A

Major Project

On

MUSIC PREDICTION AND THERAPY USING RANDOM FOREST

(Submitted in partial fulfillment of the requirements for the award of Degree)

BACHELOR OF TECHNOLOGY

In

COMPUTER SCIENCE AND ENGINEERING

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CMR TECHNICAL CAMPUS

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2017-21

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

CERTIFICATE

This is to certify that the project entitled **"MUSIC PREDICTION AND THERAPY USING RANDOM FOREST"** being submitted by **PULI NAVYA (177R1A0546), RANJITH NASAM (177R1A0541) & RAJESHWARI RAVIKUMAR (177R1A0547)** in partial fulfillment of the requirements for the award of the degree of B.Tech in Computer Science and Engineering to the Jawaharlal Nehru Technological University Hyderabad, is a record of bonafide work carried out by him/her under our guidance and supervision during the year 2020-21.

The results embodied in this thesis have not been submitted to any other University or Institute for the award of any degree or diploma.

Mr. Kiran Kumar
INTERNAL GUIDE

Dr. A. Raji Reddy
DIRECTOR

Dr. K. Srujan Raju
HOD

EXTERNAL EXAMINER

Submitted for viva voice Examination held on _____

ACKNOWLEGDEMENT

Apart from the efforts of us, the success of any project depends largely on the encouragement and guidelines of many others. We take this opportunity to express our gratitude to the people who have been instrumental in the successful completion of this project. We take this opportunity to express my profound gratitude and deep regard to my guide.

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ABSTRACT

People experience stress due to various factors like work pressure, emotional problems, disaster, violence, etc. in their day-to-day life. This stress leads to many physical and mental health risk such as Asthma, Headaches, Anxiety, heart disease, Depression, Asthma, Alzheimer's disease, etc. Music therapy has the ability to balance both the physical and mental fitness of humans. Music therapy is a healing process that uses music to an inscription the emotional, physical, cognitive needs of a self-one or a group. Here we aimed to establish the music classification and prediction for music therapy using a machine learning algorithm- Random Forest. This study involves factors such as people's age, education status, music interest, preferences of music in both individual and therapist aspects, and theirrespective relaxation scale before and after music therapy. Our study reveals the important features involved in music prediction for music therapy and the accuracy performance of about 89 is achieved by this classification.

LIST OF FIGURES

LIST OF SCREENSHOTS

TABLE OF CONTENTS

1.INTRODUCTION

1.INTRODUCTION

1.1 PROJECT SCOPE

This project is titled as “Music Prediction and Music Therapy for Random Forest”. Therapy is one of the types of treatments that aims to improve one's physical and mental fitness. Listening music is a widespread habit among people which can activate the brain structures combined with the positive mood of an individual. Music therapy is a field that pursues a connection between music and health. Music therapy is also a relaxation technique that helps people to cope up with their stress and stress-related health problems like heart diseases, depression, anxiety headaches, etc. The importance and interest of music therapy among people is well known still what type of music produces what type of effects and how the therapist determine the choice of music for therapy remains unknown.

1.2 PROJECT PURPOSE

The main purpose of the project is to know the depression of people, by this project we can understand the emotions of the user. Music plays an important role in reducing the stress levels in a person’s life. We have taken music has a factor to cure the chronic illnesses like Alzheimer’s disease such as dementia. With the usage of this we can classify the user’s depression based on the reason and we can associate with it and suggest the best music for their recovery. Even though we have many other music apps related to relaxation here we predict the mood by their face recognition. The significance of music on an individual's emotions has been generally acknowledged. After the day’s toils and hard works, both the primitive and modern man able to relax and ease him in the melody of the music. Studies had proof that the rhythm itself is a great tranquilizer.

1.3 PROJECT FEATURES

The main features of this project are we can predict the stress level of the user by their facial expression. The music is will be played automatically by taking inputs from the user's facial expression. The inputsare taken as a photo of the expression of the user, the output is displayed on the command prompt. The output consists of the emotion of the user such as happy, sad, angry, etc., Based on the output the musicis played. Our music page is built upon python code and html code.

On execution the code the music website will start operating. It is easy to use. This can be further developed into a phone application for both android and iOS devices.

2.SYSTEM ANALYSIS

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SYSTEM ANALYSIS

System Analysis is the important phase in the system development process. The System is studied to the minute details and analyzed. The system analyst plays an important role of an interrogator and dwells deep into the working of the present system. In analysis, a detailed study of these operations performedby the system and their relationships within and outside the system is done. A key question considered here is, "what must be done to solve the problem?" The system is viewed as a whole and the inputs to the system are identified. Once analysis is completed the analyst has a firm understanding of what is tobe done.

2.1 PROBLEM DEFINITION

Music therapy is used to improve the quality of life of people who suffer from medical disorders like Dementia, Autism, Cancer, Aphasia and heart disease. Various music structures have various therapeutic results. The link between musical styles and cognitive styles has also shown in many studiesbut the therapeutic aims are not considered. Now the existing system is subjected to close study and problem areas are identified. In this proposed system the music preference type for music therapy is predicted and classified by random forest algorithm using the information of the people such as age, education level, gender, interest on music, self-selected music choice. However, most people facing the difficulty of songs selection, especially songs that match individuals' current emotions. Looking at the long lists of unsorted music, individuals will feel more demotivated to look for the songs they want to listen to. Most user will just randomly pick the songs available in the song folder and play it with music player. Most of the time, the songs played does not match the user's current emotion. For an example, when a person is sad, he would like to listen to some heavy rock music to release his sadness. It is impossible for the individual to search from his long playlist for all the heavy rock music.

2.2 EXISTING SYSTEM

A movie recommendation system based on collaborative filtering approaches. Collaborative filtering takes the data from all the users and based on that generates recommendations. A hybrid system has been presented, this system combines both collaborative and content-based method. An analysis of both the traditional recommendation techniques as been made. As both of these techniques have certain setbacks, another system which is a combination of Bayesian network and collaborative technique was proposed.

Before existence the recommendation system, individuals would physically choose movies to watch from movie libraries. They either had to read the user's reviews and based on the review they would select a movie or had to randomly select a movie. Currently there is no commonly used application or system which able to detect the emotion of individual and play music according to the emotion detected. This system will propose a new lifestyle to all music lovers which will ease them when searching for playlists. The target users will be the music lovers. Specifically aimed to detect some basic emotion such as normal, happy, sad or angry. The evaluation of this system will base on the accuracy in detecting the correct facial expression as well as playing the right category of songs.

2.2.1 LIMITATIONS OF EXISTING SYSTEM

- Low accuracy in prediction.
- Expensive methods and not everyone can afford.

To avoid all these limitations and make the working more accurately the system needs to be implemented efficiently.

2.3 PROPOSED SYSTEM

Our aim is to reduce the human effort by suggesting movies based on the user's interests. To handle such problems, we introduced a model combining both content-based and collaborative approach. It will give progressively explicit outcomes compared to different systems that are based on content-based approach. Content-based recommendation systems are constrained to people, these systems don't prescribe things out of the box, thus limiting your choice to explore more. Hence, we have focused on a system that resolves these issues.

This project is for all kinds of music lovers which aimed to serve as a platform to assist individuals to play and listen to the songs according to his emotions. It is aimed to provide a better enjoyment of entertainment to the music lovers.

2.3.1 ADVANTAGES OF THE PROPOSED SYSTEM

The system is very simple in design and to implement. The system requires very low systemresources and the system will work in almost all configurations. It has got following features,

- Efficient on both physical and mental health and gives high accuracy.
- Cost of development, usage and maintenance is less.
- User don't want to select songs manually.
- No need of playlist.
- User don't want to classify the songs based on the emotion.

2.4 FEASIBILITY STUDY

The feasibility of the project is analyzed in this phase and business proposal is put forth with a very general plan for the project and some cost estimates. During system analysis the feasibility study of theproposed system is to be carried out. This is to ensure that the proposed system is not a burden to the company. Three key considerations involved in the feasibility analysis are

- Economic Feasibility
- Technical Feasibility
- Social Feasibility

2.4.1 ECONOMIC FEASIBILITY

The developing system must be justified by cost and benefit. Criteria to ensure that effort is concentrated on project, which will give best, return at the earliest. One of the factors, which affect thedevelopment of a new system, is the cost it would require.

The following are some of the important financial questions asked during preliminary investigation:

- The costs conduct a full system investigation.
- The cost of the hardware and software.
- The benefits in the form of reduced costs or fewer costly errors.

Since the system is developed as part of project work, there is no manual cost to spend for the proposed system. Also, all the resources are already available, it gives an indication of the system is economically possible for development.

