Music Recommendation using Sentiment Analysis from Facial Recognition

Geetika Dhand[1], Tanisha Beri[2], Tanvi Sobti[3], Vidhi Angrish[4]

1, 2, 3,4 Department of Computer Science and Engineering, Maharaja Surajmal Institute of Technology,

C - 4 Janakpuri, New Delhi 110058, India

Abstract. It is often difficult for a person to choose the kind of music to listen to from a wide range of options to choose from. Depending on the user's mood, there have been numerous suggestion frameworks available for concerns such as dining, shopping, and music. Humans are well-known for using facial expressions to indicate what they want to say and the context of their message. Facial recognition is a technology which has received a lot of attention because of its market possibilities as well as vast range of applications.

Furthermore, music is a form of expression which is thought to elicit a stronger emotional response.It's ability to improve someone's mood is one of a kind. This study aims to develop an effective music recommendation model that employs Face Recognition algorithms in order to assess the user's mood/emotion. The developed model would prove to be more efficient than previous algorithms.

Additionally, on a wider scale, this would allow for the recovery of efforts and time spent physically executing the process. The system's overall goal is to recognise facial emotions and quickly recommend tunes. Both time and money will be saved with the proposed system.

Keywords: Music, mood, sentiment, facial recognition, emotion detection, logistic regression

1 Introduction

People commonly use their facial expressions to express their moods/emotions. Music has always had the ability to change a person's mood. Capturing and identifying a person's mood/emotion and playing appropriate music to match that

emotion can help to soothe the user's mind and provide a pleasurable effect.

This model aims to capture the mood/emotion of the user through their facial expressions. Through the webcam interface available on computing systems, a music player is meant to record human expression[1]. The software clicks the image of the user's face just as the current song is about to end, and then uses image processing techniques and identification of point face landmarks to analyse the emotion/mood of the user at that time.

By capturing the user's image, the project intends to play tunes that match the user's requirements. Facial expression recognition has been the best type of expression analysis known to humanity since ancient times. The most effective approach for people to assess or draw conclusions about another's emotion, feeling, or thoughts. A person is attempting to convey their feelings through facial expressions.

2 Objective

The objectives of the Music Recommendation Model are as follows:

- Music Player Web Application development
- User image capture and processing
- Emotion Extraction via Sentiment Analysis of captured image
- Creation of dataset and classification of songs on the basis of mood analyzed
- Prediction of most suitable song on the basis of mood detected

3 Literature Survey

In Paper [1] comprises Mood *based music classified dataset* created by Hao Xue, Like Xue, Hailiang Xu, and Feng Su, as part of their paper with 100 training and 70 testing samples each[1].

In paper [2], it has been demonstrated that examining the user's facial expression/emotion can help determine the user's current emotional or mental state. One area where there is a significant opportunity to provide a wide range of options to clients based on their tastes and also collected data is music and videos[3].

In Paper [3], It has shown a computational study of people's attitudes, assessments, emotions and perceptions toward things, people, situations, events, themes, and

their qualities. It looks at how to detect opinion spam or fraudulent reviews, as well as a number of key mining tasks that have been researched in the literature and their representative approaches[3].

In paper [4], to recognise face emotion, researchers proposed a new method that included three stages: pre-processing, feature extraction, and classification. The first section goes through image processing stages like filtration and pretreatment, which are used to extract different facial traits[4]. The eye and lip ellipse characteristics were improved in the second phase, and the eye and lip optimum parameters were employed to identify the emotions in the third part. The acquired results revealed that facial recognition was considerably faster than other commonly used methods.

4 System Architecture

The complete project is split into two parts:

1. Development of a music based web application that captures and analyses users' emotions through their facial expressions.
2. Creation of song dataset classified by mood/emotion.

