

# Entertainment suggestion for paralyzed and bed rest patient using EEG Signals

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## ABSTRACT

For paralyzed and bed rest patient people, it is very hard for them to express themselves. They have emotions like normal people but for them, it is very hard to enjoy their time. There are millions of people in India are suffering kind of diseases. There is no such thing for entertaining them. EEG (electroencephalogram) machine is used to monitor the brain activity of the person. Fetching electroencephalogram signals using EEG machines and Using those signals as data and using the circumplex model, it helps in detecting the emotion of the paralyzed and bed rest patient person. Once the system finds the emotion then the music recommended system comes into the picture. Music recommends the system recommend music according to the emotion of the paralyzed and bed rest patient person. So that paralyzed and bed rest patients can enjoy them and relax with the help of entertainment as therapy. Music recommended system created according to two approaches, first is using expert-based music and the second approach is a feature of the music.

**Keywords—** EEG (electroencephalogram), Emotion Detection, circumflex model, Music recommended system.

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## I. INTRODUCTION

### A. EEG [electroencephalogram]

EEG (electroencephalogram) machine is used for monitoring the brain activity of the person. Many professional doctors use the EEG machine for monitoring the brain activity of the patient [13]. But EEG is also used for May conditions like a brain tumor, head injury, seizure disorder, memory problem, brain stroke, dementia, sleep problems, etc. The main thing in using EEG is that it is very safe there no risk in using or side effects. There are many types of EEG machines available for different use. Every EEG machine's functionality is different. So, for them, Using EEG (electroencephalogram) to capture the data of the paralyzed and bed rest patient's brain is easy and relevant. EEG basically used for motoring the brain of the person. Using those monitored data, the emotion of the person can be detected. So, using the EEG machine we can find the emotion of the paralyzed and bed rest patient. There are many ways to find the emotion of any person like face detection, from the social media data, physical hardware sensors but among them, EEG is the most efficient machine for monitoring the brain activity and then from that detecting the emotions of the person. There

are many techniques and algorithms for emotion detection using EEG signals. Every technique has different ways and efficient in own ways.

### B. Music as Therapy

The second part of the system is the music recommendation system. Music Recommendation will work according to the emotion of the paralyzed and bed rest patient. Here the music recommendation system will work as therapy. Physical and anxiety effects are suppressed with the help of music therapy. When music use as therapy, the Process of healing is much faster than the normal process. Over 14.7% of disabled people in the world already using music as therapy [12].

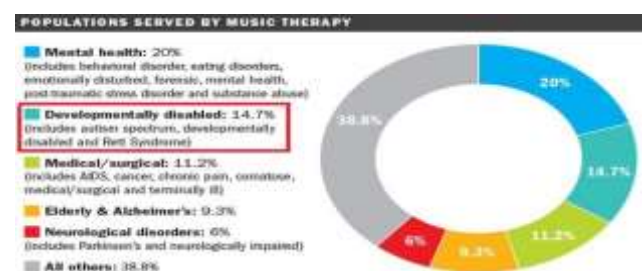


Fig. 1. People using music as therapy [12]

## II. LITERATURE SURVEY

• [Kai-Yen Wang et. al.] A CNN Algorithm is proposed for emotion detection via EEG Signals. They propose a human emotion detection system based on EEG features with multi-channel fused processing. To make an advance CNN algorithm they applied the Short-Time Fourier Transform (STFT) algorithm. Using this algorithm, they convert time Amplitude two-dimensional EEG signals into a time Frequency-Amplitude three-dimensional EEG image. Then they extract the features of EEG signals. Then they developed the CNN model in VLSI hardware design. The accuracy of this system is 83.88% On the DEAP dataset.

