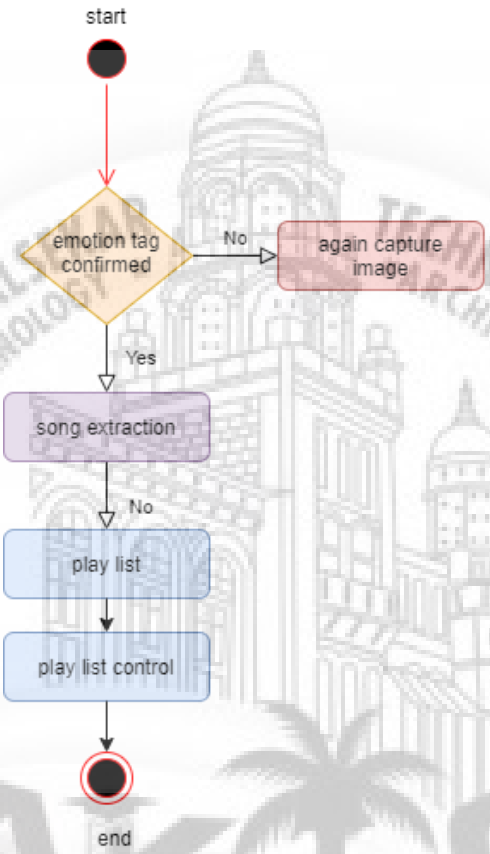


Figure 5.10: flow chart diagram for emotion recognition

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 five different Classes Songs,User,pictures,Music Player control and Device..

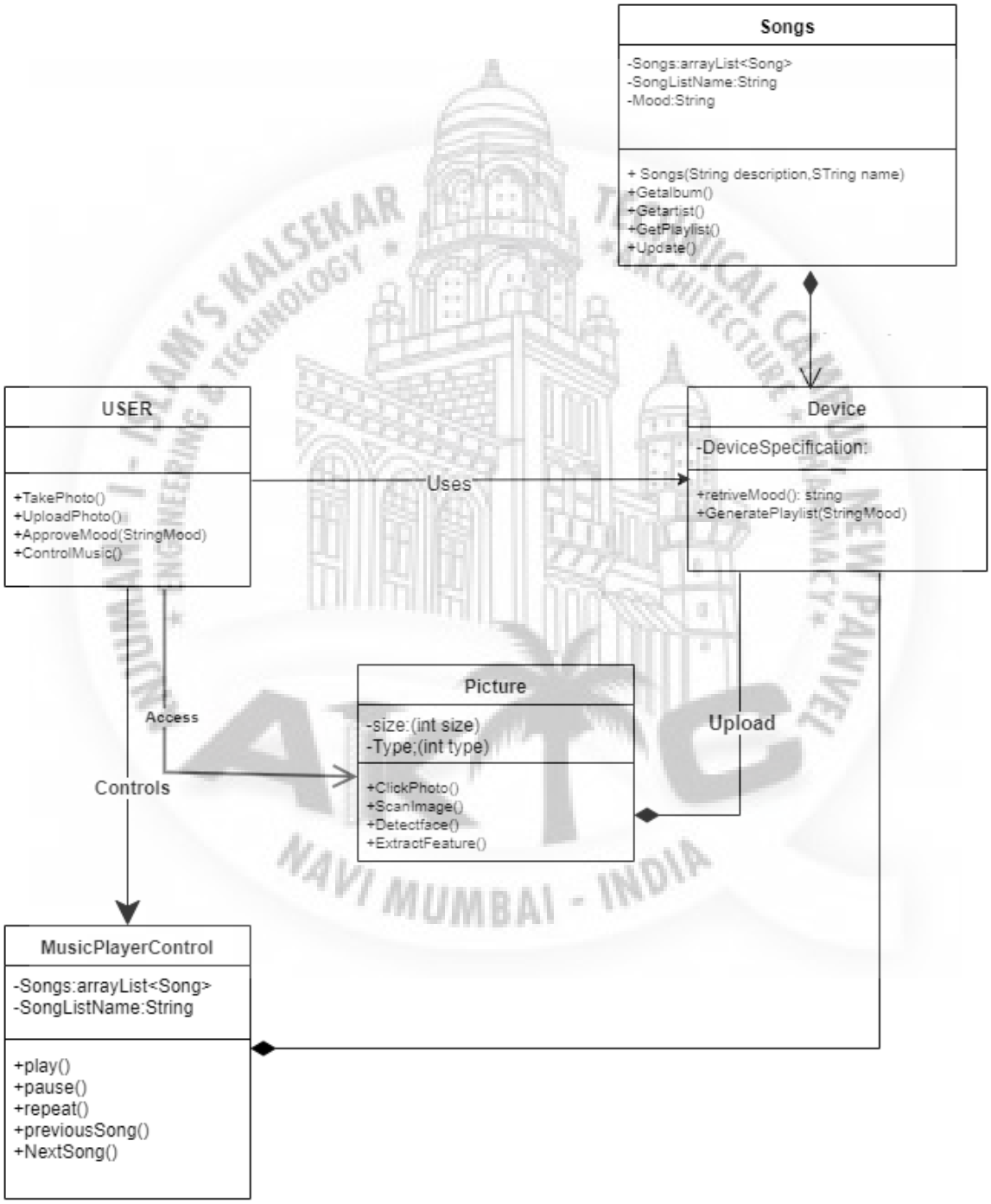


Figure 5.11: Class Diagram

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.

