

Estimation of Coherence among Physiological Signals: ECG and EEG

Abhishek Chaudhary¹, Bhavana Chauhan², Gavendra Singh³, Monika Jain⁴

Dept. of Electronics and Instrumentation Engineering,

Galgotias College of Engineering & Technology, Greater Noida

¹abhiguru.005@gmail.com, ²bhavanachauhan.38@gmail.com, ³jadaungs@gmail.com,

⁴monikajain.bits@gmail.com

ABSTRACT

Degree of association or coupling of frequency spectra between the ECG and EEG signals at a particular frequency is presented in this paper. Degree of association or coupling of frequency spectra between two signals is called Coherence. ECG or electrocardiogram and EEG or electroencephalogram are very important parameters when it comes to diagnosis and treatment of human heart and brain related problems. For this reason signal processing of such signals are most important. A continuous non-invasive, low cost and accurate monitoring of functioning of heart and brain have been proven to be invaluable in various diagnostics and clinical applications. In this paper coherence between simultaneously taken ECG signals and EEG signals of four different subjects is presented. The EEG signals acquired from the four different positions; the Frontal ($F_{p_1} - F_{p_2}$), Central ($C_3 - C_4$), Parietal ($P_3 - P_4$) and Occipital ($O_1 - O_2$) Brain Regions. Coherence is analysed by obtaining magnitude squared coherence parameters at a certain frequency band (Very Low, Low and High) using Welch method. Welch method is implemented on MATLAB.

Keywords: Cross-Power Spectral Density, Auto-Power Spectral Density, Magnitude Squared Coherence, Welch, ECG, EEG.