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A PHYSIOLOGICAL ANALYSIS ON EMOTIONAL INTELLIGENCE USING CONVOLUTION NEURAL NETWORK BASED MUSIC PLAYER

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Abstract:- Music is a fundamental attribute of the humankind. In every era of human history around the globe , music has allowed humans to express their feelings and reduce stress levels. This research paper put forward a experimental review of Music player based on Emotional intelligence by physiological analysis. Recognition of facial expression is used to identify the basic human emotions. The use of physiological analysis can lead to more reliable and objective emotion recognition results. Thus, development of new method for recognizing emotion using physiological data and with deep Convolution Neural Networks (CNN). The computational model was designed using multiple Convolution, max pooling any fully connected layers, which successfully classifies emotions in different moods. We describe the procedure that was used to identify the mapping of each song with its emotion. This research paper aimed to provide all the basic needs of music listeners by saving their time and thereby increasing user overall health.

Keywords: *Emotional intelligence, Physiological analysis, Convolutional Neural Networks (CNN), Emotion recognition, max pooling*

I INTRODUCTION

In recent years, the rapid advances and growth in machine learning models , numerous techniques and multi-sensor data or information fusion has made them possible to endow the machines or computers with the ability of emotion understanding and detection, recognition, and analysis [1,2]. Music has been proven that have a potential energy to change the state of the mind of the users. Music is often described as a “language of emotions”, the development of Emotion based music player sort the playlist according to the mood and emotion of the user [4]. It would be useful if the music player itself chooses a melody playlist as indicated by the present mind-set of the user. Emotion detection is difficult state that amalgament of feelings, behavior, and thoughts and is people's psycho-physiological emotions and reactions to internal or external stimuli. It plays a indispensable role in people's decision making, intuitive, perception and transmission communications. influencive computing has a extensive of applications. In diverse systems, if the computer vision techniques can recognize the human operator's emotional state more accurately and in real time usage, the interaction between the machine and the operator can be made more intelligent and user-friendly. Emotion recognition has more attracted increasingly keen interest from researchers and developers from diverse fields and techniques. The use of automatic emotion recognition has great potential in different intelligent systems, The introduction of automatic emotion detection and recognition into human-computer interaction applications can significantly improve the quality of user experiences. Emotion recognition is the process of understanding the emotion type expressed by a person.[7]The overall system can be divided into various logical stages like capturing image, detection of face, detection of landmark points on the detected face, classifying those feature points with the help of CNN classifier, and then generating the playlist according to that recognized mood [2,4]. However, recognizing emotions generally look at facial expressions, but only considering these features can be misguiding. Facial expressions, body language can be faked which can make feature identification difficult. For, example it has been observed that people smile during negative emotional experiences. Considering this,

physiological signals such as heart rate, blood pressure, respiratory signals can be important traits for identifying emotions accurately [5]. In some cases there is a requirement of heavy machines to record the data and experimental setup. Combination of multiple variations of EEG signals along with peripheral signals, this data is used to train a deep convolution neural network to identify emotions. For the purpose of providing the users with the best possible and effortless pleasure of music, Facial Expression Recognition (FER) based systems have been adopted as they provide more fast, accurate and efficient results with less effort. It reduces the time-consuming and it takes less than 1.4 seconds to acknowledge one instance of feeling. The high performance and therefore the less time demand of the system create it appropriate to any emotion aware applications and the rate accuracy is very high for this vision. This system eliminates the time consuming and the tedious work of manually playing the songs from any playlist accessible on the net or in the other Application.

1. Motivation and Problem Statement

Using the traditional and old music players, end user has to do manually browse the playlist of songs and select the songs that would soothe the mood and emotional experience that irritate the user and disappoint the mood of the end user. That is the requirements of a person, that user sporadically suffered through the need and desire of browsing through his playlist, according to his mood and emotions. The main concept of this research is to automatically play songs based on the emotions of the user.

II LITERATURE SURVEY

2.1 Related Techniques and literatures review

Psychologists use verbal observations about emotional reactions to research emotional conceptualization.[6] Hevner's popular paper, examined the relations between the music and emotion through the experiments in which participants were asked to describe the most symbolic sections of the piece of music that they had imagined. These empirical studies proposed a wide range of emotional models, most of which form part of one of the two approaches to emotional conceptual model: categorical and dimensional [6]. Depending on the categorical approach, people experience emotions as distinct categories. The concept that a limited quantity of fundamental and specific courses of emotion, such as joy, sorrow, anger, fear , disgust and shock, may be extracted from all other secondary emotion forms, is central to this approach. Increasing fundamental emotion can be functionally recognized as a key assessment of occurrences that have typically involved in the course of evolution. Emotional responses can be identified in all cultures and are often linked to distinct patterns of variations in physiology or emotion.

