

HIGHER ORDER SPECTRAL ANALYSIS TO IDENTIFY CARDIAC ARRHYTHMIAS

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ABSTRACT

In the modern industrialized countries every year millions of people die due to cardiac disorders. India has highest incidence of heart related diseases in the world. According to W.H.O. statistics, if no initiative is taken to check this most predictable and preventable among all chronic diseases, world will have to suffer with millions heart patients. Atrial Fibrillation (AF), Cardiac Ischemia (CI) and Sudden Cardiac Arrest (SCA) are most common types of cardiac arrhythmias. Processing of cardiac signal and identifying the cardiac disorders is challenging task in bio medical engineering. This paper introduces the work that has been done to distinguish the Electrocardiogram (ECG) of a normal healthy human (Normal Sinus Rhythm-NSR) from that of the patients affected by AF, CI, SCA. The aim of this paper is to identify cardiac arrhythmia using non linear signal processing technique such as higher order spectral analysis. Normal Spectral analysis of ECG provides only the power within frequency components but doesn't give any phase relations. So higher order spectral analysis is used to find Bispectrum, Bicoherence and Quadratic Phase Coupling to detect and characterize phase coupled harmonics in ECG. The plots of bi-spectrum and bi-coherence are potential visual aids presented in the report to analyze the cardiac problems. The experimental results indicate that Higher Order Spectral Analysis produce the best performance compared to normal spectral analysis. ECG data is collected from MIT-BIH Database. The verification of results is done by using MATLAB tool box.

KEYWORDS: Electrocardiogram (ECG), Normal Sinus Rhythm (NSR), Atrial Fibrillation (AF), Cardiac Ischemia (CI) and Sudden Cardiac Arrest (SCA)