

Emotional Detection and music Recommendation based on user Facial Expression

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Abstract: *It is often confusing for a person to decide which music he/she have to listen from a massive collection of existing options. There have been several suggestion frameworks available for issues like music, dining, and shopping depending upon the mood of user. The main objective of our music recommendation system is to provide suggestions to the users that fit the user's preferences. The analysis of the facial expression/user emotion may lead to understanding the current emotional or mental state of the user. Music and videos are one region where there is a significant chance to prescribe abundant choices to clients in light of their inclinations and also recorded information. It is well known that humans make use of facial expressions to express more clearly what they want to say and the context in which they meant their words. By developing a recommendation system, it could assist a user to make a decision regarding which music one should listen to helping the user to reduce his/her stress levels. The user would not have to waste any time in searching or to look up for songs and the best track matching the user's mood is detected, and songs would be shown to the user according to his/her mood. The image of the user is captured with the help of a webcam. The user's picture is taken and then as per the mood/emotion of the user an appropriate song from the playlist of the system is played.*

Keywords: Emotional Detection

I. INTRODUCTION

People tend to express their emotions, mainly by their facial expressions. Music has always been known to alter the mood of an individual. Capturing and recognizing the emotion being voiced by a person and displaying appropriate songs matching the one's mood and can increasingly calm the mind of a user and overall end up giving a pleasing effect. The project aims to capture the emotion expressed by a person through facial expressions. A music player is designed to capture human emotion through the web camera interface available on computing systems. The software captures the image of the user and then with the help of image segmentation and image processing techniques extracts features from the face of a target human being and tries to detect the emotion that the person is trying to express. The project aims to lighten the mood of the user, by playing songs that match the requirements of the user by capturing the image of the user. Since ancient times the best form of expression analysis known to humankind is facial expression recognition. The best possible way in which people tend to analyze or conclude the emotion or the feeling or the thoughts that another person is trying to express is by facial expression. In some cases, mood alteration may also help in overcoming situations like depression and sadness. With the aid of expression analysis, many health risks can be avoided, and also there can be steps taken that help brings the mood of a user to a better stage.

II. LITERATURE SURVEY

Renuka R Londhe et al. [1] proposed a paper which focused on the study of changes in the curvatures of the face and the intensities of the corresponding pixels. The author used Artificial Neural Networks(ANN), which was used to classify the emotions. The author also proposed various approaches for a playlist. Zheng et al. [2]proposed two significant categories for facial feature extraction, which included Appearance-based feature extraction and geometric based feature extraction, which included extraction of some essential points of the face such as mouth, eyes, and eyebrows. Nikhil et al. [3].determines the mindset of the user by using facial expression Humans often express their feeling 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 a 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. The image of the user is captured by the web camera, and the images are saved. The images are first converted from RGB to binary format. This process of representing the data is called a feature-point detection method. This process can also be done by using Haar Cascade technology provided by Open CV. The music player is developed by using a java program. It manages the database and plays the song according to the mood of the user. Z. Zeng et al. [5] researched various advances in human affect recognition. He focused on various approaches that can handle audio and/or visual recordings of displays of affective states. The paper provides a detailed review of audio/visual computing methods. The effect is described as a prototype of emotion categories which include happiness, sadness, fear, anger, disgust, and surprise. This paper focused on discussing the challenges in computing methods for the development of automatic, spontaneous affect recognizer, which helped in emotion detection. It also identified some problems that have been missed or avoided in uni-modal posed emotion recognition. Parul Tambe et al. [7] proposed an idea which automated the interactions between the users and music player, which learned all the preferences, emotions and activities of a user and gave song selection as a result. The various facial expressions of users were recorded by the device to determine the emotion of the user to predict the genre of the music. Jayshree Jha et al. [11] proposed an emotion-based music player using image processing. This showed how various algorithms and techniques that were suggested by different authors in their research could be used for connecting the music player along with human emotions. It has thus helped in reducing the efforts of user in creating and managing playlist and providing an excellent experience to the music listeners by bringing them the most suitable song according to the user's his/her current expression. Anukritine et al. [18] came up with an algorithm that gives a list of songs from the user's playlist in accordance with the user's emotion. The algorithm which was designed was focused on having less computational time and also thus reduces the cost included in using various hardware. The main idea was to segregate the emotions into five categories i.e., Joy, sad, anger, surprise and fear also provided a highly accurate audio information retrieval approach that extracted relevant information from an audio signal in less time. Aditya et al. [19] developed an android application which acts as a customized music player for a user using image processing to analyze and present songs to user according to the user's mood. The application was developed using Eclipse and also OpenCV to implement facial recognition algorithms. This paper also showed comparison between various algorithms used in facial detection. The images of the user were captured using the front camera of the mobile device. It aimed to provide satisfaction to music lovers by extracting their emotions. A. Habibzad et al.

