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A Survey on Emotion-Based Music Player

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Abstract - *The human face is an essential part of an individual's body, and it plays a significant role of general knowledge of an individual's psychological state. The appropriate human figure feedback can now be imported directly through the use of a monitor. They can then use this input in many ways. One implementation of this input may be to extract the information in order to deduce an individual's mood. Then, this data can be used to get a list of emotional state-compliant songs derived from the actually provided input. The aim of Facial Emotion Based Music Player is to scan and interpret the data and hence to create a play list depending on the parameters provided. It could however be inappropriate if the music doesn't match the listener's present emotion. In addition, there is no music player that can select songs based on an individual's emotions. This does away with the time consuming. This paper offers an emotion-based music player to resolve this issue, which can suggest songs based on an individual's emotions; sad, happy, neutral or impartial and angry.*

***Key Words*: Music player, Mood, Facial detection, Emotion Recognition.**

1. INTRODUCTION

Music Player entirely predicted on Facial Emotion is an interactive, sophisticated and innovative desktop-based application that could be used in a different manner as a music player. The application works in a different way from the traditional software, as it scans and characterizes the music files on the device and according to predefined parameters (Audio Features) present on the application to generate a set of playlists based on moods. The application's real-time user interface input (Facial Expression Recognition) is classified to generate a "mood" which are then used it to choose the recommended playlist from the original set[1].

The music's emotional definition is subjective and therefore depends on many factors such as location, tradition and culture, whereas a song's mood classification varies depending on various psychological conditions. Music listeners, collectors or psychologists may widely use mood wise music to categorize their collection of music, or to help settle their clients. This field of research is unexplored by many despite such enormous use, therefore classification task becomes much more complicated, yet significant.

The music database is growing exponentially as the audio data in the digital environment is also improving. Creating databases for this kind of database has been working to develop the emotion based music player. Due to the improvement in technological development and the regular growth of the web, the music-related network is consistently going to increase.

This has prompted an extensive music database which is definitely difficult to categorize manually depending on the music's emotional states. Subsequently, such a large assignment needs to be developed with less time consuming technique. In addition, the modifications in a mood's meanings after some time led to an enhanced issue for its classification. For illustration, the music that we are listening to today is not really the same as it was 20 years before.

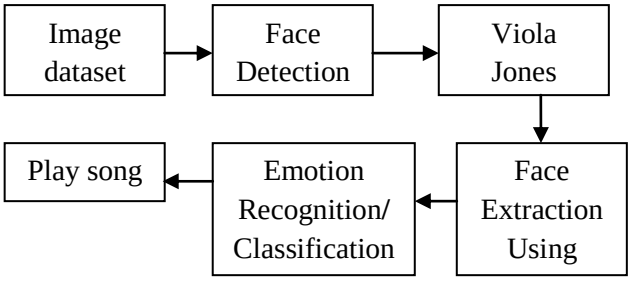

Fig -1: Block Diagram of Moody Player

2. LITERATURE SURVEY

Anuja Arora ; Aastha Kaul ; Vatsala Mittal [2], they submitted a program in which the DEAM data set was used to classify the emotions. It has more than 2800 songs with 4 emotions annotated: Happy, Sad, Angry and Relax, and with their values of valence and

excitement. The idea behind this article is to pay attention to predicting emotions of an audio file as to how good audio elements are used in the music player.

Sushmita G. Kamble and A. H. Kulkarni [3], they proposed a system in which they used PCA(Principal component approach) for feature extraction. To classify and recognize the expression Euclidean distance classifier was used. Then, the user's corresponding emotional state is recognized. When the user's expression is recognized, songs belonging to that category are then played. They used the database with 7 expressions of 4 individual's persons that results into 112 trained images.

S. L. Happy and A. Routray [4], image from database is passed to the facial landmark detection stage to remove noise by applying Gaussian Filter or mask. Here itself they used Viola Jones technique of Haar-like features with Adaboost learning for face detection. The feature detection stage consists of Eyebrow corners detector, Eye detector, Noise detector, Lip corner detector. After this active facial patches are extracted, The classification of features is done by SVM (Support Vector Machine). While testing it will take the hundreds of images from the database and extract the features and classifies accordingly. They used CK+ (Cohn-Kanade) dataset and JAFEE dataset for training and testing the database. The training database consist of 329 images in total.

Deepak Ghimire, Sung Wan Jeong, Joonwhoan Lee,Sang Hyun Park [5], the input images are selected from the training set. After this Landmark detection & Local representation will be done. By using LBP (Local Binary Pattern) algorithm, Local regions LBP features and Local Regions NCM (Normalized Centre Movement) features are extracted. Both the extracted features are added together and all these are passed to the SVM (Support Vector Machine) classifier. CK+ dataset consisting of 593 sequences of different emotions from 123 subjects by using this dataset a human facial expression can be clearly identified. Only 327 out-off 593 sequences were given label for the human facial expression. They used at least two peak expression frames for anger, fear, sadness and one peak expression frame for disgust, happy, surprise. The system was trained with 6 types of facial expression.

KrittrinChankuptarat,Raphatsak,Sriwatanaworachi, Supannada Chotipant [6],proposes a mobile music player application which is able to recommend songs based on the user emotion.When the application receives a user heart rate from a smart band or a face image from a mobile camera, it analyses what the user emotion is. Then, it suggests songs whose moods are relevant to that user emotion. The user and song emotions in this paper are divided into four types namely: neutral, happy, sad and angry. The experimental results present that detecting the happy emotion is the most precise with around 98%, while the accuracy of the sad mood detection is the lowest with 40%.