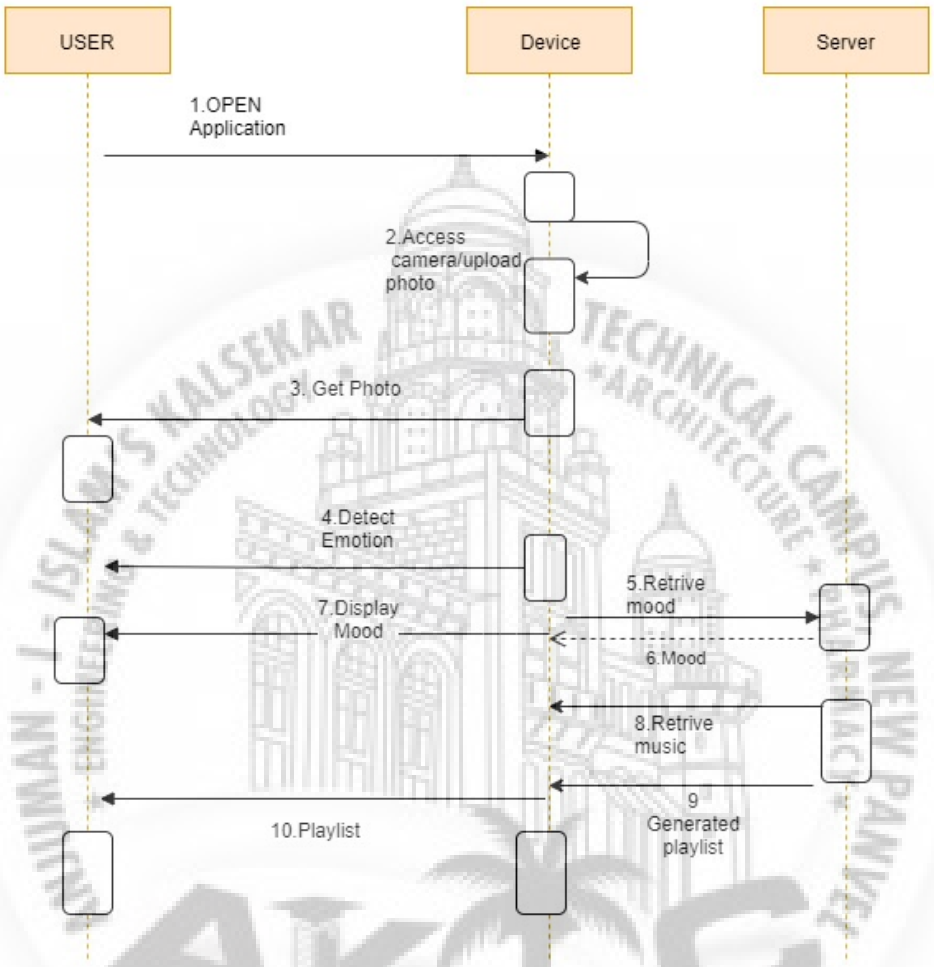


Figure 5.12: Sequence Diagram

Chapter 6

Implementation

6.1 Face Detection Module

Face detection is a computer vision technology that helps to locate/visualize human faces in digital images. This technique is a specific use case of object detection technology that deals with detecting instances of semantic objects of a certain class (such as humans, buildings or cars) in digital images and videos. Face detection is performed by using Haar classifiers and OpenCV.

