# Bachelor Thesis

Regularization Parameter Estimation for the Inverse Problem of ECG

Motivation

The goal of ECG imaging is the reconstruction of cardiac electrical sources from the BSPM (body surface potential map). The tool could have a great clinical potential by providing a cardiologist quantitative information about the heart condition, thereby enabling pre-interventional planning and facilitating the intervention procedures themselves.

With the knowledge about model geometry, a linear relationship between heart sources and BSPM can be established. The problem is however severely ill-posed, i.e. it is very sensitive to the measurement and modeling errors. Therefore a special mathematical technique, called regularization, should be applied in order to get a stable solution.
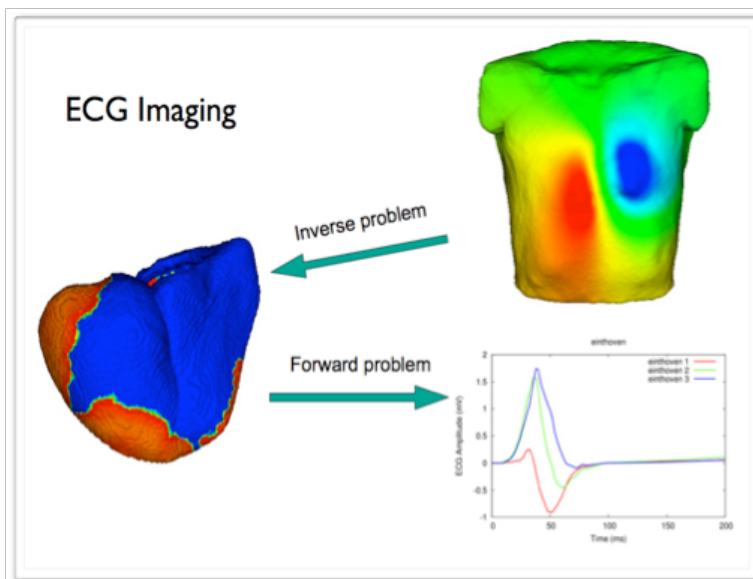
Tasks

In this project new approaches for determination of an optimal regularization parameter will be investigated. The measurement errors are unavoidable, therefore we will concentrate on the modeling errors coming mostly from uncertainty about body electrical conductivities. Using explicit integrals formulae for the potentials on the body surface, the dependency of lead fields on conductivities could be derived. This would allow to efficiently use Morozov discrepancy and other principles assuming modeling error estimates are known.

Requirements

- programming skills in C++, MATLAB
- linear algebra, analysis
- some knowledge about optimization and/or cardiac physiology would be a plus

Field of Research

Inverse problem of ECG, Improvement of IP solution by imposing additional spatio-temporal constraints

Projects

DFG / Forward and inverse problems of electrocardiography

Areas

Inverse problems
Software programming
Algorithmics

Field of Studies

Mathematics
Electrical engineering
Computer science

Starting Date

from April 2013

Contact

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