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Implementation towards Smart Music Player Based on Emotion Recognition Using Machine Learning

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ABSTRACT: 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 behaviour and emotional state. Manually segregating the list of songs and generating an appropriate playlist based on an individual's emotional features is a very tedious, time consuming, labour intensive and upheld task. Various algorithms have been proposed and developed for automating the playlist generation process. However the proposed existing algorithms in use are computationally slow, less accurate and sometimes even require use of additional hardware like EEG or sensors. This proposed system based on facial expression extracted will generate a playlist automatically thereby reducing the effort and time involved in rendering the process manually. Thus the proposed system tends to reduce the computational time involved in obtaining the results and the overall cost of the designed system, thereby increasing the overall accuracy of the system. Facial expressions are captured using an inbuilt camera. The accuracy of the emotion detection algorithm used in the system for real time images is calculated.

KEYWORDS: Music Player, Machine Learning, Face Recognition, emotion Detection.

I. INTRODUCTION

The field of science is as big as the universe itself. Every passing day there are new developments; if not big or groundbreaking, but constructive and leading towards a better tomorrow. Sound and Graphics are two vast fields of Science and Engineering that not only intrigue but also attract learners to study them in detail to explore into their depths. Since then, many such inventions have propelled us to this time where thinking of various ideas which might not have been possible a few decades back and more over implementing them is now possible. Now in the present time, where clicking a photo and listening to music "on the go" is just a part of anyone's daily life, providing any improvements in the working of such technologies that in turn make the user experience better are always appreciated. With the improvements in technology the level of sophistication in software has also increased. Also, with the idea of 'keeping it simple developing sophisticated applications is a challenge Facial Expression based Music Player is interactive, sophisticated and innovative mobile (Android) based application to be used as a music player in a different manner. The application works in a different manner from the traditional software as it scans and classifies the audio files present on the device and according to the predefined parameters (Audio Features) present on the application in order to produce a set of mood-based playlists. The real-time graphical input provided to the application is classified (Facial expression recognition) to produce a "mood" which will then be used to select the required playlist from the earlier set. Listening to music is a key activity that assists to reduce stress. Facial expression helps to determine the mood of individual.

Paper is organized as follows. Section II describes about the related work done earlier for the system to be developed. Section III presents method used and algorithms used for the detection. Section IV presents experimental results showing results of images tested. Finally, Section V presents conclusion.

II. RELATED WORK

1) An K. Chankuptarat, R. Sriwatanaworachai and S. Chotipant, "Emotion-Based Music Player," 2019.

Listening to music is a key activity that assists to reduce stress. However, it may be unhelpful if the music does not suit the current emotion of the listener. Moreover, there is no music player which is able to select songs based on the user emotion. To solve this problem, this paper proposes an emotion-based music player, which is able to suggest songs based on the user'semotions; sad, happy, neutral and angry. The applicationreceives either the user's heart rate or facial

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image from a smart band or mobile camera. It then uses the classification method to identify the user's emotion. This paper presents 2 kinds of the classification method; the heart rate-based and the facial image-based methods. Then, the application returns songs which have the same mood as the user's emotion.

2) R. Ramanathan, R. Kumaran, R. Ram Rohan, R. Gupta and V. Prabhu, "An Intelligent Music Player Based on Emotion Recognition," 2017

This paper proposes an intelligent agent that sorts music collection based on the emotions conveyed by each song, and then suggests an appropriate playlist to the user based on his/her current mood. The user's local music collection is initially clustered based on the emotion the song conveys, i.e. the mood of the song. This is calculated taking into consideration the lyrics of the song, as well as the melody. Every time the user wishes to generate a mood-based playlist, the user takes a picture of themselves at that instant. This image is subjected to facial detection and emotion recognition techniques, recognizing the emotion of the user. The music that best matches this emotion is then recommended to the user as a playlist.

3) Henal Shah, Tejas Magar, Purav Shah and Kailas Devadkar "AN INTELLIGENT MUSIC PLAYER USING SENTIMENTAL ANALYSIS" 2015.

The images are taken using the camera and they are stored by using OpenCV. The Harr Cascade training is a tool used to accurately detect and recognize the hand gestures. In the Harr Cascade algorithm, the data are stored in Xml format. qt is a cross-platform that is widely used for developing application software using graphical user interface (GUI). The motion of the handgestures is stored in the OpenCV database. The arm controller recognizes the hand gestures and sends to RS232. The RS232 acts as a interface between arm controller and the PC. The songs are sorted in playlist and played automatically according to the hand gesture. Proposed intelligent music player according to the user's mood by using sentimental or emotion analysis.

4) Nikhil Zaware, Tejas Rajgure, Amey Bhadang, D.D. Sakpal "EMOTION BASED MUSIC PLAYER" 2014. Nikhil et al. determines the mindset of the user by using facial expression. Humans often express theirfeeling by their expressions, hand gestures, and by raising the voice of tone but mostly humans express their feelings by their face. Emotion based music player reduces the time complexity of the user. Generally, people have large number of songs on their playlist. Playing songs randomly does not satisfy the mood of the user. This system helps user to play songs automatically according to their mood.

5) Anukriti Dureha "AN ACCURATE ALGORITHM FOR GENERATING A MUSIC PLAYLIST BASED ON FACIAL EXPRESSIONS" 2014.

