"Human Emotions Detection using Brain Wave Signals "

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ABSTRACT

Here we focus on issues and challenges of research project that was designed to assess the different human emotions through Electroencephalogram (EEG). EEG measurement is noninvasive and inexpensive, and have a very high sensitivity to receive information about the internal (endogenous) changes of brain state, and offer a very high time resolution in the millisecond range. Because of the latter property, these data are particularly suited for studies on brain mechanisms of cognitive-emotional information processing which occurs in the millisecond range. It has been well known that specific cortical and sub-cortical brain system is utilized and have been differentiated by regional electrical activities according to the associated emotional states. There are important challenges we face while developing efficient EEG signals emotion recognition are: (i) designing a protocol to stimulate unique emotion than multiple emotions , (ii) develop a efficient algorithm for removing noises and artifacts from the EEG signal, (iii) utilize the suitable and efficient artificial intelligence technique to classify the emotions. In addition,emotional activities of the brain causes dif-ference EEG characteristics waves, it has been attempted to investigate the brain activity related to emotion through analyzing EEG.

Keywords: *Electroencephalogram (EEG), Support Vector Machine(SVM), Brain Com-puter Interface (BCI).*

I. INTRODUCTION

Emotions are a great asset in communication and a key element in social interactions. They can be used as mechanisms for signaling, directing attention, motivating and control-ling interactions. The interactions can happen through voice commands, visually, using gesture recognition and currently in the field of science directly with the human brain.Too much or too less emotions can effect rational thinking and also behavior. Emotion plays a critical role in rational and intelligent behavior. Since long it is argued that emotional intelligence is a better predictor than IQ for measuring how successful a person is in his life time. When we are happy, our perception is biased at selecting happy events, likewise for negative emotions. Similarly, while making decisions, users are often influenced by their affective states.Reading a text while experiencing a negatively valence emotional state often leads to very different interpretation than reading the same text while in a positive state. Emotion is an omnipresent and an important factor in human life. Measuring emotion from brain activity is a relatively new method. Peoples mood heavily changes as per the way of communication .EEG is a recording of the brains electrical activity, in most cases made from electrodes over the surface of the scalp. The neuron components producing the currents are the den-drites, axons and cell bodies. The architecture of the brain is not uniform but varies with different locations. Thus the EEG can vary depending on the location of the recording elec-trodes. EEG spectrum contain characteristic waveforms which fall in 4 frequency bands viz alpha (8-13 Hz), beta(13-30 Hz), theta (4-8 Hz) and delta(¡ than 4 Hz).

II. LITERATURE REVIEW

1. Classification ofthe emotional states based on the EEGsignal process-ing.
    a. Algorithm Used: Bayes classifier.
    b. Advantages:Able to detect emotional states with 75
    c. Disadvantages:Less test reliability method for noise and accuracy.
2. Classification of EEG signal for different emotional states.

a. Algorithm Used:Linear Discriminant Analysis (LDA).

b. Advantages:Most of the subjects we got a complete 100

c. Disadvantages:Some cases due to low comfort level of the subject noise result created.

3. Emotion Detection from EEG Recordings .

a. Algorithm Used: K-Nearest Neighbour (KNN) and Random Forest (RF).

b. Advantages: To detect the emotion information from EEG recordings in a good accuracy.

c. Disadvantages:Added more feature selection method for performance improve-ment.

4. EEG-based Emotion Recognition.

a. Algorithm Used:Fishers Discriminant Analysis (FDA).

b. Advantages:Accurate analysis of brain waves.

c. Disadvantages:Not cost effective.

III. PROPOSED SYSTEM

The emotion recognition from the EEG signal, and also the findings of effective data recording from physiological signal, feature extraction , data reduction, feature classification through SVM, real time applications and the scope for future research.

SYSTEM ARCHITECHTURE

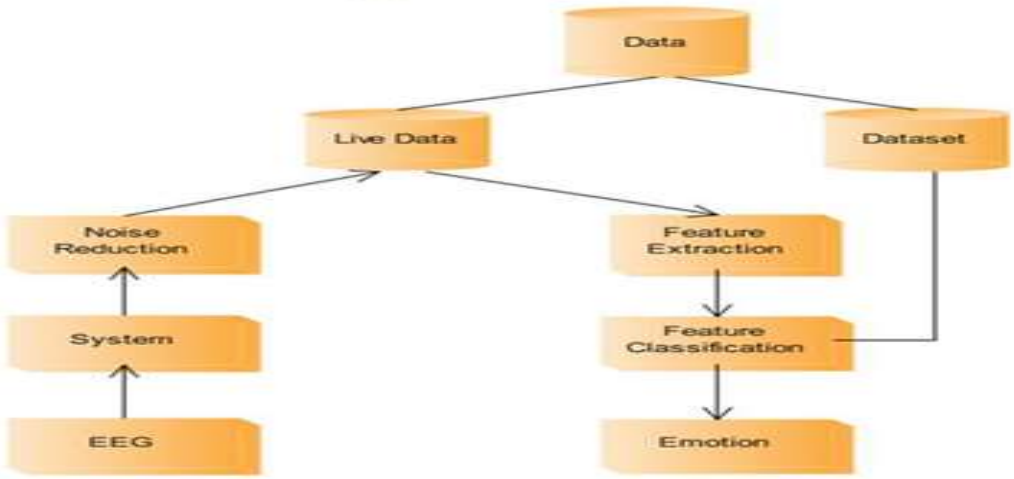

Fig: System ArchitectureDescription:

- EEG :

Electroencephalography(EEG) is an electrophysiological monitoring method to record elec-trical activity of the brain.

- System:

  EEG waveforms are generally classified according to their frequency, amplitude, and shape, as well as the sites on the scalp at which they are recorded. The most familiar classification uses EEG waveform frequency (eg. alpha, beta, theta, and delta).

- Noise Reduction:

Noise reduction is the process of removing noise from a signal. All signal processing devices, both analog and digital, have traits that make them susceptible to noise.

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- Data:
  a. Live data: Run Time monitor EEG signals from EEG Device.
  b. Database.

- Feature Extraction:

  Feature extraction starts from an initial set of measured data and builds derived values (fea-tures) intended to be informative and non-redundant, facilitating the subsequent learning and generalization steps, and in some cases leading to better human interpretations.

- Feature Classification:

  A pattern recognition technique that is used to categorize a huge number of data into differ-ent classes.

- Emotion:

  This module will represent emotional state of human.

V. CONCLUSION

The emotion recognition from the EEG signal, and also the findings of effective data recording from physiological signal, feature extraction , data reduction, feature classification through SVM, real time applications and the scope for future research.

VI. REFERENCES

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