[20] proposed a new algorithm is proposed to recognize the facial emotion, which included three stages: pre-processing, feature extraction, and classification. The first part describes various stages in image processing include preprocessing, filtering used to extract various facial features. The second part optimized the eye and lip ellipse characteristics, and in the third part, the eye and lip optimal parameters were used to classify the emotions. The obtained results showed that the speed of facial recognition was far better than other usual approaches. Prof. Nutan Deshmukh et al. [21] focused on creating a system that fetches the emotion of the user using a camera and then automates the result using the emotion detection algorithm. This algorithm captures the mood of the user after every decided interval of time as the mood of the user may not be the same after some time; it may or may not change. The proposed algorithm on an average calculated estimation takes around 0.95-1.05 sec to generate an emotionbased music system, which was better than previous existing algorithms and reduces the cost of designing. Chang Liuet al [24] described a system that makes use of Brain-Computer Interfaces, also called as BCI. BCI makes use of devices to send signals to the processing systems. EEG hardware is used in to monitor the person's cognitive state of mind. The drawback of the scheme is that they require the input from the user's brain continuously to perform the classification. An algorithm based on MID is used to continuously monitor and process the signals received from the brain of the user and use these signals to actively monitor and generate emotions that the user is currently experiencing. Swati Vaid et al [23] reviewed EEG - Electroencephalography (EEG) is a form of medical science that records the electrical activity from the neurons of brain cells. The electrical activity of the neurons from within the cells of the brain is registered. Based on the recorded activity of the neurons an approximation is made, and the emotion of the person is estimated from that analysis. This method mentioned above, although serves the purpose of getting the activity of brain cells but fails to serve the purpose of portability and economics.

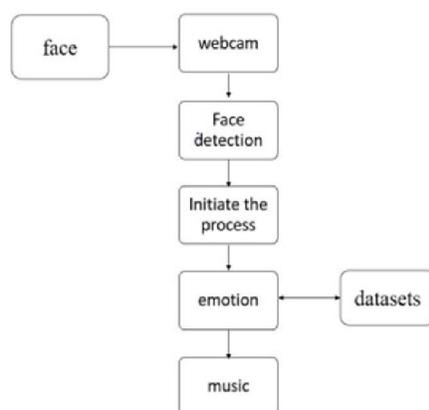
III. PROBLEM STATEMENT

In the present-day environment, there is a lot of stress and fatigue, which leads to more despair and ill health. Medical studies demonstrate that interactive and high-quality games and shows, as well as music tailored to one's mood, can lift one's spirits. By reducing stress hormones, can aid in the treatment of depression along with helping in physical aches and pains induced by the high level of stress.

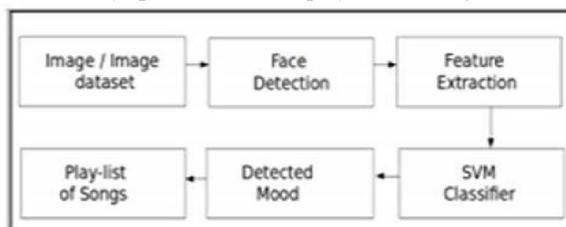
IV. EXISTING SYSTEM AND PROPOSED SYSTEM

- Both the works mood classification and music classification were done separately and were different works.
- Facial expression classification and music classification is a vast area for research.
- So, now in the proposed system these works are being combined for ease of life.
- In the existing work they've used the same dataset images as both training and testing data.
- Here, in the proposed system a readymade trained dataset will be used but as testing data our real-time images will be used. These real-time images will be used to predict the facial expression.
- In, music classification part, it is usually done using lyrics, acoustic data or the tempo of the songs.
- Here, in the proposed system also we'll be using the same (tempo of the songs) for music classification.

V. METHODOLOGY



- The webcam will be invoked first.
- The system will start collecting the video frames available in front of it.
- Now, the face of the person will be detected out of the whole video frame available.
- After, the facial part will be cropped from the frame.
- Now that cropped image will be converted to grayscale image.
- The captured image will be now compared with the dataset available.
- Now the facial expression of the person will be predicted and you'll get the predicted expression name as a text.
- Now this text (predicted expression name) will be the input to the music classification part.
- On the other hand, simultaneously music will be classified according to the mood.
- When music part will get the predicted mood/expression name as the input, the playlist generated for that specific mood will be shuffled
- After music classification, for every specified mood a playlist will be generated.



As shown in the flowchart, there are some steps of this system for doing the appropriate work. So, here giving an overview about the system. There will be some phases or we can say steps in this system. Here we will have one system which will have camera attached to it. The system will capture the real time images of the person who's in front of the camera. These real time images captured will be the input to the system and will be sent to the FER (Facial Expression Recognition) system. The system then will detect face from it as all FER systems do. Then it will classify it accordingly and give you a predicted mood of that particular person. The predicted mood will be from happy, angry, sad, calm, etc. The output data from the FER module will be taken as an input to the music classification part. Now music will be classified according to your current mood predicted. And then randomly a song according to your mood will be chosen from the classified playlist by the system.

