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Facial Expression Based Music Recommendation System

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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. 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 around 85-90%, while for static images it is around 98- 100%. Thus, it yields better accuracy in terms of performance and computational time and reduces the designing cost, compared to the algorithms used in the literature survey. Based on the obtained emotion, playlist is created.

KEYWORDS: Music suggestion, Facial Recognition, SVM, OpenCV, Python.

INTRODUCTION

Human Beings have the natural ability to look at someone’s face and guess their mood. This ability if learnt by an electronic device can have valuable applications in the real world. Music, a tool for arousing emotions and feelings, is far more powerful than language. Music is something which taps deeply into our emotional core as human beings. Thus, listening to good music can help us elevate our mood. In order to simplify this problem, we are proposing a solution which is to create an application which captures the emotions of the user by facial expression recognition algorithms. After capturing the emotion, A list of songs are suggested based on the emotion.

Existing System:

Existing recommendation systems such as Spotify, Musixmatch, Shazam, etc.

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PROBLEMSOF THE EXISTING SYSTEM

- These systems only allow you to live a static user-experience as the system will give recommendation based on the history without regard to other parameters that might impact the prediction such as feeling or emotion.
- These recommendation systems will sometimes fail to give the correct output because their suggestions are based on outdated input.
- So, the user cannot be satisfied with the output as it doesn't satisfy his emotion.

PROPOSED SYSTEM

BENEFITS OF THE PROPOSED SYSTEM

- They recognize the mood of the user then their selection of songs for making a playlist is such that it will pick songs reflecting the current mood.
- It will try to enhance the users' mood.
- This system is better than static recommendation system as it will suggest music based on users' mood by facial recognition and helps them to improve their mood.

METHODS

Software Requirements:Front-End: React JS, Back-End: Node JS and Fire Base. Windows 10 or windows 8.Hardware Requirements: Computer or Laptop, 32- or 64-bit operating system, x-64-bit processor, 4 or 8 GB RAM, Processor: Intel i3 or i5 or i7.

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LITERATURE SURVEY

*Aurobind V. IyerProfessor in CSE Dept.*Music is one of the most effective media as it can instill deep feelings and swamp listeners with subliminal messages. It deftly plays with our emotions which in turn affect our mood. Books, movies and television dramas are a few other media but, in contrast to these, music delivers its message in mere moments. It can aid us when we are feeling low and empower us. When we listen to sad songs, we tend to feel a decline in mood. When we listen to happy songs, we feel happier. Manual classification of songs based on mood, for making of a playlist, is time consuming and labor intensive. Our paper proposes a system 'EmoPlayer', an Android application, which help to minimize these efforts by suggesting the user a list of songs based on his current emotion. The system captures user's image using camera and detects his face. It then detects the emotion and makes a list of songs which will enhance his mood as the songs keep playing. EmoPlayer uses Viola Jones algorithm for face detection and Fisher faces classifier for emotion classification.The point of this paper was to explore the area of facial expression recognition for implementation of an emotion-based music player. Manual face analysis utilized by people was immediately supplanted by reasonable computer programming. A wide variety of image processing techniques was developed to meet the facial expression recognition system requirements. Apart from theoretical background, this work gives approaches to outline and execute emotion-based music player. Proposed system is able to process the facial image and recognize basic emotions and then play music based on these emotions and also suggest music that enhances the mood of the user. In the future work we would like to focus on improving the emotion recognition rate of our system and also recognize more different emotions. Also, we would like to develop an automatic music genre classification system and automatic music emotion classification system. These new modules combined with the existing system will help automate the whole existing system of emotion-based mood enhancing music recommendation system.*Shlok Gilda in CSE Dept.* Songs, as a medium of expression, have always been a popular choice to depict and understand human emotions. Reliable emotion-based classification systems can go a long way in helping us parse their meaning. However, research in the field of emotion-based music classification has not yielded optimal results. In this paper, we present an affective cross-platform music player, EMP, which recommends music based on the real-time mood of the user. EMP provides smart mood-based music recommendation by incorporating the capabilities of emotion context reasoning within our adaptive music recommendation system. Our music player contains three modules: Emotion Module, Music Classification Module and Recommendation Module. The Emotion Module takes an image of the user's face as an input and makes use of deep learning algorithms to identify their mood with an accuracy of 90.23%. The Music Classification Module makes use of audio features to achieve a remarkable result of 97.69% while classifying songs into 4 different mood classes. The Recommendation Module suggests songs to the user by mapping their emotions to the mood type of the song, taking into consideration the preferences of the user.The results obtained above are very promising. The high accuracy and quick response time of the application makes it suitable for most practical purposes. The music classification module in particular, performs significantly well; it achieves high accuracy in the "angry" category, while also performing appreciably well in the "happy" and "calm" categories. Thus, EMP reduces user efforts for generating playlists. by efficiently mapping the user's emotion to the correct song class with an overall accuracy of 97.69%, it achieves optimistic results for the four moods studied. We also recognize the room for improvement. It would be interesting to analyze how the system performs when all seven basic emotions are taken into consideration; additional songs from different languages and regions can also be added to make the recommendation system more robust. User preferences can be collected to improve the overall system using collaborative filtering. We plan to address these issues in a future work.