2.2 Existing work

Vinayak Bali et al. Proposed Emotion Based Music Player, It eases the work of the user by capturing image and detecting the suggesting a customized playlist through more advanced and interactive features. The user's negative or bad thoughts are slowly converted to positive thoughts by changing the song from low tone to excited tone. Effectively categorize the songs based on the detected mood by using LSTM algorithm. The resultant system proposed to have increased accuracy in the range of 80% to 99% [1]. Shahin Amiriparian et al. proposed Emotion detection and Themes Recognition in Music Using Convolutional and Recurrent Neural Networks and different modules. In this methodology, the present and current fusion system of end-to-end recurrent neural networks (RNN) and pre-trained convolutional feature extractors for music and emotion recognition. They trained more than 9 models and conducted various fusion experiments. The best performing model recognized 74.2 % ROC-AUC on the test partition which is 1.6 % points over the baseline systems of the MediaEval 2019 Emotion & Themes in Music task[2]. Prof. Vijaykumar R. Ghu et al. proposed Emotion Based Music Player Using Facial Recognition. This paper mainly focus on the methodologies which are available for the detecting and recognizing human emotions for developing emotions based music player, It also gives a brief idea about systems working, perfect playlist generation and human emotions classification. The application is developed in such a way that it can manage the content received by user, analyse the physiological signals and the image properties and detect the mood of the user based on music mp3 file properties so that they can be added into particular playlists according to the mood [3]. Vaasu Gupta et al. proposed A Mood Based Music Player. This project is based on the principle of detection of human emotions using image processing, and to play music which is appropriate for enhancing that emotional state [4-5]. The overall system can be divided into various logical stages like capturing image, detection of face, detection of landmark points on the detected face, classifying those feature points

with the help of SVM classifier, and then generating the playlist according to that recognized mood.

2.3 Issues in Existing Works

In reality, sensitivity is to "respond to, or be aware of, the experiences of senses that human beings convey their emotions through various means of language, voice, literature, music and art. The meaning of sentire derived from Latin roots. Even if an AI can replicate such mediums algorithmically, it remains to be seen if the feelings it evokes are indeed oneself. After all, the AI identifies only an algorithm for its emotion. Human emotions, though extremely complicated, are also derived from internal studied conditions. This does not diminish the value of human feelings or thoughts and emotions.

Indeed it is all the more remarkable that the algorithm can give rise to complex emotions such as love and joy rather than materialize spontaneously. If the human mind is a complex algorithm, the emotional expression of mankind is also algorithmic. Perhaps Shakespeare's great works are not spontaneous artistic accomplishment; they may rather be created by the minds of their authors algorithmically. The distinction between AI and humans may be simply because their algorithms are complex. In the end the line that distinguishes humans and AI decrease as humans progress through the 21st century. Progress in neuroscience shows that people can be more algorithmic

III . PROPOSED WORK

3.1 Approach

Most existing works build their own databases in the absence of a common database. As manual annotation is time consuming, there are generally less than 1000 in the early works database. It's advantageous to have a larger database covering different kinds of music, genres or even songs of different languages to make the database as general and as large as possible. First, the emotional model or how many emotional types can be used also does not have any consensus. The certain taxonomy is centered on psychologists' specific feelings, while others are derived from clustering psychotic symptoms or labels. To accurately equate the source material, musical parts are typically translated into a typical (e.g. tracking frequency of 22,050 Hz, 16-bit resolution, monochannel) type. Since full material parts may often include portions of various feelings, it is also preferred to minimize the variance of the emotions within the segment and to lower the amplitude of the whole composition from 20-30 to 280 Hz Conducting music analysis approach, or merely choosing the middle 30-second or 30-second section from the 30th segment of the album. To remove the chorus portion. There have been few studies to research the effect of music segments [7-11]

There is a multidimensional sensation of hearing music. Various interpretations of emotions in music are also linked to various acoustic signals patterns. For example, while the excitement is connected with the pace (fast / slow), pitch (high / low, "loudness (high / low) and timbre (bright / soft) the valence is connected with the 2 modes (substantial / mild) [6]. It is also noted that the perception of emotions often depends on one but a combination of a single musical factor. For instance, high-pitched chords can be more optimistic than soft chords and low-pitched chords, no matter how fashion [7].

