

## EMOTION BASED MUSIC PLAYING DEVICE

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**Abstract** - Human expression plays a vital role in determining the current state and mood of an individual, it helps in extracting and understanding the emotion that an individual has based on various features of the face such as eyes, cheeks, forehead or even through the curve of the smile. Music is basically an art form that soothes and calms human brain and body.[1] Taking these two aspects and blending them together our project deals with detecting emotion of an individual through facial expression and playing music according to the mood detected that will alleviate the mood or simply calm the individual and can also get quicker song according to the mood, saving time from looking up different songs and parallel developing a portable device that can be used anywhere with the help of raspberry pi providing the functionality of playing music according to the emotion detected.

**Key Words:** Emotions, Songs, Training, Testing, Detection

### 1. INTRODUCTION

#### 1.1 BACKGROUND

Music plays a very primary role in elevating an individual’s life as it is an important medium of entertainment for music lovers and listeners. In today’s world, with the increasing advancements in the field of multimedia and technology, various music players have been developed with features like fast forward, reverse, variable playback speed, genre classification, streaming playback with multicast streams and including volume modulation, etc.[3] These features might satisfy the user’s basic requirements, but the user has got to face the task of manually browsing the playlist of songs and choose songs supported their current mood and behavior.

### 1.2 LITERATURE REVIEW

There are several applications that provides facilities and services for music playlist generation or play a particular song and in this process all manual work is involved. Now to provide there are various techniques and approaches have been proposed and developed to classify human emotional state of behavior. The proposed approaches have only focused on only some of the basic emotions using complex techniques like Viola and Jones.

Several research papers giving a brief about the idea are:

Sr. No.	Research Paper/ Patent	Title	Inventor	Description
1	Research Paper	EMOTION BASED MUSIC RECOMMENDATION SYSTEM	H. Immanuel James, J. James Anto Arnold, J. Maria Masilla Ruban, M. Tamilarasan, R. Saranya	The research paper describes various features and facial parts that can be used to detect emotion and proposes a method for generating music based on detected emotion.
2	Research Paper	EMOTION BASED MUSIC PLAYER	Sri Charan Nimmagadda	The project focuses on an android application that would capture an image of the user and detect 4 emotions and develops a simple algorithm for generating a playlist and detecting emotion further also lets user add a song and skip a song.
3	Research Paper	EMOTION BASED MUSIC PLAYER	Hafeez Kabani, Sharik Khan, Omar Khan, Shabana Tadvi	This module uses the intensity of speech in order to detect emotion and further uses artificial neural, confusion matrix for generation of the playlist.
4	Research	SMART MUSIC	Shlok	This study basically describes

	Paper	PLAYER INTEGRATING FACIAL EMOTION RECOGNITION AND MUSIC MOOD RECOMMENDATION	Gilda , Husain Zafar , Chintan Soni , Kshitija Waghurdekar	the process through 3 modules , emotion module for capturing the user's details, Music classification module that uses deep learning for recognizing emotion and further Recommendation module for suggesting the playlist.
5	Patent	METHOD AND APPARATUS FOR RECOGNIZING AN EMOTION OF AN INDIVIDUAL ON FACIAL ACTION UNITS	Sudha Velusamy, Hariprasad Kannan, Balasubramaniam Anand, Anshul Sharma	The invention basically describes the facial action units that can be used and algorithm for combining 2 facial action units for accurate detection of the emotion.
6	Patent	GENERATING MUSIC PLAYLIST BASED ON FACIAL EXPRESSION	Markus Mans Folke Andreasson	This patent describes how to capture the area of interest for emotion detection and database for storing playlist assigned to particular mood.
7	Patent	MUSIC PLAYING SYSTEM AND MUSIC PLAYING METHOD BASED ON SPEECH EMOTION RECOGNITION	Kai-Tai Song, Carlos Cervantes	This invention describes how using speech and emotion coordinates using different algorithm for playing the music playlist according to the emotion detected
8	Patent	FACIAL EMOTION RECOGNITION	Mutasem K. Alsmadi	This disclosure provides an automatic geometric method for analyzing and recognizing human facial expression based on extracted features using a neural network and then using genetic and back propagation algorithm for detecting emotion.
9	Patent	REAL -TIME EMOTION RECOGNITION FROM AUDIO SIGNAL	Yaser Khan Chris Huybrechts Jaeyoun Kim Thomas C Butcher	This invention focuses on detecting audio signal and rapid audio fingerprint on computing devices. Features are detected and extracted to determine degree of similarity.
10	Patent	APPARATUS AND METHODS FOR THE DETECTION OF EMOTIONS IN AUDIO INTERACTION.	Pereg Oren Wasserblat Moshe	This invention provide method and apparatus for detecting emotional states of a speaker in an audio recording. There is no requirement of predefined voice sample of the speaker.

The above stated are some of the journals gives a broad view of understanding on what approaches that have made and evinces techniques and algorithms that is machine learning using support vector mechanism for capturing the facial emotion and further generating a playlist for the user.

### 1.3 OBJECTIVES

Emotion based music player is a novel approach that helps the user to automatically play songs according to the emotions of the user. It recognizes the facial emotions of the user and plays the songs according to their emotion. The emotions are recognized using a machine learning method Support Vector Machine (SVM) algorithm.[4]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 behaviors and emotional state. The webcam captures the image of the user. It then extracts the facial features of the user from the captured image. Facial expression categorized into 2, smiling and not smiling.

According to the emotion, the music will be played from the predefined directories.

