Analysis of Normal and Epileptic EEG Signal with Filtering Method

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Abstract – *The Emotion performs an essential position in our day by day existence and paintings. Real-time evaluation and law of emotion will enhance humans's lifestyles and make it higher. For example, within the communication of human-system-interplay, emotion recognition will make the process more smooth and herbal. Another example, in the remedy of sufferers, in particular those with expression troubles, the real emotion kingdom of sufferers will assist doctors to offer greater appropriate medical care. In recent years, emotion popularity from EEG has won mass attention. Also it's far a completely critical factor in mind computer interface (BCI) structures, for you to successfully enhance the communication between human and machines. Reliable approach which efficient in detection of person's health are proposed. The design can detect the circumstance of the character individual the use of image classifier and EEG analyzer the usage of adaptive threshold detection method.*

Key Words: EEG Sampling Quantization Personality inference Emotion analysis

1. INTRODUCTION

1.1 This EMOTION is a psycho-physiological process prompted via conscious and/or unconscious notion of an item or situation and is frequently associated with mood, temperament, character and disposition, and motivation. Emotions play an important role in human conversation and may be expressed both verbally through emotional vocabulary, or by expressing non-verbal cues such as intonation of voice, facial expressions and gestures. Most of the present day human-pc interaction (HCI) structures are deficient in decoding this statistics and suffer from the dearth of emotional intelligence.

1.2 ELECTROENCEPHALOGRAPHY(EEG)

Emotion is a subjective revel in characterised by way of psycho-physiological expressions, biological reactions, and intellectual states. From a mental point of view, an emotion is a complicated mental state that includes 3 distinct components: a subjective revel in, a physiological reaction, and a behavioural or expressive response Basic emotions exist and are culturally unbiased. These simple emotions can be read literally from humans's facial expressions.

Regarding structures which can assist studying the affective techniques in the human brain, EEG, PET scans, or fMRI stand out. EEG can detect changes in mind activity over milliseconds, which is remarkable considering an action potential takes ~zero.5–a hundred thirty ms to propagate throughout a unmarried neuron, depending at the form of neuron. Nevertheless, EEG measures the mind's electrical hobby immediately, at the same time as fMRI and PET record adjustments in blood glide or metabolic interest, which can be oblique markers of mind electrical activity.

TABLE 1.1 FIVE TYPES OF EEG SIGNALS

Wave	Frequency (Hz)	Too much	Too low	Extremely good
Delta	0 to 4	Learning problem, inability to think	No sound sleep	Natural healing
Theta	4 to 8	Depression, hyperactive	Anxiety, stress	Creativity, Emotional connection
Alpha	8 to 12	Day dreaming, too relaxed	High stress, insomnia	Relaxation
Beta	12 to 40	High arousal, inability to relax	Day dreaming, Depression	Memory, Problem Solving
Gamma	40 to 100	High arousal, Stress	Depression, Learning disabilities	Information processing, Learning

EEG signals in the purchase manner can effortlessly be con-taminated with noise signals. We pre-system the records by using the elimination of artifacts within the manner of EEG recording to hold sign stability and keep the powerful information segments. Continuous EEG facts are filtered with a bandpass (1-45Hz) clear out to put off linear trends and minimise the introduction of artifacts. We made use of popular statistical strategies for feature extraction. It is located that once humans are uncovered to unique emotion like happiness or unhappiness, higher frequency signals are more prominently visible in comparison to decrease frequency signals, especially regions of the mind. During intense emotional interest, changes had been noticed in the alpha sign in occipital and frontal areas of the mind. In case of very excessive sad emotion show, Beta indicators were also visible over Temporal and Frontal regions. For classification of facts we've used Linear Discriminant Analysis (LDA). The category price in case of unhappy feelings is eighty four.37%, for happiness it is 78.12% and for relaxed nation it's far found to be 92.70%.

TABLE 1.2 IMPROVE SIGNAL STIMULATION

Wave	Way to increase waves	Brain speed
Delta	Sleep	Very slow
Theta	Depressants	Slow
Alpha	Alcohol	Moderate
Beta	Coffee, energy drink	High
Gamma	Meditation	Very high

1.3 IMAGE PROCESSING

Image processing is a physical process used to convert an image signal into a physical image. The image signal can be either digital or analog. The actual output itself can be an actual physical image or the characteristics of an image. The most common type of image processing is photography.

Image processing basically includes the following three steps:

- Importing the image via image acquisition tools;
- Analysing and manipulating the image;
- Output in which result can be altered image or report that is based on image analysis.

There are sorts of techniques used for picture processing specifically, analogue and virtual picture processing. Analogue picture processing may be used for the tough copies like printouts and pics. Image analysts use diverse fundamentals of interpretation whilst the use of those visible techniques. Digital image processing strategies help in manipulation of the digital photographs via the usage of computers. The 3 popular levels that all kinds of statistics must undergo whilst using virtual method are pre-processing, enhancement, and display, records extraction.