Cyril Laurier and Perfecto Herrera, Mood Cloud [7], a real-time music mood visualization tool, Mood Cloud classifies music emotions into 5 types namely: aggressive, happy, party, relax and sad. It applies the SVM library to analyze the emotion dataset. The result is then presented by using a Flash player.

3. SYSTEM ANALYSIS AND DESIGN

A. Existing Music Player Applications

The existing applications for music players are being evaluated to establish an appropriate application. There are currently 3 major streaming music applications with a large percentage of users.

- Apple Music: The well-known worldwide music streaming application. The advantage of this application is the music suggestion by user favorite; however, the subscription cost is quite high.
- Spotify: Another worldwide music streaming application. It also suggests songs based on the user's data collection. Moreover, the subscription cost is much cheaper than Apple Music.
- Wynk Music: This is a music streaming & downloading app, for every mood! it has more than 1.8 million songs across Indian and International music. Stream and download songs by genres, moods, artists or simply tune into one of the many Radio channels and let it surprise

The overview of the programs mentioned is illustrated in Table I. These applications can recognize user emotions and recommended tracks you.

Table -1: Music Streaming Application Comparison

	Online Music Streams	Offline Music	Create playlist	Search	Karaoke Music	Emotion Detection
Apple Music	Yes	Yes	Yes	Yes	No	No
Spotify	Yes	Yes	Yes	Yes	No	No
Wynk Music	Yes	Yes	Yes	Yes	Yes	No
Emotion Based Music Player	Yes	Yes	Yes	Yes	No	Yes

B. System Requirement

The emotion-based music player has 2 actors; namely, admin and user.

1) Admin: this actor can upload the music files on the database. Admin is unable to interfere with any of the users' preferences and playlists.

2) User: this actor can access to all features of this application i.e. playlist creation, user emotion detection, song searching, and song recommendation.

Table II shows the accuracy rate using PCA with different facial expressions, that also trained effectively with audio characteristics

Table -2: Accuracy Rate using PCA Based on Facial Expression

Facial Expression	**Accuracy rate using PCA(%)**
Happy	88.81
Disgust	88.80
Neutral	92.31
Sad	81.12
Anger	94.40
Surprise	92.31
Fear	88.11

C. Facial Recognition Methods

- **Eigen Faces**

In this module, face recognition is discriminating input signals (image data) into several classes (persons). The input signals are highly noisy (e.g. the noise is caused by differing lighting conditions, pose etc.), yet the input images aren't completely random and in spite of their differences there are patterns which occur in any input signal. Such patterns, which may be observed altogether signals might be - within the domain of face recognition - the presence of some objects (eyes, nose, mouth) in any face also as relative distances between these objects. These characteristic features are called eigenfaces within the face recognition domain (or principal components generally). They can be extracted out of original image data by means of a mathematical tool called Principal Component Analysis (PCA). By means of PCA one can transform each original image of the training set into a corresponding eigenfaces. An important feature of PCA is that one can reconstruct any original image from the training set by combining the eigenfaces. Remember that eigenfaces are nothing but characteristic features of the faces. Therefore one could say that the first face image are often reconstructed from eigenfaces if one adds up all the eigenfaces (features) within the right proportion.

- **Fisher Faces**

Bit harder to illustrate in this Module, since they define regions of a face that better differentiate faces from each other. None of them appear to represent different light settings; at least this is not as clear as in the Eigenfaces system.

The Fisherfaces allow a reconstruction of the projected image, a bit like the Eigenfaces did. But it can only identified the features to distinguish between subjects, that can't be expected a nice reconstruction of the original image.

D. User Emotion Recognition

For this model, the Cohn Kanade extended dataset[8] is used. The images are strengthened by contrast trying to limit the equalization of optimized histograms and converted to grayscale in order to ensure standardization and increase classifier productivity.

For face detection where the image is split into specified-size windows, a cascade classifier, treated with face images is used. Each window is moved to the

cascade classifiers and accepted if all the classifiers are passed through, otherwise it is rejected.The faces identified are then used to train the face, which works to reduce the difference between groups. Fisher face recognition approach proves to be effective as it works better with advanced features such as spectacles and facial hair. Illumination is also relatively deterministic.

Throughout the run time of the installation, a photograph is taken which is predicted to belong to some of the emotion classes by the fisher face classifier after preprocessing. The system also allowing the user to modify the model to further, briefly or regularly. The variance within the classes so that only variance would be that of emotional shift are to be identified and suggest the relevant song based on the user's emotion recognized.

E. Music Recommendation

To identify a particular region, the emotion sensed from the image processing is provided as input to the music patterns. So avoid interfacing with a media player or media plugins needing manual installation, then the application interface is used to access the music file. Thus makes the program play music on any system regardless of its music player. Once the Facial Expression was identified and split the image using PCA to accurately know the user's expression and further it will play the music based on the emotion of the particular user.

Table -1: Time for the modules

Module	Time Taken(sec)
Face Detection	0.8126
Facial Feature Extraction	0.9216
Classification using PCA	0.1956
Emotions	0.9994

4. CONCLUSION

The application furthermore aims to provide a simpler, additional hardware-free and reliable emotion-based music system to the Windows operating system users. The Emotion-based music program would help people who are searching for music driven on the emotion and emotional behavior. It could help to reduce the search time for music and thus reduce the unnecessary computational time and thus increase the overall accuracy and efficiency of the system. Not only will the tool relieve physical stress, it also acts as a aid for the music therapy services and can also assist the music therapist in treating a patient. It will also be a complete system for music lovers and listeners, with its additional features discussed elsewhere here.

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