Step-by-Step Face Detection Algorithm

1. First we need to load the required XML classifiers.

2. Then load our input image (or video) in grayscale mode.

3. Now we find the faces in the image. If faces are found, it returns the positions of detected faces as Rect(x,y,w,h).

4. Once we get these locations, we can create a ROI for the face.

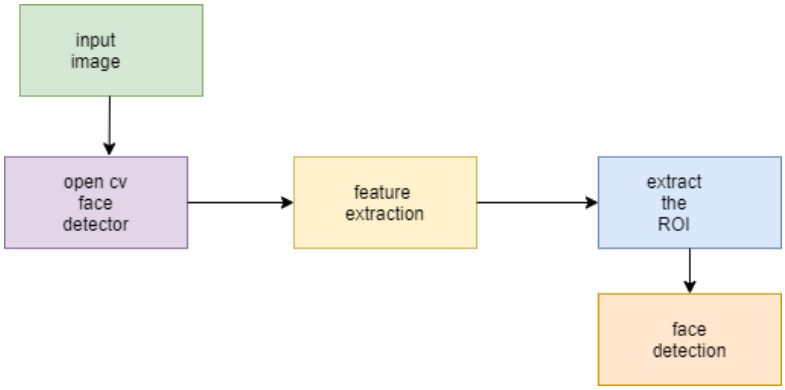


Figure 6.1: Face Detection

Facedetection.py

```
import keras
import numpy as np
import pandas as pd
from keras.models import Sequential
from keras.preprocessing import image
from keras.preprocessing.image import ImageDataGenerator
from keras_preprocessing.image import load_img
import cv2
import time



face_cascade = cv2.CascadeClassifier('static/haarcascades/
    haarcascade_frontalface_default.xml')


from keras.models import model_from_json

# emotions = ('angry','fear','happy','disgust','sad','neutral','surprise')
emotions = ('angry','disgust','fear','happy','sad','surprise','neutral')

from keras import backend as K
K.clear_session()

model = model_from_json(open('static/26-01-2020_model_structure.json').read())
model.load_weights('static/26-01-2020_model_weights.h5',by_name=True)

def detect():
    image_load = cv2.imread('static/emo_photos/image.png')
    gray = cv2.cvtColor(image_load,cv2.COLOR_BGR2GRAY)
    faces = face_cascade.detectMultiScale(gray,1.3,5)

    pred_list = []

    for (x,y,w,h) in faces:
        cv2.rectangle(image_load,(x,y),(x+w,y+h),(255,0,0),2)

        detect_face = image_load[int(y):int(y+h),int(x):int(x+h)]
        detect_face = cv2.cvtColor(detect_face,cv2.COLOR_BGR2GRAY)

        detect_face = cv2.resize(detect_face,(48,48))

        img_pixels = image.img_to_array(detect_face)
```

```
44
45          img_pixels = np.expand_dims(img_pixels, axis=0)
46
47          img_pixels /= 255
48          model._make_predict_function()
49          prediction = model.predict(img_pixels)
50
51          max_index = np.argmax(prediction[0])
52
53          emotion = emotions[max_index]
54
55          percentage = round(prediction[0][max_index]*100,2)
56
57          pred_list = [emotion,percentage]
58
59          imag = cv2.putText(image_load,emotion,(int(x),int(y)),cv2.
                FONT_HERSHEY_SIMPLEX,1,(255,0,0),2)
60          cv2.imwrite("static/emo_photos/image.png",imag)
61
62      # cv2.imshow('Image Prediction',image_load)
63  #
64  #       cv2.waitKey(0)
65  # #       Songs.songs_scrapping(emotion)
66  #       cv2.destroyAllWindows()
67      return pred_list
68  # detect("image.png")
69  detect()
```

6.2 Emotion Recognition Module

6.2.1 Emotion Recognition

Working :-

1. We have 48x 48-pixel resolution so we have width and height as 48.
2. Then we have 7 emotions that we are predicting namely (0=Angry, 1=Disgust, 2=Fear, 3=Happy, 4=Sad, 5=Surprise, 6=Neutral), so we have 7 labels. We will be processing our inputs with a batch size of 6.

Step-by-Step Emotion Recognition Algorithm

1. Sequential()-A sequential model is just a linear stack of layers which is putting layers on top of each other as we progress from the input layer to the output layer.

2. model.add(Conv2D())-This is a 2D Convolutional layer which performs the convolution operation.This layer creates a convolution kernel that is convolved with the layer input to produce a tensor of outputs. Here we are using a 3x3 kernel size and Rectified Linear Unit (ReLU) as our activation function.

3. model.add(BatchNormalization())-It performs the batch normalization operation on inputs to the next layer so that we have our inputs in a specified scale say 0 to 1 instead of being scattered all over the place.

4. model add(MaxPooling2D())-This function performs the pooling operation on the data as explained at the beginning of the post. We are taking a pooling window of 2x2 with 2x2 strides in this model.

5. model.add(Dropout())-As explained above Dropout is a technique where randomly selected neurons are ignored during the training. They are “dropped out” randomly. This reduces over-fitting.

6. model.add(Flatten()) - This just flattens the input from ND to 1D and does not affect the batch size.

7. model.add(Dense()) - According to Keras Documentation, Dense implements the operation: output = activation(dot(input, kernel)where activationis the element-wise activation function passed as the activation argument, kernel is a weights matrix created by the layer

.