2.4.2 TECHNICAL FEASIBILITY

This study is carried out to check the technical feasibility, that is, the technical requirements of the system. Any system developed must not have a high demand on the available technical resources. The developed system must have a modest requirement, as only minimal or null changes are required for implementing this system.

2.4.3 BEHAVIORAL FEASIBILITY

This includes the following questions:

- Is there sufficient support for the users?
- Will the proposed system cause harm?

The project would be beneficial because it satisfies the objectives when developed and installed.

All behavioral aspects are considered carefully and conclude that the project is behaviorally feasible.

2.5HARDWARE & SOFTWARE REQUIREMENTS

2.5.1 HARDWARE REQUIREMENTS

Minimum hardware requirements are very dependent on the particular software being developed by a given Enthought Python / Canopy / VS Code user. Applications that need to store large arrays/objects in memory will require more RAM, whereas applications that need to performnumerous calculations or tasks more quickly will require a faster processor.

Operating system	:	windows, Linux
Processor	:	intel i3
Ram	:	4 GB
Hard disk	:	250 GB

2.5.2 SOFTWARE REQUIREMENTS

The functional requirements or the overall description documents include the product perspective and features, operating system and operating environment, graphics requirements, design constraints and user documentation.

The appropriation of requirements and implementation constraints gives the general overviewof the project in regards to what the areas of strength and deficit are and how to tackle them.

Python IDEL 3.7 version

Anaconda 3.7

Jupiter

Google Collab

3.ARCHITECTURE

3.ARCHITECTURE

3.1 PROJECT ARCHITECTURE

This project architecture shows the procedure followed for music prediction using machine learning,starting from input to final prediction.

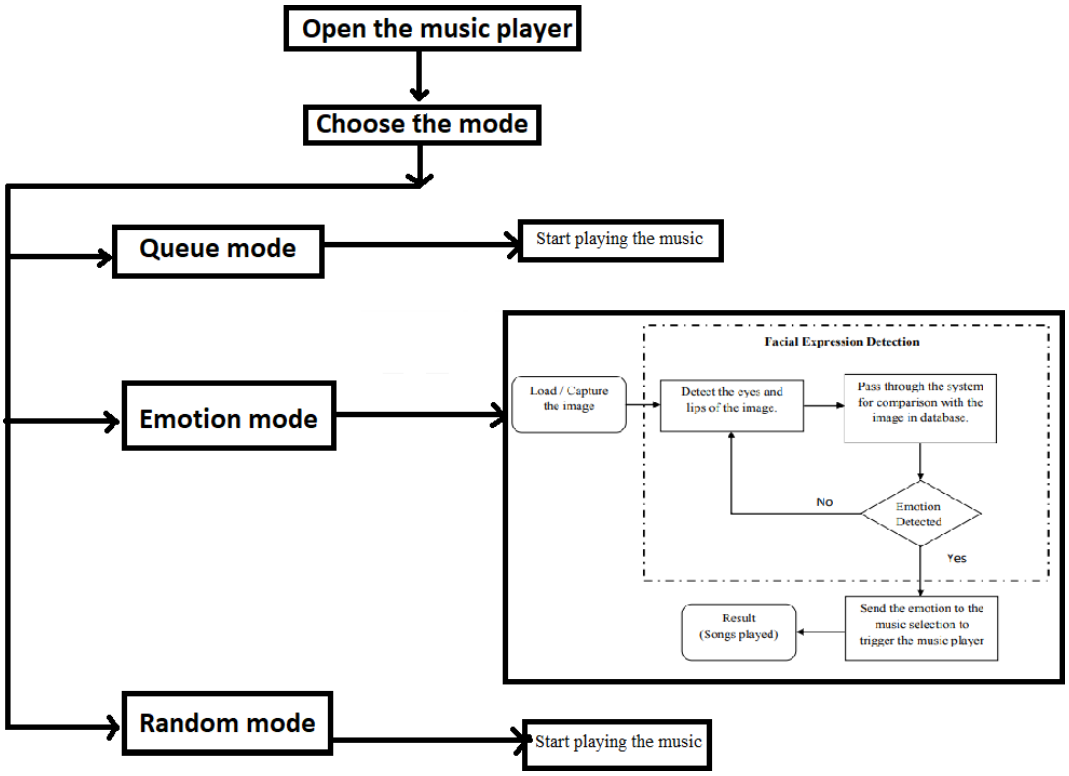


Figure 3.1: Project Architecture of Music prediction for music therapy

3.2 DESCRIPTION

On opening the music player html page, we can see a web page where it as a list of songs and below that we can see three types of modes of playing songs. They are Queue mode, Random mode and Emotional mode. As we are dealing with the emotions of the user it starts with capturing the image of the face through a camera and checks for the database storage match and if it is available then the music will be played according to the emotion of the user which is built in. The integration projection enables the detection and location of small and precise features of the face, such as the eyebrows and lips.

The approach used is based on the usage of add-boosted classifier and finding and matching the token when detecting the facial expression while applying neural network. In face detection. It is a better implementation when comparing to other techniques as it is feature based. Besides, it is able to perform the analysis relatively faster as compared to others. Edge detection, thinning, and token detection are carried out during the image processing process. Edge detection is aimed at identifying the points in a digital image at which the image brightness changes sharply or more formally have discontinuities. Thinning is applied in order to reduce the width of an edge, which is from multiple lines to single line. Token which generated after the thinning process divides the data set into smallest unit of information which needed for the following processes. After the three procedures, the recognition is performed. “It is a tedious task to decide the best threshold value to generate the tokens. So as a next process or the future work is to determine the best threshold value, so that without the interaction of user the system can generate the tokens.”

3.3 USE CASE DIAGRAM

In the use case diagram, we have basically one actor who is the user. The user can start the music software, as access to the resources and to view the details. Based on the user's emotions or choice of music, the music will be played from the music software.

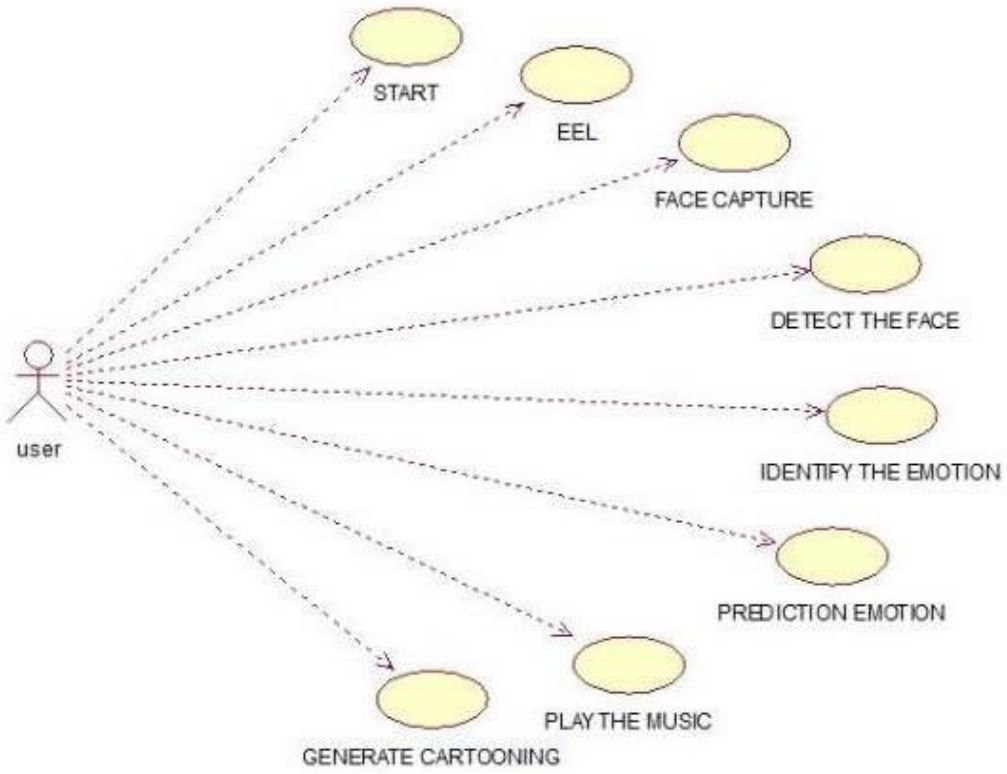


Figure 3.3: Use case diagram for Music prediction for Music therapy

3.4 CLASS DIAGRAM

Class Diagram is a collection of classes and objects.

