Time dependent multivariate linear analysis of cardiovascular signals using wavelet transform

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Scientific activities during the reported period

1. Wavelet coherence estimator
   - 1.1. Development of the estimator for use with cardiovascular and respiration signals
   - 1.2. Significance analysis and error estimation
   - 1.3. Application to real data obtained in our laboratory in two representative situations: supine rest and change pf posture from supine to standing.
2. Baroreflex sensitivity estimation using wavelet transfer function
   - 2.1. Development of the new estimator
   - 2.2. Validation of the estimator in the simple case when time is averaged.
   - 2.3. Comparison and correlation with the classical Transfer Function (TF) method and the phenilapharine method on real data of normal subjects and of CHF and MI patients.
   - 2.4. Application of the new estimator using the added time domain of the wavelet transfer function to improve correlation with the clinically proven phenilapharine method

Conclusions so far

The main advantage of using the wavelet transform as a base for the new estimators is the additional degree of freedom (the time domain). Both the wavelet coherence and the wavelet transfer function estimators exhibit high performance in comparison with more classical estimators. The present framework enhances the use of those estimators as an intuitive and straightforward complementary tool for the bivariate spectral analysis of the ANS regulatory mechanisms.

Publications

K. Keissar, L. R. Davrath, S. Akselrod, " Coherence analysis between respiration and heart rate variability using continuous wavelet transform." PTRSA. *[Accepted for publication]*

K. Keissar, L. R. Davrath, S. Akselrod, "Wavelet Transform Coherence in Cardiovascular Analysis – Error Analysis and Feasibility Study." *Computers In Cardiology 2008. Bologna , Italy, 17-Sep-2008*

K. Keissar, R. Maestri, G. D. Pinna, M. T. La Rovere, S. Akselrod " Enhanced non-invasive Baroreflex sensitivity assessment using Wavelet Transfer Function." *5th Conference of the European Study Group on Cardiovascular Oscillations 2008. Parma, Italy, 06-april-2008*