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*Ziyang Yu Dept. of Info. Science*In recent years, with the development and application of big data, deep learning has received more and more attention. As a deep learning neural network, convolutional neural network plays an extremely important role in face image recognition. In this paper, a combination of micro-expression recognition technology of convolutional neural network and automatic music recommendation algorithm is developed to identify a model that recognizes facial micro-expressions and recommends music according to corresponding mood. The facial micro-expression recognition model established in this paper uses FER2013 with a recognition rate of 62.1%. After identifying the corresponding expression, a content-based music recommendation algorithm is used to extract the feature vector of the song and a cosine similarity algorithm is used to make the music recommendation. This research helps to improve the practicality of the music recommendation system, and the related results will also serve as a reference for the application of the music recommendation system in areas such as emotion regulation.In this paper, we proposed a model of facial micro expression recognition based on convolutional neural network (CNN). After training the model on FER2013 data set, we got a recognition rate of 62.1%. On the basis of the state that facial expression and emotion were both recognized, the content-based recommendation algorithm was applied to automatically recommend music for users. Compared with the existing algorithms that only recommend music according to the users' past listening preferences, the algorithm proposed in this paper increases the user's emotion recognition, so that the recommended music can better meet the users' listening needs. Therefore, this algorithm has a relevantly promising application market. Although we have made some achievements, still some problems need to be solved. For example, the accuracy of micro expression emotion recognition needs to be improved. In the follow-up work, the recognition rate of tags with low recognition will be improved, and

the music recommendation algorithm will be further optimized and improved.

*Renata L. Rosa*In recent years, the sentiment analysis has been explored by several Internet services to recommend contents in accordance with human emotions, which are expressed through informal texts posted on social networks. However, the metrics used in the sentiment analysis only classify a sentence with positive, neutral or negative intensity, and do not detect sentiment variations in accordance with the user’s profile. In this arena, this paper presents a music recommendation system based on a sentiment intensity metric, named enhanced Sentiment Metric (eSM) that is the association of a lexicon-based sentiment metric with a correction factor based on the user’s profile. This correction factor is discovered by means of subjective tests, conducted in a laboratory environment. Based on the experimental results, the correction factor is formulated and used to adjust the final sentiment intensity. The users' sentiments are extracted from sentences posted on social networks and the music recommendation system is performed through a framework of low complexity for mobile devices, which suggests songs based on the current user’s sentiment intensity. Also, the framework was built considering ergonomic criteria of usability. The performance of the proposed framework is evaluated with remote users using the crowdsourcing method, reaching a rating of 91% of user satisfaction, outperforming a randomly assigned song suggestion that reached 65% of user satisfaction. Furthermore, the paper presents low perceived impacts on the analysis of energy consumption, network and latency in accordance with the processing and memory perception of the recommendation system, showing advantages for the consumer electronic world.The subjective tests results highlight the importance of considering the user’s profile in a sentiment metric. Thus, the tests in the laboratory environment have shown what parameters may influence the final sentiment intensity of a sentence. Based on the results, a correction factor was obtained, which depend on age, educational level and gender. The correction factor was used to obtain a more real sentiment intensity value. The new sentiment intensity metric, eSM, improved the music recommendation system, showing that the sentiments can change depending on the user's profile. The tests showed that the weight factor used in the ESM can be applied to another sentiment metric, for instance, the SentiStrength metric. The remote subjective tests reached 91% user satisfaction regarding the eSM in contrast to 65% of a randomly assigned song suggestion that did not consider a sentiment intensity, and 78% user satisfaction was reached by considering only a sentiment intensity metric, the Sentimeter-Br2. The user’s profile was analyzed and the results showed that 78% of users preferred to listen to a musical genre similar to their current emotional state, and only 22% preferred to listen to a different musical genre in relation to their current emotional state. For example, if a person has a state of mood of sadness than this person prefers to listen to a more melancholic song.