3.2 Algorithm in Rhythm

Rhythms are the pattern of different strength pulses / notes. Tempo, meter, or phrasing intervals are often described [7]. A quick-tempo song is often seen to have high excitement. The following 5 features are proposed for the rhythms intensity, rhythm regularity, consistent rhythm, average frequency and average tempo to define the rhythm of rhythm / flux, whereas the firm rhythm with negative valence. The average starter strength of the start curve, determined based on the mentioned algorithm. Rhythmus strength is average. Performance calculates rhythm regularity and clarity [7-9]

3.3 User Experience Research

MIR researchers have made great efforts to automate MER and over the last few years, the form of music being studied has slowly shifted from symbolic to raw to audio and from classical Western music to folk music. Western classical music is frequently selected in early studies due partly to the rich musicological and psychological literature on classical, and partly because the perceived emotions of classical music selection seem to be easy to reach agreement. But since MER seeks to promote music rehabilitation and management in daily listening, popular music dominates regular listening and study [7-10].

MER adopts a categorical conceptualization of emotions and classifies music pieces by emotional classes. The great benefits of this approach are that it is easily integrated in a re-testing system based on text or metadata. Emotion labels provide a nuclear representation of music, similar to several other music metadata like genres or

instrumentation, that enables users to recover music by means of several keywords. Several works have been guided and professional classificators who forecast the emotional class best for the affective contents of the amusing signal. [7,9] The key downside to MER's categorical approach is that a limited number of primary emotional groups are too small compared with the richness of human-perceived music. The use of a finer granularity does not, on the other hand, automatically solve the whole problem, since it is very vague and relies upon the vocabulary used to categorize emotions. Moreover, the subjects may be overloaded with a large number of emotional classes, so that psychological experiments are not considered realistic [7].

3.4 Advantages of proposed work

Emotion is contextual, the collecting of reality evidence on the ground will take place with caution. Existing methods of annotation may be grouped into two categories ,expert or subject-specific. The professional approach requires only a few (often under five) artistic experts to express sentiment. [9]Musical plays that are frequently literally discarded and passions cannot be relied upon by experts. The subject-based approach conducts a hypothetical evaluation which requires several untrained subjects to express empathy. The simple reality is always calculated by measuring the views of all participants, so that the nature of the tests will reduce the problem of life exhaustion [3-6]

In fact, the analytical annotation never lasts more than one hour to increase the precision of the emotional annotations [18].The another tendency is to leverage so-called human estimation to make annotation an enjoyable work. The amount of songs that are required to annotate is therefore reduced. In particular, the aim is to make emotional annotations an over-product of web-based gaming. These games are also developed as multiplayer games, implying that many players play the game together in order to compete with another. In general, this practice could increase the reliability of the notes [22]

IV METHODOLOGY

The next step is to create a machine-learning model, after acquiring a ground mark and music features, to learn the facial emotional labeling and music features. Musical emotional classes are mostly done by existing classification algorithms, for example the neural network, k-nearest neighbour (k-NN), maximal similarity, decision tree.[7,10]

Given that songs can contain more than one emotion, multi-label classification algorithms, such as SVM, have been used to assign multiple emotional labels for a song. Emotion recognition of user: Current mood state of the user is determined using Neural Networks (Convolutional Neural Nets or Recurrent NN). Input can be either graphic based (facial) or voice Chatbot oriented (audio). The determined mood is mapped across a provided mood table to generate a range of possible mood [15]

4.1 List of modules

Motivated by personal variables including cultural context, age , sex and temperament that affect the interpretation of emotion, Yang et al. have suggested a fuzzy approach that tests each emotions intensity in associated with the classification song and offers a more quantitative assessment of an emotional essence in association with the classification of the song.[1-12] The spatial aspects in this report are an important feature in music to date neglected. Most research concentrated on musical passages which are consistent with emotional language. Nevertheless, it is important to explore the time-dependent interaction between music and emotion, since certain types of music (in particular, classical music) convey or invoke various feelings since time progresses. Continual recording methods, often paired with nonverbal responses, have been around since the classic work to analyze emotional feeling as a complex creation [2]

Emotion based music player system provides the specified playlist as for the user's emotional state and facial expression. The proposed system consists of three major modules:

A. Formation of music player

In this research, online platform environment has been used for instant run feature pushes code and resource changes to your environment. It clearly understands the changes and often sends them without restarting. so you can see the effects immediately. The code editor helps to write better code, work faster and more productive by offering advance code completion, refactoring, and code analysis. As we type, this platform provides suggestions in drop list. Simply press tab to insert in the code. Fast and feature- rich faster than real device and allows you to prototype and test your platform. [1,3]

B. Emotion extraction modules

In this module image of a user is captured using the camera or it can be accessed from the stored image in the phone from the stored memory. This captured image enhanced in the form of the tone mapping in order to restore the original contrast of the image from restored image [1]. After image enhancement is over, all the images are converted into binary image format and the face is detected in the image model. The Convolution Neural Network is now used for human facial recognization and emotion detection. It consists of hidden layers (n layers depending upon the data set). The output layer showed the approximate result of the recognized face. Back propagation method is used for making the model error-free and producing the accurate result or match for the emotions that are recognized and classified. [4]