1.4 Sampling and Quantization

The sampling price determines the spatial resolution of the digitized picture, while the quantization degree determines the number of grey degrees inside the digitized photograph. A significance of the sampled image is expressed as a virtual value in picture processing. The transition between continuous values of the image function and its virtual equivalent is called quantization

2. SYSTEM ANALYSIS

2.1 EXISTING SCHEME

2.2 In the present device a network architecture specially for EEG feature extraction, one which adopts hidden unit clustering with added pooling neuron in keeping with cluster is found out. The type accuracy with capabilities extracted by using our proposed technique is benchmarked against that with trendy power features. Experimental consequences display that our proposed function extraction approach achieves accuracy starting from forty four% to 59% for three-emotion category.

2.3 PROPOSED SCHEME

In this system, emotions are predicted by EEG signal acquired from brain waves. These waves are grouped in the form of alpha, beta, delta, and so on. Later this are splited and processed to find feelings of individuality. Then if suppose person is in depressed state are relaxed by playing music and in joy state person are maintained in that state for prolonged time.

2.4 ADVANTAGES OF PROPOSED SYSTEM

- Three dimensional condition detection
- Emotion recognition will help us to get accurate info

3. REQUIREMENT SPECIFICATIONS

3.1 The requirements specification is a technical specification of requirements for the software products. It is step one inside the requirements evaluation technique it lists the necessities of a particular software gadget inclusive of purposeful, overall performance and security necessities. The necessities also provide usage situations from a person, an operational and an administrative angle. The cause of software necessities specification is to offer a detailed assessment of the software project, its parameters and goals. This describes the undertaking audience and its person interface, hardware and software necessities. It defines how the consumer, team and audience see the mission and its functionality.

3.2 HARDWARE REQUIREMENTS

- Hard Disk   :   40GB and Above
  - RAM   :   512MB and Above
  - Processor   :   Pentium III and Above

3.3 SOFTWARE REQUIREMENTS

- Windows Operating System XP and Above

- MATLAB 7.6.0(R2008)

4. FEASIBILITY STUDY

5. TECHNICALFEASIBILITY

It is evident that necessary hardware and software are available for development and implementation of proposed system It uses MATLAB

5.1 ECONOMICAL FEASIBILITY

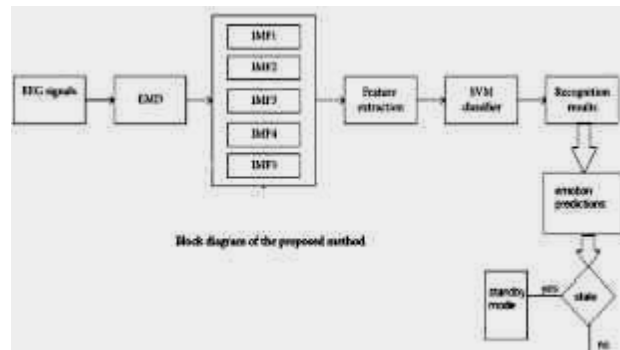The cost for the proposed system is comparatively less to other medical software's.

5.2 OPERATIONAL FEASIBILITY

In this project it requires to configure the software and technical background is necessary to work on the microcontroller and software.

6. SYSTEM ARCHITECTURE

6.1 MODULE DESIGN SPECIFICATION

OVERALL ARCHITECTURE OF THE

SYSTEM

Figure 1 - ARCHITECTURE OF THE PROPOSED SYSTEM DESCRIPTION

The EEG (Electroencephalogram) indicators generated using the programmable

Microcontroller is given as input to the EMD (Empirical Mode Decomposition) which decomposes the signals into IMF (Intrinsic Mode Functions) at the side of a fashion, and obtain instant frequency data. Here the EMD decomposes the EEG alerts into 5 intrinsic mode features specifically IMF1,IMF2,IMF3,IMF4,IMF5 for 5 types of alerts alpha, beta, gamma, delta, theta respectively.

Based at the type of IMF signal the characteristic is extracted. And the extracted function is given to the SVM classifier. The SVM classifier classifies every function the use of the kernel function(x,y) to recognize the emotion. The recognized results are used to expect emotion

7. SYSTEM MODULES

7.1 MODULE DESCRIPTION

7.1.1 MODULE 1: Pre – processing

The input RGB photo is resized to a height of 320 pixels. The resized photograph undergoes two separate processing pipelines: a saturation-primarily based one, and a color texture one. In the first one, the photograph is first of all gamma corrected after which the RGB values are converted to HSV to extract the saturation channel. These values are routinely threshold and morphological operations are carried out to easy up the acquired binary picture. A second processing based on the segmentation algorithm that works on both colour and texture features

7.1.2 MODULE 2: EEG dataset Creation and Group Segmentation

This module consists of methods involved in getting the EEG data sets which matches with mood swings. The EEG data set is processed in the MATLAB environment to segment it better by their alpha, beta, Gama, theta ranges.

7.1.3 MODULE 3: Classification

This module is used to classify the EEG info with respect to wave region to provide the individual's emotional status like normal or abnormal, happy or Sad etc. These features are further used for analysis purpose of the individual's emotional conditions and mood swings for psychological analysis.

