



e-ISSN: 2319-8753 | p-ISSN: 2347-6710

IJRSET

International Journal of Innovative Research in
SCIENCE | ENGINEERING | TECHNOLOGY

INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

Volume 11, Issue 11, November 2022

ISSN INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA

Impact Factor: 8.118

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A Review of EEG Signal and its Analysis

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ABSTRACT: Electroencephalography (EEG) is a method to record an electroencephylogram of the spontaneous electrical activity of the brain. It is typically non-invasive, with the EEG electrodes placed along the scalp (commonly called "scalp EEG") using the International 10-20 system, or variations of it.

Rhythmical potentials are generated by brain. These potential originate from individual neurons of the brain. The waveform pattern is complex is termed Electroencephylogram(EEG). The millions of the cells discharge synchronously and get summed up for the net generated potential.

I. INTRODUCTION

The neurons are electrically polarized at rest similar to other cells. The neuron has potential of -70 mv w.r.t the exterior. When a neuron is subjected to a stimulus, a nerve impulse due to change in membrane potential is generated which spreads in the cells.This depolarize the cell and shortly afterwards repolarization takes place.The signal of EEG are taken from electrodes either from scalp or directly from the cerebral cortex.The peak to peak amplitude is 100 mv if picked from cerebral cortex.The frequency varies from 0.5 Hz to 50 Hz. The basic frequency of EEG is classified into five band for analysis purpose. Delta ->1-4Hz Theta->4-8 Hz Alpha-> 8-13 Hz Beta-> 13-22 Hz Gamma-> 22-30 Hz.

EEG Frequency Bands

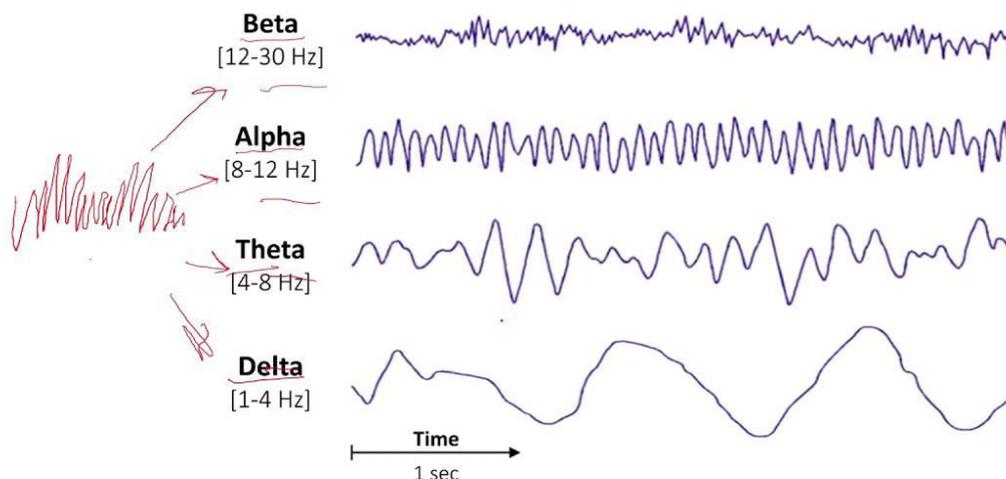


Fig.-1 Electroencephylogram consist of Delta ->1-4Hz Theta->4-8 Hz Alpha-> 8-13 Hz Beta-> 13-22 Hz waves



II. CONCLUSION

Delta Waves are the slowest type with the highest amplitude (wavelength). These brainwaves are most commonly observed in people during deep sleep when no dreaming occurs. They are primarily located in the brain’s right hemisphere during stages 3 and 4 of sleep and increase in intensity as the sleep becomes more profound.

