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Implementation of EEG Based BCI For Mental Status Monitoring using LabVIEW

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Abstract: This paper embellishes the wavelet based feature extraction of visual based assessment using Electroencephalogram (EEG) signal through graphical representation. The visual model was studied with the help of Two-Dimensional (valence-evoked) concept. Different visuals (colors with different shades and pictures like fruits, foods and games) were studied for assessment. These visuals were showcased manually. EEG signals were obtained from 10 subjects are decomposed into frequency bands as alpha, beta, delta, gamma, theta using discrete wavelet function. Comparative features were calculated to acquire further informations. The effects of visuals therefore seen as valence-inspire potential by power spectral density of gamma band. The primary goal of this work is not just to investigate the impact of the visuals on various recurrence of mental response, additionally to direct the psychiatrist towards the non-surgical treatments and medications. This work prescribed an optional approach for rationally influenced patient's treatment as one of the stage. There are number of techniques to evaluate the visual evoke potential recognition such as Fourier Transform based, Hilbert-Hauns transform based and wavelet Transform based techniques. Nevertheless the above said strategies have been applies with the content based programming dialect. In this research work, it is proposed and actualized a disconnected exploratory element extraction with representation of dialect, which gives an apparent fulfillment in bioelectrical signal processing.

Keywords: Electroencephalogram, Graphics-based language, Mental Retardation, Visual effect, LabVIEW.

1. INTRODUCTION

Currently studies on biomedical engineering have concentrated more on noninvasive measurements Electroencephalogram (EEG) based visual recognition. The Central Nervous System (CNS) of human body comprises of the brain and spinal cord. The human brain is made up of billions of neurons. These neurons communicate with each other by sending impulses through synaptic activities. Normal brain functions involve continuous brain activity. Such activities are recorded by Electroencephalogram (EEG). Among many invasive and non-invasive brain signal acquisition techniques, noninvasive techniques are the most commonly used one because of its high temporal resolution in range of milliseconds which results in dynamic study of mechanism

by computational methods [1]. When compared to other brain imaging techniques, EEG recordings are acquired with portable and inexpensive headband [2][3]. In EEG, the neural activity is recorded with small metal plate electrode usually Silver Chloride electrode. The voltage fluctuations are recorded by EEG. It has different amplitude and frequency. The amplitude of normal subjects in awake state recorded by electrode is in range of 10-200 μ V with frequency ranges from 0.4-100 Hz[4]. Based on frequency ranges, there are predominantly five sorts of mind waves. They are delta (somewhere around 0.4 and 4 Hz), theta (somewhere around 4 and 7 Hz), alpha (somewhere around 8 and 13 Hz), beta (somewhere around 14 and 40 Hz) and gamma (over 40 Hz). These frequencies may vary according to brain's function [5]. Each brain wave is associated with any one mental state [6] which are shown in Table 1.

Table 1: Brain waves and its associated mental state

<i>Waves</i>	<i>Associated Mental State</i>
Delta	Deep, dreamless sleep
Theta	Light sleep or extreme relaxation.
Alpha	Deep relaxation, lovely daydream or during light meditation
Beta	Normal waking consciousness and a heightened state of alertness, logic and critical reasoning
Gamma	Formation of ideas, language and memory processing, and various types of learning

2. LITERATURE REVIEW

In the detection of Cognitive State for Brain-Computer Interfaces work [7], four Cognitive States, for example, resting state, thought, memory and feeling have been recognized by social occasion, handling and arranging EEG signals from subjects. EEG signs were examined to discover the components by using spectral power, frequency band combination ratios and linear combination of power of EEG frequency bands.

One of the design and implementation of visual brain-computer interfaces [8] incorporating BCIs in analyzing the perspective nature of cerebrum responses to exogenous visual stimuli and endogenous potential outcomes associated with the subject's reaction to the visual stimuli. Visual BCIs have turned out to be famous on account of the high correspondence speeds, simplicity of client preparing, and low client variety. Be that as it may, building hearty and pragmatic BCI frameworks still represents an extraordinary test to specialists. The paper audits the current visual BCI frameworks and investigates the difficulties in future advancement.

A Review on Mental Health Issues and Challenges in India [9] survey the weight of mental issue and concentrates on the different issues and difficulties at group level were done. The electronic databases for studies identified with pervasiveness of different psychiatric morbidities and related components at group level were created.

Suggestion of a New Brain Reaction Index for the EEG Signal Identification and Analysis[10] work depicts the mind signs are decipher in various measures.

In this paper research of proposal or the new brain response record during mental estimation from the EEG signals were examined.

3. METHODOLOGY

In general, the mentally retarded people always depend on other persons for meeting their own needs. The mental retarded people cannot express their feeling on the things doting. This project aims to identify the things that the mentally retarded people loving matter and provided their surroundings with their favorites. So that it is possible to bring up the brain active levels of the mental retarded people and allow them to meet up their needs on their

own. The input database which consists of different visuals such as colors with different shades and pictures like fruits, foods and games were studied for assessment [11]. The visual information's are shown manually. A headband with single electrode is allowed to be placed on subjects head which record the variations on brain wave. The electrode used is of dry silver chloride (Ag-Cl) electrode. From the electrode the obtained signal is filtered by band pass filter and notch filter. The filtered signal is then digitalized. The process of filtering and digitalization takes place on TGA Module. The digital data are transmitted by Bluetooth transmitter. This whole process takes place on headband. The signal transmitted is then received by a Bluetooth receivers on other side are shown in Figure 1 and the information are plotted as real time graph. Simultaneously the data are stored in data base. For each subject, a separate data base be created and stored.

