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Emotional Detection and Music Recommendation System based on User Facial Expression

Mihir Joshi[1], Dhruvi Khimasiya[2], Utkarsh Limbachiya[3]

Student, E&TC, Thakur College of Engineering and Technology, Mumbai, India[1]

Student, E&TC, Thakur College of Engineering and Technology, Mumbai, India[2]

Student, E&TC, Thakur College of Engineering and Technology, Mumbai, India[3]

Abstract: This study introduces a novel music recommendation system driven by facial expressions, aiming to ease the burden of selecting music from vast collections. Acknowledging that more than 60% of users feel overwhelmed by extensive song libraries, the system utilizes webcam images for real-time emotion analysis. By suggesting personalized songs aligned with the user's mood, the system minimizes search efforts and reduces stress. The primary focus is on enhancing user experience through concise and efficient music recommendations, providing a unique solution to the widespread challenge of managing large music libraries.

Keywords: music recommendation, facial expression analysis, extensive libraries, webcam

I. INTRODUCTION

People tend to show their feelings through their facial expressions. People's moods have traditionally been known to change in response to music. The ability to detect and identify the emotion that a person is expressing, as well as play music that fits the user's mood, can gradually ease the user's anxiety and have a pleasant overall effect. The project's goal is to use a person's facial expressions to convey their emotions. A webcam interface on computer systems is used in the construction of a music player to record human emotion. The program takes a picture of the user, then uses image processing and segmentation methods to extract information from the target person's face and attempt to identify the sentiment that the person is attempting to convey. By playing music that fits the user's preferences and projecting the user's image, the initiative seeks to uplift the user's mood. Facial expression recognition has been the most advanced kind of expression analysis available to humans since ancient times. Facial expressions are the finest means by which people can deduce or evaluate the emotion, sentiment, or thoughts that another person is attempting to convey.

Occasionally, changing one's mood can also aid in overcoming difficult circumstances like despair and depression. Many health concerns can be prevented with the use of expression analysis, and actions that improve a user's mood can also be done.

II. LITERATURE SURVEY

Renuka R Londhe et al. provided a paper that focused on the analysis of changes in the curvatures of the face and the intensities of the relevant pixels. Artificial Neural Networks (ANN) were employed by the author to categorize the emotions. The author also suggested a few different playlist strategies. Zheng and colleagues introduced two noteworthy classifications for the extraction of facial features: appearance-based feature extraction and geometric-based feature extraction. The former comprised the extraction of some key facial areas like the lips, eyes, and eyebrows.

Nikhilet al. uses facial expressions to detect the user's mentality. People frequently use facial expressions, hand gestures, and tone of voice to convey how they are feeling, but most often, they use their faces. A music player that is emotionally driven lessens the user's time complexity. People typically have a lot of music on their playlists. The user's mood is not satisfied when music is played at random. The user can set up the system to play music automatically based on their mood. The web camera records an image of the user, which is then stored. First, the RGB format of the photos is transformed to binary. This data representation approach is known as a feature-point detection method. The Open CV technique known as Haar Cascade can also be used for this operation. A Java application is used in the development of the music player.

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III. METHODOLOGY

Emotion Extraction Module -The image of the user is captured with the help of a camera/webcam. Once the user's image is taken using a camera or webcam, the captured image frame from the webcam feed undergoes a conversion to grayscale. This enhances the classifier's efficiency in identifying the face within the image, contributing to improved 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 employed to recognize the emotion expressed by the user.This is employed to recognize the emotion expressed by the user.

Audio Extraction Module - Following the extraction of the user's emotion, the music or audio corresponding to the voiced emotion is presented to the user. A list of songs associated with the emotion is showcased, allowing the user to choose any preferred song. The displayed song order is influenced by the user's listening habits, and this module is developed using web technologies such as PHP, MySQL, HTML, CSS, and JAVASCRIPT.

Emotion-Audio Integration Module - The identified emotions linked to the songs are saved, and the web page constructed showcases the songs corresponding to each emotion 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.

