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Heart Sound Cancellation from Lung Sound Recordings using empirical mode decomposition technique

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Auscultation is noninvasive, low-cost and accurate method for assessing heart and respiratory diseases. Importance of this method is a result of high association of acoustic signals generated by lungs and heart with relevant pulmonary and cardiac pathology. However, importance of classic auscultation has decreased due to its inherent restrictions: physical limitations of human ear and the subjectivity of an examiner.This technique got a second breath when it became possible to add objectivity into auscultation data gathering by using computer complexes. However, the identification of breathing and heart sounds is a difficult task due to the nonstationary character of signals.Therefore it is highly desirable to find a technique that would allow to separate different components of a signal, suppress noise and make a signal as audible as possible.

In this paper I would like to introduce a new hybrid method, based on the empirical mode decomposition (EMD) technique [1] and suppression of noise in signal using *spectral subtraction technique* [2] for separation of heart sound signals from respiratory sound signals.

Minimum priory information is required for the performing the separation of signals with the suggested method. In addition basis functions generated from signal and adaptive in nature are used in EMD technique. Mixed signal is split into several components. Experiments have been conducted on simulated and real-life recorded mixed signals.

The proposed method enables the researcher to efficiently remove heart sounds interference from lung sounds signals without any requirement of having the reference signal. This feature makes this method advantageous comparing with already existing techniques.

[1] Eds By Norden E. Huang, Samuel S. Shen. , *The Hilbert-Huang Transform and Its Applications* , World Scientific Publishing Company, 2005.

[2] Steven F. Boll *IEEE Transactions on Signal Processing* **27(2)**, (1979), pp 113-120