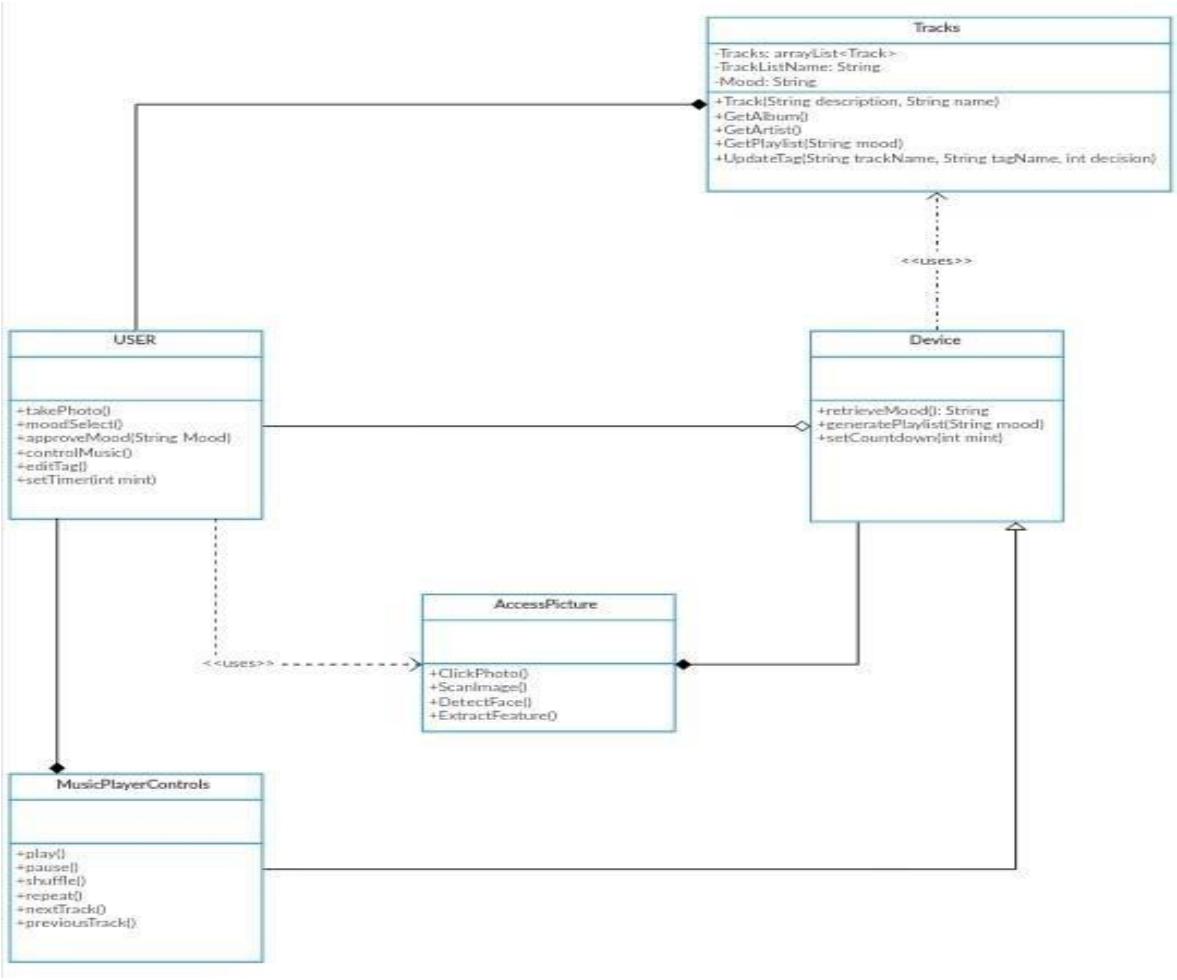


Figure 3.4: Class Diagram for Music prediction for Music therapy

3.5 SEQUENCE DIAGRAM

A sequence diagram is a graphical view of a scenario that shows object interaction in a time- basedsequence what happens first, what happens next.

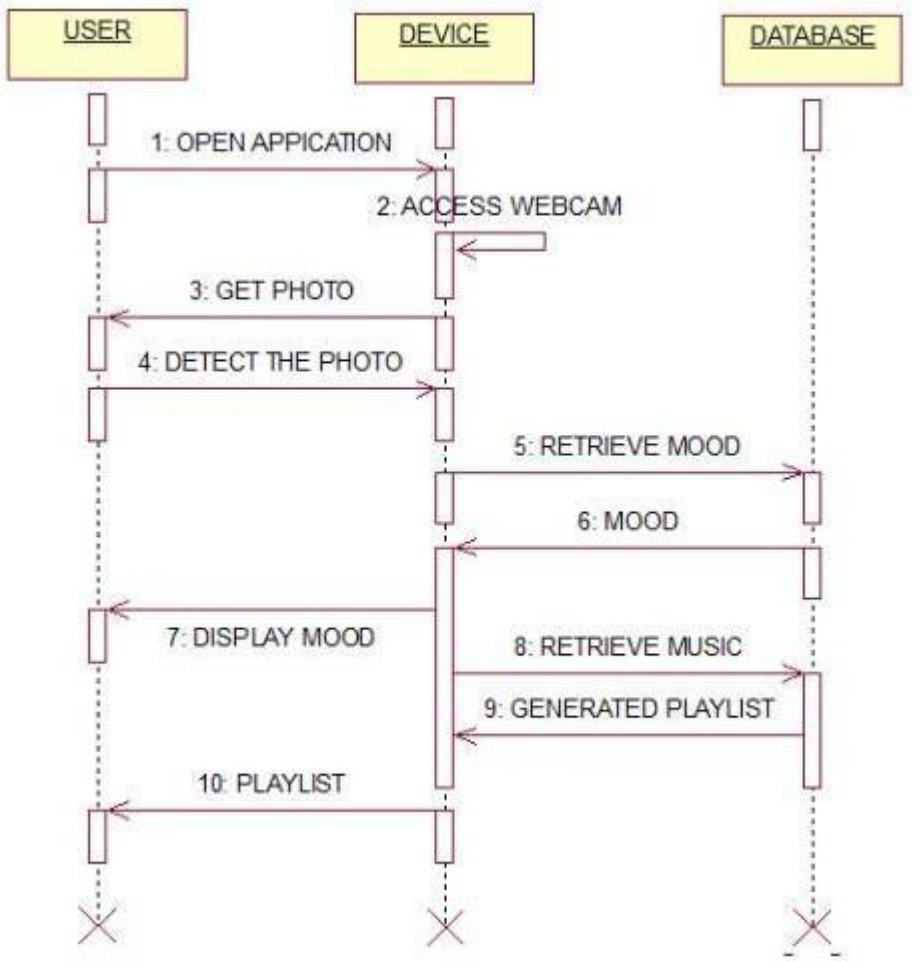


Figure 3.5: Sequence diagram for Music Prediction for Music Therapy

3.6 ACTIVITY DIAGRAM

It describes about flow of activity states.

