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Emotion Based Music Player

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Abstract*—Music plays an important role in human beings life. It is proven that listening to music helps in reducing stress and produces dopamine (hormone) which regulates in good/relaxed mood. Music player is an application for playing digital audio files and allow users to organize their multimedia collection, play songs. Artificial intelligence (AI) is a technology that enables a machine to simulate human behavior. Machine learning is a subset of Artificial Intelligence which allows a machine to auto- matically learn from past data without programming explicitly. The goal of Artificial Intelligence is to make smart computer to solve complex problems, Emotion based music player uses Artificial intelligence and Machine Learning to make decisions and recognize the emotions regarding identification of Facial expressions. It is a tedious job to select a song as there are thousands of songs in a playlist, consequently users face the problem of selecting songs manually through the playlist based on their current mood, Thus Emotion based music player is being implemented. Human emotion detection is in need of demand, the modern artificial intelligent systems can emulate and gauge reactions from face. Machine learning algorithms are suitable for detection and predictions of emotions. A camera captures user's image, detects the person's expression, maps the mood and plays music according to the playlist accomplished. Emotion Based Music Player helps the user by sensing their emotion, plays the song, also recommends related songs that would comfort or resonates to the user's state of mind. An image of the user is captured by the system. The image gets analyzed by software and will be classified into happy, sad, neutral, angry emotion. The data gets extracted and detected with the training datasets. The music playlist will be displayed and songs will be played to boost the user's mood after successful detection of the face and mapping of emotional sentiments.

I. INTRODUCTION

When using conventional music players, the user had to manually browse the playlist and choose songs that would lift his or her spirits and emotional state. The work required a lot of labour, and coming up with a suitable list of tunes was frequently difficult. The development of Music Information Retrieval (MIR) and Audio Emotion Recognition (AER) pro- vided the traditional systems with a function that automatically parsed the playlist based on various emotional classifications. The goal of Audio Emotion Recognition (AER) is to classify audio signals according to distinct emotional categories using certain audio properties. An important aspect of the study of music information recognition (MIR) is the extraction of distinct audio aspects from an audio stream.By eliminating the need for manual playlist segmentation and song anno- tation based on user emotion, AER and MIR improved the functionality of conventional music players. However, these systems lacked the necessary mechanisms to allow a music player to be controlled by a user's emotions. Information retrieval methods are less efficient since the current algorithms produce unpredictable returns and frequently increase the sys- tem's overall memory overheads. They are unable to quickly extract useful information from an auditory source. Current audio emotion recognition algorithms use mood models that are slackly connected to a user's perception.The state-of-the-art lacks designs that can create a personalised playlist by deducing human emotions from a facial image without using additional resources. The current designs either use extra hardware or human voice. The project suggests an approach designed to reduce the downsides and flaws of the current technology. The project's main goal is to create a precise algorithm that will produce a playlist of songs from a user's playlist in accordance with that user's emotional state. The algorithm is less computationally intensive, uses less storage, and costs less to use more hardware. It classifies face images into one of four categories: sad, angry, neutral, or happy.

II. PROBLEM STATEMENT

One's life is significantly impacted by music. It serves asa significant form of entertainment and is frequently used therapeutically. The development of technology and ongo- ing breakthroughs in multimedia have led to the creation of sophisticated music players that are rich in features like volume modulation, genre classification, and more. Although these capabilities effectively met each person's needs, a user occasionally felt the need and desire

to browse through his playlist in accordance with his mood and emotions. The work required a lot of labour, and finding the right song list was frequently difficult. Therefore, an emotion-based musicplayer will employ face feature tracking and facial scanning to identify the user's mood and then create a customised playlist for them, making the procedure simple for them. It will give music lovers and connoisseurs a better experience.

III. MOTIVATION

The primary goal of an emotion-based music player is to provide user-preferred music with emotion identification by automatically playing songs based on the user's feelings. In the current system, the user must manually choose the tunes because songs generated at random may not suit the user's mood. The user must first categorise the songs into several emotion groups before manually choosing a certain emotion. Using an emotion-based music player will help you avoid com- plications. The music will be played from the predetermined folders in accordance with the emotion detected.

