JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue

JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)

An International Scholarly Open Access, Peer-reviewed, Refereed Journal

Entertainment Suggestion for handicap and dumb people by detecting their emotions using EEG Signals

Niraj Gangwani, Student PCET-NMIET, nirajgangwani8@gmail.com
Tushar Memane, Student PCET-NMIET, tusharmemane25@gmail.com
Akshay Rasal, Student PCET-NMIET, rasalakshayr@gmail.com
Prof. Mrs. Harsha Sarode, Assistant Professor, harsha.sarode@nmiet.edu.in

Abstract— **Since emotions play an important role in the daily life of human beings, the need and importance of automatic emotion recognition has grown with increasing role of human computer interface applications. Emotion recognition could be done from the text, speech, facial expression or gesture. In this paper, we concentrate on recognition of "inner" emotions from electroencephalogram (EEG) signals. We propose real-time fractal dimension based algorithm of quantification of basic emotions using Arousal-Valence emotion model. Two emotion induction experiments with music stimuli and sound stimuli from International Affective Digitized Sounds (IADS) database were proposed and implemented. Finally, the real-time algorithm was proposed, implemented and tested to recognize six emotions such as fear, frustrated, sad, happy, pleasant and satisfied. Real-time applications were proposed and implemented in 3D virtual environments. The user emotions are recognized and visualized in real time on his/her avatar adding one more so-called "emotion dimension" to human computer interfaces. An EEGenabled music therapy site was proposed and implemented. The music played to the patients helps them deal with problems such as pain and depression. An EEG-based web-enable music player which can display the music according to the user's current emotion states was designed and implemented.**

Keywords— **emotion recognition, EEG, emotion visualization, fractal dimension, HCI, BCI**

I. INTRODUCTION

Nowadays, new forms of human-centric and human-driven interaction with digital media have the potential of revolutionising entertainment, learning, and many other areas of life. Since emotions play an important role in the daily life of human beings, the need and importance of automatic emotion recognition has grown with an increasing role of human computer interface applications. Emotion recognition could be done from the text, speech, facial expression or gesture. Recently, more researches were done on emotion recognition from EEG [6, 18, 27, 28, 33, 43]. Traditionally, EEG-based technology has been used in medical applications. Currently, new wireless headsets that meet consumer criteria for wearability, price, portability and ease-of-use are coming to the market. It makes possible to spread the technology to the areas such as entertainment, elearning, virtual worlds, cyberworlds, etc. Automatic emotion recognition from EEG signals is receiving more attention with the development of new forms of human-centric and human-driven interaction with digital media. In this paper, we concentrate on recognition of the "inner" emotions from EEG signals as humans could control their facial expressions or vocal intonation. There are different emotion classifications proposed by researchers. We follow two-dimensional Arousal-Valence model [38]. This model allows mapping of the discrete emotion labels to the Arousal-Valence coordinate system. One of emotion definitions is as follows: "The bodily changes follow directly the perception of the exciting fact, and that our feeling of the changes as they occur is the emotion" [20]. Our hypothesis is that the feeling of changes can be noticed from EEG as fractal dimension changes. We focused on study of fractal dimension model and algorithms, and proposed a fractal based approach to emotion recognition. To evoke emotions, different stimuli could be used: visual, auditory, and combined. They activate different areas of the brain. Our hypothesis is that emotions have spatio-temporal location. There is no easily available benchmark databases of EEG labeled with emotions. But there are labeled databases of audio stimuli for emotion induction - International Affective Digitized Sounds (IADS) [8] and visual stimuli - International Affective Picture System (IAPS) [26]. Thus, we proposed and carried out one experiment on emotion induction using IADS database of labeled audio stimuli. We also proposed and implemented an experiment with music stimuli to induce emotions by playing music pieces. Both experiments were carried out with prepared questionnaires for the participants to label the recorded EEG with the corresponding emotions. There are a number of algorithms for recognizing emotions. The main problem of such algorithms is a lack of accuracy. Research is needed to be carried out to evaluate different algorithms and propose algorithms with the improved accuracy. As emotion recognition is a new area, a benchmark database of EEG signals for different emotions is needed to be set up, which could be used for further research on EEG-based emotion recognition. Until now, only limited types of emotions could be recognized. Research could be done on more types of emotions recognition. Additionally, most of the emotion recognition algorithms were

