International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 09 Issue: 06 | Jun 2022 www.irjet.net p-ISSN: 2395-0072

SMART MUSIC PLAYER BASED ON EMOTION DETECTION

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Abstract -*A user's emotion or mood can be detected by his/her facial expressions. These expressions can be derived from the live feed via the system's camera. A lot of research is being conducted in the field of Computer Vision and Machine Learning, where machines are trained to identify various human emotions or moods. Machine Learning provides various techniques through which human emotions can be detected. Music is a great connector. Music players and other streaming apps have a high demand as these apps can be used anytime, anywhere and can be combined with daily activities, traveling, sports, etc. People often use music as a means of mood regulation, specifically to change a bad mood, increase energy level or reduce tension. Also, listening to the right kind of music at the right time may improve mental health. Thus, human emotions have a strong relationship with music. In our proposed system, a mood-based music player is created which performs real time mood detection and suggests songs as per detected mood. The objective of this system is to analyze the user's image, predict the expression of the user and suggest songs suitable to detect mood.*

Key Words: **Emotion, CNN, Computer Vision, Features**

1. INTRODUCTION

Facial expressions give important clues about emotions. Computer systems based on affective interaction could play an important role in the next generation of computer vision systems. Face emotion can be used in areas of security, entertainment and human machine interface (HMI). A human can express his/her emotion through lip and eye. The Human Emotions are broadly classified as Happy, Sad, Surprise, Fear, Anger, Disgust, and Contempt. Music plays an important role in enhancing an individual's life as it is an important medium of entertainment for music lovers and listeners and sometimes even imparts a therapeutic approach. In today's world, with ever-increasing advancements in the field of multimedia and technology, various music players have been developed with features like fast-forward, reverse, variable playback speed, local playback, streaming playback with the multicast streams and including volume modulation, genre classification etc. Although these features satisfy the user's basic requirements, yet the user has to face the task of manually browsing through the playlist of songs and select songs based on his current mood and behavior.

1.1 PROBLEM DEFINITION

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. 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. It is impossible for the individual to search from his long playlist for all the heavy rock music. The individual would rather choose the songs randomly. This drawback can be overcome by creating an Smart Music Player Based On Emotion Detection where the mood of the person can be detected and recommend music accordingly. Human Face is taken as the Input and emotion is identified. Song that portrays the emotion is the output.

1.2 OBJECTIVE

The main objective of the work is to identify the emotion of the user and recommend songs based on the identified emotion. The human face is an important organ of an individual 's body and it especially plays an important role in extraction of an individual 's behaviors and emotional state. The webcam captures the image of the user. It then extracts the facial features of the user from the captured image and identifies the emotion.

1.3 SCOPE

Facial expressions are a great indicator of the state of a mind for a person. Indeed, the most natural way to express emotions is through facial expressions. Humans tend to link the music they listen to, to the emotion they are feeling. The song playlists though are, at times too large to sort out automatically. The work sets out to use various techniques

for an emotion recognition system, analyzing the impacts of different techniques used.

2. LITRATURE SURVEY

[A]Title:-Facial Expression based Song Recommendation: A Survey
Authors:- Armaan Khan ,Ankit Kumar
Publication Journal & Year:- IRJET-2021.

Summary:- This application detects facial photo by using a device camera This type of recommendation system will be very useful for people because of its de-pendency on the user's emotions rather than the user's past history. recent development in different algorithms for emotion detection promises a very wide range of possibilities. This system can reduce the manual work of creating a playlist by a user and automatically create a playlist for the user and he can spend that time listening to music. it will also help in reducing the time it takes for a user to search for a song according to his current mood.

[B]Title:- A MACHINE LEARNING APPROACH FOR EMOTION BASED MUSIC PLAYER
Authors:- Ashwini Rokade , Aman Kumar Sinha , Pranay Doijad
Publication Journal & Year:- IJASRT, 2021.

Summary:- the automatic facial expression based on human emotions. Here number of technologies developed for emotion detection and music recommendation has been studied. This survey revealed that a significant amount of efforts have been made on enhancing emotion detection from the human face in real life. It just make simple the process of selecting the song manually all the time depending on the type of the song he/she want to listen.

[C]Title:- A Survey on Autonomous Techniques for Music Classification based on Human Emotions Recognition
Authors:- Deepti Chaudhary , Niraj Pratap Singh and Sachin Singh
Publication Journal & Year:- IJCDS, 2021

Summary:- The detailed discussion of datasets used for ATMC, database analysis methods, pre-processing, audio features, classification techniques and evaluation parameters is provided. As it has already been discussed that emotion is considered as parameter for music classification by MIREX in 2007, still there are many open issues that are to be considered as discussed in previous section. The issues regarding collection of large music dataset and their proper database analysis is still unsatisfactory and needs lot of attention so that the songs of all the genres and languages can be considered by researchers working in this field.