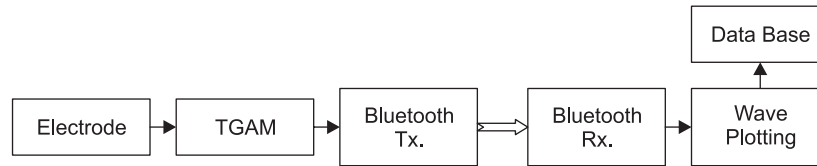


Figure 1: Block Diagram of single electrode based EEG signal Acquisition

The subjects are allowed to wear the headband. The visuals of images are showed continuously at regular interval of time [12][13]. Based on the inputs, the variations are recorded. Whenever the mentally retarded people identify their favorites there will be a huge variation on brain waves of subjects due to excitement [14]. From the large variations, it is possible to identify the things that they are fond [15]. By continuously providing them their favorites in the surroundings it is possible to stimulate their brains and able to require their brain ability and improve their stability. This project helps them to lead an independent life without depending on others.

4. RESULTS

The input databases for colors consist of different shades. Likewise, the other inputs are shown for subjects in order to record their waves to identify the things they doting off. Figure 2 shows the data for colors with different shades.



Figure 2: Data for colors with different shades

In this output, different waves are obtained for different visuals shown for them. The variations shows the color they fond. In this Figure 3, the waves in blue color represents the color they likes more because it has more variation than others.

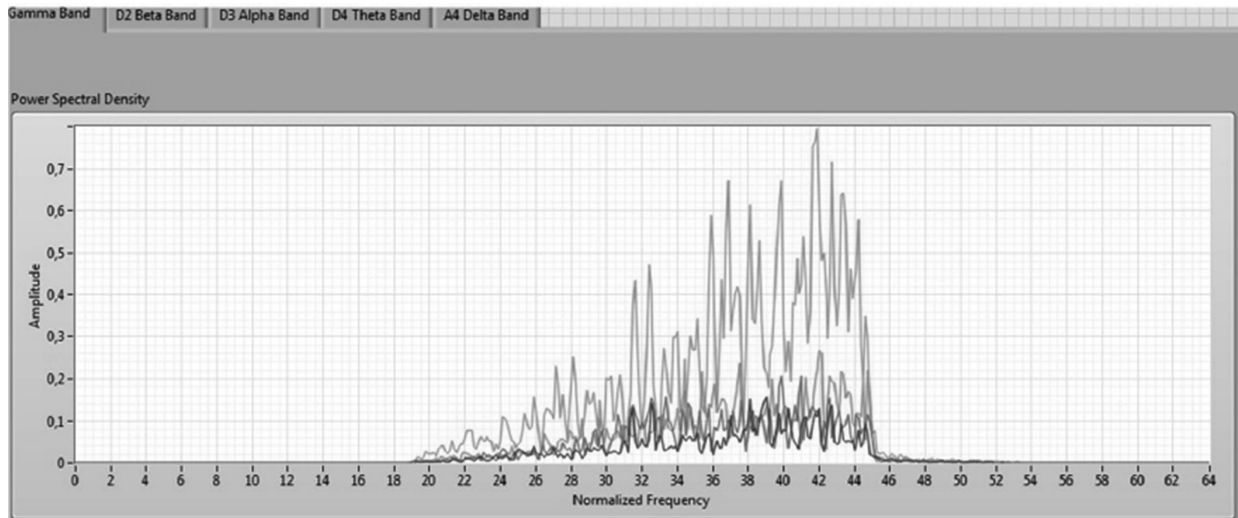


Figure 3: LabVIEW output for gamma band for visuals

Similarly the other inputs are shown and there are identified. By continuously providing the mentally retarded people with their favorites, providing their surroundings with their favorites it is possible to stimulate the brain activity and able to improve their brain ability and stability.

5. CONCLUSION

Mental disorders are believed to differ crosswise over time, inside similar populaces in the meantime. This dynamic nature of the psychiatric disease impacts its arranging, subsidizing and social insurance conveyance. Different reviews had demonstrated that the pervasiveness of mental issue is high in female sex, kid and juvenile populace, students, elderly populace, individuals experiencing ceaseless medicinal conditions and handicapped populace. The proposed technique breaks down the mind sprint of mentally retarded individuals which makes them free to address their issues with their own.

6. FUTURE SCOPE

In future, the framework can be upgraded to concentrate on early incitement to guarantee ideal subjective development and behavioral advancement which can give premise to the rationally impede individuals to lead their life all alone. Likewise the framework can be produced to be helpful for kids experienced Attention Deficit Hyperactivity Disorder (ADHD) to enhance their focus to a consideration level.

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