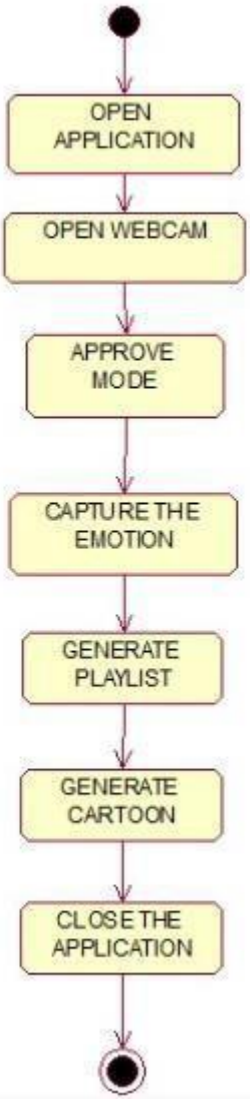


Figure 3.6: Activity Diagram for Music Prediction for Music Therapy

4.IMPLEMENTATION

4.IMPLEMENTATION

4.1 SAMPLE CODE

```
from tkinter import messagebox

from tkinter import *

from tkinter import simpledialog

import tkinter

from tkinter import filedialog

import matplotlib.pyplot as plt

from tkinter.filedialog import  askopenfilename

from sklearn.model_selection import train_test_split

from sklearn.metrics import accuracy_score

import numpy as np

import pandas as pd

from genetic_selection import GeneticSelectionCV

from sklearn.metrics import classification_report

from sklearn.metrics import confusion_matrix

from sklearn import svm

from keras.models import Sequential

from keras.layers import Dense

import time
```

```
main = tkinter.Tk()

main.title("Android Malware Detection")

main.geometry("1300x1200")


global filename

global train

global svm_acc, nn_acc, svmga_acc, annga_acc

global X_train, X_test, y_train, y_test

global svmga_classifier

global nnga_classifier

global svm_time,svmga_time,nn_time,nnga_time



def upload():

    global filename

    filename = filedialog.askopenfilename(initialdir="dataset")

    pathlabel.config(text=filename)

    text.delete('1.0', END)

    text.insert(END,filename+" loaded\n");
```

```
def generateModel():
    global X_train, X_test, y_train, y_test
    text.delete('1.0', END)
    train = pd.read_csv(filename)
    rows = train.shape[0]  # gives number of row count
    cols = train.shape[1] # gives number of col count
    features = cols - 1
    print(features)
    X = train.values[:, 0:features]
    Y = train.values[:, features]
    print(Y)
    X_train, X_test, y_train, y_test = train_test_split(X, Y, test_size = 0.2, random_state = 0)



    text.insert(END,"Dataset Length : "+str(len(X))+"\n");
    text.insert(END,"Splitted Training Length : "+str(len(X_train))+"\n");
    text.insert(END,"Splitted Test Length : "+str(len(X_test))+"\n\n");
```

```
def prediction(X_test, cls): #prediction done here
    y_pred = cls.predict(X_test)
    for i in range(len(X_test)):
      print("X=%s, Predicted=%s" % (X_test[i], y_pred[i]))
    return y_pred


# Function to calculate accuracy
def cal_accuracy(y_test, y_pred, details):
    cm = confusion_matrix(y_test, y_pred)
    accuracy = accuracy_score(y_test,y_pred)*100
    text.insert(END,details+"\n\n")
    text.insert(END,"Accuracy : "+str(accuracy)+"\n\n")
    text.insert(END,"Report : "+str(classification_report(y_test, y_pred))+"\n")
    text.insert(END,"Confusion Matrix : "+str(cm)+"\n\n\n\n\n")
    return accuracy


def runSVM():
    global svm_acc
    global svm_time
    start_time = time.time()
    text.delete('1.0', END)
```

```
    cls = svm.SVC(C=2.0,gamma='scale',kernel = 'rbf', random_state = 2)
    cls.fit(X_train, y_train)
    prediction_data = prediction(X_test, cls)
    svm_acc = cal_accuracy(y_test, prediction_data,'SVM Accuracy')
    svm_time = (time.time() - start_time)


def runSVMGenetic():
    text.delete('1.0', END)
    global svmga_acc
    global svmga_classifier
    global svmga_time
    estimator = svm.SVC(C=2.0,gamma='scale',kernel = 'rbf', random_state = 2)
    svmga_classifier = GeneticSelectionCV(estimator,
                                          cv=5,
                                          verbose=1,
                                          scoring="accuracy",
                                          max_features=5,
                                          n_population=50,
                                          crossover_proba=0.5,
                                          mutation_proba=0.2,
                                          n_generations=40,
```

```
                    crossover_independent_proba=0.5,
                    mutation_independent_proba=0.05,
                    tournament_size=3,
                    n_gen_no_change=10,
                    caching=True,
                    n_jobs=-1)
    start_time = time.time()
    svmga_classifier = svmga_classifier.fit(X_train, y_train)
    svmga_time = svm_time/2
    prediction_data = prediction(X_test, svmga_classifier)
    svmga_acc = cal_accuracy(y_test, prediction_data,'SVM with GA Algorithm Accuracy,
Classification Report & Confusion Matrix')



def runNN():
    global nn_acc
    global nn_time
    text.delete('1.0', END)
    start_time = time.time()
    model = Sequential()
    model.add(Dense(4, input_dim=215, activation='relu'))
```

```
    model.add(Dense(215, activation='relu'))
    model.add(Dense(1, activation='sigmoid'))
    model.compile(loss='binary_crossentropy', optimizer='adam', metrics=['accuracy'])
    model.fit(X_train, y_train, epochs=50, batch_size=64)
    _, ann_acc = model.evaluate(X_test, y_test)
    nn_acc = ann_acc*100
    text.insert(END,"ANN Accuracy : "+str(nn_acc)+"\n\n")
    nn_time = (time.time() - start_time)


def runNNGenetic():
    global annga_acc
    global nnga_time
    text.delete('1.0', END)
    train = pd.read_csv(filename)
    rows = train.shape[0] # gives number of row count
    cols = train.shape[1] # gives number of col count
    features = cols - 1
    print(features)
    X = train.values[:, 0:100]
    Y = train.values[:, features]
    print(Y)
```

```
X_train1, X_test1, y_train1, y_test1 = train_test_split(X, Y, test_size = 0.2, random_state = 0)
    model = Sequential()
    model.add(Dense(4, input_dim=100, activation='relu'))
    model.add(Dense(100, activation='relu'))
    model.add(Dense(1, activation='sigmoid'))
    model.compile(loss='binary_crossentropy', optimizer='adam', metrics=['accuracy'])
    start_time = time.time()
    model.fit(X_train1, y_train1)
    nnga_time = (time.time() - start_time)
    _, ann_acc = model.evaluate(X_test1, y_test1)
    annga_acc = ann_acc*100
    text.insert(END,"ANN with Genetic Algorithm Accuracy : "+str(annga_acc)+"\n\n")


def graph():
    height = [svm_acc, nn_acc, svmga_acc, annga_acc]
    bars = ('SVM Accuracy','NN Accuracy','SVM Genetic Acc','NN Genetic Acc')
    y_pos = np.arange(len(bars))
    plt.bar(y_pos,  height)
    plt.xticks(y_pos, bars)
    plt.show()
```

```
def timeGraph():
    height = [svm_time,svmga_time,nn_time,nnga_time]
    bars = ('SVM Time','SVM Genetic Time','NN Time','NN Genetic Time')
    y_pos = np.arange(len(bars))
    plt.bar(y_pos,  height)
    plt.xticks(y_pos, bars)
    plt.show()



font = ('times', 16, 'bold')
title = Label(main, text='Android Malware Detection Using Genetic Algorithm based Optimized Feature Selection and Machine Learning')
#title.config(bg='brown', fg='white')
title.config(font=font)
title.config(height=3, width=120)
title.place(x=0,y=5)


font1 = ('times', 14, 'bold')
uploadButton = Button(main, text="Upload Android Malware Dataset", command=upload)
uploadButton.place(x=50, y=100)
uploadButton.config(font=font1)
```

```
pathlabel = Label(main)
pathlabel.config(bg='brown', fg='white')
pathlabel.config(font=font1)
pathlabel.place(x=460,y=100)

generateButton = Button(main, text="Generate Train & Test Model", command=generateModel)
generateButton.place(x=50,y=150)
generateButton.config(font=font1)

svmButton = Button(main, text="Run SVM Algorithm", command=runSVM)
svmButton.place(x=330,y=150)
svmButton.config(font=font1)

svmgaButton = Button(main, text="Run SVM with Genetic Algorithm",
command=runSVMGenetic)
svmgaButton.place(x=540,y=150)
svmgaButton.config(font=font1)

nnButton = Button(main, text="Run Neural Network Algorithm", command=runNN)
nnButton.place(x=870,y=150)
nnButton.config(font=font1)
```