• [Chinmayi Bankar et. al.] Proposed a system for driving control using emotion analysis via EEG. They proposed to detection the emotion of the driver via EEG then play music according to emotion. So, the driver stays in a positive clam mind. This process is running in a loop. By doing this their aim is the reduction of an accident. They proposed a Circumflex model for emotion detection. There are two types of EEG Electrode, the first is a gel electrode and the second is the dry electrode. They proposed a dry electrode. Then according to the emotion system will recommend the song to change the mood in a relaxed mind.

• [Barjinder Kaur et. al.] They Proposed an EEG based emotion recognition model. They use the SVM machine learning algorithm for emotion detection from EEG data. They successfully detected three motions (Anger, clam, happy). They use real-time data of 10 users. The fractal dimension (FD) feature is fetched by the highchair technique from EEG signals. Then using SVM with an accuracy of 60% is achieved. They successfully classified happy emotions with the best accuracy. The other two emotions are classified with low accuracy.

• [Prashant Lahane et. al.] They use EEG signals for emotion recognition. First using Kernel Density Estimation (KDE) to capture EEG signals. Once KDE captures the EEG signals then they proposed an ANN (Artificial neural network) for emotion classification from EEG Signals. They use a real-time (video) dataset of 10 users. They also add a synthetic dataset CLAW, which is a mixture of Gaussian densities. They use 14 channels of EEG. They successfully detect three emotions. They got 60% accuracy.

• [Dongwann Kang et. al.] Using an IoT they fetch the data from a text on social media of user. Analyzing those text data for emotion detection. Once emotion detected they proposed two approaches for music recommendation. First Expert-based approach; in this approach, they use some expert for distribution of music according to the emotion. A second approach is a feature-based approach, in this approach, there is no use of an expert. They use the rhythm and articulation of the music for the distribution of songs according to emotion. They created a feedback system for music recommendation. So, the system will recommend music according to feedback.

## III. PROPOSED WORK

### A. System Overview

There are two modules in the proposed system:

- 1) Detection of the emotion of the person
- 2) Music recommendation

Module 1: Detection of the emotion of the person:

To detect the emotion first, extract features from EEG signals then convert those signals into a proper data format. All machine learning algorithms required the proper format of a dataset. Some noisy data are in the dataset and that noisy data need to be removed by pre-processing. Every data needs to check is there any null value are there or not. If there is a null value available in the dataset, that data needs to be removed or replaced by mean or median values of the data.

For emotion classification, it is a very important task to detect the arousal value. Arousal value represents an excitement level of the human. The value of arousal is high it means the exited level is very high. The value of arousal data is low it means the excitement level is very low. Like arousal, valance is also impotent for emotion recognition. Valence value represents a negative/positive mindset of the human. The value of Valence is high it means the mind set of persons is positive. The value of valence data is low it means the mindset of persons is negative.

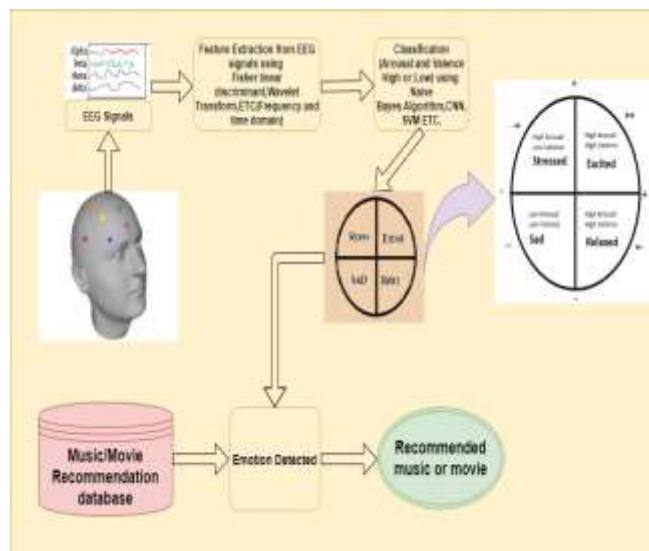


Fig. 2. Proposed System.