IV. OBJECTIVES

The primary objective of an emotion based music player is to improve the existing music player. In given approach it helps the user to automatically play songs based on the emotions ofthe user.

- Characteristics of facial expressions are captured usingan inbuilt camera.
- The captured image is filtered to grayscale image.
- The Extraction of facial features
- The emotion of the user's image will be mapped.
- Generating songs based on user preference.

V. RELATED WORKS

Deebika, Indira, Jesline[1] have proposed Machine Learning Based Music Player by detecting emotions. The purpose of capturing the image is to be detect the mood of a person. Classifying the songs based on emotion could then be used after detecting the emotion. Initially, after capturing emotion is detected through extraction of features like mouth, eyebrows and eyes. The crucial part of a person's body and the one which plays a crucial role in knowing someone's mood is face. For the process of extraction of input, webcam or mobile camera is employed. The purpose of capturing the image isto detect the mood of a person. The information to be used to retrieve a list of songs accordingly. Classifying the songs based on emotion could then be used after detecting the emotion. Initially, after capturing emotion is detected through extraction of features like mouth, eyebrows and eyes. Depending on the emotion detected, the mapping of emotion to the list of songs in accordance to the mood is done and thereby song is played. PyCharm tool is implemented for analysis, the overall process involving feature extraction and segmentation. For emotion detection, human face is to be recognized first and hence the human face is given as input image. The image undergoes image enhancement, where tone mapping is applied to images for maximizing the image contrast. The combination of two features that is eyes and lips is adequate to convey emotions accurately

Charvi, Kshijith, Rajesh, Rahman[2] have proposed Emotion Detection and Characterization using Facial Features. The objective of filter is to find the face in an image givenas input. In each sub window Haar features are calculated and the difference is compared with the learnt threshold that separates objects and non-objects. Face detection is done by Viola jones algorithm using HAAR based feature filter. The Fisherface classifier uses Principal Component Analysis and Linear Discriminant Analysis, both of which contribute to its accuracy. PCA aims to reduce dimensionality, such thatvariables in the dataset are reduced to minimum. The datasetused here is cohn-kenade consisting of 500 images of genres such as happy, sad, neutral and angry. The new set of variables, called principal components makes the classification much simpler in terms of space complexity. It gives a precision output of 0.74 .Needs only 2 features for detecting the emotion of a complete face, which satisfyingly decreases amount of storage data necessary for testing and for future applications. Karthik Subramanian Nathan, Manasi arun, Megla S Kan-nan[3] have proposed Emotion based Music Player for An-droid. The implementation is divided into two phases face detection and feature extraction. User takes a picture of himself/herself or uploads a picture from the gallery. The face rectangle is computed using a Face API. Viola Jones algorithmuses HAAR filter to obtain the internal image with coordinate points of given input facial features. These coordinates are used to classify the emotion depicted in the image using Support Vector Machine classifier. Based on the results of the classifier each emotion tag is assigned a score and the tag with the maximum score is returned as the emotion of the user. To implement the above module, Microsoft Cognitive Service Emotion API was utilized to analyse the face

rectangle and the corresponding emotion was returned. The audio signal is first divided into short-term windows (frames) and for each frame 8 features are calculated. The emotion was mapped according to the Valence-Arousal Co-ordinate System. The dataset consists of 50 voice samples whose valence and arousal values are known. The 50 voice samples are in wav format. Therefore, each mp3 song needs to be converted to .wav format. The average amount of time needed to determine the valence and each song needs to be 54 seconds long to be considered arousing. The features of the mp3 file were then translated to wav format. Once the results from the music analysis have been obtained, the title of the music as well as its arousal, valence, and mood the playlist is created, together with song and face emotion are calculated, the outcomes are significantly superior to other players of music that solely track facial expressions and keep a bundle of songs datasets.