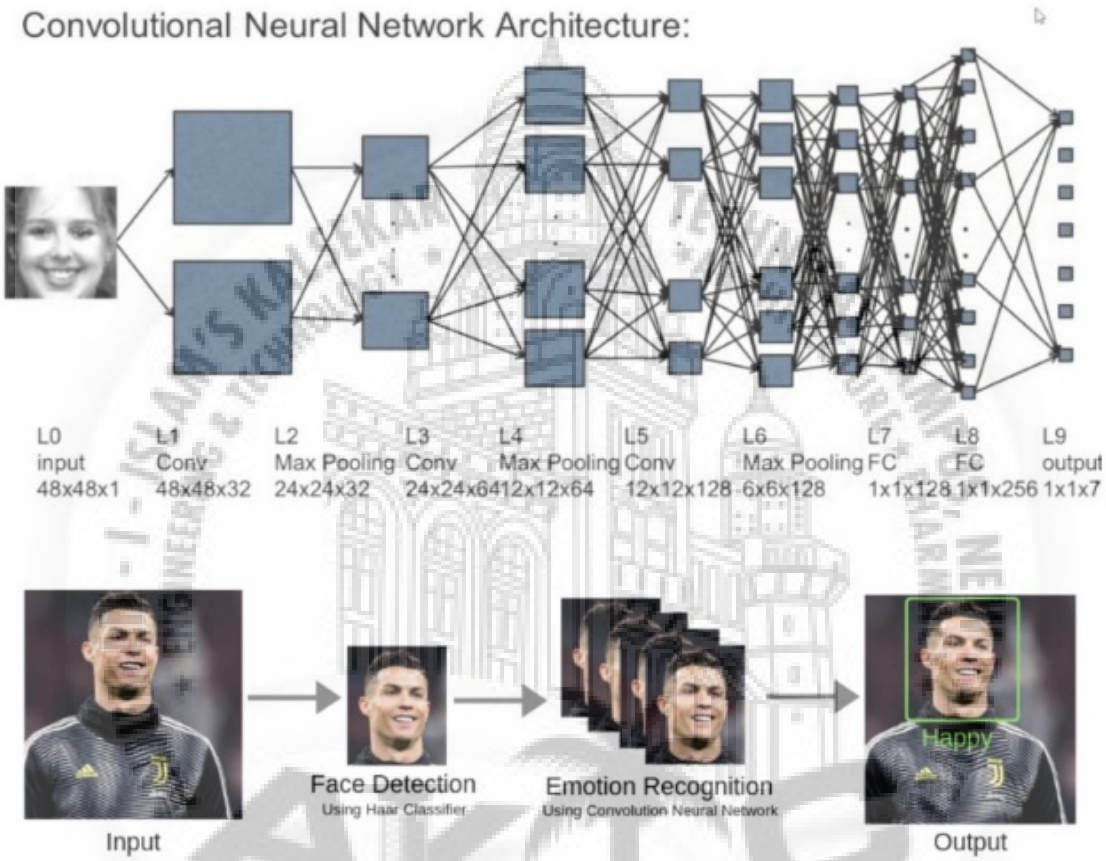


Figure 6.2: Emotion Recognition

emotiondetection.py

```
1
2  import keras
3  import numpy as np
4  import pandas as pd
5  from keras.models import Sequential
6  from keras.preprocessing import image
7  from keras.preprocessing.image import ImageDataGenerator
8  from keras_preprocessing.image import load_img
9  import cv2
10 import time
11
12
13
14 face_cascade = cv2.CascadeClassifier('static/haarcascades/
       haarcascade_frontalface_default.xml')
15
```

```
16
17 from keras.models import model_from_json
18
19 # emotions = ('angry','fear','happy','disgust','sad','neutral','surprise')
20 emotions = ('angry','disgust','fear','happy','sad','surprise','neutral')
21
22 from keras import backend as K
23 K.clear_session()
24
25 model = model_from_json(open('static/26-01-2020_model_structure.json').read())
26 model.load_weights('static/26-01-2020_model_weights.h5',by_name=True)
27
28 def detect():
29     image_load = cv2.imread('static/emo_photos/image.png')
30     gray = cv2.cvtColor(image_load,cv2.COLOR_BGR2GRAY)
31     faces = face_cascade.detectMultiScale(gray,1.3,5)
32
33     pred_list = []
34
35     for (x,y,w,h) in faces:
36         cv2.rectangle(image_load,(x,y),(x+w,y+h),(255,0,0),2)
37
38         detect_face = image_load[int(y):int(y+h),int(x):int(x+h)]
39         detect_face = cv2.cvtColor(detect_face,cv2.COLOR_BGR2GRAY)
40
41         detect_face = cv2.resize(detect_face,(48,48))
42
43         img_pixels = image.img_to_array(detect_face)
44
45         img_pixels = np.expand_dims(img_pixels,axis=0)
46
47         img_pixels /= 255
48         model._make_predict_function()
49         prediction = model.predict(img_pixels)
50
51         max_index = np.argmax(prediction[0])
52
53         emotion = emotions[max_index]
54
55         percentage = round(prediction[0][max_index]*100,2)
56
57         pred_list = [emotion,percentage]
58
59         imag = cv2.putText(image_load,emotion,(int(x),int(y)),cv2.
               FONT_HERSHEY_SIMPLEX,1,(255,0,0),2)
60         cv2.imwrite("static/emo_photos/image.png",imag)
61
62     # cv2.imshow('Image Prediction',image_load)
63 #
64 #     cv2.waitKey(0)
65 # #     Songs.songs_scrapping(emotion)
66 #     cv2.destroyAllWindows()
67     return pred_list
68 # detect("image.png")
69 detect()
```

6.3 Song Extraction Module

Given module take input as extraction emotion tag and based on that it extract the songs from the youtube using youtubedl free library provided by python and generate playlist for user also provide normal music player operations to user.

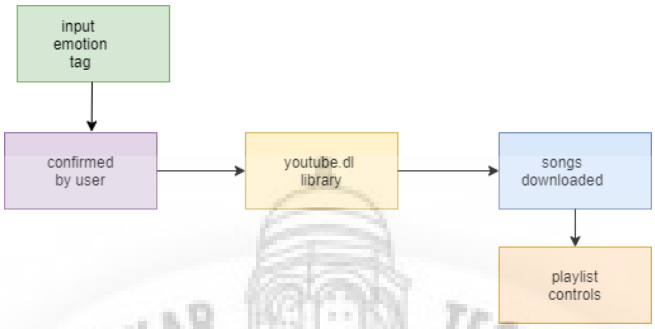


Figure 6.3: Song Extraction

Songscrapping.py

```
from urllib.request import FancyURLopener
import bs4 as bs
import os
import subprocess
import random
import youtube_dl

# emotion=['angry','disgust','fear','happy','sad','surprise','neutral']
# selectedEmot = 0;


class Songs:
    def songs_scrapping(emot):

        #         selectedEmot=emot
        emot = 'surprise'
        word2 = emot + " mood songs"
        # word2 = word2+' lyrics'
        url2 = 'https://www.youtube.com/results?search_query=+'+word2
        yt2 = 'https://www.youtube.com'
        # webbrowser.open_new_tab(url)

        class MyOpener2(FancyURLopener):
            # Set this to a string you want for your user agent
            version = 'Mozilla/5.0 (Windows; U; Windows NT 5.1; it; rv:1.8.1.11)
                Gecko/20071127 Firefox/2.0.0.11'

        myopener2 = MyOpener2()
        page2 = myopener2.open(url2).read()
        webpage2 = page2.decode('utf-8')

        soup2 = bs.BeautifulSoup(webpage2, 'lxml')

        div2 = soup2.body
        string = str(div2)
        split_div = string.split("watch?v=")
        songs_list = []
        for i in range(1, len(split_div)):
```

```
            x = split_div[i]
            a = ""
            for j in x:
                if j != '"':
                    a += j
                else:
                    break
            songs_list.append(a)
        for s in songs_list:
            os.system("cd C:\\Users\\ZEE\\Pictures\\djangoversion1\\django\
                emomusic\\static\\songs\\" +
                      emot + " && youtube-dl -x --audio-format mp3 "+s)
        print('finish')
```

Chapter 7

System Testing

System Testing is a level of testing that validates the complete and fully integrated software product. The purpose of a system test is to evaluate the end-to-end system specifications. Usually, the software is only one element of a larger computer-based system. Below shows the test cases of our system.

