Master Thesis/ Diplomarbeiten
„A Wavefront-Based Approach to Non-Invasive Reconstruction of Myocardial Activation“

Motivation
The visualization of cardiac muscle excitation from ECG measurements (ECG Imaging) is a problem of great clinical relevance that is mathematically ill-posed. It can only be solved by introducing a-priori knowledge on the reconstructed sources into the solution (regularization).

Traditional regularization methods are mostly unsatisfying since they are based on the assumption that the electric sources have a smooth distribution. It is, however, well-known that cardiac potentials have sharp edges in both time and space. These edges can be interpreted as activation wavefronts, which are known to occur shortly before a muscle contracts.

Reconstructing such wavefronts instead of potential distributions means a reduction of dimensions. This makes the imaging problem less ill-posed. In approaches by van Oosterom and Huiskamp wavefronts of intracellular action potentials (TMVs) have been reconstructed. This thesis will focus on imaging wavefront-based models of TMVs in line with an approach that has recently been published by Brooks for epicardial potentials (EPs).

Tasks
- Implementation of a wavefront-based imaging algorithm
- Performance test on simulated and measured ECG data.

Requirements
- some know-how in signal processing, common sense and creativity
- programming experience in C/C++ or MATLAB
- basic knowledge of Mac OS X/UNIX

Notice
Some knowledge in human physiology is preferred but not required. The project can be performed in English or German.