VI. METHODOLOGY

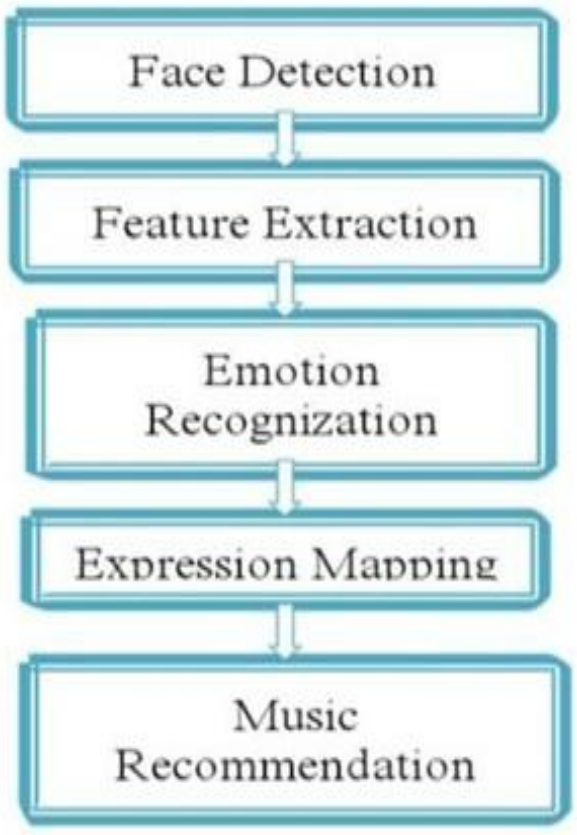

Fig. 1. Emotion based music player methodology

A. *Face Detection*

The goal of face detection is to locate human faces in pictures. The Face detection begins by looking for human eyes(which are the simplest traits to find),nose and mouth. Using the Haar Cascade Algorithm, comprehensive facial detecting technology which produces precise results. The Objects are identified via a machine learning object detection software. The programme needs lots of photos that are favourable to train the classifier, usage of negative photos of non-faces and faces are used as shown in figure 1.

B. *Feature Extraction*

For methods like face tracking, facial emotion detection, or face recognition, facial feature extraction is crucial. The technique of removing facial features from a human face image, such as eyes, nose, mouth, and so forth. For face identification, it consists of segmentation, image rendering, and scaling. Principal component analysis and Fisherface Algorithm, also known as Fisher Linear Discriminate, are two methods used to combine data. In Fig. 1. After emotion detection, music recommendation (PCA), and linear analysis process, a message is shown to the user (LDA). Data are analysed using PCA to look for patterns and reduce the computational complexity of the dataset with the least amount of information loss. They can extract facial features with greater accuracy for human face identification. LDA finds a linear projection of high dimensional data into a lower dimensional subspace.

C. *User Emotion Recognition*

A technology called facial emotion recognition is utilised for analysing sentiments by different sources. Fisher face is an algorithm which works on the basis of Linear discriminate analysis and Principal component analysis concept. Initially takes classified photos, minimise the data's dimension and by determining its according to the specified categories, statistical value is stored as values.

D. *Emotion Mapping*

Expressions can be classified to basic emotions like anger, disgust, fear, joy, sadness, and surprise. User given expression is compared with the expressions in the dataset. It displays the mapped expression as a result.

E. *Music Recommendation*

The last step is music recommendation system, is to provide suggestions to the users that fit the user's

preferences. The analysis of the facial expression may lead to understanding the current emotional of the user. Based on the emotion of the user the related playlist will be recommended.