MODULE SPECIFICATION

We have divided our project in to 2 modules.They are:

1. Facial Expression Recognition Module.
2. Music Suggestion module

Facial Expression Recognition Module: -

❖ In this module, we will detect the emotion of a user. We built a model from SVM supervised ML algorithm. An image is uploaded and then using python OPENCV, the features of the image are extracted and these features of the

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image are extracted and these features is applied on SVM training model to predict the emotion of the user.

Music Suggestion Module: -

❖ The output obtained from the above module is taken as input in this module. The input which is the emotion of an user will be used to detect the music. A list of music related to the emotion is displayed and user can able to select the music and play it.

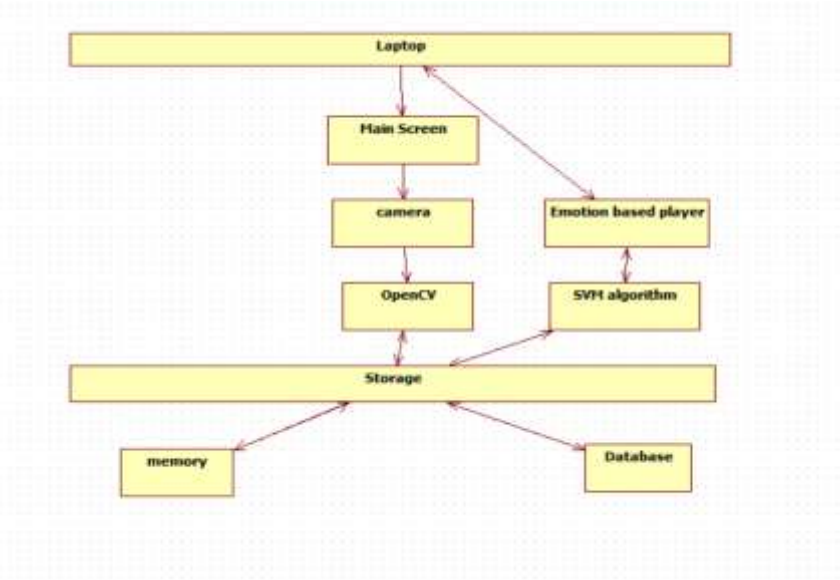
ARCHITECTURAL DESIGN

Requirements of the software should be transformed into an architecture thatdescribes the software's top-level structure and identifies its components This isaccomplishedthrougharchitecturaldesign(alsocalledsystemdesign),whichactsas a preliminary 'blueprint' from which software can be developed IEEE definesarchitectural design as 'the process of defining a collection of hardware andsoftware components and their interfaces .

Thesoftware requirementsdocumentanddesigningamodelforproviding implementation details. These details are used to specify the components of thesystem along with their inputs, outputs, functions, and the interaction betweenthem. An architecturaldesignperforms thefollowing functions:

1. Itdefinesanabstractionlevelatwhichthedesignerscanspecifythefunctionaland performance behaviour of thesystem.
2. Itactsasaguidelineforenhancingthesystem(wheneverrequired)bydescribingthose features of the system that can be modified easily withoutaffecting the systemintegrity.
3. Itevaluatesalltop-leveldesigns.
4. It develops and documents top-level design for the external and internalinterfaces.
5. Itdevelopspreliminaryversionsofuserdocumentation.
6. It defines and documents preliminary test requirements and the schedule forsoftwareintegration.
7. Thesourcesofarchitecturaldesignarelistedbelow.
8. Informationregardingtheapplicationdomainforthesoftwaretobedeveloped.
9. Usingdata-flowdiagrams.
10. Availabilityofarchitecturalpatternsandarchitecturalstyles.

Architectural design is of crucial importance in software engineering duringwhich the essential requirements like reliability, cost, and performance are dealtwith This task is cumbersome as the software engineering paradigm is shiftingfrommonolithic,stand-alone,built-from-scratchsystemstocomponentized,evolvable,standards-based,andproductline-orientedsystemsAlso,akeychallenge for designers is to know precisely how to proceed from requirementsto architectural design To avoid these problems, designers adopt strategies suchas reusability, componentization, platform-based, standards-based, and so on. Operations personnel are also involved. All these stakeholders must also beconsulted while reviewing the architectural design in order to minimize the risksand errors.