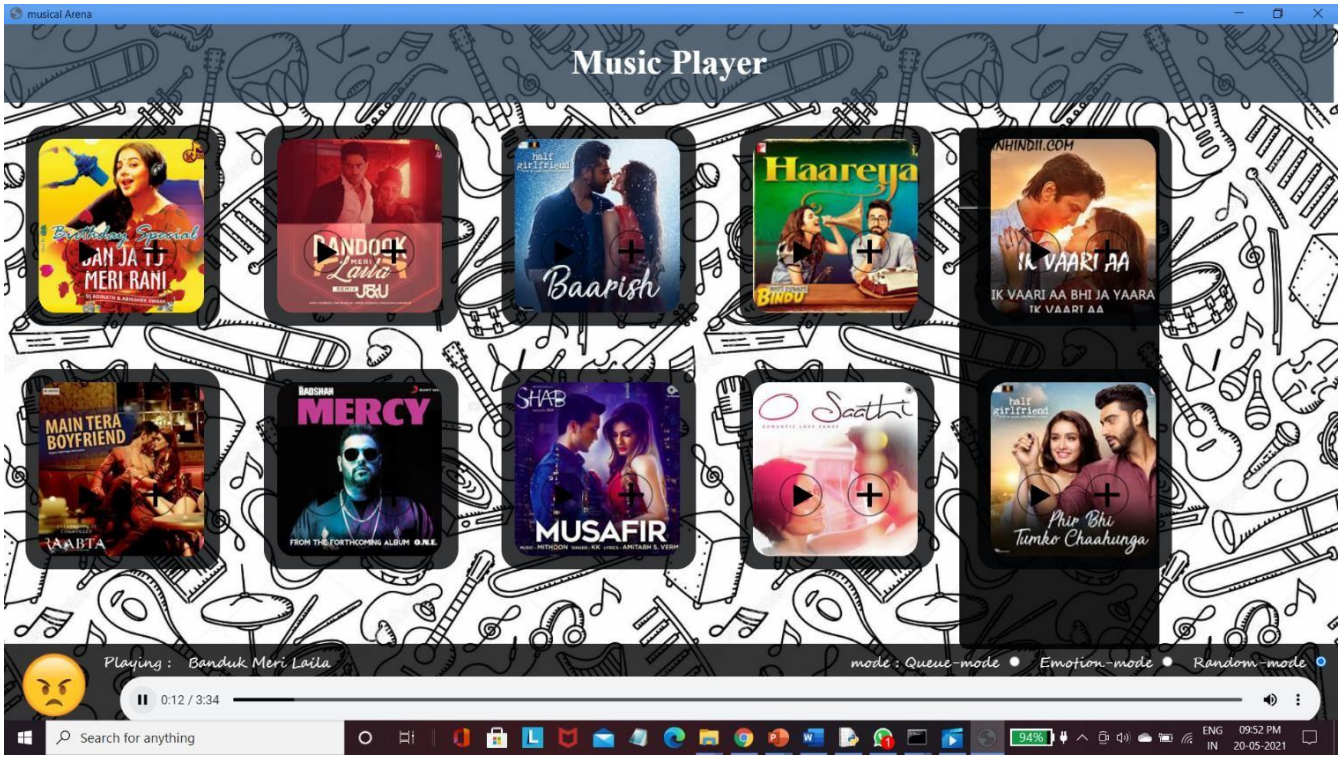
```
nngaButton = Button(main, text="Run Neural Network with Genetic Algorithm",
command=runNNGenetic)

nngaButton.place(x=50,y=200)

nngaButton.config(font=font1)


graphButton = Button(main, text="Accuracy Graph", command=graph)

graphButton.place(x=460,y=200)

graphButton.config(font=font1)


exitButton = Button(main, text="Execution Time Graph", command=timeGraph)

exitButton.place(x=650,y=200)

exitButton.config(font=font1)



font1 = ('times', 12, 'bold')

text=Text(main,height=20,width=150)

scroll=Scrollbar(text)

text.configure(yscrollcommand=scroll.set)

text.place(x=10,y=250)

text.config(font=font1)

#main.config()

main.mainloop()
```

5.SCREENSHOTS

5. SCREENSHOTS

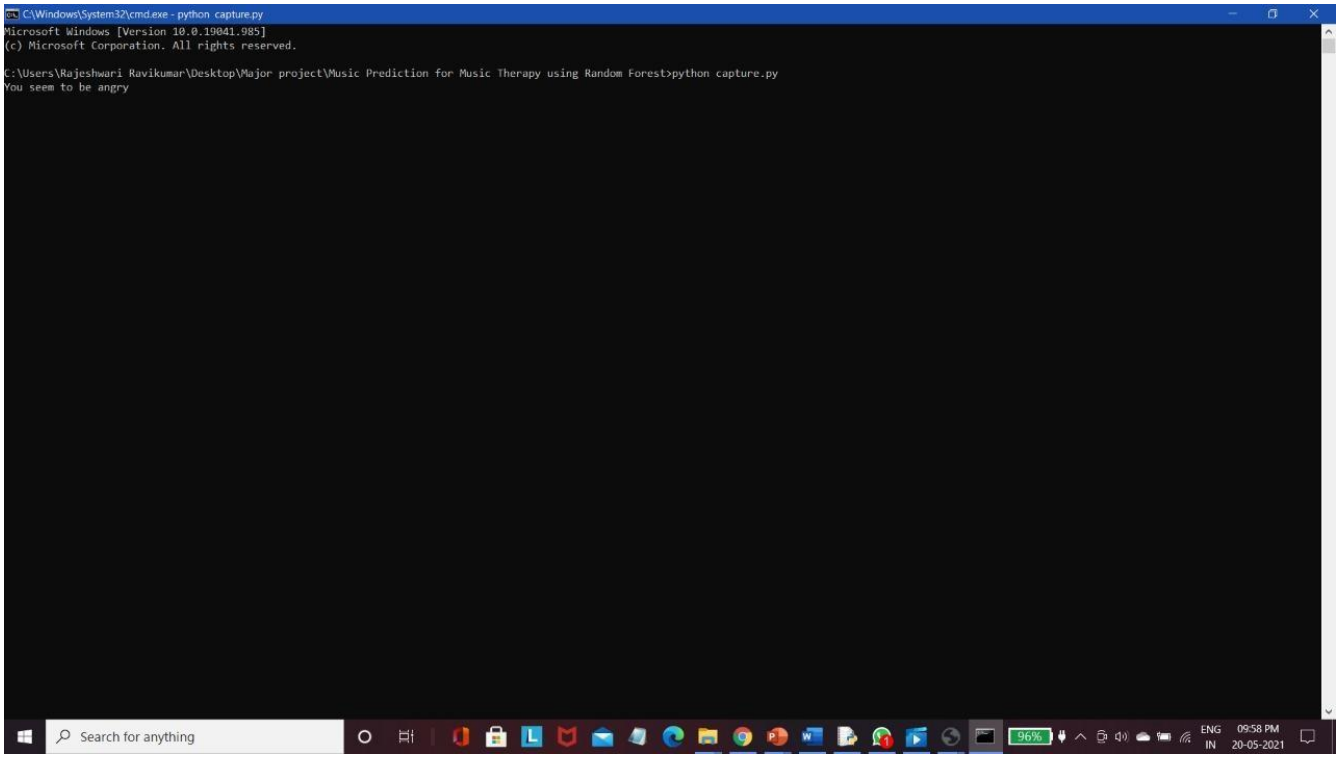
5.1 MUSIC WEBPAGE

After face recognition the emotion is detected to be angry, music is played accordingly.



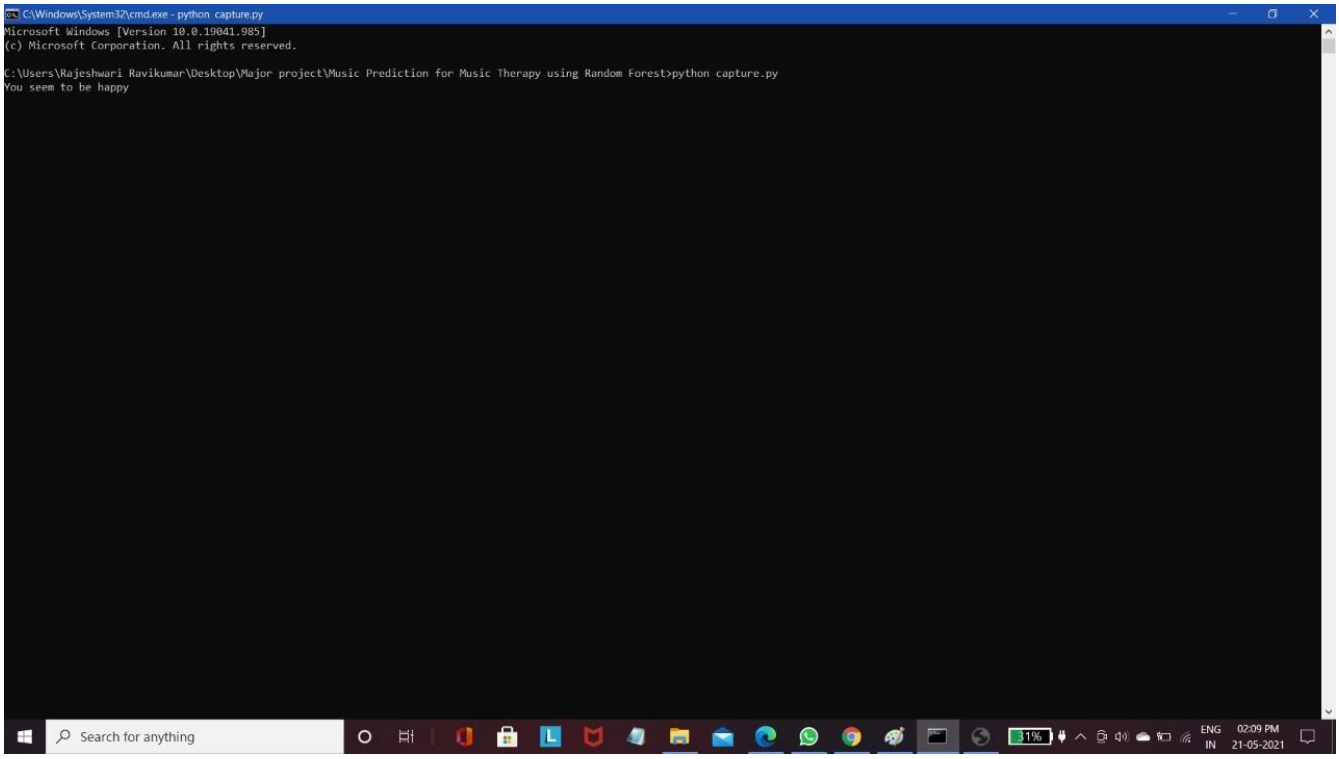
Screenshot 5.1: Music Page result for the emotion Angry

