

ANALYSIS OF EEG SIGNAL BY MEDITATION USING MATLAB

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ABSTRACT– Meditation is the treatment which is subjected to the patients suffering from various neurological disorders like epilepsy, coma, fainting, sleep disorders, depressions etc. Meditation leads to the physiological and psychological functioning of the brain. This paper represents the study of effect of meditation on EEG signal apart from feeling relaxed. To obtain new insights into the nature of EEG during meditation, the signal recorded using NeuroskyMindwave Sensor were analyzed using MATLAB.

Index Terms - Electroencephalography, Meditation, NeuroskyMindwave Sensor

I. INTRODUCTION

Since many years, meditation is being practiced by many people as a stress relief mechanism. Hence, studies on meditation has proved that it is a scientific as well as medical activity which provides mental relaxation , frees from stressed life , allows emerging of positive thoughts and helps to vanish the negative thoughts.

Electroencephalogram (EEG) is a recording of spontaneous brain electrical activity by means of electrodes located on the scalp [1]. It is playing a more and more important part in analyzing brain activity and diagnosing brain disease now. So, it is one of the most important neurological signal and is often used to detect brain's neurological dysfunction and neurophysiological disorders.

MATLAB is the language of technical computing and analyzing data using numerous algorithms. Capability of MATLAB in EEG signal processing is high. With the assistance of MATLAB , the EEG signal becomes ,more readable and easier to understand. This study compares before meditation EEG signal with after meditation EEG signal in MATLAB using Euclidean Algorithm.

II. LITERATURE SURVEY

Neurological disorders are most common in human beings nowadays .In this patient suffer from disease like depression, sleep disorder, mental disturbance, memory loss , epilepsy , fainting etc.

40 million people worldwide have Neurological disorder. However, much extend we can compute on these disorder by undergoing Meditation. Meditation arose from ancient spiritual tradition centered in India. From thousands of years, it has achieved substantial popularity as a therapeutic tool as well as a method of self-development. It is widely perceived to have potent, specific effects on body and mind [2].

Previous researchers showed that meditation can significantly affect physical and mental relaxation. There are many forms of meditation that have been developed and passed on by humanity's religious and spiritual traditions.

Vipassana, oldest of the Buddhist meditation technique is practiced primarily in south and south east Asia but now it is also a popular form of meditation in Western countries.

There are, however, different forms of meditation that utilize music, movement, or visual or auditory contemplation of physical objects or processes. The authors of various studies believe that meditation indicates greater sensitivity to emotional expression and positive emotion due to neural activated circuitry. Meditation thus is a stress buster in our day to day stressful life.

Various physical and neurological activities has great impact on Brain waves that is on EEG Signal. Numerous studies and techniques are adopted to depict the exact effect of neurophysiological activities on EEG.

Electroencephalography (EEG) is a non-invasive method to record electrical activity of the brain along the scalp. EEG is playing more and more important part in analyzing brain activities and diagnosing brain diseases, so it is one of the most important neurological signal and is often used to detect brain's neurological dysfunction. EEG measures voltage fluctuations resulting from ionic current within the neurons of the brain. In clinical context, EEG refers to brain's spontaneous electrical activity over a period of time.

The 10-20 electrode pattern is one of the method to collect the EEG signal from the scalp of the subject. This 10-20 electrode pattern is used in order to achieve higher accuracy which is costly as well. Also the Neurosky Mindwave MW001 Sensor which deals with the collection of brain waves proves to be effective. The study of analysis deals with the single channel of brain. But in medical practice actually 20 channels of the brain are used.

