

Scientific Computing

- Publications
- Center for Biomedical Computing
- Projects
- Available Master's topics
- Intranet
- People

CBC Workshop on Heart Modeling - February 26, 2009

The purpose of this workshop was to present the current status and challenges in the Inverse Problem project.

Total number of participants: 17
 Total number of guests outside of CBC: 3
 Number of different nationalities represented: 5
 Total number of speakers: 6
 Total number of talks: 6

10.15-12.00 in Bakrommet, fourth floor:

- 10.15-11.15 Modeling the Human Heart - Open Questions. Olaf Dössel
- 11.15-12.00 Multi-level Regularization. Trond Mannseth
- 12.00-13.00 Lunch

13.00-16.15 in Underhuset, third floor:

- 13.00-13.45 A method for determining advantageous properties of an anti-arrhythmic drug based on a mathematical model of cardiac cells. Aslak Tveito, Glenn Lines, Pan Li
- 13.45-14.30 Computer modeling of cardiac electro-mechanics. Joakim Sundnes, Samuel Wall
- 14.30-14.45 Break
- 14.45-15.30 A Review on Solutions of the Inverse Problem of Electrocardiography. Olaf Dössel
- 15.30-16.15 The inverse problem of identifying ischemic heart disease. Bjørn Fredrik Nielsen, Marius Lysaker, Per Grøttum

Abstracts

Abstract of the 10.15-11.15 talk:

Modeling the Human Heart - Open Questions.

- Olaf Dössel, Karlsruhe, Germany

Computer models of the healthy heart are already very near to reality.

Looking into the details of the simulated and the measured ECG we recognise differences in the QRS complex and the T-wave. What's wrong? Also comparing measured and simulated intracardiac signals from the human atria small but clearly visible differences can be found. What's the reason for that? The next stage is modeling the heart including specific diseases. A simplified computer model of the human atria showing atrial fibrillation will be presented and discussed. Also other diseases are elaborated: Can we localize extrasystoles from the ECG? Can we replicate Long-QT- and Short-QT-syndrome?

Do we really understand the ST-segment elevation in case of ischemia and infarction?

Will it be possible on the long run to personalize computer models of the heart for specific diagnosis and optimized therapy planning?

Abstract of the 11.15-12.00 talk:

Multi-level Regularization.

- Trond Mannseth, Bergen, Norway



For many inverse problems one would ideally like to identify the unknown parameter function at a level of detail corresponding to the forward-model grid-cell scale. Most often, however, the available data are not sufficiently informative for such identification. The question then arises as to what level of detail in the parameter function that is warranted by the data. Multi-level regularization can be seen as a search for the right level of detail - taking place during the estimation. I will discuss the foundation for multi-level regularization of inverse problems where the unknown parameter function occurs as an elliptic coefficient in the forward model. This will lead up to presenting the main framework of adaptive multi-scale estimation, and multi-level, level set estimation. Some examples of applications of these methods will be given.

Abstract of the 14.45-15.30 talk:

A Review on Solutions of the Inverse Problem of Electrocardiography.

- Olaf Dössel, Karlsruhe, Germany

For more than 20 years scientists are aiming at imaging electrophysiological characteristics of the heart non-invasively based on measured Body Surface Potential Maps. In this lecture first the various source models are presented: epi- and endocardial potentials, transmembrane voltages, impressed current densities, activation times etc. Second the regularization techniques for the ill-posed problem are outlined: Tikhonov 0, 1st or 2nd order, GMRes, spatio-temporal approaches, maximum a posteriori estimates, heart model based solutions etc. The third topic of the lecture is an estimate on the sensitivity of the solution to measurement and modeling errors. In the fourth part the added value of Magnetocardiography MCG is briefly evaluated. Finally an outlook on clinical applications will be given.

| | |
|------------------------------|--|
| What | ▪ Minisymposium |
| When | Feb 26, 2009 from 10:15 AM to 04:15 PM |
| Where | Bakrommet and Underhuset |
| Contact Name | Bjørn Fredrik Nielsen |
| Attendees | Rolv Erlend Bredesen Tim Dorscheidt Olaf Dössel Per Grøttum Hans Petter Langtangen Pan Li Glenn T. Lines Marius Lysaker Emil Løvgren Dana Mackenzie Trond Mannseth Bjørn Fredrik Nielsen Harald Osnes Tomas S. Ruud Kirsten ten Tusscher Aslak Tveito Sam Wall |
| Add event to calendar |  vCal  iCal |