8. APPENDICES

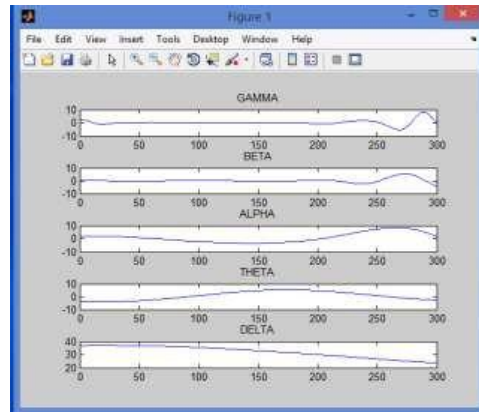### 8.1 SAMPLE SCREENSHOTS FROM THE PROJECT

8.1.1 IN HAPPY MOOD

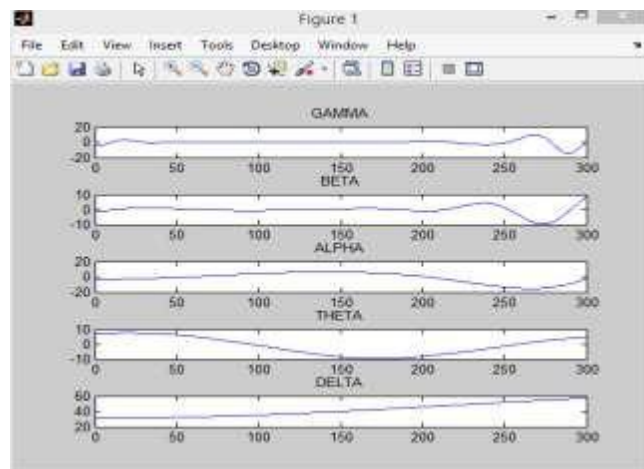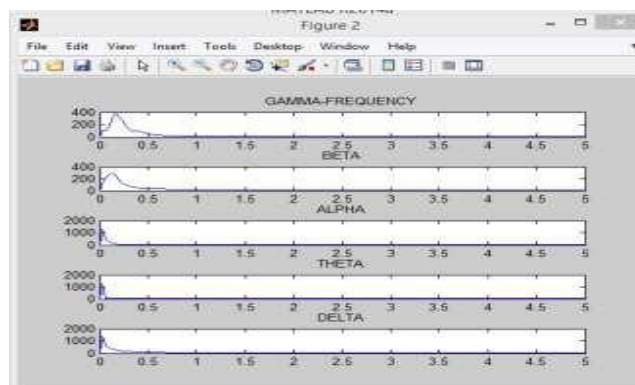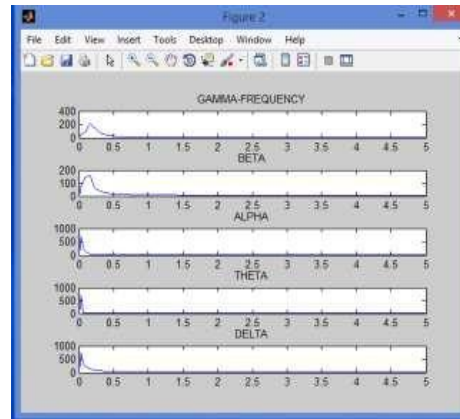**Figure 2 Stemming ranges of the discovered signals for 300 samples**

Figure 3 Frequency graph of classified signals for 1000 samples

8.1.2 ANGRY/ABNORMAL

9. CONCLUSIONS

Three primary steps in the overall performance evaluation system: information collection, facts transformation, and statistics visualization. Data collection is the system through which data about application overall performance are acquired from an executing program. Data are usually amassed in a file, both at some stage in or after execution, although in some conditions it is able to be presented to the consumer in actual time. Three simple information collection strategies may be prominent:

The uncooked information produced via profiles, counters, or lines are not often inside the shape required to answer overall performance questions. Hence, data alterations are applied, often with the goal of decreasing total statistics quantity. Transformations may be used to determine imply values or different better-order records or to extract profile and counter statistics from lines. For instance, a profile recording the time spent in every subroutine on every processor is probably converted to decide the mean time spent in every subroutine on every processor, and the same old deviation from this suggest. Similarly, a hint can be processed to produce a histogram giving the distribution of message sizes. Each of the numerous overall performance gear described in subsequent sections carries some set of integrated alterations; more specialised transformation also can be coded via the programmer. Parallel overall performance statistics are inherently multidimensional, which include execution times, communique prices, and so forth, for more than one program components, on specific processors, and for exceptional trouble sizes. Although records reduction strategies may be utilized in some conditions to compress performance information to scalar values, it is often essential so that it will explore the raw multidimensional it is well known in computational science and engineering, this process can benefit enormously from the use of data visualization techniques. Both conventional and more specialized display techniques can be applied to performance data. Therefore it is concluded that our project can be done with more enhancements and cost efficient components. The extra added features may be done with sensors on LIVE such that it can identify the mentality of the persons. The Facial Recognition can be done on-live without pixel training using Machine Learning as the Future Enhancement.

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