

EEG signals and wireless transfer of EEG Signals

Md Belal Bin Heyat¹, Shaguftah², Yassir. M. Hasan³, Mohd Maroof Siddiqui⁴

Department of ECE, Integral University, Lucknow, UP, India^{1, 2, 3, 4}

Abstract: The full form of the EEG signal is Electroencephalogram. EEG signal is discovered by 1300 years. Electroencephalogram is fully computerized arrangement. EEG appliances are made in many outfits, electrodes & memory. Its work as combination of neuroimaging structures i.e. FMRI. Bio potential generates neural activity of brain is known as Electroencephalogram. The many EEG wave are used in the system like alpha wave, beta wave, gamma wave, theta wave and delta wave. All waves are work as different-different amplitude, frequency & location. The time frequency analysis of the EEG signal is done by no of condition like time domain, single event, long time period etc. EEG signal are used in no of diseases like epileptic seizures, brain death etc. Wireless system are used in the electroencephalogram transmitted data through radio signal no wire are used. It's done by fourth order Butterworth filter. Converting ADC to DAC using Atmel Atmega 1281 microcontroller. XStream-PKG-U USB used in wireless transmission of the EEG signal, X-CTU software is used in interfacing of the wireless system.

Keywords: EEG signal, Electroencephalogram, ADC, DAC, Atmel Atmega 1281 microcontroller, X-CTU.

1. INTRODUCTION

EEG (Electroencephalogram)-Early 1300years ongoing, it is continuous process like growth of clinical untried, finding, appreciation, analysis& management of neurological and physical anomalies of brain, EEG are completely computerized arrangement. Electroencephalogram appliances are fortified with many outfits, correct electrode and memory for much extended time recording of certain hours. Electroencephalogram apparatuses may be combined with neuro imaging structures such as functional magnetic

resonance imaging. Actual subtle needle such as electrodes can be secondhand for footage the Electroencephalogram over the cortex and avoid nonlinearity things induced by the Brain.

Bio potential generates neural movement of mind called as EEG. Electroencephalogram signal recurrent use of stimulus, wakeful, sleep is evoked reaction. The no of EEG signal are used i.e. α wave, β wave, Θ wave, gamma wave, Delta wave.

S. No.	EEG Wave	Amplitude	Frequency	Situation
1.	Alpha wave	002 to 010 μ v	08 to 13 Hz	Posterior positions of head, together sides, greater in amplitude non dominant side
2.	Beta wave	001 to 005 μ v	13 to 22 Hz	Symmetrical delivery, both sides, peak evident frontally, small amplitude waves
3.	Gamma wave	010 to 020 μ v	22 to 30 Hz	Originate location which is not related to mission at hand
4.	Delta wave	020 to 400 μ v	0.5 to 04 Hz	Subsequent of children, directly in adults
5.	Theta wave	100 to 500 μ v	04 to 08 Hz	Location found not related to task hand

2. TIME FREQUENCY ANALYSIS OF EEG SIGNAL

- o Analysis of time Domain.
- o Peak through a single event.
- o No time Information of frequency & Magnitude.
- o Oscillation of Neurons. Evoked & Induced oscillations are done by this analysis.
- o Period of time is long.
- o Coherence, Coupling is a sophisticated method.
- o Some technique is used in analysis of time frequency analysis of EEG signal i.e. Discrete Fourier Transform (DFT), Short Term Fourier Transform (STFT) etc.
- o 10Hz, 20Hz, 40Hz frequency, Zero amplitude & finite duration wavelets are used in frequency analysis of EEG signal.

3. USED OF EEG SIGNAL

- o Epileptic seizures
- o Encephalopathy
- o Brain death
- o Catatonia
- o Anti-epileptic medication
- o Anesthesia
- o Wada test
- o Prognosticate etc.

4. ADVANTAGE OF EEG

- o Electroencephalogram provides immediate care in high traffic hospitals.
- o Electroencephalogram sensors used in SPECT, MEG etc.

- o Electroencephalogram recorded at 250 & 2000 Hz sampling rate.
- o Electroencephalogram allows better response of auditory stimuli.
- o Electroencephalogram do not aggravate like claustrophobia.
- o Electroencephalogram does not involve Positron Emission Tomography.
- o Electroencephalogram detects covert processing.
- o Electroencephalogram is a powerful tool for tracking brain changes.

5. WIRELESS COMMUNICATION

The transfer of data or information between two or more points without wire or electrical conductor. Common technology of this system is radio technique. Radio wave are used, radio wave distance is short i.e. few meters, thousands or millions of kilometers of deep space region. The no of application of radio wireless technology is Cellular telephone, Personal digital assistants, wireless networking, GPS units, garage door opener, computer mouse, computer keyboard etc. wireless communication methods are radio communication, microwave communication, free space optical communication, ultra sonic communication (short range), electromagnetic induction etc.

6. APPLICATION OF WIRELESS TECHNOLOGY

- o Computer interface devices
- o Mobile telephones
- o Wireless data communication
- o Wireless energy transfer
- o Wireless medical technology etc.

7. WIRELESS TRANSFER OF EEG SIGNAL

This technique is not difficult to the old technique. Its apparatus is very easy to realize. Channel wireless EEG records acquirement organization of remote monitoring, notice electroencephalogram signals & to transfer data through radio frequency. Obtaining electroencephalogram signals finished electrodes retained on skin, riddling the electroencephalogram signal done by 4th order Butterworth filter withinferior cutoff frequency i.e. 0.5Hz & superior cutoff frequency is 35Hz. Notch filter used to eliminate power line frequency.

