Karlsruhe Institute of Technology

Institute of Biomedical Engineering (IBT)

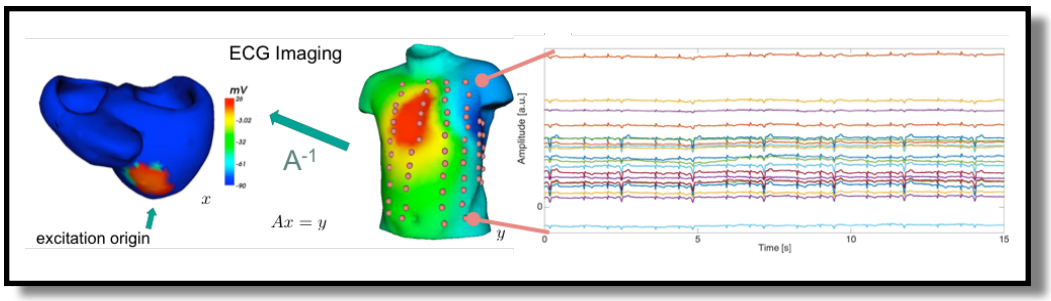
Research Project

Removing the offset of the body surface potential map to improve the reconstruction of ventricular ectopic beats for ECG imaging

Motivation

Ventricular arrhythmias (ventricular ectopic beats (VEB) and ventricular tachycardias (VT)) can endanger the health and degradate general life quality of a patient. It can also increase the risk of syncopes or sudden cardiac death. VEB and VT are treated by cardiologists in catheter guided ablation therapy. During this procedure, cardiologist find the origin of the ectopic beat and perform a proper ablation. The process of finding the origin of the VEB is often very tedious and can lead to other medical complications further coasts. In order to minimize risk and increase accuracy, other more recent methods for the direct localization of ectopic foci using only the body surface potential map (BSPM) have been developed. ECG imaging (ECGI) of the electrical activity of the heart is completely non-invasive and could provide cardiologists with a much more accurate ablation point to treat the arrhythmia.

ECGI can only deliver accurate results if high signal quality is provided. Since this is not always the case, additional signal processing or optimization methods to remove signal artifacts must be applied. One of the most common artifact in ECG signals is the isoline offset in the ECG. Accurately removing this offset can increase the quality of the reconstruction of VEB.



Tasks

In this project, a simulation study to compare two offset removal algorithms should be performed. The first artifact removal method is based on a signal processing or filtering approach. The offset is estimated directly from the ECG and removed afterwards. The second method integrates the estimation of the offset into reconstruction of the electrical activity on the heart. In the end, it should be stated what method works faster, more accurately and has the potential of being used in the clinics.

Requirements

- Literature research
- Programming skills in MATLAB
- Strong fundamentals of signal processing
- Statistics and data mining
- Ideally, fundamentals of cardiac physiology and anatomy

Field of Research

Signal processing of the ECG
Inverse problem of ECG

Project

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Areas

Signal processing
Optimization methods
Software programming

Field of Studies

Engineering
Computer science

Starting Date

April 2015

Contact

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