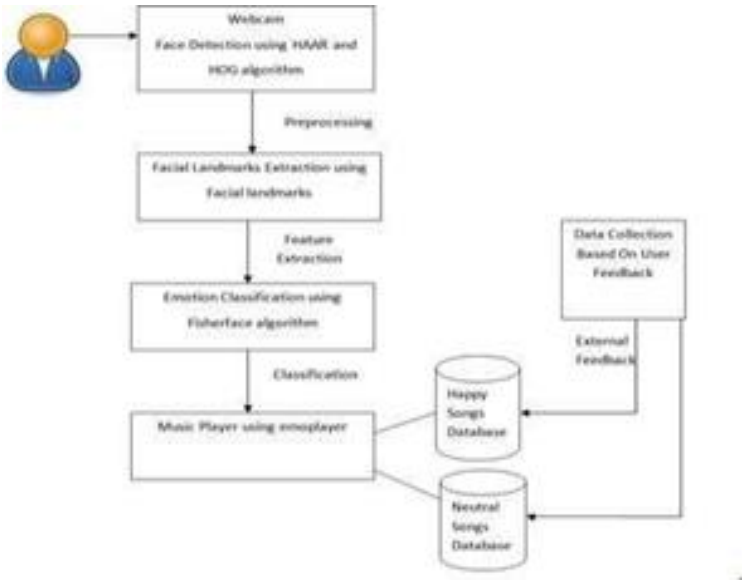

Fig. 1 Architecture

IV. 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. The values are given in Table 1 and the result is shown in Figure.

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User	Emotion	Facial expression	Accuracy
1	Happy	Happy	95
2	Sad	Happy	0
3	Disgust	Disgust	93
4	Sad	Sad	95

Table 1. Instructions Explained to the User.

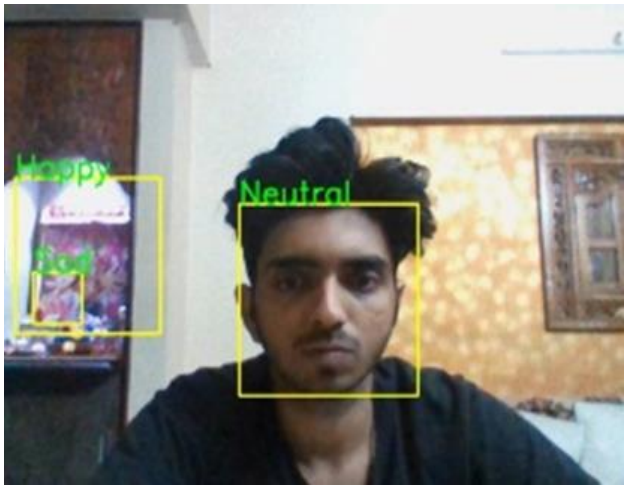

Figure 1. Experimenting- measuring

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. The values are given in Table 2 and the result is shown in Figure 2

User	Emotion	Facial expression	Accuracy
1	Happy	Happy	95
2	Sad	Happy	0
3	Disgust	Disgust	93
4	Sad	Sad	95

Table 2. Instructions not explained to the User

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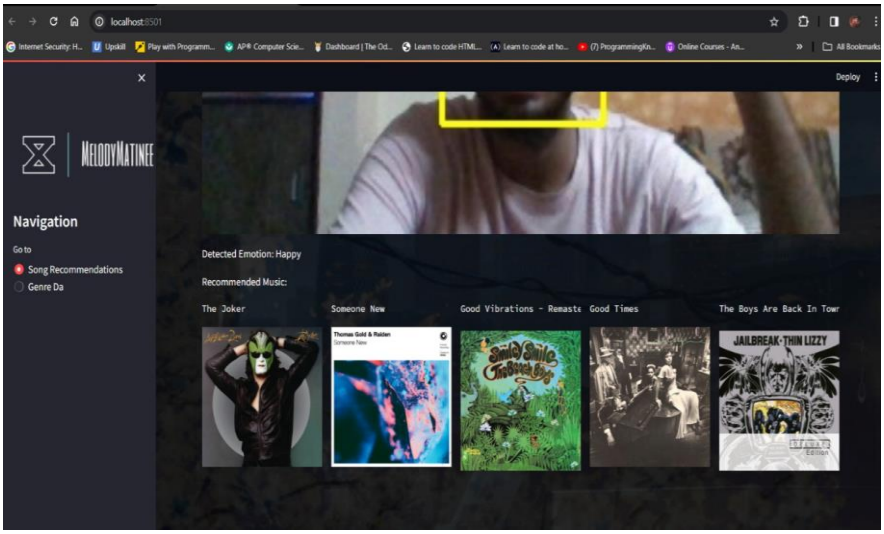
Figure 2. Experiment Results- Instructions not explained to the User.

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. 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.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.

Upon successful detection, the music player selects a suitable song that aligns with the user's mood. 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 users are spared from the effort of manual song search as the music player, using a webcam to capture the user's image, automatically identifies the mood or emotion.



V. CONCLUSION

Emotion recognition using facial expressions is one of the important topics of research and has gathered much attention in the past. 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.

This automation not only streamlines the process but also eliminates the need for manual playlist curation, offering a seamless and personalized user experience.This provide valuable insights into how technology can be harnessed to connect music with human emotions, ultimately creating a more immersive and satisfying listening experience for users. As this field continues to advance, it holds the promise of further enriching the intersection of technology, emotion, and music.

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