International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 2 Issue 2, February- 2013

Smart Headgear

Prabha Subramani[1], Srinivas M[2], Prathibha R[3], Mohan Kumar A. M[4]
R.V.College Of Engineering,Bangalore-560059

Abstract

The aim is to develop a device which can measure brainwaves of different frequencies within the brain. Electrodes are placed on specific sites on the scalp to detect and record the electrical impulses within the brain. A frequency is the number of times a wave repeats itself within a second. It can be compared to the frequencies that we tune into on our radio. If any of these frequencies are deficient, excessive, or difficult to access, our mental performance can suffer. Mental status is indicated through embedded LED display by green & red lights.Green lights indicate a focused, active mental state, while red lights indicate drowsiness, anxiety, and other states not conducive to operating a bike or vehicle. Flashing red lights indicate extreme anxiety (panic).

1. Introduction

EEGs are a noninvasive way to look into your brain. While the brain is extremely complex, areas of it can lock into circular firing patterns, resulting in telltale brain waves that one can observe with the right equipment. Intensity of these waves change depending on your internal state. The waves we will be most easily able to distinguish are alpha and beta waves -- alpha waves occur at around 8-12 Hz and when measured from the frontal lobe provide an estimate of how relaxed a person is, while beta waves are around 12-30 Hz and correspond to how much a person is concentrating or how alert they are.The concentration of each wave can also tell more specific things about your thought patterns depending on where you measure them from. For example, alpha concentrations on the left motor cortex increase when you think about moving your right hand. Regardless of where you're taking measurements, looking at the concentrations of waves in real time - a process called biofeedback - can give you much greater control over them.

2. EEG

Electroencephalography (EEG) is the recording of electrical activity along the scalp. EEG measures voltage fluctuations resulting from ionic current flows within the neurons of the brain. In clinical contexts, EEG refers to the recording of the brain's spontaneous electrical activity over a short period of time, usually 20–40 minutes, as recorded from multiple electrodes placed on the scalp. Diagnostic applications generally focus on the spectral content of EEG, that is, the type of neural oscillations that can be observed in EEG signals. In neurology, the main diagnostic application of EEG is in the case of epilepsy, as epileptic activity can create clear abnormalities on a standard EEG study. A secondary clinical use of EEG is in the diagnosis of coma, encephalopathies, and brain death. A third clinical use of EEG is for studies of sleep and sleep disorders where recordings are typically done for one full night, sometimes more. EEG used to be a first-line method for the diagnosis of tumors, stroke and other focal brain disorders, but this use has decreased with the advent of anatomical imaging techniques with high (<1 mm) spatial resolution such as MRI and CT. Despite limited spatial resolution, EEG continues to be a valuable tool for research and diagnosis, especially when millisecond-range temporal resolution (not possible with CT or MRI) is required.

Derivatives of the EEG technique include evoked potentials (EP), which involves averaging the EEG activity time-locked to the presentation of a stimulus of some sort (visual, somatosensory, or auditory). Event-related potentials (ERPs) refer to averaged EEG responses that are time-locked to more complex processing of stimuli; this technique is used in cognitive science, cognitive psychology, and psychophysiological research.

3. Application

Smart Helmet

For many people cycling as a primary means of transportation, Smart headgear is a helmet that translates electroencephalogram (EEG) feedback into an embedded LED display. Smart headgear can support safety by adding visibility and increased awareness to the cyclist/motorist interaction process.

Transparency in voting system

In the present political scenario, electing a person involves hectic background processes. Smart headgear can be used to bring transparency by disqualifying the votes of individuals who are under the influence of alcohol and those who are not in stable state of mind.

To analyse stress levels in students

Nowdays students get stressed due to the academic pressure.If the child wears the smart headgear,the parents can monitor their child's mental health status in an effective manner.The green led would indicate alert/calm staus of mind and red led would indicate the child is under stress.Hence appropriate measures can be taken to control stress.

4. Figure

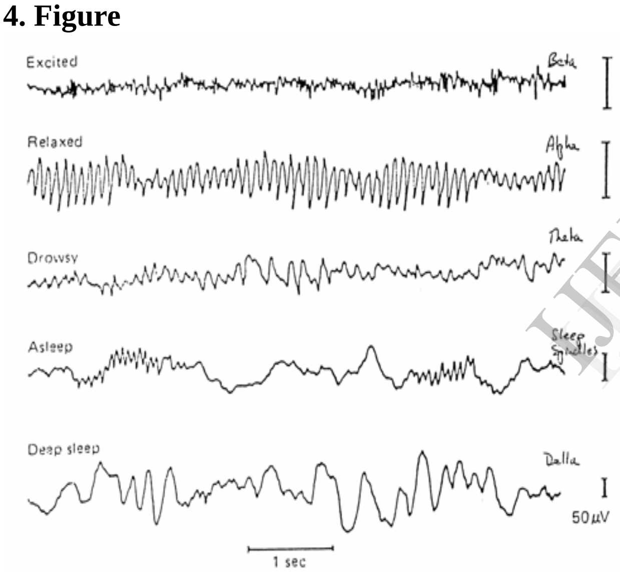

Figure.1The brain waves are illustrated in this figure

Our mind regulates its activities by means of electric waves which are registered in the brain, emiting tiny electrochemical impulses of varied frequencies, which can be registered by an electroencephalogram. These brainwaves are known as:

Beta emited when we are consciously alert, or we feel agitated, tense, afraid, with frequencies ranging from 13 to 60 pulses per second in the Hertz scale.