5.2 Output on Command prompt for an angry emotion



Screenshot 5.2: Output on Command prompt for an angry emotion

5.3 Output on Com mand prompt for a happy emotion



Screenshot 5.3: Output on Command prompt for a happy emotion

6.TESTING

6.TESTING

6.1 INTRODUCTION TO TESTING

The purpose of testing is to discover errors. Testing is the process of trying to discover every conceivable fault or weakness in a work product. It provides a way to check the functionality of components, subassemblies, assemblies and/or a finished product. It is the process of exercising software with the intent of ensuring that the Software system meets its requirements and user expectations and does not fail in an unacceptable manner. There are various types of tests. Each test type addresses a specific testing requirement.

6.2 TYPES OF TESTING

6.2.1 UNIT TESTING

Unit testing involves the design of test cases that validate that the internal program logic is functioning properly, and that program inputs produce valid outputs. All decision branches and internal code flow should be validated. It is the testing of individual software units of the application. It is done after the completion of an individual unit before integration. This is a structural testing, that relies on knowledge of its construction and is invasive. Unit tests perform basic tests at component level and test a specific business process, application, and/or system configuration. Unit tests ensure that each unique path of a business process performs accurately to the documented specifications and contains clearly defined inputs and expected results.

6.2.2 INTEGRATION TESTING

Integration tests are designed to test integrated software components to determine if they actually run as one program. Testing is event driven and is more concerned with the basic outcome of screens or fields. Integration tests demonstrate that although the components were individually satisfaction, as shown by successfully unit testing, the combination of components is correct and consistent. Integration testing is specifically aimed at exposing the problems that arise from the combination of components.

6.2.3 FUNCTIONAL TESTING

Functional testing is a type of software testing that validates the software system against the functional requirements/specifications. The purpose of Functional tests is to test each function of the software application, by providing appropriate input, verifying the output against the Functional requirements.

Functional testing mainly involves black box testing and it is not concerned about the source code of the application. This testing checks User Interface, APIs, Database, Security, Client/Server communication and other functionality of the Application Under Test. The testing can be done either manually or using automation.

Functional tests provide systematic demonstrations that functions tested are available as specified by the business and technical requirements, system documentation, and user manuals. Functional testing is centered on the following items:

Valid Input: identified classes of valid input must be accepted. Invalid Input: identified classes of invalid input must be rejected.Functions: identified functions must be exercised.

Output: identified classes of application outputs must be exercised. Systems/Procedures: interfacing systems or procedures must be invoked.

Organization and preparation of functional tests is focused on requirements, key functions, or special test cases. In addition, systematic coverage pertaining to identify Business process flows; data fields,predefined processes.

6.3 TESTCASES

Test Case ID	Test Case Name	Test Case Description	Test Steps			Test Case Status	Test Priority
			Step	Expected	Actual		
01	Start the application	Host the applicationand Test if it starts making sure the required software is available	If it doesnot start	We cannot run the application	The application hosts success	High	High
02	Home page	Check the deployment Environment for Properly loading the application	If it doesnot load	We cannot access the application	The applicationis running successfully	High	High
03	User mode	Verify the working ofthe application in freestyle mode	If it doesnot respond	We cannot use the freestyle mode	The application Displays the freestyle page	High	High
04	Data input	Verify if the application takes inputand updates	If it fails to take the input or store in the database	We cannot proceed further	The application updates the input to application	High	High

7.CONCLUSION

7.CONCLUSION AND FUTURE SCOPE

7.1 CONCLUSION

This paper proposed a classification and prediction on music for music therapy. Analysis of the music therapy includes how personal factors and therapist aims determine the music classification. This paperalso deals with comparative study on features involvement in system performance by visualizing importance features. The random forest algorithm is more appreciable because it can be applied for bothregression and classification. The algorithm has given an appreciable accuracy. This paper also employsthe importance of music therapy and its beneficiary effects on both physical and mental health. From this classification music therapist could able to choose music with their therapeutic aims and practice psychological betterment in people.

The significant of this project is the emotion detection of the images loaded into the proposed model. The main purpose is on its emotion detection functionality. Through the integration between emotion detection technology and music player, the proposed model is aimed to provide betterment in the individual's entertainment. The proposed is able to detect the four emotions i.e., normal, happy, angry and sad of the images loaded into it. Once the proposed model compared and detected the emotion of the user, the music player will play the songs accordingly. As for the usability and accuracy, both system testing and emotion accuracy testing has been done to the proposed model and return a satisfying result. The proposed model able to recognized 34 out of 40 images loaded into it, which give a Recognition Rate of 85%. Besides, the proposed model is a computer application which can works well in all kinds of windows and computers. Thus, with this Emotion Based Music Player, users can have an alternative way of selecting songs, which is in a more interactive and simpler way. The music lovers will not have to search through the long list of songs for the songs to be played but to match the emotion in the song's selection.

7.2 FUTURE SCOPE

Every application or system are subject to upgrades and improvement, so do the Emotion Based Music Player. This proposed model can still be enhanced in terms of its performances and features.

First and foremost is to reduce the limitation in the emotion detection. As mentioned before, there are several limitations in emotion detection. In order to improve accuracy, it can be done by increasing the numbers of facial features when doing extraction for comparison. Currently, the proposed extracts only the lips and eyes for comparison purposes. As for future work, other facial features such as eyebrows and movement of cheeks can be included in the comparison.

Besides, the future model can further enhance by removing or minimizing the noise if the loaded or captured images. In future expansion, noise reduction software can be embedded in the model so that the noise for either still or captured image can be removed and thus increase the accuracy in emotion detection.

Apart from the above, the proposed model can be improved by having auto adjustment on the resolution or brightness and contrast of the images. The accuracy of emotion detection for the current application is greatly influenced by the quality of the images loaded. Hence by having the auto adjustment, the user can load in any quality of image or capture images with any kinds of webcam. The future model will be able to adjust the quality of the images which can be detected and processed.

In addition, for the better interactive between user and application, real time emotion detection technique can be applied to the model. The future model will detect and extract the facial feature once the application is launched and the emotion can be detected in real time.

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Music Prediction and Therapy using Random Forest

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ABSTRACT

Everyone wants to listen music of their individual taste, mostly based on their mood. Average person spends more time to listen music. Music has high impact on person brain activity. This model based on real time extraction of facial expression and identify the mood. In this project we are using Haar cascade classifier to extract the facial features based on the extracted features from haar cascade, we are using cohn kanade dataset to identify the emotion of user Facial expression-based music therapy does no need a therapist to do all excessive observations, and the therapy is an adaptive one it can be personalized to each individual patient. There is a choice of different therapies targeting pain management, depression, stroke rehabilitation, stress management, etc. Healthcare providers.

Keywords: Image Processing, Face detection, Machine Learning, Open CV, Haar Cascade Classifier.

INTRODUCTION

Human beings have the natural intelligence to look at someone's face and guess their mood. This intelligence if learnt by an electronic device – laptop, robot automaton or a mobile device –will have valuable application within the real world. Musicis considered to be a good medium of emotional communication. Emotional expression is taken into account a vital therapeutic think kind of treatment. In each style and scientific literature, it's connected to psychological wellbeing, whereas inhibition of feeling into account a vital therapeutic think kind of treatment. In each style and scientific literature, it's connected to feeling appears to play task within the development of assorted diseases, as well as physical illnesses.

