Music Recommendation Using Facial Emotion Recognition

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Abstract: Emotion plays a vital role in human beings to express their feelings. These feelings can be expressed in various gestures such as in body language, in the voice tone or in face these emotions are helpful for an individual to understand what they are exactly conveying their thoughts or ideas which helps in better interaction. In this 5G generation the majority of the work is done under the influence of machines hence machine human interaction is very much necessary for making our lives easier. Machines can offer us more help if they are able to perceive and recognize human emotions .These interactions can be made possible only through effective communication which can be divided as verbal or non-verbal. Facial Emotion recognition, one of the crucial non-verbal means by which this communication occurs by identifying the state and mood of the person .In addition to facial emotion .Music also plays a very important role in recognizing an individual emotions .It is also a form of art which lightens the mood of a person it's an entertainment medium for music lovers and listeners. Music has a major impact on person's mood the main objective of our project is to create an automated system which plays music according to the user's emotion which can be beneficial for the user.

Keywords: Artificial Intelligence(AI); Face Detection; Emotion classification; Convolutional Neural Network

I. INTRODUCTION

Artificial intelligence the capability of a computer or robot controlled by a computer to execute tasks commonly associated with intelligent beings. The term is often used to the express the developed systems which are bestowed characteristic of humans, such as the ability to reason, and in adapted learning and also in knowing how to apply the knowledge in real-world scenarios.

Even though there's been continuing advances in the computer processing speed and memory capacity, as of now there are no programs which can match the human flexibility or in tasks that require day to day knowledge. On the other hand, few of the programs are able to achieve the level of performance of experts and professionals by obtaining the necessary output in a specific task. They have various applications such as computer search engines and voice or handwriting recognition.

The first step in CNN is removal of background so as to extract an emotion correctly from the image. The primary role of this model is to extract the primary expressional vector (EV).

Music plays a vital role in making an individual's life better, as music is connected with listener's emotions researchers declare that music is the best solution to resolve depression and other mental disorders. Due to the advancement of technology music players can be paused, played or fast forwarded according to the listener's comfort, but one of the major disadvantages is that the listener has to manually search the music which becomes tedious so our aim is to provide a website which makes this job easier by playing the music that matches the user's mood.

A. Convolutional Neural Network:

A Convolutional Neural Network is a one of the Deep Learning algorithms which take image as a input and assigns the learnable weights to various objects and differentiate one from another in image. The objective of the CNN to extract features from the input image and also

analyze the image. The face which has been detected, the CNN filter recognizes facial features, such as eyes, lips, ears, cheeks, and nose.

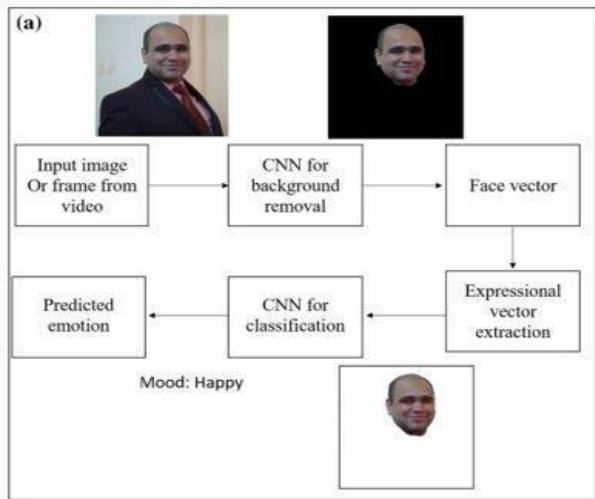Finally, emotion from the current input image is detected.

Fig 1.   Steps in CNN

II. METHODOLOGY

Ekman and Friesen said that emotion can be represented as happy, surprise, disgust, sad ,angry, fear as shown in Fig. 2.

Fig 2.   Six basic human expressions

Meharabian stated that,55% communicative cues can be judged by facial expression which can be used in smart devices like computer/robots can sense/understand the human's intension from their expression then it will be helpful to the system to assist them by giving suggestions or proposals as per their needs.

Based on the literature survey it was evident that most of the existing models are prototype based and not much of them are real time based applications .

Our project aims to implement a real time facial emotion recognition prototype which will be a web based application.

Music acts as great connector which unites markets ages, languages, preferences. The music streaming apps can be used anytime and listened during daily activities to boost the mood. With development of mobile networks and digital technologies music has become the mainstream consumer content for many young people. Music helps in mood regulation, to increase the energy level or reduce tension also by listening to right music it might improve the mental health of the listener thus playing an important relationship with human emotions.

In our proposed system, a emotion based music player is created which detects the emotion from the face in real time and suggests songs according to it which becomes an additional feature to the pre-installed music player in mobile application. This implementation leads to customer satisfaction as it analyses the users image, predicts the expression and then songs are suggested based on detected emotion.