Alpha when we are in a state of physical and mental relaxation, although aware of what is happening around us, its frequency are around 7 to 13 pulses per second.

Theta more or less 4 to 7 pulses, it is a state of somnolence with reduced consciousness.

Delta when there is unconsciousness, deep sleep or catalepsy, emitting between 0.1 and 4 cycles per second.

In general, we are accostumed to using the beta brain rythm. When we diminish the brain rythm to alpha, we put ourselves in the ideal condition to learn new information, keep fact, data, perform elaborate tasks, learn languages, analyse complex situations. Meditation, relaxation exercises, and activities that enable the sense of calm, also enable this alpha state. According to neuroscientists, analysing electroencephalograms of people submmited to tests in order to research the effect of decreasing the brain rythm, the attentive relaxation or the deep relaxation, produce signficant increases in the levels of beta-endorphin, noroepinephrine and dopamine, linked to feelings of enlarged mental clarity and formation of rememberances, and that this effect lasts for hours and even days. It is an ideal state for synthetic thought and creativity, the proper functions of the right hemisphere. As it is easy for the hemisphere to create images, to visualise, to make associations, to deal with drawings, diagrams and emotions, as well as the use of good-humour and pleasure, learning is better absorbed if these elements are added to the study methods.

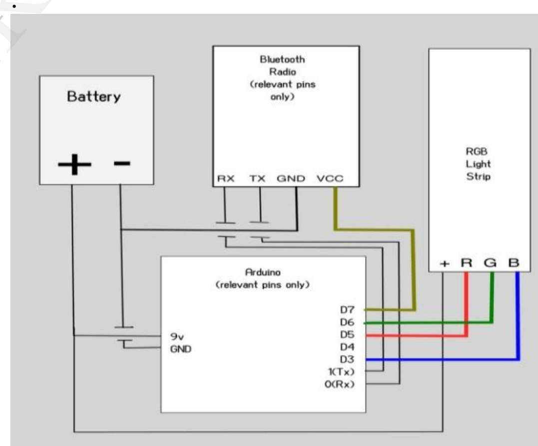

Figure. 1.Circuit diagram for smart headgear

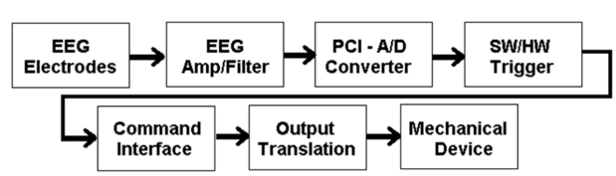

Figure.2 Block diagram for EEG circuit implementation

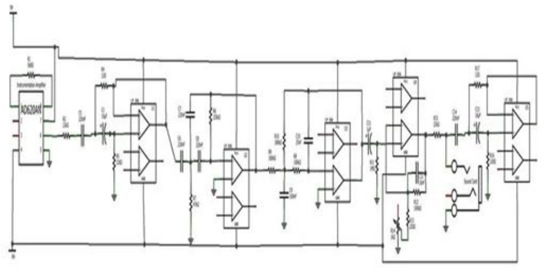

Figure.3 Circuit diagram for EEG circuit implementation

.

5.Table

Sr.no.	*State*	*Frequency Range*	*State of mind*
1.	Delta	0.5-4hz	Deep sleep
2.	Theta	4-8hz	Drowsiness
3.	Alpha	8-14hz	Relaxed but alert
4.	Beta	14-30hz	Highly alert and focussed

6.Conclusion

The brainwaves are obtained and analyzed.It is indicated using the LEDs.Red colour indicates drowsiness and Green colour indicates calm and stable state of mind.The device has many applications as listed above and it is beneficial for the society.In future,we would like to design in a way such that it is compact and easily affordable and cost effective.

7. Acknowledgement

We wish to thank all the faculty members of our dept for providing their constant support and encouragement without which this wouldn't have been possible.We wish to thank our HOD for providing us with all the facilities required.

8. References

[1] R.S.Khandpur, Handbook of Biomedical Instrumentation, 12th ed., TataMc Grawhill Publishing Limited,2003

[2] Blaukopf, K. The TV screen: An unexplored area of our mediasphere. Communications, 15,1990

[3] Bogen, J.E., & Bogen, G.M. ,. Hemispheric specialization and cerebral duality. Behavioral & Brain Sciences, 1983

9.Bibliography

1 .PRABHA SUBRAMANI
DEPT OF INSTRUMENTATION TECHNOLOGY,RVCE
BANGALORE-59
prabha266@gmail.com

2. SRINIVAS M
DEPT OF INSTRUMENTATION TECHNOLOGY,RVCE
,BANGALORE-59

3.PRATHIBHA R
DEPT OF INSTRUMENTATION TECHNOLOGY,RVCE
,BANGALORE-59

4.MOHAN KUMAR A.M
DEPT OF INSTRUMENTATION TECHNOLOGY,RVCE
,BANGALORE-59