This paper presents an algorithm that automates the process of generating an audio playlist, based on the facial expressions of a user, for rendering salvage of time and labor, invested in performing the process manually. The algorithm proposed in this paper aspires to reduce the overall computational time and the cost of the designed system. It also aims at increasing the accuracy of the designed system. The facial expression recognition module of the proposed algorithm is validated by testing the system against user dependent and user independent dataset. Experimental results indicate that the user dependent results give 100% accuracy, while user independent results for joy and surprise are 100 %, but for sad, anger and fear are 84.3 %, 80 % and is 66% respectively

III. METHODOLOGY

A. Methodology

For these system we give input of user face after thatsystem detect the emotion on user face using the inbuilt python library. Then match the emotion to the audio files which already classify according to the emotions after matching the files then songs will be recommended. In Lyrics classification user will give the input English song lyrics after that system will tell the user which type of this song like happy song, sad song, relax song etc.

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B. System Architecture

The architecture of our proposed system is shown in figure



Fig: System Architecture

C. Modules:

- 1. Facial Expression Recognition The output of detection block forms an input to the facial feature extraction block. The required features are extracted using the Python library that is imported in the Android Studio folder. This helps in classifying that the input real time image has as its expression i.e. the users expression.
- 2. Song recommendation: As songs are audio files. And many Songs are Recommend to the user according to the detected emotion. And Play Particular songs
- 3. Lyrics Classification: In this module user will give the input English songlyrics after that system will tell the user which type of this song like happy song, sad song, relax song etc.

D. Mathematical Model

No Let S be the Whole system which consists: S= {I, P, O}. Where,

I is the input of the system. P is the procedure applied to the system to process the given input. O is the output of the system.

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A. Input:

I = {I1, I2, I3}

Where,

I1 = Face detection.

I2 = Audio List

I3 = Lyrics
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B. Process

 $P = \{ p1, p2, p3 \}$

- p1 = Face detection
- p2 = Emotion detection
- p3 = Audio selection

C. Output:

 $O = \{ o \}$

o = Audio played on emotion detected.

E. Algorithm

1) Support Vector Machine:

SVM is a machine learning technique to separate data which tries to maximize the gap between the categories. This Algorithm helps to classify the textual feedback and classifies according to emotions.

Input: D Dataset, Semantic of Tokens, Feeds; Output: Classification of Application Step1: for each Feed id in D do Step2: Get on-demand features and stored on vector x for tweet id Step3: x.add (Get Features (Feed id)); Step4: end for Step5: for each Feed in x vector do Step6: Fetch first feature and stored in b, and other features in w Step7: h w, b (x) = g (z) here, z = (w T x + b) Step8: if ($z \le 0$) Step9: assign g(z) = 1; Step10: else g(z) = -1; Step11: end if

2) Random Forest:

Random forest is a supervised learning algorithm which is used for both classification as well as regression. But however, it is mainly used for classification problems. A forest is made up of trees and more trees means more robust forest. Similarly, random forest algorithm creates decision trees on data samples and then gets the prediction from each of them and finally selects the best solution by means of Twitter. It is an ensemble method which is better than a single decision tree because it reduces the over-fitting by averaging the result.

Working of Random Forest Algorithm

- Step 1: First, start with the selection of random samples from a given Twitter dataset.
- Step 2 : Next, this algorithm will construct a decision tree for every sample. Then it will get the prediction result from every decision tree.
- Step 3 : In this step, Twitter will be performed for every predicted result.
- Step 4 : At last, select the emotion prediction result as the final prediction result.
- 3) Naive Bayes:

Naive Bayes Classifier is one of the simple and most effective Classification algorithms which helps in building the fast machine learning models that can make quick predictions. It is a probabilistic classifier, which means it predicts on the basis of the probability of an object.

- 1: for Test Class do
- 2: training the classifier naive Bayes
- 3: gauss nb=gaussianNB ().fit (training classes)
- 4: predicting the target variable test classes clf.predict(test class)
- 5: import the models of accuracy score
- 6: accuracy score and matrix of test class prediction given
- 7: end for

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- 4) Decision Tree:
 - 1. Check if algorithm satisfies termination criteria
 - 2. Computer information-theoretic criteria for all attributes
 - 3. Choose best attribute according to the information-theoretic criteria
 - 4. Create a decision node based on the best attribute in step
 - 5. Induce (i.e. split) the dataset based on newly created decision node in step 4
 - 6. For all sub-dataset in step 5, call C4.5 algorithm to get a sub-tree (recursive call)
 - 7. Attach the tree obtained in step 6 to the decision node in step 4
 - 8. Return tree

IV. EXPERIMENTAL RESULTS



Fig1 : Happy emotion Detected , Happy Emotion Music List



Fig 2 : Angry emotion Detected , Angry Emotion Music List

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Fig 3 : Neutral emotion Detected , Neutral Emotion Music List

/ tk — — — X	
You're insecure Don't know what for you're turning heads When you walk thro	Sentiment Analysis ×
Sentiment Prediction	ОК

Fig 4: English Song Lyrics, Output of Song lyrics(Happy song)

V. CONCLUSION

The Emotion-Based Music Player is used to automate and give a better music player experience for the end user. The application solves the basic needs of music listeners without troubling them as existing applications do: it uses technology to increase the interaction of the system with the user in many ways. It eases the work of the end-user by capturing the image using a camera, determining their emotion, and suggesting a customized play-list through a more advanced and interactive system. The user will also be notified of songs that are not being played, to help them free up storage space.

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