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- Here in the above figure, the architectural view of the entire application isshown
- We are developing the application using Tkinter module, OpenCV, SVM Algorithm and storage as database.
- Theapplicationwhenlaunched,worksaccordinglyasdeveloped using the Python 3.7.
- All the screens are displayed according to the modules specified

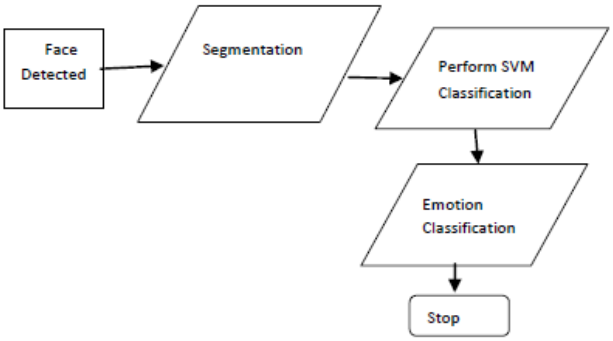
Design Concepts for Our Project:

- Abstraction: As the user's data is hidden with the password protected only, he/she can be seen when it opened.
- Modularity: As the project is divided into different modules, it is a modular design approach that we follow to develop.
- Information Hiding: As the user data is protected with a password i.e., the file is only seen by user.
- Architecture: As the project following program modules and providing conceptual integrity of the system.

ALGORITHM DESIGN

Step 1: Start
Step 2: Open the Application.
Step 3: The user should upload an image containing a face.
Step 4: Pre-process and detect the emotion of the face in the image.
Step 5: Select a song from the list that is suggested based on emotion.
Step 6: Stop

DATA FLOW PROCESS



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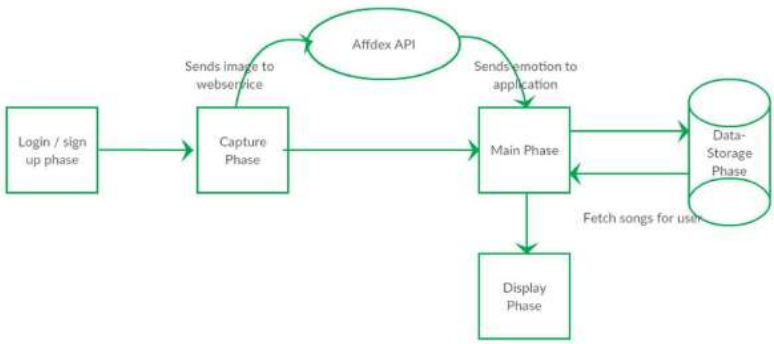

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RESULTS

User Interface

Upload an Image

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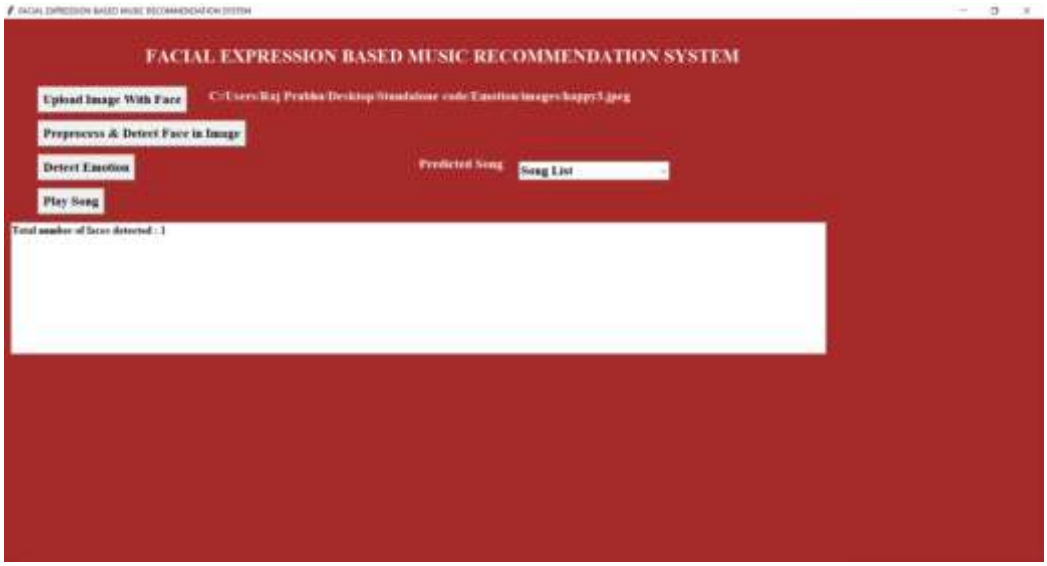
Image is uploaded