[D]Title:- EMO-(Emotion-Based Music Player)
Authors:- Sarvesh pal,Ankith Mishra
Publication Journal & Year:- IEEE, 2021.

Summary:- The system is thus intended to provide a cheaper, additional hardware-free and accurate emotion-based music system to Windows operating system users. Emotion based music systems will be of great advantage to the users looking for music based on their mood and emotional behavior. The system will help to reduce the time to search the music according to the mood of the user. By reducing the unnecessary time to compute, this increase the overall accuracy and efficiency of the system.

[E]Title:- Emotion Based Smart Music Player
Authors:- Kodamanchili Mohan, Kalleda Vinay Raj, Pendli Anirudh Reddy, Pannamaneni Saiprasad
Publication Journal & Year:- IJSCSEIT, 2021.

Summary:- The proposed system processes images of facial expressions, recognizes the actions related to basic emotions, and then plays music based on these emotions. In the future, the application can export songs to a dedicated cloud database and allows users to download desired songs, as well as to recognize complex and mixed emotions. Therefore, the developed application will provide users with the most suitable songs based on their current emotions, thereby reducing the workload of users creating and managing playlists, bringing more fun to music listeners, not only helping users, but also songs can be organized systematically.

3. EXISTING SYSTEM

The existing music player does not have the emotion analysis engine. The classification of songs takes time as it demands manual selection. Users must classify the songs into various emotions and then select the song. Randomly played songs may not match the mood of the user due to lower accuracy. Sound Tree is a music recommendation system that can be integrated into an external web application and deployed as a web service. It uses people-to-people correlation based on the user's past behavior such as previously listened, downloaded songs. Music.AI uses the list of moods as input for the mood of the user and suggests songs based on the selected mood.

4. PROPOSED SYSTEM

In our proposed system, a Smart Music Player Based on Emotion Detection is created which performs real-time emotion detection and suggests songs as per detected emotion. This becomes an additional feature to the traditional music player apps that come pre-installed on our mobile phones. The objective of this system is to analyze the user's image, predict the expression of the user and suggest songs suitable to the detected emotion. Advantages are the

songs are recommended based on the emotion detected. It is an automated system where the user need not select the emotion manually.