### 1.4 PROBLEM DEFINITION

In old-style music players, a user had to manually browse through the playlist and select songs that would soothe his mood. In today 's world, with ever increasing advancements in the field of multimedia and technology, various music players have been developed with features like fast forward, reverse, variable playback speed, local playback, streaming playback with multicast streams and including volume modulation, genre classification etc. These features may satisfy the user 's basic requirements, but the user has to face the task of manually browsing through the playlist of songs and select songs based on the current mood and behavior. That is the requirement of an individual, a user sporadically suffered through the need and desire of browsing through his playlist, according to his mood and emotions. [1]

### 1.5 PURPOSE

The foremost concept of this project is to automatically play songs based on the emotions of the user.

It aims to provide user-preferred music with respect to the emotions detected. In existing system user has to manually select the songs, randomly played songs may not match to the mood of the user, user has to classify the songs into multiple emotions and then for playing the songs user has to manually select a particular emotion.

### 1.6 SCOPE

Facial expressions are a great indicator of the state of a mind for a person. Indeed, the most natural way to express

emotions is through facial expressions. Humans tend to link the music they listen to; to the emotion they are feeling. The song playlists though are, at times too large to sort out automatically. It can be a great relief if the music player was "smart enough" to sort out the music based on the current state of emotion the person is feeling. The project sets out to use various techniques for an emotion recognition system, analyzing the impacts of different techniques used.

## 2. TECHNIQUE

The working revolves around detecting emotion and playing the song accordingly, as we move further and dig deeper with each step we analyse various aspects that needs to be taken care of like the dataset that can be used for detecting emotion and when the emotion is detected what kind of music should play whether to alleviate the mood or keep it as it is.

Finding the right song for ones current mood is troublesome, especially, when a person is in a bad mood and has to search through the entire playlist to find that one song that clams him down. Also, generating a playlist is no piece of cake. It requires time, patience and a lot of effort.

The subsequent table shows that data consists of 48x48 pixel grayscale images of faces. The faces are automatically registered to the face is more or less centred and occupies about an equivalent amount of space in each image. The task is to categorize each face supported the emotion shown within the countenance in to at least one of seven categories (0=Angry, 1=Disgust, 2=Fear, 3=Happy, 4=Sad, 5=Surprise, 6=Neutral). [12]

fer2013. csv contains a columns "emotion", "pixels" and "usage". The "emotion" column contains a numeric code starting from zero to six inclusive, for the emotion that's present within the image. The "pixels" column contains a string surrounded in quotes for every image. The "usage" column shows if the image is under training set phase or testing set phase.

Python libraries such as openCV and imutils is used for processing the image and other functions that user will provide in order to detect the emotion, keras is used for estimating and developing deep learning models, tensorflow is used for defining and training neural network models, numpy has been used to store the array of images. [13]Altogether thislibraries are blended together and further when user makes different facial expression in front of camera the emotion is detected along with the probabilities of a particular emotion and further plays a song according to the mood detected which would alleviate the mood. Music directories are used to play music in our product after detection of emotion. A main directory named "Songs" that

contains sub-directory for every emotion. Each sub-directory contains songs that corresponds to the emotion. Songs in the sub folders can be changed/replaced or deleted by the programmer depending on the requirements of user. At times it is possible that user might like different kinds of songs in certain mood. For example, when a user’s emotion is detected to be Sad, then it is totally users choice what kind of mood does he/she wants. There are two possibilities in this scenario:

- a) User wants to continue his/her sad mood.
- b) User wants to elevate his/her mood and wants to be happy.

Therefore, depending on the choice of users the songs in the sub directories can be changed.

As the program runs successfully on system, the same code is used in the hardware device raspberry pi after installing the operating system[11] further the changes are made according to the device configuration and the device becomes portable where raspberry camera is used to capture image and when the emotion is detected the the song plays from the speaker connected through the aux cable of device.

**Hardware Requirements**

- Raspberry pi 4b
- Raspberry pi camera 8mp
- Rechargeable Batteries(2100mah)
- Speaker

**Software Requirements**

- Python 3.6
- OpenCV 3.1
- Keras
- Tensorflow
- Numpy
- Imutils



Fig:1 Prototype Device

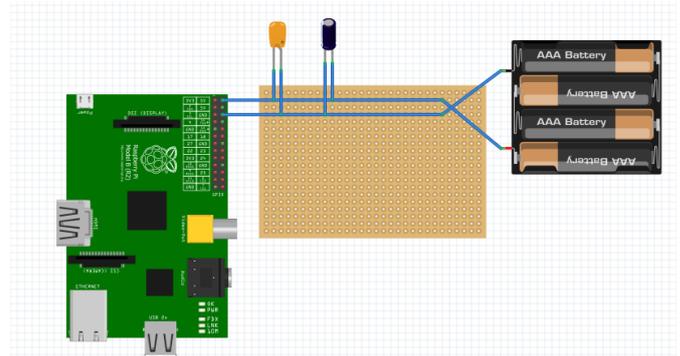


Fig:2 Connections of raspberry pi

Figure 1 shows the prototype of the product and where camera will detect the emotion and the song will play accordingly from the speaker and power is provided from the batteries which makes the device portable.

Figure 2 shows the block diagram where pin 2 of raspberry is connected to positive leg of 1000µf, one leg of 1µf and positive wire of battery case and pin 6 of raspberry pi is connected to the negative leg of 1000µf, one leg of 1µf and negative wire of battery case.

**FUTURE SCOPE**

Image capturing can be made more efficient in low light environment.

More accurate playlist can be generated

Even more compact device can be designed

**3. CONCLUSION**

The Emotion-Based Music Player is used to avoid manual work and give a better music player experience for the end user. The product solves the basic needs of music enthusiasts without troubling them as existing applications do: it uses technology to increase the interaction of the system with the user in many ways. It eases the work of the end-user by capturing the image using a camera, determining their emotion, and suggesting a customized play-list through a more advanced and interactive system.

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