7.1 Test Cases and Test Results

Test ID	Test Case Title	Test Condition	System Behavior	Expected Result
T01	Face detection	input face image	Face detected successfully	output detected face ROI
T02	emotion recognition	(all emotion) input image	emotion recognized successfully	recognized emotion tag on image
T03	emotion confirmed by user	input image	confirmed successfully	based on tag it extract songs
T04	capture image	input image	confirmed successfully	output image
T05	playlist generation	input emotion tag	confirmed successfully	output playlist songs

7.2 Test Cases

Title: Face Detection
Description: A System should be able to successfully detect face.

Precondition: the user must provide an input image with face. *Assumption:* a supported browser or android mobile is being used.

Test Steps:

1. Open an application
2. click on home page.
3. click on capture button
4. capture the image.

Expected Result: A application that captures the image and detect Face.
Actual Result: face Detected successfully.

Title: Emotion Recognition.
Description: A user can see the emotion which is detected

Precondition: the user must provide an input image with human face.

Assumption: a supported browser or android mobile is being used.

Test Steps:

1. Open an application
2. click on home page.
3. click on capture button
4. capture the image.
5. detected emotion will be shown on image as emotion tag

Expected Result: A application that captures the image and recognize emotion ..
Actual Result: all seven emotion recognized successfully.

Title: Emotion confirmed by user
Description: A user can see the emotion which is detected if it true so user can confirmed it.

Precondition: the user must click on the confirmed button. *Assumption:* a supported browser or android mobile is being used.

Test Steps:

1. Open an application
2. click on home page.
3. click on capture button
4. capture the image.
5. detected face .
6. detected emotion tag will be shown on image.
7. if detected emotion is true the user click on confirmed button otherwise user has to capture another picture.

Expected Result: A application that captures the image and recognize emotion and confirmed it..
Actual Result: all seven emotion recognized and confirmed successfully.

Title: Capture image.
Description: A user can see the capture button after capturing capturing image will be appeared.

Precondition: the user must click on the capture button. *Assumption:* a supported browser or android mobile is being used.

Test Steps:

1. Open an application
2. click on home page.
3. click on capture button
4. capture the image.

Expected Result: A application that captures the image.
Actual Result: image captured successfully

Title: playlist generation
Description: A user can listen the list of songs based on emotion of their face.

Precondition: the user must click on the confirmed button. *Assumption:* a supported browser or android mobile is being used.

Test Steps:

1. Open an application
2. click on home page.
3. click on capture button
4. capture the image.
5. detected face .
6. detected emotion tag will be shown on image.
7. if detected emotion is true the user click on confirmed button otherwise user has to capture another picture.
8. songs will be downloded based on confirmed tag and appeared on next page.
9. it provide different playlist operation

Expected Result: A application that provides a playlist based on the recognized mood or emotion.
Actual Result: playlist generated for all seven type of emotion successfully.

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 system shall generate the correct results with an accuracy of 80% above.
Efficiency-2 : The system shall provide the right tools to support all its features.