Steps followed by our model to classify the facial emotion is as follows:

Step 1: The dataset of facial emotion recognition is extracted from known sources.

Step 2: The extracted dataset is then preprocessed if required.

Step 3: After preprocessing the image, face image or image sequence is generated. From these images, features are extracted and sent to classifier.

*Step 4:*The model then predicts the expressions. Model is saved in a json file and then it will be imported to the OpenCV module to recognize the real time images in the videos taken from the user.

Step 5: The emotion is recognized and compared with the wide array of pre-recorded dataset and the suitable emotion is displayed.

Step 6: Based on the emotion recognized suitable songs are being suggested. The user can choose a particular song and can play it.
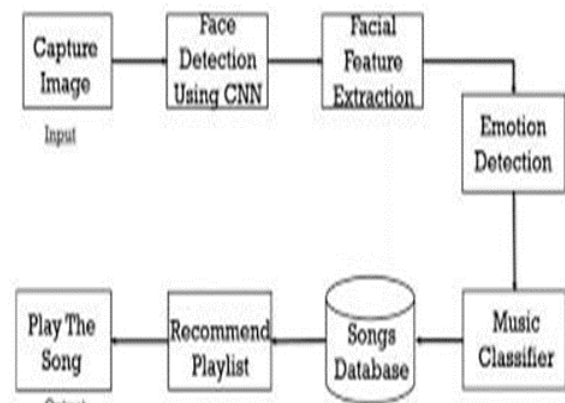

Fig 3.   Flowchart

Fig 4.   Expected output

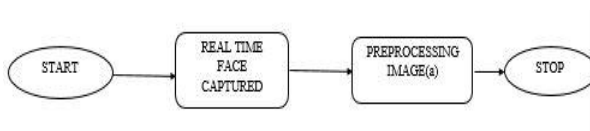## III. IMPLEMENTATION

Fig 5.   Image capture

In this project using OpenCV module for detecting and capturing the face in real time. The captured image is then preprocessed to appropriate shape and size as it has to be tested by the trained model which uses FER2013 dataset for accurate emotion detection.
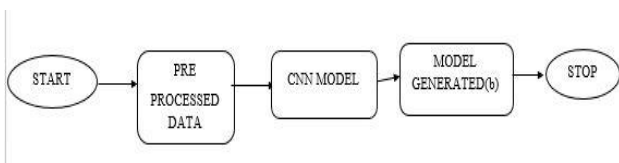

Fig 6.   Creating a model

Here, we are building CNN model using MobileNet architecture. This architecture takes less computational power to run hence it's a perfect fit for mobile application, embedded system and computers without GPU or low computational efficiency with compromising significantly with the accuracy of the results. It is also suited for web browsers as it has limitation over computation, graphic processing and storage.

In order to generate this model, we load the preprocessed train, test data from the FER2013 dataset extracted and pass it to the architecture. The model is compiled with appropriate weights and saved so that it can be used to predict the emotion for real time implementation rather than training the model again.
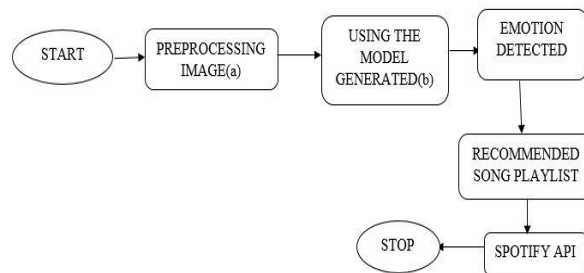

Fig 7.   Recommending music playlist based on emotion detected

When the user access our website "emosic" the open CV module access the users webcam to detect the real time face. To detect the emotion from the captured face we make use of the previously saved model file.

Once the emotion is detected it is displayed on the website and a link to access the list of songs based on the mood is displayed.

When the user clicks on any of the suggested songs our website gets redirected to Spotify platform so the user can listen.

A. About Emosic

We have created and connected the output of python file which had detected the emotion to a website using flask.

Flask is basically a micro web framework; it is known as microframework because it does not require particular libraries or tools. It only provides useful tools that make creating web application in python easier.

As soon as the user access our emosic website, a home page will be displayed which has a button "let's start" and few navigation links such as features, contact.

A feature page contains a brief introduction about our website and the contact page contains a form where user can give feedback.