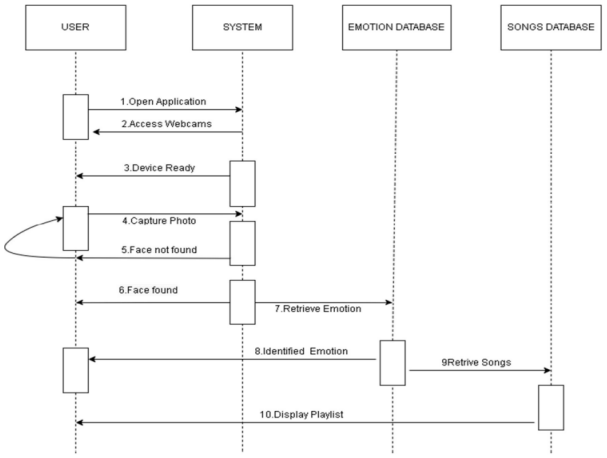

Fig. 1: Sequence Diagram

5. METHODOLOGY

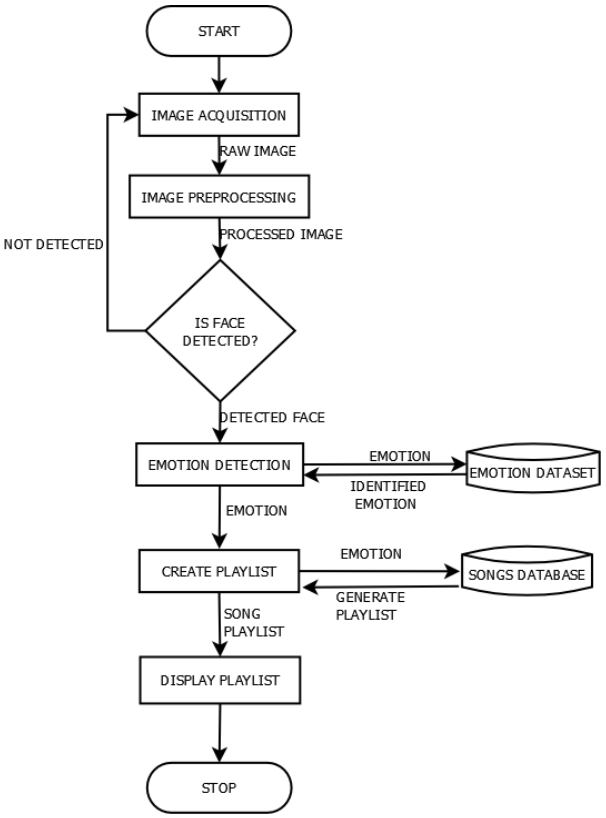

Fig. 2: Flowchart

5.1 Face Detection Module

The object recognition using cascaded classifiers based on Haar function is an effective method of object recognition. This algorithm follows machine learning approach to increase its efficiency and precision. Different degree images are used to train the function. In this method, the cascade function is trained on a large number of positive and negative images. Both face images and images with no face are used to train at the beginning. Then extract features from it. For this Haar-traits(drawing properties) are used. They are similar to our convolution kernel, each feature is a separate and single value, which is obtained by removing the sum of the pixels falling under the white rectangle from the sum of pixels falling under the black rectangle.

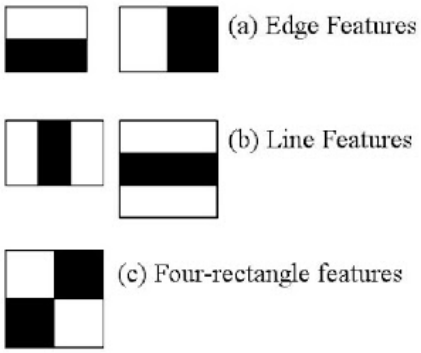

Fig. 3: Haar Features

Detection of feature points: It detects feature points on its own. For facial recognition, the RGB image is first converted into a binary image. If the average pixel value is less than 110, black pixels are used as substitute pixels, otherwise, white pixels are used as substitute pixels.

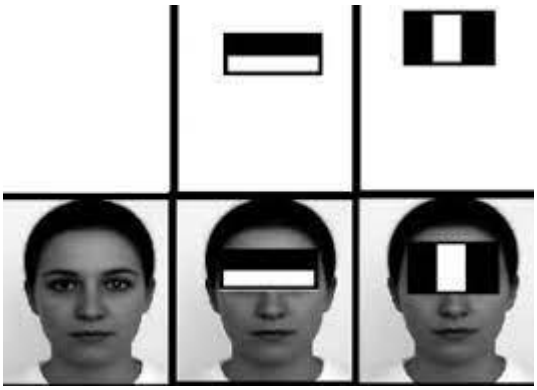

Fig .4: Haar Feature Extraction Of Face

Now, all possible models and positions of all cores are used to estimate many functions. But of all these functions we calculated, most of them are not relevant. The figure below shows two good attributes in the first row. The first function

selected seems to focus on the attribute that the eye area is usually darker than the nose and cheek areas. The second function selected is based on the fact that the eyes are darker than the bridge of the nose.

5.2 Emotion Detection Module

For feature extraction, CNN is used. For the emotion recognition module, we have to train the system using datasets containing images of happy, anger, sad and neutral emotions. In order to identify features from dataset images for the model construction, CNN has the special capability of automatic learning. In other words, CNN can learn features by itself.

CNN has the ability to develop an internal representation of a two-dimensional image. This is represented as a three-dimensional matrix and operations are done on this matrix for training and testing.

Five-Layer Model: This model, as the name suggests, consists of five layers. The first three stages consist of convolutional and max-pooling layers each, followed by a fully connected layer of 1024 neurons and an output layer of 7 neurons with a soft-max activation function. The first convolutional layers utilized 32, 32, and 64 kernels of 5*5, 4*4, and 5*5. These convolutional layers are followed by max-pooling layers that use kernels of dimension 3*3 and stride 2, and each of these used ReLu for the activation function. The visual representation of the model architecture is shown in below figure.

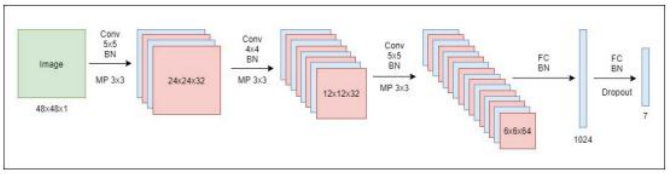

Fig. 5: 5 Layer CNN Model

Accuracy can be increased by increasing the number of epochs or by increasing the number of images in dataset. The input will be given to convolution layer of the neural network. The process that happens at convolution layer is filtering. Filtering is the math behind matching. First step here is to line up the feature and image patch. Then multiply each image pixel by the corresponding feature pixel. Add them up and divide by the total number of pixels in the feature.