In the application, when a song is played, the face of the user is captured through a web camera. It is then processed to analyze the user's emotion or mood[5]. Finally, using the mood based song dataset created, the next suitable song based on emotion of the user is queued in the playlist. The following flowchart (Fig. 1) depicts the architecture of the song recommendation model.

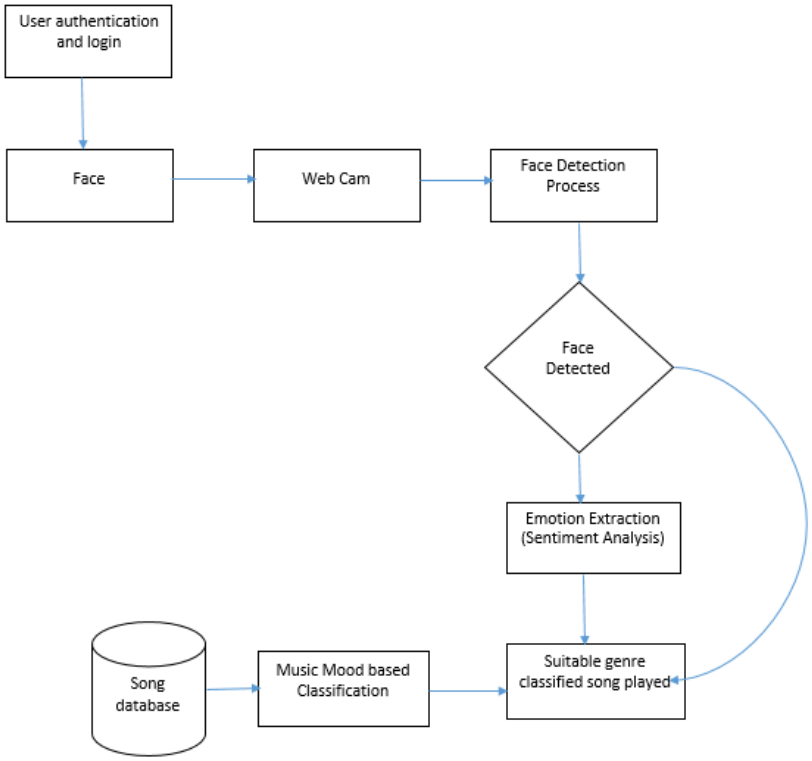


Fig. 1. Architecture of mood based song recommendation system

5 Methodology

5.1 Face Detection

The primary goal of facial detection is identification and capturing of the user's face and using the image to analyze their emotion[6]. This is done using a JavaScript facial recognition framework called face-api.js. It is built on top of TensorFlow.js, a prominent JavaScript machine learning toolkit. It implements various models based on their application. For this model, the 68 point face landmark detection model was used to analyze the expression of the user. The first step is to capture the image of the user using a webcam, as shown in Fig. 2.

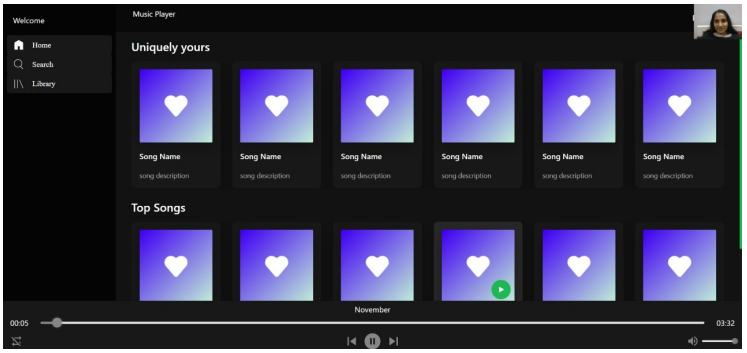


Fig. 2. Face Detection using a webcam

The next step would be to process the captured image and determine the user's emotion. face-api.js uses 68 point face matching descriptors to classify the user's expression into the following categories (example in Fig. 3):

1. Neutral
2. Happy
3. Sad
4. Angry
5. Fearful
6. Disgusted
7. Surprised

```
expressions: FaceExpressions {
  neutral: 8.770869897034572e-8,
  happy: 0.9999998807907104,
  sad: 2.3022627360091974e-8,
  angry: 7.265963546977672e-13,
  fearful: 2.0815996495948674e-12,
  disgusted: 5.361498327553435e-14,
  surprised: 1.1740783900648921e-9
}
```

Fig. 3. Sample output for Expression value extraction

The expression with the highest value is evaluated as the user's emotion, as depicted in Fig. 4.