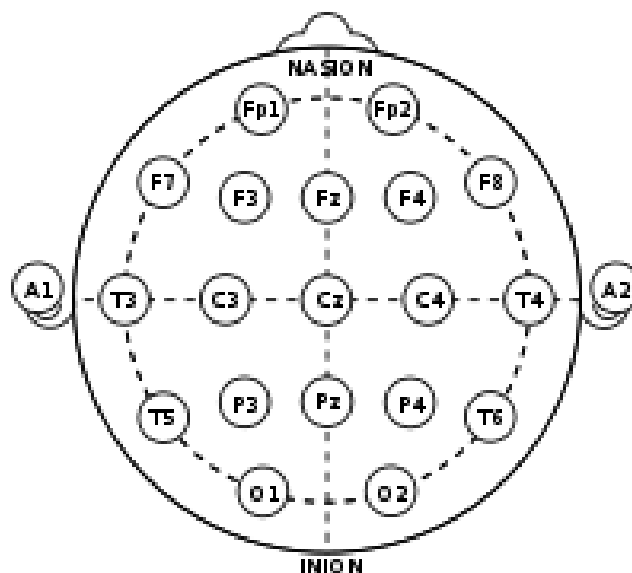


Fig. 1. 10-20 Electrode placement

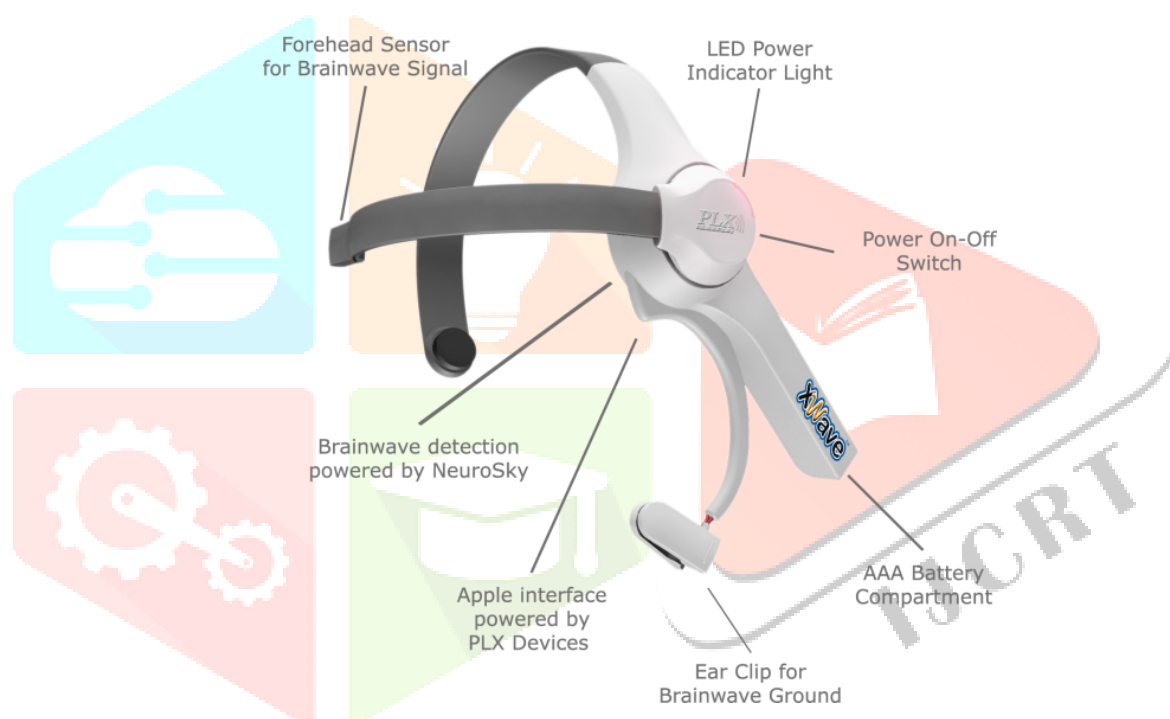


Fig. 2. Neurosky Mindwave Sensor

III. REAL TIME RECORDING PROCESS

In this study, the before meditation EEG samples as well as after meditation EEG samples are collected using single channel MW001 Mindwave EEG sensor manufactured by Neurosky [3].

Output of sensor is given to PC/Laptop via Bluetooth which is present in sensor itself. Hence, no additional circuitry is required for it. The Thinkgear technology or a Thinkgear chip which is inside the Neurosky product enables the sensor device to interface with the brainwaves of respective subject. The Thinkgear module possesses advanced filtering technology with high noise immunity.

The data received by PC/Laptop via Bluetooth is then processed in MATLAB using Euclidean Algorithm, which will compute the difference between EEG signal collected before meditation and EEG signal collected after meditation [4].

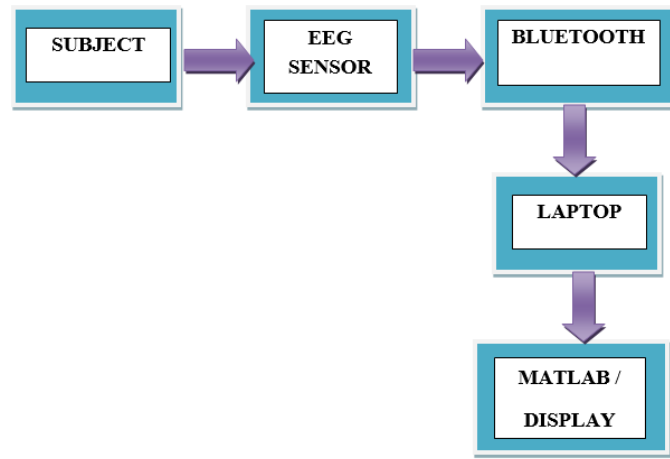


Fig. 3. Proposed Setup

IV. RESULTS

Figure 4. And Figure 5. Defines the EEG samples for before and after meditation respectively. As seen from the sample of before meditation, there are fluctuations in the signal. Whereas from the sample of after meditation EEG signal it is observed that it is constant for a period.