5.3 Music Recommendation Module

The output of neural network classifier is one of the four emotion labels: happy, anger, sad and neutral. HTML pages with user interface for each emotion are designed for the system in such a way that once the emotion of user is identified, playlist corresponding to that emotion will be displayed in the screen. The first song in the playlist of the page displayed will be played first. Songs are selected such that it reflects the emotion of the user.

6. RESULTS

Following are the screenshots of the interface and output of the proposed system.

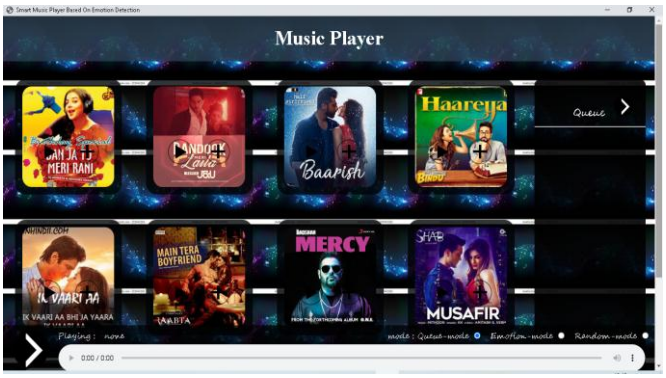

Fig. 6: Home Page

Fig. 7: Song played when Happy emotion detected

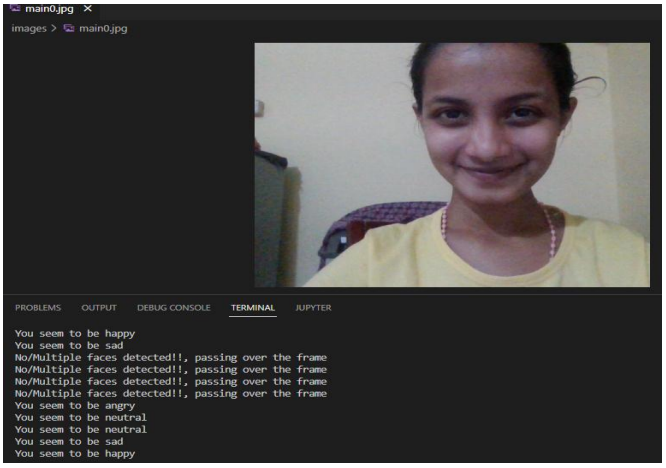

Fig. 8: Happy Emotion Detected

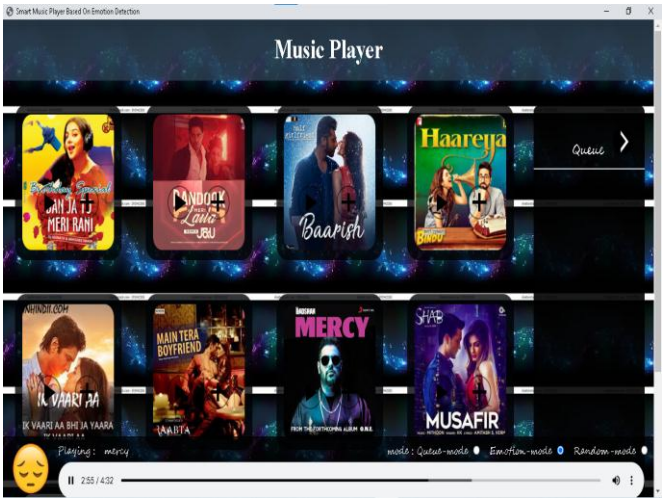

Fig. 9: Song played when Sad emotion detected

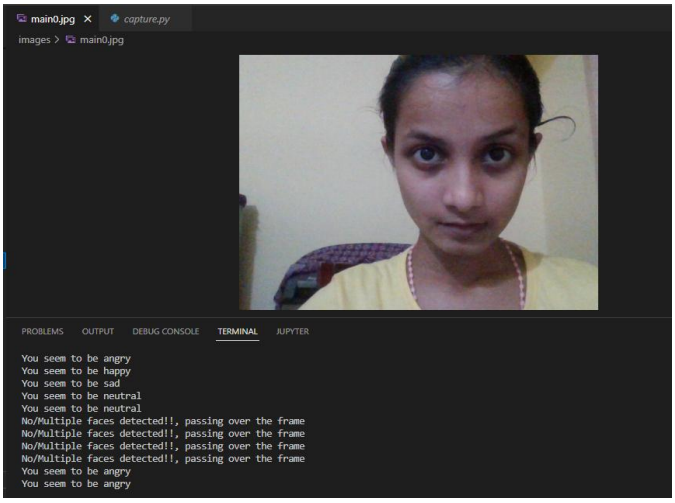

Fig. 12: Angry Emotion Detected

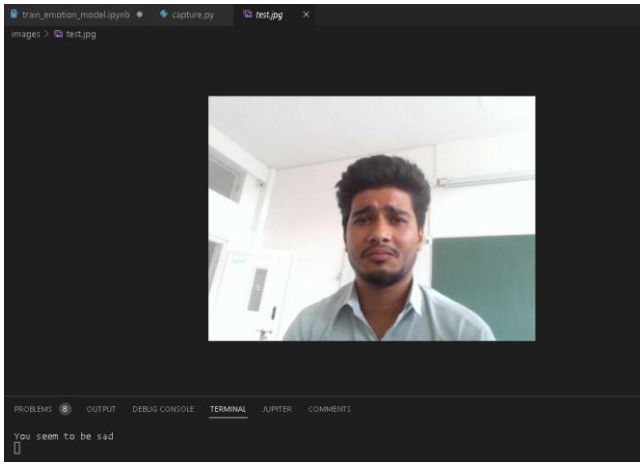

Fig. 10 : Sad Emotion Detected

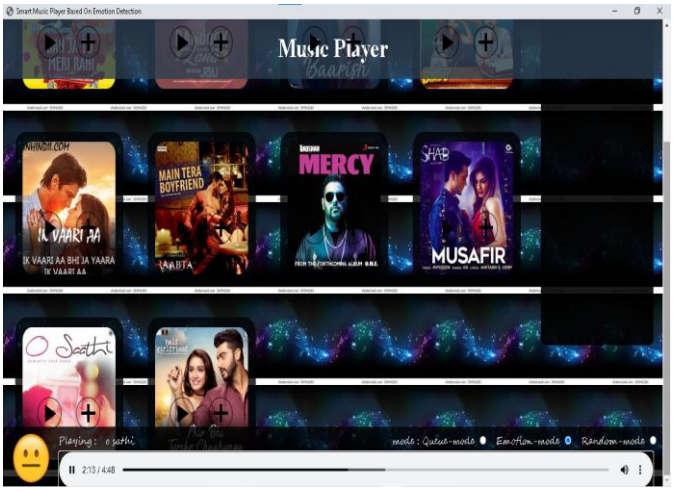

Fig. 13 : Song played when Neutral emotion detected