There are some Classification is needed for emotion detection, by using arousal and valence values system can detect the emotion of the person.

- When arousal and valence both values are high it means emotion of the person is Excited.
- When arousal and valence both values are low it means the emotion of the person is Sad. –
- When arousal value is high and valence value is low it means emotion of the person is Stress.
- When arousal value is low and valence high is low it means emotion of the person is relaxed.

Module 2: Music recommendation:

Once an emotion is detected then, the music Recommendation system will recommend music-movie according to the emotion of the handicap dumb person. For music recommendation, create a dataset of music-movie according to emotion. To create a recommended system, use two approaches,

- Expert Based Music approach: Create a music dataset according to the emotion with the help of some expert persons. Here, the Expert creates a database of music according to the emotion.
- Feature-Based Music approach: In this approach create a database according to the feature of the music.

In the last, combine these two approaches and create one music recommendation database. And when emotion is detected then recommend music according to the emotion of the person (Fig.3).

B. Dataset

This research work also uses the DEAP dataset which is an online available dataset that the possibility of use for detection of emotion. This dataset is available at <http://www.eecs.qmul.ac.uk/mmv/datasets/deap/>. DEAP Dataset of YouTube videos for analysis of many persons using EEG's electrode. Arousal and Valence Data are between 1 to 9.1 Represent very lowest value and 9

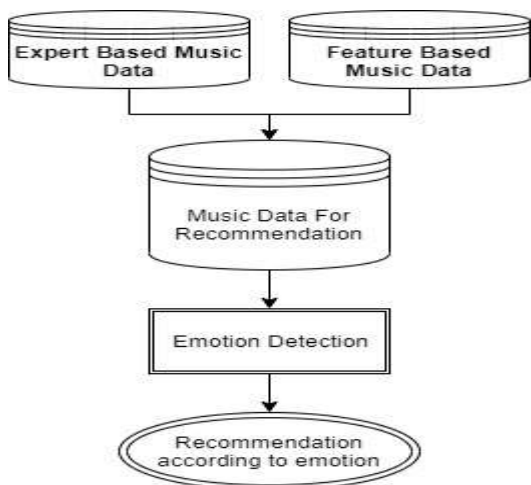


Fig 3. Music Recommendation System.

represent the highest value. If the value of valence and arousal greater than 5.5 it means the value of valence and arousal is high and if the value of both is less than 4.5 it means the value of valence and arousal is low(Fig.4).

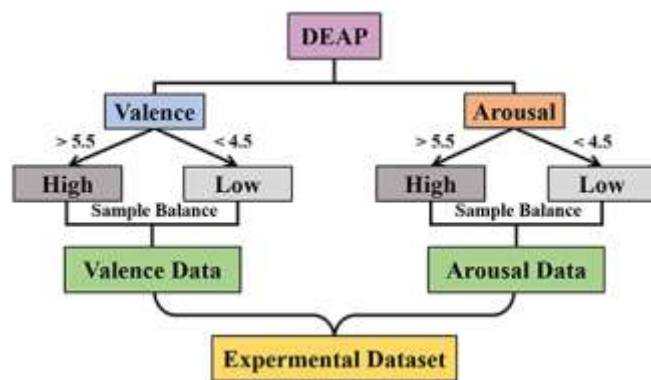


Fig. 4 Experimental dataset selection [15 et.al.]

C. Research Contribution

First, we learn the emotion detection using DEAP dataset. There are many Machine Learning algorithms are like SVM, KNN, etc. Using these machine learning algorithms tries to detect emotion detection on the DEAP dataset. Once it's completed then using the EEG machine Gets the signals of the persons and tries real-time emotion detection. Another part of the system is a music recommendation system. So, create a music recommendation system according to the emotion.

IV. CONCLUSION AND FUTURE WORK

Emotion detection will be done by using the EEG headset and also using the DEAP dataset using the circumplex model. Music will be recommended according to the emotion of the paralyzed 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. 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.

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