developed for off-line data processing. In our paper, we target on real-time emotion recognition and its applications. The user emotions are recognized and visualized in real time on his/her avatar. We add one more so-called "emotion dimension" to human computer interfaces. Also an EEG-based music therapy and a music player are implemented with our real-time emotion recognition algorithm. Although in this paper, we describe standalone implementations of emotion recognition and its applications, it could be easily extended for further use in collaborative environments/cyberworlds..

II. LITERATURE SURVEY

Paper Name: An Emotional Symbolic Music Generation System based on LSTM Networks Author: Kun Zhao, Siqi Li, Juanjuan Cai, Hui Wang, Jingling Wang
Description: With the evolving of AI technology in recent years, Artificial Neural Networks have been used in the task of algorithmic music composition and have shown significant results. Music is highly associated with human emotion, however, there are few attempts of intelligent music composition in the scene of expressing different emotions. In this work, Biaxial LSTM networks have been used to generate polyphonic music, and the thought of Look Back is also introduced into the architecture to improve the long-term structure. Above all, we design a novel system for emotional music generation with a manner of steerable parameters for 4 basic emotions divided by Russell's 2-demonsion valence-arousal (VA) emotional space. The evaluation indices of generated music by this model is closer to real music, and via human listening test, it shows that the different affects expressed by the generated emotional samples can be distinguished correctly in majority[1].
Paper Name: Algorithmic Music Composition Based on Artificial Intelligence: A Survey Author: Omar Lopez-Rincon, Oleg Starostenko, Gerardo Ayala-San Martín Description: Here present a taxonomy of the Artificial Intelligence (AI) methods currently applied for algorithmic music composition. Algorithmic music composition is the area which concerns about research on processes of composing music pieces automatically by a computer system. The use of Artificial intelligence for algorithmic music includes application of AI methods as the main tool for the composition of music. There exist various models of AI used in music composition. They are as follows: generative models, heuristics in evolutionary algorithms, neural networks, stochastic methods, agents, decision trees, declarative programming and grammatical representation. This survey aims to present the trending techniques for automatic music composition[2].
Paper Name: Emotion Based Music Player Using Facial Recognition Author: Prof. Vijaykumar R. Ghule, Abhijeet B. Benke, Shubham S. Jadhav, Swapnil A. Joshi Description: An individual's face is an important part of a human body and it especially plays an important role in knowing an individual's temperament. Educe the required input from the individual face can now be done directly employing a camera. This input will then be used in various ways. One of the applications of this input can be for extracting the information to analyze the temperament of an individual. This data can then be used to get a list of songs that comply with the "temperament" derived from the input provided earlier. This will result in removing the time-consuming and tedious task of segregating or grouping songs into different lists manually and helps to bring into existence a good playlist based on an users' emotional features.
Paper Name: An Accurate Algorithm for Generating a Music Playlist based on Facial Expressions Author: Anukriti Dureha Description: Manual segregation of a playlist and annotation of songs, in accordance with the current emotional state of a user, is labor intensive and time consuming. Various algorithms have been used to automate this process. However, the existing algorithms are slow, increase the overall cost of the system by using additional hardware (e.g. EEG systems and sensors) and have less accuracy.

III. OBJECTIVES

The main objective of the work is to provide the caregiver with the ability to monitor EEG signal and recognize emotion .