The users face will be detected as soon as he/she clicks the button and the detected emotion will be rendered. Based on this emotion a song playlist will be displayed. The user can then select any one of the song and it gets redirected to Spotify platform.
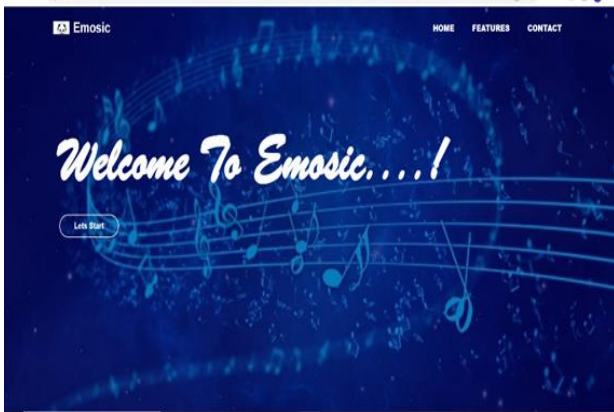
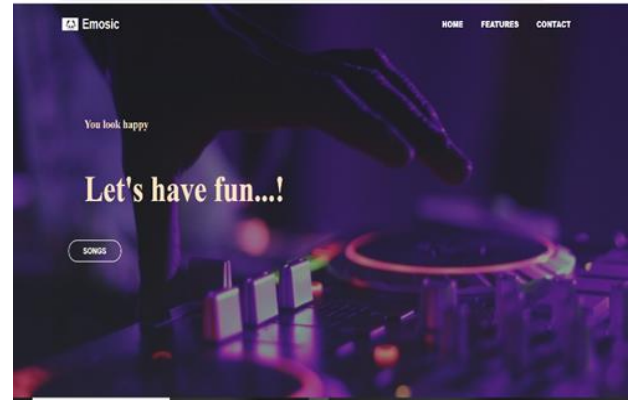*B. Website Output*

Fig 8.   The first webpage the user sees

Fig 9.   The features page

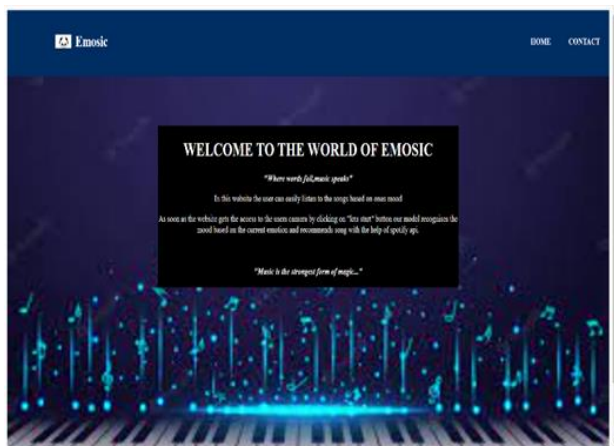

Fig 10.   The contact page
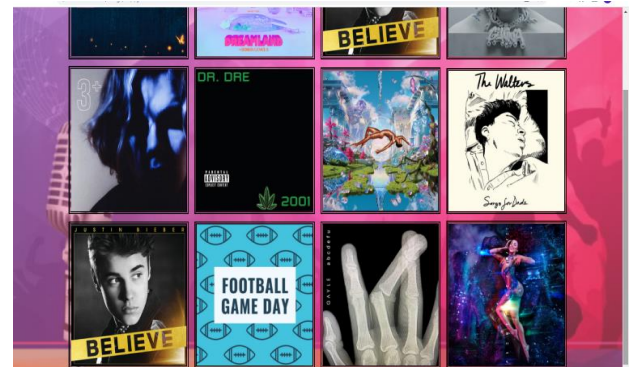

Fig 11.   The emotion detected "happy" is displayed

Fig 12.   When the user clicks on songs button the list of suggested happy songs being displayed
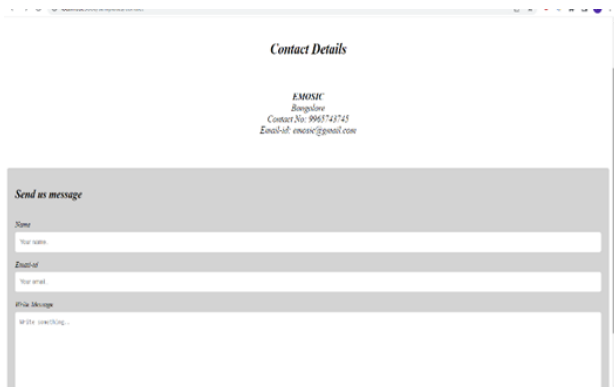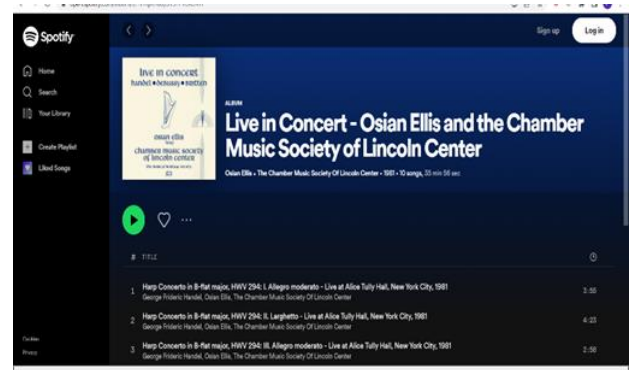

Fig 13.   The selected song from the suggestion is being played by the user

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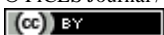
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