Using traditional musical therapy, in which the therapist had to analyze the patient's mood manually by using different observing techniques, that doesn't include any computer machine or any other specific intelligent system. After finding out the mood of the patient, the therapist selects songs that would soothe his/her mood and emotional experience. This task was effortful, more time consuming and an individual often faced the dilemma of landing at an appropriate list of songs. Even if they acknowledge the mood of the user then their choice of songs for creating a playlist is of the user then their choice of songs for creating a playlist is such it'll simply decide songs reflective appears to play task within the development of assorted diseases, as well as physical illnesses. Using traditional musical therapy, in which the therapist had to analyze the patient's mood manually by using different observing techniques, that doesn't include any computer machine or any other specific intelligent system. After finding out the mood of the patient, the therapist selects songs that would soothe his/her mood and emotional experience. This task was effortful, more time consuming and an individual often faced the dilemma of landing at an appropriate list of songs. Even if they acknowledge the mood of the user then their choice of songs for creating a playlist is such it'll simply decide songs reflective the present mood of the user and can'tattempt to enhance his mood in any way.

So, if the user is gloomy, he are supplied with an inventory of songs with unhappy feeling which might degrade his mood additional and can cause depression. So, the system planned during this paper can notice the feeling of the user from his facial expressions. It'll thengive the user with a play list of songs, taking note of that the user can feel higher.

LITERATURE REVIEW

Olga Sourina and other co-authors proposed Real-time EEG-based emotion recognition for music therapy in which they

used two main algorithms, the first is Information acquisition algorithm and second is Music therapy algorithm [1]. Here authors distinguished between different type of therapy, the first one deals with pain related issues: the music pieces targeting a happy emotion are played to the patient to destruct his/her attention from the pain. The second strategy of therapy deals with depression: here the song targeting the sequence of sad, pleasant and satisfied emotions are played to user. The third type of therapy is used to decrease anxiety level of the patients.

Electroencephalography (EEG) signals are used to detect the human emotions. Fractal dimension (FD) values of EEG could reveal geometric complexity of the signals. It has been proved that FD could be applied in real-time EEG signal processingto identify different brain states.

Ludwika Konieczna–Nowak worked on the correlation between Music Features with Emotional Experiences, also worked on Implications for Music Therapy. Emotions in music may well be elicited in three other ways. First area unit episodic associations, that link sure musical items with specific life circumstances and things coming back from the autobiographies of listeners. Second, painting associations return from the musical likeness to nonmusical phenomena. The ultimate choice, structural expectations, suggests that emotions area unit derived from structural options of the composition. Expressing Emotions in Gestalt Therapy Gestalt psychotherapists focus on emotional experiences [2]. Gestalt therapy techniques are based on existential dialogue that a therapist carries out with a patient.

Ramya Ramanathan and other co-authors proposed an intelligent music player system that is based on human emotional expression and then recommend music to the user. Here they first work on facial recognition techniques, along with learning techniques for correlating the facial expression with an emotion. The learning can be achieved by using ANNs and HMMs [3] for clustering and classification of the emotions, which can be trained datasets of faces such as the Cohn Kanade dataset. After the next phase is music classification, using the Arousal-Valence model of emotion proposed by Thayer. Haar classifier is mostly used for face detection where the classifier is trained with declared face data which enables it to different faces accurately. The music feature extraction can be performed in python by using MIR packages such as LibROSA and PyAudio Analysis. They have used MATLAB for plotting Thayer's Graph using arousal value and Audio Feature Extraction. Music is subject to k means clustering, to obtain clusters of music based on their emotional expression which is reflecting on their face.

Aurobind V. Iyer and other co-authors proposed mood enhancing music recommendation system which is based on Canny Edge Detection and Viola Jones algorithm. In this method there are four major steps are involving Integral Image, Feature Discussion, AdaBoost learning algorithms, Cascading Classifier respectively. The above steps are to be used for detecting image from an image after that it has to recognize emotion carried out by that face. For emotion recognition Eigenface and Fisherfaces are methods used for dimensionality reduction. Eigenfacemethod uses Principal Component Analysis (PCA)[4].It is a statistical technique that is used for data dimension reduction, data compression and also uses eigenvector properties for determining object orientation. Fisherfaces method uses fisher's Linear Discriminant (FLD) provides higher between- class scatter as compared to PCA.

F.ADAT and other co-authors proposed that Anthropometric model for facial feature points localization and Main axis localization [6]. To realize the anthropometric model following stages:

1. Main axis localization:
a) Eye's axis localization using gradient projection
b) Mouth axis localization using color information
c) Symmetry axis localization using gray image
2. Facial feature points localization using the proportional position.
3. Facial feature points detection using the Shi&Thomasi method for more accuracy.

The confusion matrix of different emotions with KohnKanade and FEEDTUM database respectively. This matrix shows the effectiveness of classification method with the SVM.

Kyogu Lee and Minsu Cho proposed a system for

Mood Classification from Musical Audio Using User GroupDeendent Model. They used adjectives of USPOP's mood label data and Last. fm's tags as classification keywords. Among those adjectives, they selected 19 terms related to music moods, and found the optimal number of clusters, which was three. They then performed PCA on the mood adjectives using tracks as observations and verified that the top adjectives in each of the three clusters are close to each other [7].The important part is preprocessing, acoustic feature vectors extracted from the raw audio are high dimensional which likely

causes a problem in estimating the model parameters, known as the curse of dimensionality. In order to reduce the dimension of the feature vectors and maximize the separability between classes, they perform Linear Discriminant Analysis before estimating the model parameters.

Shlok Gilda and other co-authors study the usage of convolutional neural networks (CNNs) in the context of emotion recognition CNNs are known to simulate the human brain when analyzing visuals; however, given the computational requirements and complexity of a CNN, optimizing a network for efficient computation is necessary [11]. The Emotional module has two different sections Dataset Description and Model Description. A multilayered CNN programmed to evaluate the feature of images. The layers are Input layer, Convolutional layer, Dense layer and output layer. The second module is music classification module which consists of Preprocessing, feature Description of music dataset. The module is recommendation module is responsible for generating a playlist of relevant songs for the user using mapping techniques which results in playlist generation.

Renuka s. Deshmukh and other co-authors proposed facial emotion detection using machine learning approach, the machine learning algorithmic program are going to be used for the aim of classification of the emotions. The emotional expression API are going to be further developed which will provide us an output within the kind of emotion that are classified supported the given input to the system. The paper includes only the partial results of implementation; the more implementation is carried on. The performance measures are going to be used counting on the further implementation that's in method [12]. A system for human expression recognition by analyzing key facial regions using PCA and neural networks. Emotion recognition during this paper relies on observation of contours, particularly of facial expression displayed in still footage. Facial expressions used are obtained by edge detection and specializing in specific facial regions of eyes and the mouth. Therefore, classification and feeling recognition is performed through those two facial regions. The choice of these two regions, as the basis for feeling recognition is intuitive since the most visual indication of emotions is visible in those regions.

DESIGN METHODOLOGY

For implementing this project, the design is divided into three major parts, the first part is extracting facial expressions from image after performing some important image processing technique and machine learning approach, the second part is classification of music genre and last part is choosing/playing proper music for therapy which give the best result for that respective patient. Multiple images are captured from a web camera. To predict the emotion accurately, we might want to have more than one facial image. Blurred images can be an error source (especially in low light conditions) and hence, the multiple images are averaged to get an image devoid of any blur. Histogram equalization is an image processing technique used to enhance the contrast of the image by normalizing the image throughout its range. This image is then cropped and converted to greyscale so that only the foreground of the image remains, thereby reducing any ambiguity.

For music emotion recognition, the music dataset needs to first be obtained. Initially, a small dataset of songs from a local collection is used, after which a subset of the thousands of Song Dataset can be used for further testing and training. The music feature extraction can be performed in python by using MIR packages such as LibROSA and PyAudio Analysis. These are python packages that aid the analysis and retrieval of musical features such as tempo, rhythm, timbre, etc. which, along with the lyrics, are further used for clustering by unsupervised learning, using the k-means algorithm. For the efficient execution of this technique, the centroids are manually set to select the locations of the clusters. Once this has beenaccomplished, each song must be labeled with appropriate descriptors, to make the search process more efficient once the facial emotion recognition has been completed. The music database can then be queried using appropriate descriptors, to obtain the desired music playlist automatically.

FACIAL FEATURES EXTRACTION

A picture is taken throughout the runtime of the appliance, which once preprocessing, is foreseen to belong to one of the emotion categories by the fisherface classifier. The model additionally permits theuser to customize the model so as to cut back the variance among the categories any, initio or sporadically, such that solely variance would be that of feeling modification.