Fig. 11: Song played when Angry emotion detected

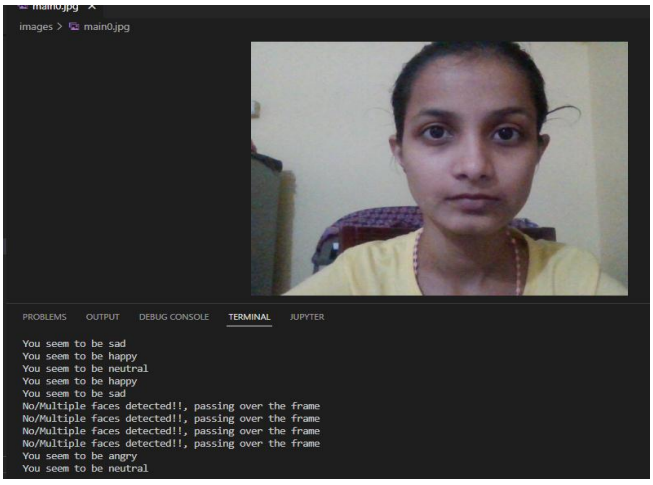

Fig. 14: Neutral Emotion Detected

Fig. 15 : Random Mode

7. CONCLUSION

A music player which plays songs according to the user's emotion has been designed. The system has been divided into different modules for implementation which includes face detection, emotion detection and song classification. The proposed system is designed as an emotion aware application which provides a solution to the tangible approach of manual segregation of large playlists. Implementation of static face detection is done using Viola Jones Algorithm and testing of the same was done using images from different facial datasets. Dynamic face detection will be implemented as future work so that users can analyze emotions real time and such an application involves computational complexity and larger amount of dataset for getting higher accuracy level. The CNN classifier is designed in such a way that 4 emotion labels can be recognized: happy, anger, sad and neutral and more emotions can be worked for in the future.

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