VII. ALGORITHMS

A. Haar cascade

Face detection is a hot topic with many practical applications. Modern smartphones and laptops have face detection software built in that can verify the user's identification. Numerous apps have the ability to capture, detect, and process faces in real time while also determining the user's age and gender and applying some really amazing filters. The list is not just restricted to these mobile applications because face detection has numerous uses in surveillance, security, and biometrics. The initial Object Detection Framework for Real Time Face Detection in Video Footage was put forth by Viola and Jones in 2001, however, and that is where its Success stories have their roots.The purpose of this essay is to examine some of the intriguing ideas put out by the Viola-Jones Face Detection Technique, also known as the Haar Cascades. Long before the Deep Learning Era even began, this work was completed. However, when compared to the potent models that can be created using current Deep Learning Techniques, it is a superb piece of work. The algorithm is still virtually universally applied. In GitHub, it offers models that have been fully trained. It moves quickly. It's fairly true.The locations of many facial features, like the centres of the pupils, the inside and outer corners of the eyes, and the widows peak in the hairline, had to be manually determined. Twenty distances, including the mouth and eye widths, were calculated using the coordinates. In this way, a person could process around 40 images in an hour and create a database of the calculated distances. Then, a computer would automatically compare the distances for each image, figure out how far apart they were, and then return the closed records as a potential match. It is an Object Detection Algorithm that is used to find faces in still photos or moving videos. The edge or line detection features Viola and Jones suggested in their 2001 study "Rapid Object Detection using a Boosted Cascade of Simple Features" are used by the technique. To train, the algorithm is given a large number of positive photos with faces and a large number of negative images without any faces. The model produced by this training is accessible at the OpenCV GitHub repository. The models are housed in this repository as XML files and maybe read using OpenCV functions. These comprise models for detecting faces, eyes, upper and lower bodies, licence plates, and so forth.

B. Fisher Face

One of the extensively used face recognition algorithms is Fisherface. It aims to optimise the separation between classes during training, making it preferable to other methods like eigen face. By leveraging GUI applications and databases that are employed in the form of a Papuan facial picture, the aim of this research is to develop a programme of face recognition application using the Fisherface approach. Fisher's Linear Discriminant (FDL) or Linear Discriminant Analysis (LDA) methods are used to obtain features of an image's characteristic in order to recognise it. These methods are based on the Princi- pal Component Analysis (PCA) method's reduction of the face space dimension. Fisherface is the algorithm utilised in the image recognition process, and minimal Euclidean is used for face image matching or identification. The results show that for image recognition where the testing image is identical to the training image, the program's success rate is 100; however, for73 facial test images with various expressions and positions, 70 faces are correctly recognised and 3 faces are incorrectly recognised, meaning that the program's success rate is 93.

VIII. RESULTS

A. The Interface

The interface of emotion based music player consists of Logo and the tagline as "Let music flow and enrich your soul". The interface has all songs aligned according to the emotions designed i.e Happy, Sad, Neutral, and Angry. There are three types of mode described such as Queue mode, Emotion Mode and Random Mode. The emotion detected by the user is Happy and the song is played accordingly as shown in figure 2