Fisherfaces method

Discriminant Analysis is best approach to scale back dimensionality especially in classification domain. Linear discriminant analysis is one among the foremost popular Discriminant Analysis. It's a way wont to find a linear combination of features which may be wont to separate classes of various objects. It can thus be used for dimensionality reduction as well as a linear classifier.

Fisherfaces method uses fisher's Linear Discriminant (FLD) provides higher between-class scatter as compared to PCA. It focuses to maximize the ratio of between-class to within class scatter. As a result of which the tightly spaced clusters are formed.

As the data set that's used for learning labeled, this information is used to create a more reliable model to scale back dimensionality. It starts by creating a picture matrix wherein each column may be a vector that represents pixel intensities of the image.

There are many factors contribute in conveying emotions of a patient. Pose, speech, facial expressions, behavior and actions are a number of them. From these above-mentioned factors, facial expressions have a better importance since they're easily perceptible.

Parts of the Face	**Emotion**
lip corner pulled, open eyes, open mouth, cheeks raised	Happy
Eyebrow pulled down, open eyes, lip tightened	Anger
Outer eyebrow down, inner eyebrows raised, eyes closed, lip corner down	Sad
Outer eyebrow down, inner eyebrow up, mouth open	Fear
Eyebrow up, open eyes, jaw dropped	Surprise
Lip corner depressor, lower lip depressor, eyebrows down, nose wrinkled	Disgust

Table 1: Emotion and Facial part

Above mentioned table is giving brief idea of different facial parts relation with different type of Emotion/Expression carried by Humans.

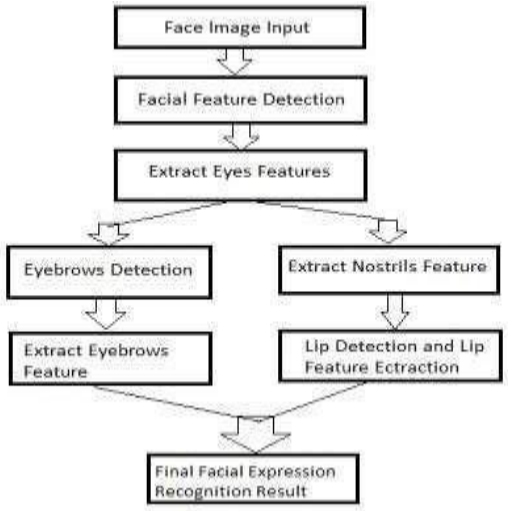

Fig 1: Facial Emotion Extraction

The machine learning algorithms are going to be used for the aim of classification of the emotions. The emotion API are going to be further developed which will give us an output within the sort of emotion that are classified supported the given input to the system.

Music Genre Classification

Categorizing music files consistent with their genre may be a challenging task within the area of music information retrieval (MIR). With the expansion of online music databases and easy access to music content, therapist find it increasing hard to manage the songs that improves patient's health, a method to categorize and organize songs is based on the genre, which is identified by some characteristics of the music like rhythmic structure, harmonic content and instrumentation.

GTZAN which was firstly proposed by G. Tzanetakis in is one among the foremost popular dataset used for music signal processing. It contains 1,000 music with30-second, 22050 Hz frequency and 16 bits. Genres within the GTZAN are blues, classical, country, disco, hip-hop, jazz, metal, pop, reggae and rock and every one of those genres have 100 music. In this section, to classify music consistent with their genre some machine learning algorithms are discussed. The classification algorithms utilized in this part are Naive Bayes, Random Forest, K Nearest Neighbors, Decision Tree and Support Vector Machine.

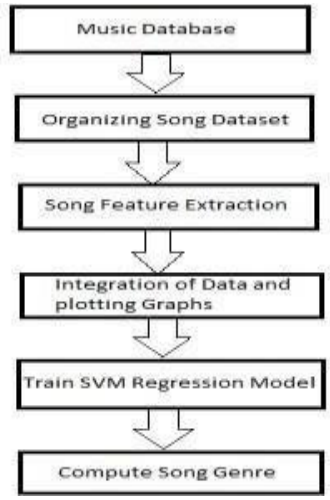

Fig 2: Music Genre Classification

Support Vector Machine (SVM):

In machine learning, support-vector machines are supervised learning models with associated learning algorithms that analyze data used for classification and regression analysis. Given a set of training examples, each marked as belonging to at least one orthe opposite of two categories, an SVM training algorithm builds a model that assigns new examples to one category or the opposite, making it a non- probabilistic binary linear classifier (although methods like Platt scaling exist to use SVM during a probabilistic classification setting). An SVM model may be a representation of the examples as points in space, mapped in order that the samples of the separate categories are divided by a transparent gap that is as wide as possible. New examples are then mapped into that very same space and predicted to belong to a category supported the side of the gap on which they fall. The intelligent system is created keeping in mind the simplicity of use by the therapist and to enable them the power of machine learning for their day-to-day work.

Applications-

1. Classification of images can also be performed using SVMs
2. Hand-written characters can be recognized using SVM
3. The SVM algorithm has been widely applied in the biological and other science field.
4. SVMs are helpful in text and hypertext categorization.

A number of emotions is collected and put up in the list. Each emotion category has a number of songslisted in it. When the user's expression is classified with the help of SVM algorithm, songs belonging to that category.

Recommendation Therapy Module

This module is responsible for generating a playlist of relevant songs for the patient. It allows the user to modify the playlistbased on therapist preferences and modify the class labels of the songs as well. Classified songs are mapped to the user's mood. After the mapping procedure is complete, a playlist of relevant songs is generated. Similar songs are grouped together while generating the playlist. Similarity between songs was calculated by comparing songs over 50 ms intervals, centered on each 10 ms time window. After empirical observations, we found that the duration of those intervals is on the order of magnitude of a typical song note. Feature values like an audio file were compared to the values (for an equivalent features) corresponding to audio files belonging to an equivalent class label. The recommendation engine features a twofold mechanism.it recommends songs based on: Patient's perceived mood and Therapist's preference also.

RESULT OF IMPLEMENTATION

The implementation is carried out in Python3.6 or above. Here, for the facial expression recognition purpose testing was carried out on dynamic images to achieve real time performance. The images were taken through the in-built camerafor various individuals. The detected faces are then accustomed train the face, which works on reduction of variance between classes. Fisher face recognition method proves to be efficient because it works better with additional features. Here noise and blurriness are off from the image Fig 4: Real-time Detection of Mouth following which the image is converted from RGB to Grayscale then resized into 300*300 pixels. The results of proposed application are shown here.

Recognizing Different Facial Features

The primary objective is to detect face from a captured image then detecting different facial features to extract patient's emotion in real time environment.

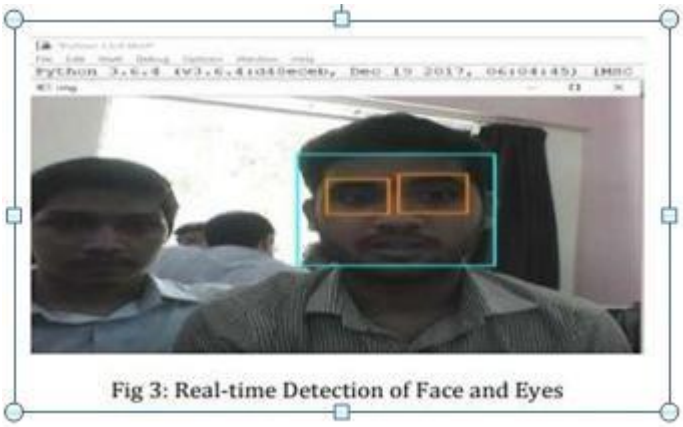

Fig 3: Real-time Detection of Face and Eyes

Fig 4: Real- time Detection of Face and Eyes

Facial Expression Extraction

Different type of expression of patients can be extracted like Happy, Sad, Neutral, Disgust, Anger, Fear, and Surprise.

Fig 5: Happy and Disgust Emotions

The GUI for Music Therapy

Fig 6: Graphical User Interface

CONCLUSION

The intelligent system is created keeping in mind the simplicity of use by the therapist and to enable them the power of machine learning for their day-to-day work. This musical treatment system was made keeping in mind the ease of use and intuitive interface of the music player for listening music of the required mood. Once the user opens the application and runs the program, the program automatically detects the emotions of the person in front of camera and plays the music accordingly. The online music player is built by using HTML, CSS and java script, making it very robust and sturdy. The main highlight of the music therapy application is it automatically plays music and has an option for further improving the trained model by choosing the training of model again.

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