The next step up from Delta waves are the Theta Brainwaves. They are particularly prevalent in the first stage of sleep and when people are daydreaming. Theta waves are present when you wake up from a very light dream where you’re not yet asleep nor fully conscious. In this light sleep, you can even have the sensation of dreaming or sensory hallucinations. Theta waves are also associated with REM sleep, as we have the most vivid dreams.

In the waking state, Theta Waves are most profound during meditation, spiritual activities, and deep reflection. Great ideas can come from this state as people become more connected to their inner selves. It is also a form of daydreaming. Alpha waves are usually found in the brain’s occipital lobe when patients are typically awake with their eyes closed. Opening our eyes would reduce the intensity of alpha brainwaves. These Alpha waves are not present when we are asleep. During the day, after a mental activity, the period of time right after the task is completed where you are relaxing, or “coming down” is a state of Alpha. Another example might be walking through a garden in a contemplative state.

Beta brainwaves are the 2nd fastest type of brain frequency and most accurately associated with the engaged brain. It is usually higher in people who think logically, and increases, as we grow older. The downside of Beta brainwaves is that too much causes anxiety and stress. An intense Beta brainwave session, like taking an IQ test, may sometimes result in a mild headache as the blood flow to the brain increases.

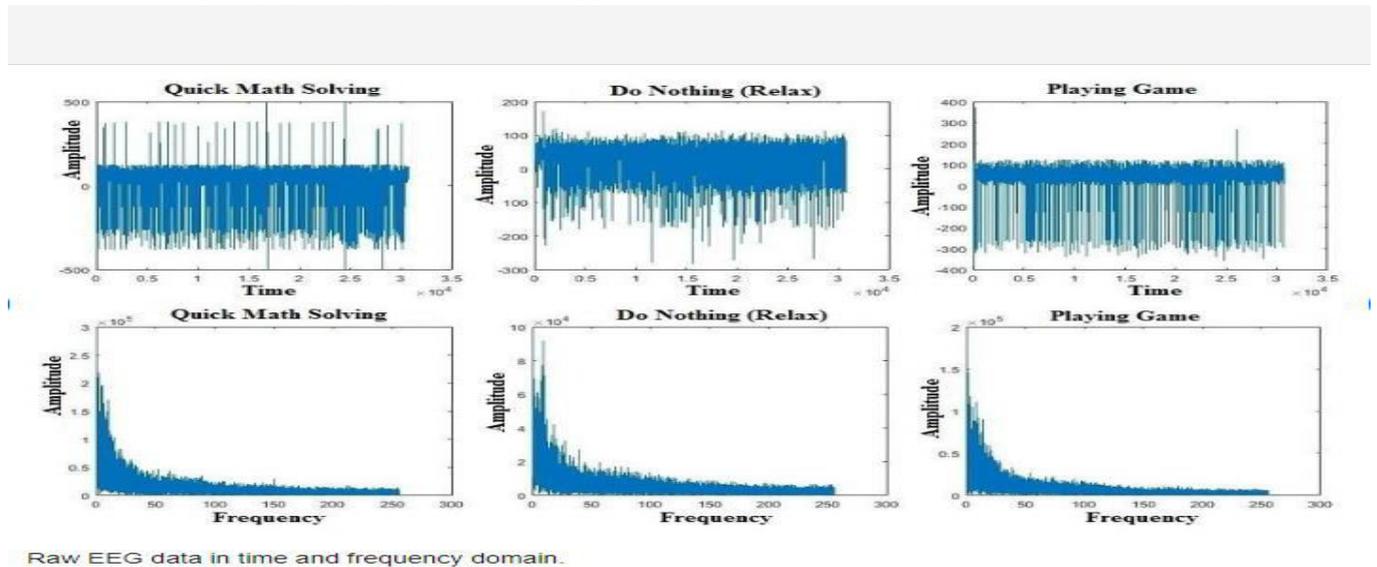


Fig.-2 shows time and frequency domain EEG waves

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INNO SPACE
SJIF Scientific Journal Impact Factor
Impact Factor: 8.118



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