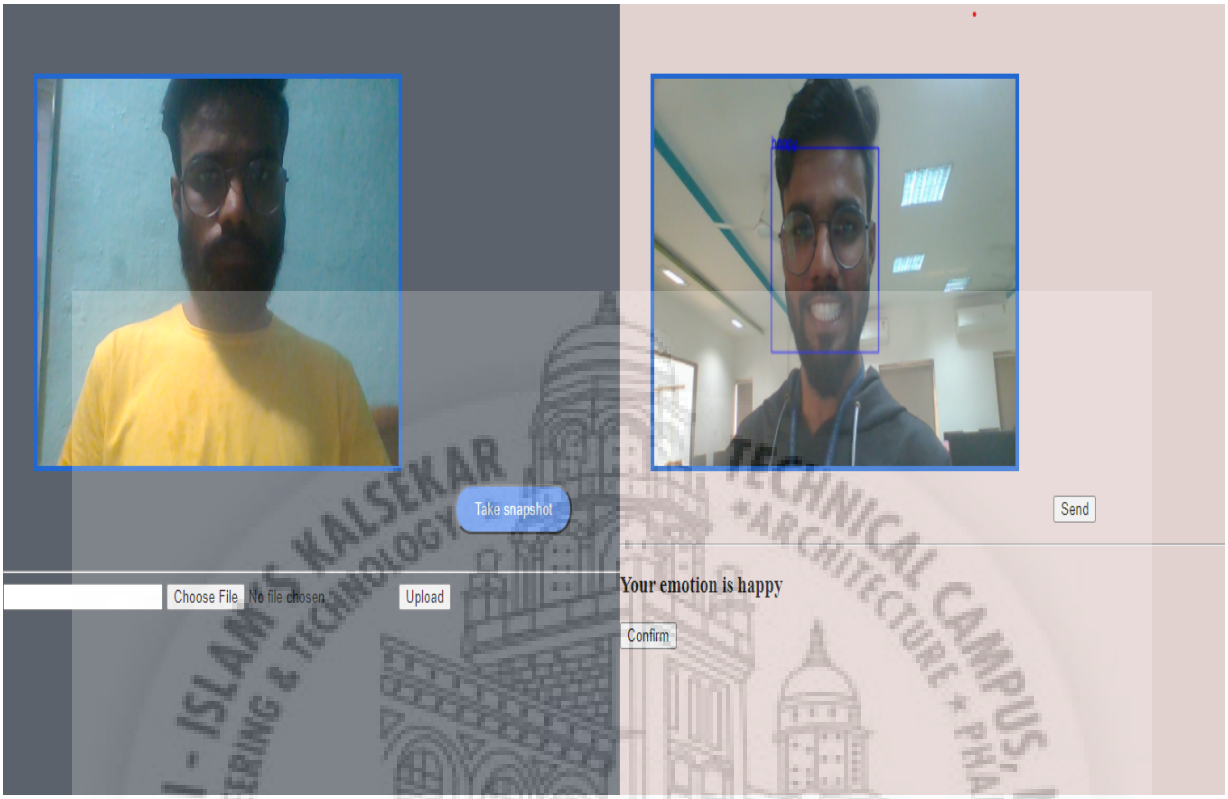
Chapter 8

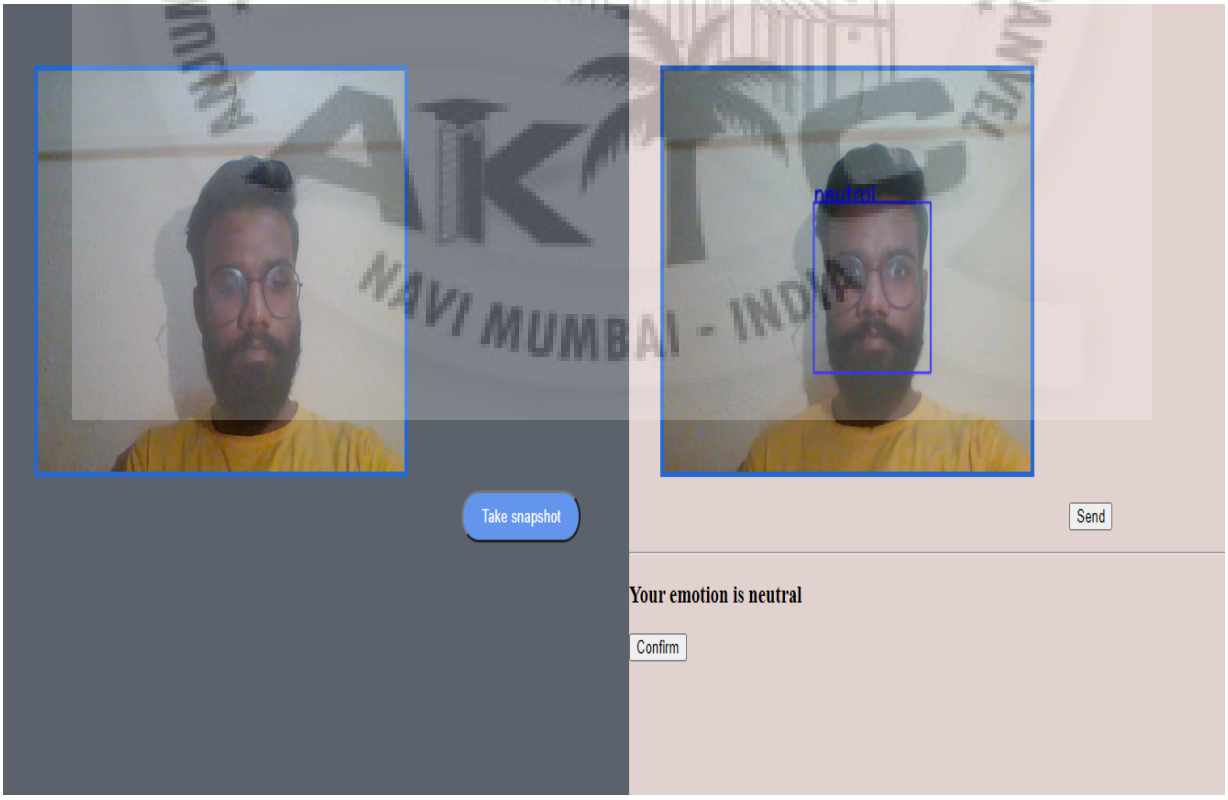
Screenshots of Project

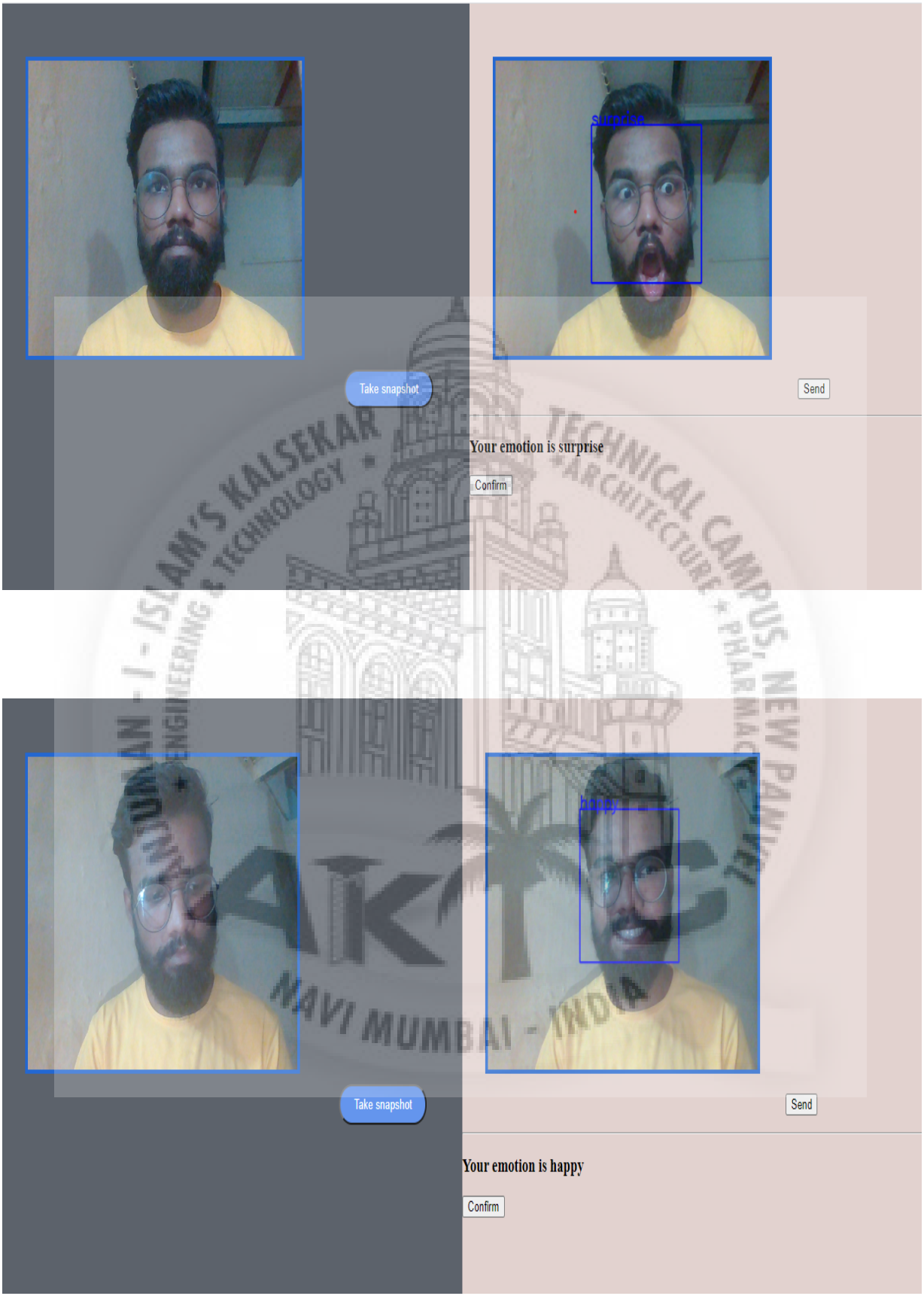
8.1 Website


EMO MUSIC
Home
About Us
Contact Us
Meet the Team
Zeeshan Siddique
Web Developer
Hasib Rawal
Web Developer
zeeshan khan
Web Developer
Prof.abdul salam shaikhWeb Developer
EMO MUSIC
Home
About Us
Contact Us
Lets Connect
Contact us today, and get reply with in 24 hours!
Your name
Your Email Address
Your Phone Number
Your Web Site starts with http://
Type your Message Here....
Submit