- Emotion Extraction Module -The image of the user is captured with the help of a camera/webcam. Once the picture captured, the frame of the captured image from webcam feed is converted to a grayscale image to improve the performance of the classifier, which is used to identify the face present in the picture. Once the conversion is complete, the image is sent to the classifier algorithm which, with the help of feature extraction techniques can extract the face from the frame of the web camera feed. From the extracted face, individual features are obtained and are sent to the trained network to detect the emotion expressed by the user. These images will be used to train the classifier so that when a completely new and unknown set of images is presented to the classifier, it is able to extract the position of facial landmarks from those images based on the knowledge that it had already acquired from the training set and return the coordinates of the new facial landmarks that it detected. The network is trained with the help of CK extensive data set. This is used to identify the emotion being voiced by the user
- Audio Extraction Module - After the emotion of the user is extracted the music/audio based on the emotion voiced by the user is displayed to the user, a list of songs based on the emotion is displayed, and the user can listen to any song he/she would like to. Based on the regularity that the user would listen to the songs are displayed in that order. This module is developed using web technologies like PHP, MySQL, HTML, CSS, JAVASCRIPT.
- Emotion - Audio Integration Module - The emotions which are extracted for the songs are stored, and the songs based on the emotion are displayed on the web page built using PHP and MySQL. For example, if the emotion or the facial feature is categorized under happy, then songs from the happy database are displayed to the user

VI. RESULT/PERFORMANCE ANALYSIS

This study proposes a music recommendation system which extracts the image of the user, which is captured with the help of a camera attached to the computing platform. Once the picture has been captured, the captured frame of the image from webcam feed is then being converted to a grayscale image to improve the performance of the classifier that is used to identify the face present in the picture. Once the conversion is complete, the image is sent to the classifier algorithm which, with the help of feature extraction techniques is able to extract the face from the frame of the web camera feed. Once the face is extracted individual features from the face is extracted and is sent to the trained network to detect the emotion expressed by the user. A classifier that is used to detect or obtain the facial landmarks from the face of the user is trained on HELEN dataset. HELEN dataset contains more than 2000 images. These images will be used to train the classifier so that when a completely new and unknown set of images is presented to the classifier, it is able to extract the position of facial landmarks from those images based on the knowledge that it had already acquired from the training set and return the coordinates of the new facial landmarks that it detected. The network is trained with the help of CK extensive data set. This is used to identify the emotion being voiced by the user. Once this has been detected, an appropriate song is selected by the music player that would best match the mood of the user. The overall idea behind making the system is to enhance the experience of the user and ultimately relieve some stress or lighten the mood of the user. The user does not have to waste any time in searching or to look up for songs and the best track matching the user's mood is detected and played automatically by the music player. The image of the user is captured with the help of a webcam. The user's picture is taken and then as per the mood/emotion of the user an appropriate song from the playlist of the user is played matching the user's requirement. The system has successfully been able to capture the emotion of a user. It has been tested in a realtime environment for this predicate. It has to be, however, tested in different lighting

conditions to determine the robustness of the developed system. The system has also been able to grab the new images of the user and appropriately update its classifier and training dataset. The system was designed using the facial landmarks scheme and is tested under various scenarios for the result that would be obtained. It is seen that the classifier has an accuracy of more than 80 percent for most of the test cases, which is pretty good accuracy in terms of emotion classification. It can also be seen that the classifier can accurately predict the expression of the user in a real-time scenario when tested live for a user.

VII. RESULTS ANALYSIS

- Experiment Results- Instructions Explained to the User. In this scenario the users were given instructions as to what is to be done to perform the prediction of the emotion expressed which provided the following results. Sometimes in cases where the inner emotion is sad and facial expression is happy it resulted in a fail case.
- Experiment Results - Instructions not given to the User. In this scenario the users were not given any instructions as to what is to be do and thus the inner emotions or the emotions recognized failed, there were also cases where in the emotion matched with the facial expressions of the user.

VIII. CONCLUSION

Emotion recognition using facial expressions is one of the important topics of research and has gathered much attention in the past. It can be seen that the problem of emotion recognition with the help of image processing algorithms has been increasing day by day. Researchers are continuously working on ways to resolve this by the use of different kinds of features and image processing methods. The applications of image processing algorithms in the field of both medical science and human science are of vast importance. There are continuously new ways and methods being developed that make use of image processing algorithms to extract the emotion of the user and make use of the extracted emotion to treat the user. Emotion recognition has gained a lot of importance in all aspects of life and if a robust algorithm implemented which can accurately classify the emotions of the person, then a great deal of advancement in the industry can be achieved with the help of this. The system has successfully been able to capture the emotion of a user. It has been tested in a real-time environment for this predicate. However, it has to be tested in different lighting conditions to determine the robustness of the developed system. The system has also been able to grab the new images of the user and appropriately update its classifier and training dataset. The system was designed using the facial landmarks scheme and was tested under various scenarios for the result that would be obtained. It is seen that the classifier has an accuracy of more than 80 percent for most of the test cases, which is pretty good accuracy in terms of emotion classification. It can also be seen that the classifier can accurately predict the expression of the user in a real-time scenario when tested live for a user.

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