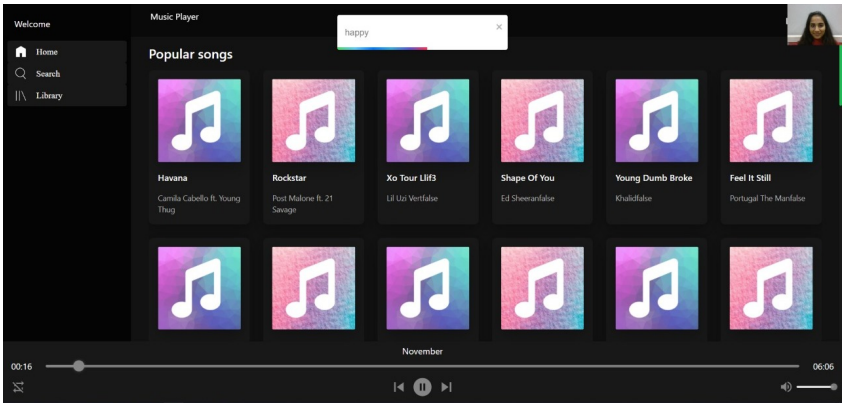


Fig. 4. Mood Extraction ("happy") of the user

5.2 Music Mood Detection

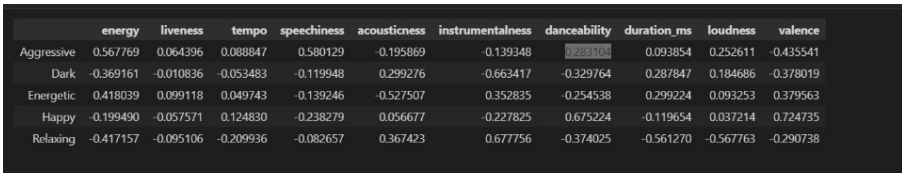
To implement music mood detection two methodologies were used: Logistic Regression and Neural Networks.
The song is played in response to the emotion that has been detected. The emotions are assigned for each song[5]. When the user's emotion is transferred, the respective song will be played.

The five emotions that can be used are: aggressive, dark, energetic, happy, relaxing. When the happy emotion is identified the songs that are assigned for that particular emotion are played and the same happens with the other emotions. In order to identify the mood of the song, mean values of the following features are generated with respect to each emotion using Logistic Regression: energy, liveness, tempo, speechiness, acousticness, instrumentalness, danceability, duration_ms, loudness, valence.

The song database is passed through a model which runs once and trains the dataset which consists of song features (such as acousticness) for each song, as represented in Fig. 5, and also calculates their mean values for further calculation.

Fig. 5. Example of song feature extraction

After song feature extraction, the mean values of the song features (Fig. 6) corresponding to the song moods (such as aggressive) are evaluated.



	energy	liveness	tempo	speechiness	acousticness	instrumentalness	danceability	duration_ms	loudness	valence
Aggressive	0.567769	0.064396	0.088847	0.580129	-0.195869	-0.139348	0.283104	0.093854	0.252611	-0.435541
Dark	-0.369161	-0.010836	-0.053483	-0.119948	0.299276	-0.663417	-0.329764	0.287847	0.184686	-0.378019
Energetic	0.418039	0.099118	0.049743	-0.139246	-0.527507	0.352835	-0.254538	0.299224	0.093253	0.379563
Happy	-0.199490	-0.057571	0.124830	-0.238279	0.056677	-0.227825	0.675224	-0.119654	0.037214	0.724735
Relaxing	-0.417157	-0.095106	-0.209936	-0.082657	0.367423	0.677756	-0.374025	-0.561270	-0.567763	-0.290738

Fig. 6. Mean Values for Song Moods Calculated

Using the mean value matrix and respective song feature set extracted for individual songs, the relative values for song features are calculated. The features with the lowest values and therefore the highest similarity indices are used to determine the mood of the song.