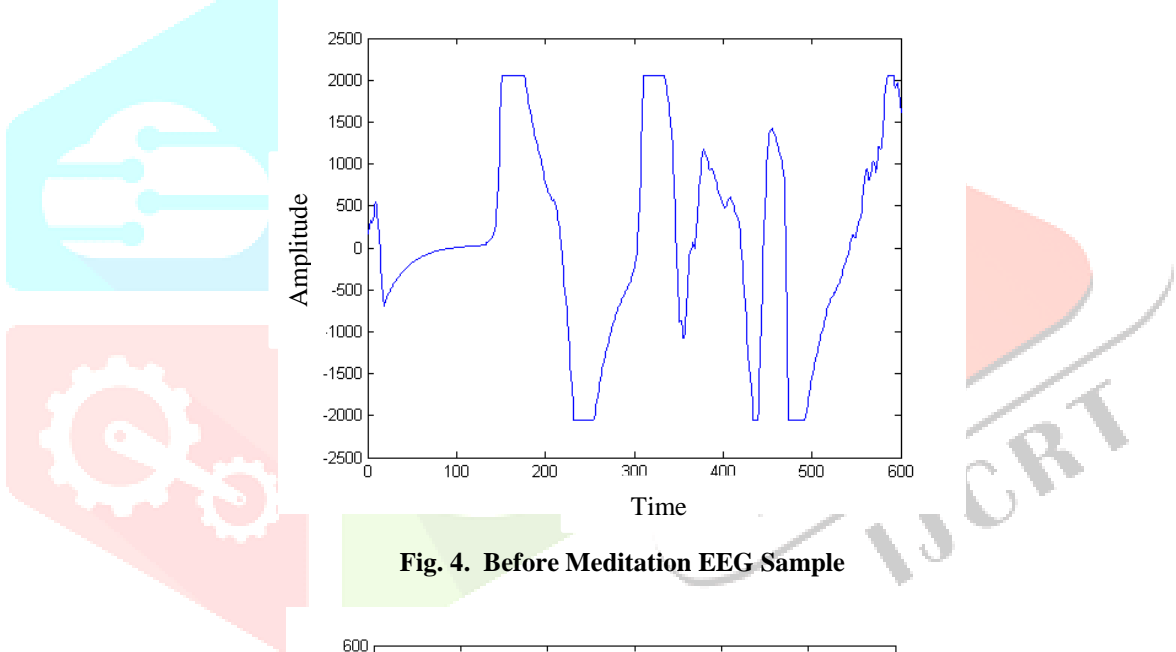


Fig. 4. Before Meditation EEG Sample

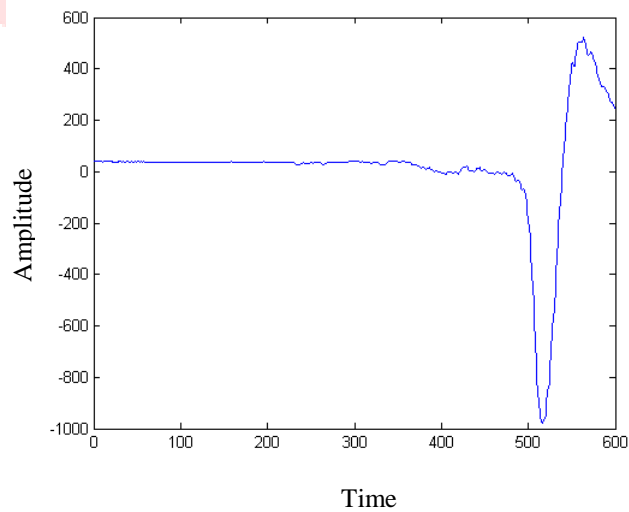


Fig. 5. After Meditation EEG Sample

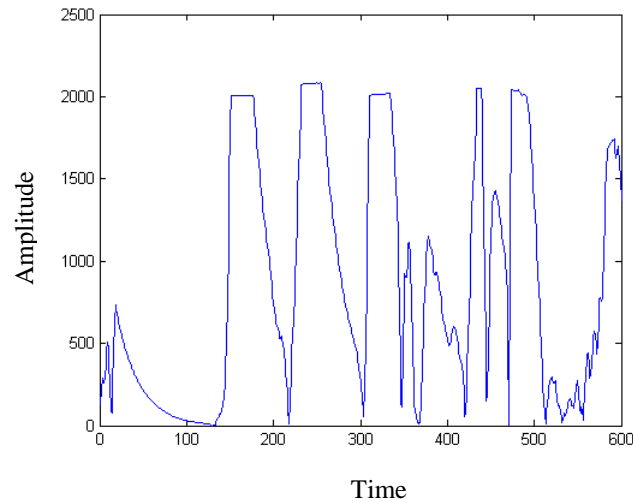


Fig. 6. Compared result of EEG Sample

V. CONCLUSION AND FUTURE SCOPE

This study helped us to observe the exact impact of meditation on EEG Waves using Euclidean algorithm in MATLAB. The study can be applied in meditation training and the progress of the trainee can be tracked by real time EEG analysis.

To increase the classification accuracy of human stress using EEG and NeuroSky Mind Wave can too be extended from our study. With the use of MATLAB scripting and NeuroSky developer toolkit, investigation on a more detailed EEG frequency band, such as the Alpha, Beta and Gamma wave; can potentially increase classifier's accuracy owing to the greater EEG features provided.

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