Karlsruher Institut für Technologie

Institut für Biomedizinische Technik

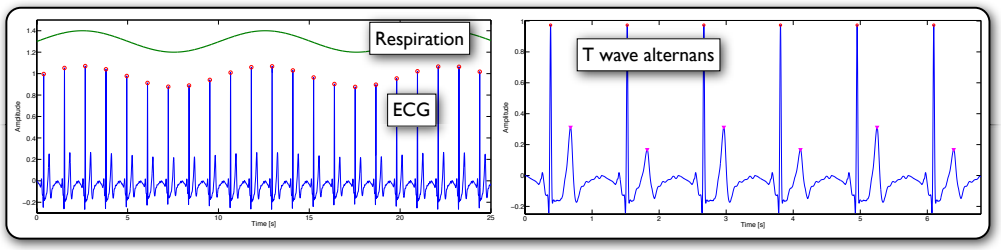
Master Thesis

Developing robust methods for the electrocardiogram derived respiration and for the detection and quantification of T wave alternans

Motivation

The respiratory cycle modifies the electrocardiographic (ECG) signal. While breathing, the mechanical displacement of the human chest together with a change in the impedance of the thorax lead to a modified electrical axis of the heart. Therefore, a change in beat morphology in ECG can be appreciated. This modification can be used to estimate the time evolution of the respiration signal and its main frequency components. The respiration signal can deliver additional information about the overall health condition of the subject.

T wave alternans have been associated with dangerous cardiac arrhythmias in patients with a history of heart failure, cardiac channelopathies and acute coronary syndrome. T wave alternans have been postulated as risk predictors for cardiovascular mortality and sudden cardiac death. Furthermore, they are used deciding about implantation of cardioverter-defribillator. In addition, quantification of T wave alternans could also be relevant guiding therapeutical and pharmacological treatment.



Tasks

In this project, an algorithm for the detection of derivation of the respiration activity from the ECG should be developed. Different methods presented in the literature together with innovative techniques should be implemented and evaluated. In addition, an algorithm for the detection and quantitative analysis of T wave alternans should be also achieved. In the end, both methods can be extended to work in a multichannel environment.

Requirements

- Literature research
- Programming skills in MATLAB
- Strong fundamentals of signal processing
- Data mining and statistics
- Ideally some fundamentals of cardiac physiology

Field of Research
Signal processing of the ECG

Project
Supported by the german state of Baden-Würtemberg

Areas
Signal processing
Software programming
Algorithmic

Field of Studies
Electrical engineering
Computer science

Starting Date
November 2013

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