5.3 Song/Playlist Queue Creation

After performing emotion extraction from the user's facial expression[7] and music mood classification on the song dataset, the final step is to create a song playlist/queue on the basis of emotion detected. The emotion extracted from the user's face is used to extract a random song from the same mood genre in the

dataset and is queued after the song playing currently. The mood matching is also flexible in certain circumstances. For example, in case of detection of the user emotion “Calm”, songs from the “Happy” genre can also be played[8].

6 Future Enhancement

A music player with a facial recognition and emotion based recommendation system is quite beneficial and practical in the present day scenario, where artificial intelligence is growing so rapidly. This project can be further enhanced by modifying the determination of factor for selection of song from an absolute value to a scalable range of values, as this will improve the flexibility of the application.

7 Conclusion

In this study, we presented a model for recommending songs on the basis of facial expression mood detection and recommending appropriate music to the user. This project proposes designing and developing a music recommendation system on the basis of emotion captured through face recognition.

Music has the ability to heal any type of stress or anxiety. Recent advancements suggest that establishing an emotion-based music recommendation system has a lot of potential. As a result, the suggested system includes a face-based emotion identification system that can detect emotions and play music based on those emotions.

References

1. Hao Xue, Like Xue, Hailiang Xu, and Feng Su: Multimodal Music Mood Classification by Fusion of Audio and Lyrics, In Proc. of MMM 2015, LNCS 8936, Sydney, 2015, pg 26-37.

2. S Metilda Florence and M Uma: Emotional Detection and Music Recommendation System based on User Facial Expression, 2020 IOP Conf. Ser.: Mater. Sci. Eng, 912.

3. Kumar A., Beri T., Sobti T.: A Survey of Sentiment Analysis and Opinion Mining, Hassanien A.E., Bhattacharyya S., Chakrabati S., Bhattacharya A., Dutta S. (eds) Emerging Technologies in Data Mining and Information Security. Advances in

Intelligent Systems and Computing, 2020, Springer, Singapore., vol 1300.

4. A. habibzad, ninavin, Mir kamalMirnia: A new algorithm to classify face emotions through eye and lip feature by using particle swarm optimization, 4th International Conference on Computer Modeling and Simulation, 2012 .

5. H. Immanuel James, J. James Anto Arnold, J. Maria Masilla Ruban, M. Tamilarasan, R. Saranya: Emotion Based Music Recommendation System, IRJET, vol. 6, pg. 2096-2101.

6. Deny John Samuvel, B. Perumal and Muthukumaran Elangovan: Music Recommendation System Based On Facial Emotion Recognition,3C Tecnología. Glosas de innovación aplicadas a la pyme. Edición Especial,March 2020, 261-271.

7. F. Abdat, C. Maaoui and A. Pruski: Humancomputer interaction using emotion recognition from facial expression, 2011 UKSim 5th European Symposium on Computer.

8. Anukriti Dureha: An Accurate Algorithm for Generating a Music Playlist based on Facial Expressions, IJCA 2014.

9. G. Dhand and K. Sheoran: Protocols SMEER (Secure Multitier Energy Efficient Routing Protocol) and SCOR (Secure Elliptic curve based Chaotic key Galois Cryptography on Opportunistic Routing), Materials Today: Proceedings, Vol.37, 2021, pp. 1324-1327.