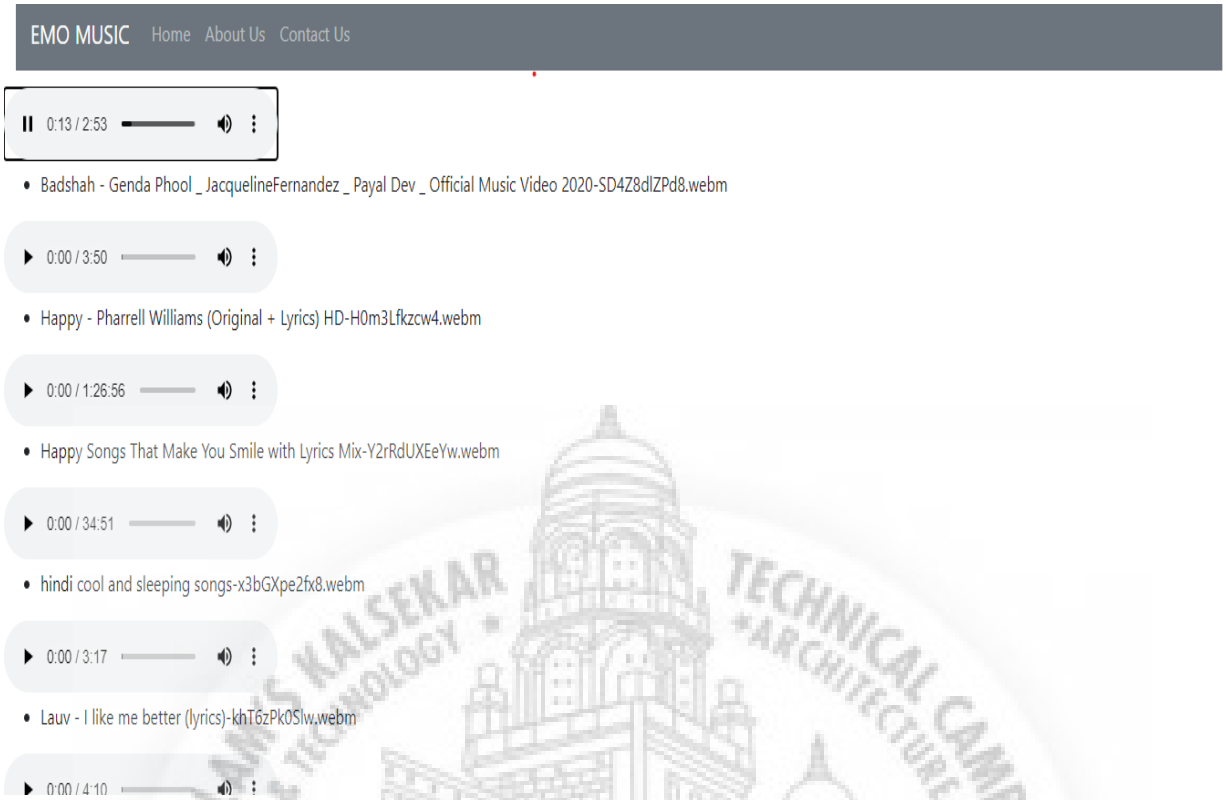
8.2 emotion detection






surprise
Take snapshot
Send
Your emotion is surprise
Confirm
happy
Take snapshot
Send
Your emotion is happy
Confirm

8.3 songs playlist based on detected emotions


EMO MUSIC
Home
About Us
Contact Us
0:13 / 2:53
Badshah - Genda Phool _ JacquelineFernandez _ Payal Dev _ Official Music Video 2020-SD4Z8dlZPd8.webm
0:00 / 3:50
Happy - Pharrell Williams (Original + Lyrics) HD-H0m3Lfkzcw4.webm
0:00 / 1:26:56
Happy Songs That Make You Smile with Lyrics Mix-Y2rRdUXEeYw.webm
0:00 / 34:51
hindi cool and sleeping songs-x3bGXpe2fx8.webm
0:00 / 3:17
Lauv - I like me better (lyrics)-khT6zPk0Slw.webm
0:00 / 4:10

Chapter 9

Conclusion and Future Scope

9.1 Conclusion

Experimental results for the various classes of emotion yield a better accuracy rate as compared to previous existing systems.The system thus aims at providing an android web-app platform.In this work, a novel Face Detection and Emotion recognition algorithm is proposed. the overall accuracy of emotion recognition is between 85-95% and for playlist generation it takes 5-15sec based on the internet speed of user.The Emotion Based Music Player will be of having great advantages to the users who are looking for music based on their mood and emotional behavior. It will help to reduce the searching time for music and reducing the unnecessary computational time.

9.2 Future Scope

- Optimizing the EMO-algorithm by including additional features which helps system to categorize user based on many other factors like location and suggesting the user to travel to that location and play songs accordingly.
- Making the application run without needing an internet connection.
- in future it can be used as emotion based rating system to get feedback of customers.

- Including other emotions
- Playing songs automatically
- playlist can be share with your friends.

References

[1] Shlok Gilda ,Husain Zafar, Chintan Soni, Kshitija Waghurdekar *"Smart music player integrating facial emotion recognition and music mood recommendation"* , 2018

[2] Sushmita G. Kamble ,A. H. Kulkarni *"Facial expression based music player"*,2016

[3] Yunjing An , Shutao Sun , Shujuan Wang *"Naive Bayes classifiers for music emotion classification based on lyrics."*,2016

[4] Hari Prasad Mal , P. Swarnalatha *"Facial expression detection using facial expression model"*,2017

[5] Li Cuimei , Qi Zhiliang , Jia Nan , Wu Jianhua *" Human face detection algorithm via Haar cascade classifier combined with three additional classifiers"*,2017

[6] Ramya Ramanathan , Radha Kumaran , R Ram Rohan , Rajat Gupta ; Vishalakshi Prabhu *"An Intelligent Music Player Based on Emotion Recognition"*. 2017

[7] Marryam Murtaza , Muhammad Sharif , Musarrat AbdullahYasmin , Tanveer Ahmad *"Facial expression detection using Six Facial Expressions Hexagon (SFEH) model"* .2019

[8] Slideshare*"https://www.slideshare.net/nizamotp/emotion-based-music-player-58090818"*2019

[9] Wikipedia

"https://en.wikipedia.org/wiki/Emotion$_r$ecognition"2019

Achievements

1. Conferences
   (a) *Emo-music:An Emotion Based Music Player*; Rawal Hasib,Mohd Zeeshan,Khan Zeeshan, IEEE STC29: 29th IEEE Software Technology Conference,National Institute of Standards and Technology Gaithersburg, MD, MD, United States, June 1-4, 2020
   (b) *Emo-music:An Emotion Based Music Player*; Rawal Hasib,Mohd Zeeshan,Khan Zeeshan, "The 8th International Conference on Information, Communication and Networks(ICICN 2020)" ,August 22-25 2020(Venue : Xi'an China)
2. Project Competitions
   (a) *Emo-music:An Emotion Based Music Player*; Rawal Hasib,Mohd Zeeshan,Khan Zeeshan, 4th National Level Tech Fest Connect-2020 , 22nd January 2020 (Venue : Jamia Institute of Engineering , Akkalkuwa)

Figure 9.1: Certificate

Figure 9.2: Certificate

Figure 9.3: Certificate