After that recommend music with respect to emotion

IV. METHODOLOGY

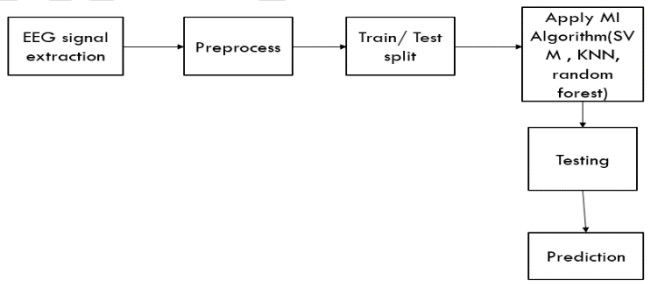

Fig:- System Architecture

Data Acquisition

In this study, the DEAP database, a database for emotion analysis using physiological signals, labeled based on valence-arousal-dominance emotion model, is used [14]. DEAP dataset includes 32 participants. To stimulate the auditory and visual cortex, 1-min long music videos were played for each participant. 40 music videos were shown to each participants, and seven different modalities were recorded, EEG is used in this study, more information is provided in [14]. The 40 video clips were pre-determined so that their valence/arousal time length would be large enough in valence/arousal scope. Each participant was asked to grade each music video from 1 to 9 for valence, arousal, dominance and liking.

Preprocessing

To reduce the electronic amplifier, power line and external interference noise, the average mean reference (AMR) method was utilized. For each selected channel, the mean is calculated and subtracted from every single sample of that channel. To reduce the individual difference effect, all the values were normalized between [0, 1].

Feature extraction

Due to DWT effective multi-resolution capability in analysis of non-stationary signals, we followed our previous work [9] for the feature extraction, in which, DWT was applied on the windowed EEG signals of the selected channels. The EEG signals are windowed due to increasing possibility of the quick detection of the emotional state. Thus, the 4- and 2-seconds temporal windows with 50% overlap were chosen. The EEG signals are decomposed into 5 different bands, including; theta (4-8 Hz), alpha (8-16 Hz), beta (16-32 Hz), gamma (32-64 Hz) and noises (> 64 Hz) via db4 mother wavelet function. Afterwards, the entropy and energy were extracted from each window of every frequency band.

Classification

In this research, kernel SVM, KNN, same as , and ANN are used for classification with the eight-fold crossvalidation. The goal of SVM, as a parametric classifier, is to formulate a separating hyperplane with application of solving a quadratic optimization problem in the feature space [16]. Kernel SVM finds the optimum hyperplane into a higher dimensional space, that maximizes the generalization capability, where the distance between margins is maximum. The RBF kernel is a function which projects input vectors into a gaussian space, using equation

V. Conclusions

Emotion detection will be done by using the DEAP dataset using the circumplex model. Music will be recommended according to the emotion of the dumb people and bed rest patient. Music provides a soothing effect on human temperament. Because of these, it will also reduce the stress level of the paralyzed and bed rest patient.

VI. Future Scope

Dataset of the music and movie recommended according to age because every age group have different choice of songs and movies. Some songs can bring bad memories. For example, if the paralyzed and bed rest patient is depressed and played a song and that song brings the bad memories of the person.it will bring stress or anxiety. As future work, we will consider a different combination of songs directory according to the age group because every age group has a different taste in music

Acknowledgment

The heading of the Acknowledgment section and the References section must not be numbered.
Causal Productions wishes to acknowledge Michael Shell and other contributors for developing and maintaining the IEEE LaTeX style files which have been used in the preparation of this template. To see the list of contributors, please refer to the top of file IEEETran.cls in the IEEE LaTeX distribution.

References

[1] Kai-YenWang, Yun-Lung Ho, Yu-De Huang, Wai-Chi Fang. Design of Intelligent EEG System for Human Emotion Recognition with Convolutional Neural NetworkIn 2018.,Volume 156,January 2018,Pages 530539.

[2] Chinmayi Bankar, Aditya Bhide; Anuja Kulkarni; Chirag Ghube Mangesh Bedekar. Driving Control(Via music) Using Emotion Analysis Via EEG 2018 IEEE Pune.27 June 2019.

[3] Barjinder Kaur, Dinesh Singh, Partha Pratim Roy. EEG Based Emotion Classification Mechanism in BCIIn:2018 Procedia Computer Science.Volume 132, 2018, Pages 752-758.

[4] Prashant Lahane, Arun Kumar Sangaiah. An Approach to EEG Based Emotion Recognition and Classification