C. Audio feature extraction module

In this stage, the predicted mood of the user is used to classify songs and to create a playlist for the particular mood. This classification of songs happens on the basis of genre of the songs. The genre of the various songs will be taken from online libraries and according to the mood detected the songs will be classified and a playlist will be created. The playlist will accordingly get modifies and updated with user's choice and its choice will be stored in database for future references[1,3-8]. There are several online libraries that classifies the song according to its tempo and various other musical aspects. It will address three significant things: location of face from *Facial expression detection.*

V APPLICATION OF MODULES

A. Data set

The Raw data set is downloaded one by one from Google images for seven emotions. Extra dataset is taken from Kaggle data sets for facial expression detection.

B. *Trained dataset*

Before processing the model, the training and testing phases is undergone. Trained dataset are those which are taught to the model. At the time of training [12], system takes dataset of faces (images) with their respective expression; eye should be in centre location mostly and learns a set of weights, which splits the facial expressions for classification

C. Preprocessing

Data can be raw, inconsistent and noisy, and it can be hard to obtain the reliable results with that data sets. Data pre-processing can help to solve such issues and prepares raw data sequences to be processed further as the first input to a neural network models. Smoothing and Scaling for pre processing of signals and data sets. We detail both of these in the following subsections[1,4].

D. *Evaluation process*

Once training process is over, now we check if it is better when using this step. This is where dataset set aside previous comes into consideration [3]. Evaluation allows the testing of the model against data sets that never been seen and used for training and is meant to be representative of how the prototype is perform while in the real world scenario and for real time users.

E. Parameter Tuning process

Once the evaluation process is done, further more development in training can be possible by tuning the parameters. There were few parameters we have that were completely assumed when the training was over [34].For the more models that are more complex to analyze, the starting conditions played vital role in the determination of the result of data which is used for training. Differences can be seen on the whether a model starts off training with initialized values to zeroes versus some more values distributed , which leads to the query of which distribution is to be used in training. Since there are many deliberation at this state of training, It is important to define that makes a good model [28]. These parameters are referred to as Hyper parameters. The adjustment or tuning of these parameters depends on the model, dataset and the training process. Once you are done with these procedure and are satisfied then have to move on to the last step.

All the photos present in dataset are firstly converted to grayscale, for making pre-processing and detection more efficiently, faster and easier. Each input image is in form of pixels (e.g. 48x48). Now the pixel represented images are sent to the convolution layers (hidden layers). In Between each layer Maximum pooling is done, the purpose of doing so, is to down-sample the input data or image, reducing the dimensions and allows assumption to be made about characteristics contained in sub regions [35] . As well as it decreases the computational cost by reducing number of parameters to understand. Example, if input image is of matrix 4x4 representation and let's say output we want is in 2x2, then pooling is performed in between all hidden layers and gives the result image. After that data is sent to dense layer, to prevent over-fitting. Dropout technique is

used to reduce over-fitting in neural networks. The output layer conveys the detected class [30].

Let's say if the detected expression is happy, then the next step is to select anyone training dataset for music model. Now, the dataset is trained according to the match for playing music. LSTM neural network is used for classifying the songs. One hot encoding is performed to represent categorical variables into binary vectors, so as to make the classification faster and better. Then the song is played according to the current mood of the person

V. DISCUSSION

- In our research, worked by using deep convolutional neural network for human emotion classification based on the physiological signals are generated in human body upon any emotional intelligence.
- The proposed technique specified encouraging results on different data sets. Also showed how the results outplayed previous works done using various analysis and techniques.
- To trigger generalization, In this research the trained models in previous methodologies compared and analyzed specific models. Upon observing these results this is best approach module for emotion recognition with along physiological signals. In this manner, our research work can be used as a baseline for future experiments.

VI CONCLUSION AND FUTURE WORK

A Physiological Analysis on Emotional Intelligence using Convolution Neural Network based Music Playeris used to high-performance emotion recognition system and give a better musical player experience for end user. Many techniques are attempted for human emotion recognition. In our experiments study the capability of physiological signals to detect emotions. For the classification of emotions, we used the deep learning which is the new technology in classification of the techniques Application solves all basic needs of music listeners and lovers without troubling them as existing applications do and this aimed to provide people with befitting music using facial recognition. It uses computer vision technology to increase the interaction of the system with the user in numerous ways. It eases the work of the user by capturing image and detecting the emotion of user a customized playlist through more advanced and interactive features. The user's negative thoughts are moderately converted to positive thoughts by switching the song from low tone to excited tone.

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