Average electroencephalogram signal amplitude is $\sim 100\mu\text{V}$ & gain of the circuit is 6000. Converting analog electroencephalogram signals into digital format by Atmel Atmega1281 microcontroller. Digital signal transferred to Maxstream X24-019 radio frequency modem finished microcontroller's Universal Synchronous Asynchronous Receiver Transmitter. The wireless system module used the XStream universal serial bus radio frequency Modem. The X Stream-PKG-U Universal serial bus radio frequency modem provides extended data communications & advanced networking of Original Equipment manufacturers & embedded arrangement integrators. Out-of-box, modem is prepared to long variety wireless

linkbetween plans. Simplyarrive serial records into one modem & records surface onother sideways of wireless link. Modem transmittedstandard synchronous serialrecords stream between two modems.

X-CTU software offers interface i.e. disconnected into four tabs:

- o **PC Settings tab**- PC serial port into interface by XStream radio frequency modem.
- o **Range Test tab**- Test XStream radio frequency modem.
- o **Terminal tab**- Read & configure XStream radio frequency modem.
- o **Modem Configuration tab**- RF modem parameter is read & configure.

8. CONCLUSION

The article of this paper is EEG signal and wireless transfer of EEG signal i.e. considered by the electroencephalogram is work as different different design, technique & system. The different disease of brain is measured in different different signal. That's signal amplitude & frequency is different. The amplitude & frequency is measured in μV & Hz unit. The data transfer are used in old technique i.e. wire are used but modern year Wireless technique are used in EEG signal.

REFERENCES

- [1] <https://en.wikipedia.org/wiki/EEG>
- [2] Charlie Drewes, "Electromyography: Recording Electrical Signals from Human Muscle", Department of Zoology and Genetics Iowa State University Ames, IA 50011 515-294-8061.
- [3] Siddiqui, Mohd Maroof. "Vision of 5G Communication." High Performance Architecture and Grid Computing. Springer Berlin Heidelberg, 2011. 252-256.
- [4] Mantri, Archana, et al., eds. High Performance Architecture and Grid Computing: International Conference, HPAGC 2011, Chandigarh, India, July 19-20, 2011. Proceedings. Vol. 169. Springer, 2011.
- [5] Siddiqui, Mohd Maroof, et al. "Detection of rapid eye movement behaviour disorder using short time frequency analysis of PSD approach applied on EEG signal (ROC-LOC)." Biomedical Research 26.3 (2015): 587- 593.
- [6] Pandey, Varsha, et al. "SLEEP DISORDERS AND EEG RECORDING." International Journal of Electronics and Computer Science Engineering (IJECSE) 4.3 (2015): 206-210.
- [7] Siddiqui, Mohd Maroof, et al. "EEG Signals Play Major Role to diagnose Sleep Disorder." International Journal of Electronics and Computer Science Engineering (IJECSE) 2.2 (2013): 503-505.
- [8] Anas, Ali, and Mohd Maroof Siddiqui. "Advent of Biometric Sensors in Field of Access Control." International Journal of Electronics and Computer Science Engineering (IJECSE) 4.3 (2015): 326-329
- [9] Siddiqui, Mohd Maroof, et al. "Detection of Periodic Limb Movement with the Help of Short Time Frequency Analysis of PSD Applied on EEG Signals." Extraction 4.11 (2015).
- [10] Misra, Anand Mohan, et al. "APPLICATION OF "MECHATRONICS" ALPHA I (FIRE FIGHTING ROBOT)." INTERNATIONAL JOURNAL OF ENGINEERING SCIENCE & ADVANCED TECHNOLOGY (IJESAT) 2.4(2012): 831 – 835
- [11] Akhtar, Mahnaz, Khadim Abbas, and Mohd Maroof Siddiqui. "NOCTURNAL FRONTAL LOBE EPILEPSY (NFLE): MEDICAL SLEEP DISORDER." International Conference on Emerging Trends in Technology, Science and Upcoming Research in Computer Science, DAVIM, Faridabad, 25th April, (2015):1168-1172

BIOGRAPHIES

Md Belal Bin Heyat received the B.Tech degree in electronics and Instrumentation engineering from Integral University, Lucknow, UP, India in 2014. He is currently pursuing M.Tech in electronics circuit &

system, department of electronics and communication engineering from Integral University, Lucknow, Uttar Pradesh, India. He has authored & co-authored in no of journals and conferences. His research interests include electronics, communication engineering, instrumentation, medical and Biomedical engineering.



Shaguftah has received her B.Tech degree in electronics and telecommunication engineering from Marathwada Mitra Mandal's Institute of Technology, University of Pune,

Maharashtra, India in 2013. She is currently pursuing M.Tech in electronics circuit & system, department of electronics and communication engineering from Integral University, Lucknow, Uttar Pradesh, India. She has authored & co-authored in no of journals and conferences. Her research interests include electronics, communication engineering, signals, digital electronics and Biomedical engineering.



Yassir. M. Hassan received the B.Tech degree in electrical and electronics engineering from Sherwood College of Engineering & Research Technology (GBTU), Lucknow, UP, India in 2013. He is currently a

M.Tech degree pursuing in electronics circuit & system, department of electronics and communication engineering from Integral University, Lucknow, Uttar Pradesh, India.



Mohd. Maroof Siddiqui received his B. Tech and M. Tech degrees in Electronics and Communication Engineering from Integral University and is pursuing PhD in Electronics Engineering from Amity University. He has more than 6 years of teaching

experience. He has authored and co-authored more than 60 articles in journals, conferences and book chapters. Some of his papers have appeared in prestigious SCI journals and conferences. He was the chair of a number of conferences sessions and was the member of the Technical Program Committee for several major international conferences. He is an editor and reviewer for 15 international journals. More than 70 papers have been reviewed since 2011 by him. He is a member and associate member of 5 technical societies. His current research interests include biomedical signal processing, analysis of EEGs and biomedical applications.