Pre-processing Image & Detecting number of faces



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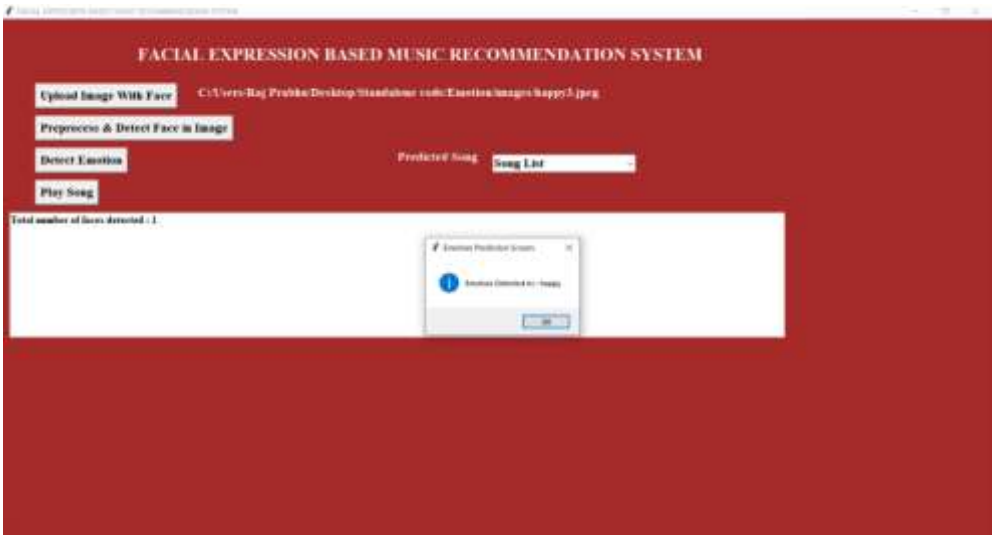
Detecting Emotion



Select a song from the list based on the emotion

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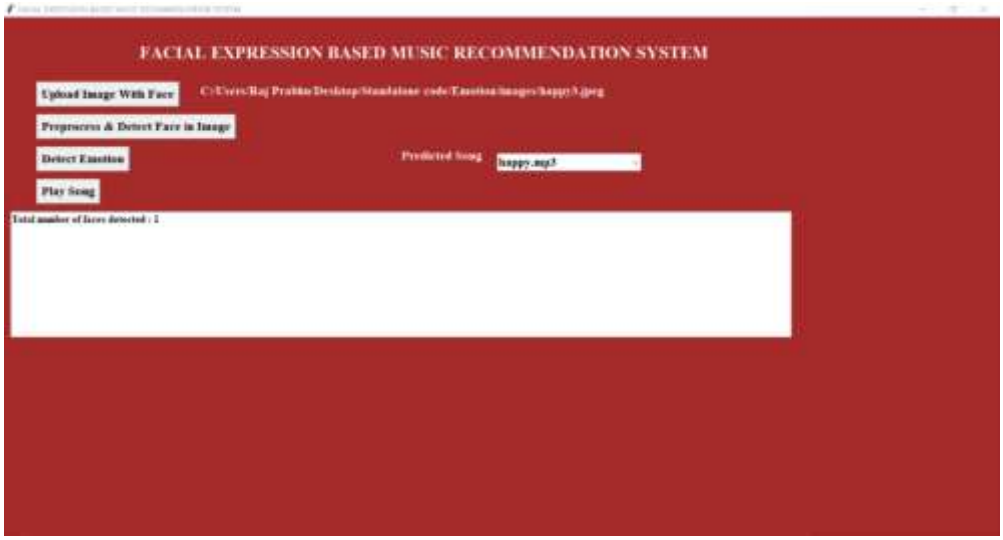
Play the Song



USER MANUAL

- There are several steps to be followed for using this:
- Initially user have to download and install the application.
- Before opening the application, the first job is to user needs to capture his image containing his face by webcam.
- After capturing his image, user need to open the application and the first thing is to upload his image into the application.
- Then the image is uploaded. User must perform another function named Pre-process and detect the faces. After doing it, a message is displayed indicating the number of faces in the image.
- Then the user should perform the detect emotion function to detect the emotion of the user.
- A message box is displayed revealing the emotion of the user. Then there is a song list field which will display the list of music which is based on the emotion detected.
- User can select the song and tap the play button for the song to be played.
- This is the whole process and different songs are suggested based on different emotions.

CONCLUSION

- In this project, we presented a model to recommend a music based on the emotion which is detected from the facial expression.
- This project proposed designed and developed an emotion-based music recommendation system using face recognition system. Music is the one that has the power to heal any stress or any kind of emotions.
- Recent development promises a wide scope in developing emotion-based music recommendation system.
- Thus, the proposed system presents face based emotion recognition system to detect the emotions and play music from the emotion detected.

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