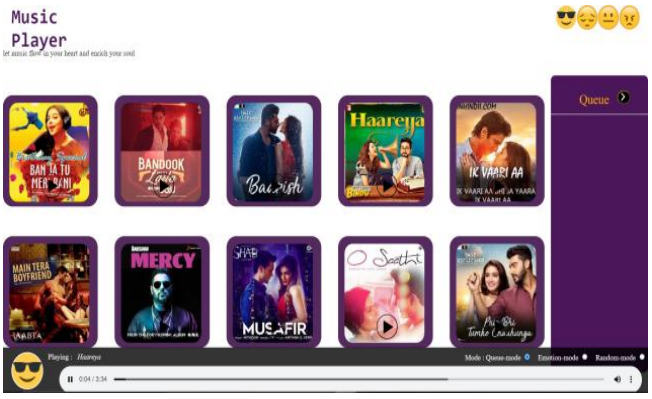

Fig. 2. Emotion Based Music Player playing Happy song

B. *The Emoji*

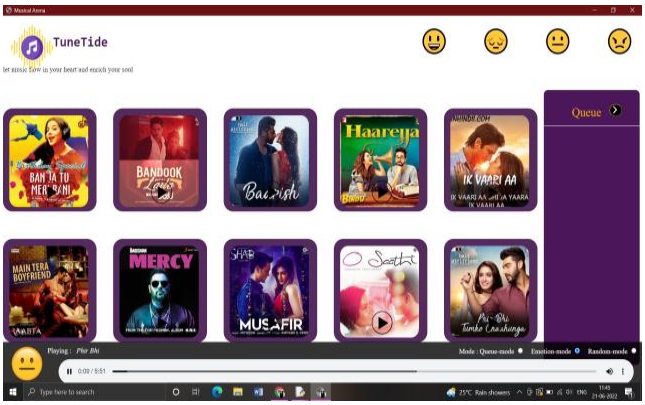

Fig. 3. emotion based music player playing neutral song

The interface also has four emoji's lined up, when the user places the cursor on the emoji, the song will be played accordingly according to emoji described such as Happy,Sad, Neutral, Angry as shown in figure 3.

C. *Emotion Detection*

The interface capturing user's face, mapping emotions and detecting the user's mood as neutral as shown in figure 4.

D. *Message*

After successful detection of the user's mood and the song is played, there will be a message produced in the background according to the emotion detected as shown in figure 5.

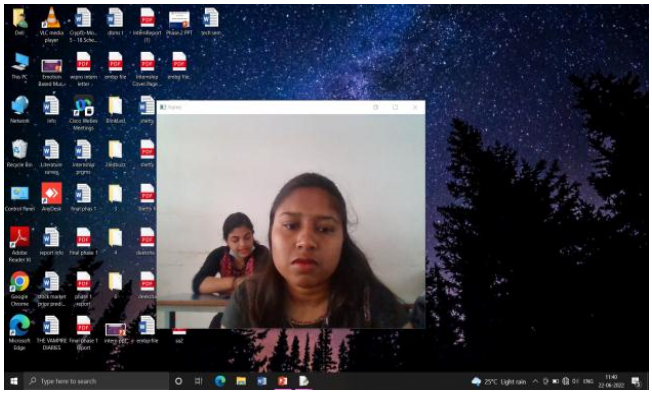

Fig. 4. Emotion detection as neutral

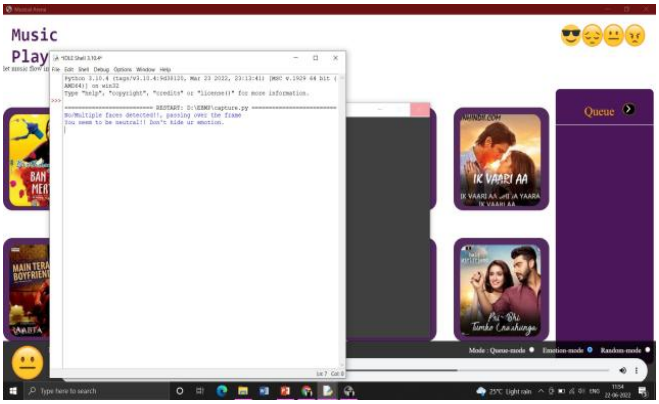

Fig. 5. A message displayed to user after emotion detection and songrecommendation

CONCLUSION

The Emotion based music player has been developed. The music player provides custom playlist of music according to users emotion by real-time analysis of the Facial emotion ex- pressed and according to the emotion the playlist is generated. EBMP have far superior results than other music players that only analyse facial emotions and maintain a fixed song dataset since both Facial And Song Emotion are computed. The music player also has an additional feature which is not in existing system, which is selecting emoji's and the song is played accordingly. There are four moods deployed that is Happy, Sad, Neutral, Angry, When the user clicks on the emoji, the song will be played.

FUTURE ENHANCEMENTS

Songs can be exported to a cloud database so that customers can download whatever song they desire because mobile applications have a finite amount of memory. When we can only use cloud storage for additional memory needs, it is not practical to store a tonne of music inside an app. This also broadens the spectrum of songs we are working with and hence will improve the results. Identification of Complex and Mixed Emotions, Currently only four prominent emotions are being examined and there may be certain other emotions that a facial expression may convey. The user can add mixed emotions to the classes in order to maximise efficiency and prevent incorrect classification of emotions. Analysing the song lyrics and estimate the emotion of the song and combine the emotion with the emotion of the song. Including voice input for faster emotion recognition.

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