Karlsruher Institut für Technologie

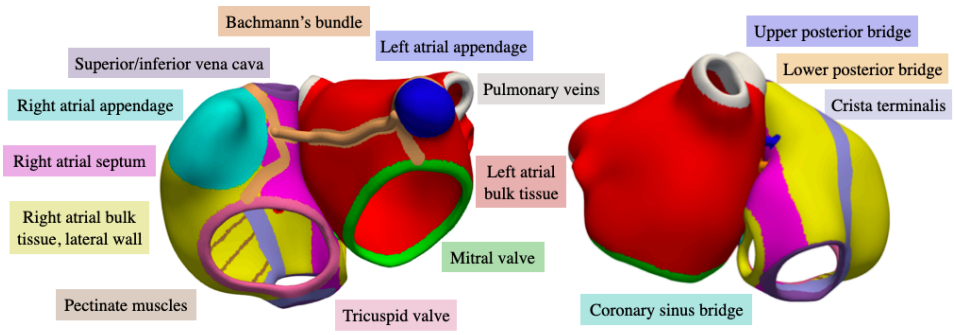
Institut für Biomedizinische Technik

Master Thesis

Eikonal-Based Method to Analyse Regional Changes of Conduction Velocity in Patients with Atrial Fibrillation

Motivation

Cardiovascular diseases are the leading causes of mortality and mobility in the world. Treatment strategies are far from optimal partially due to the lack of correct characterisation of cardiac tissue. One of the most important parameters to characterise is the conduction velocity (CV). This is relevant for cardiac arrhythmia because slow and heterogeneous CV is one of the main mechanisms of reentry. Most of current methods used to estimate CV based on clinical local activations times lack validation in anisotropic conditions. On the other hand, understanding how CV is affected in altered rhythms such as atrial flutter or atrial fibrillation (AF) vs sinus rhythm (SR) could provide additional insights in the pathophysiology of these diseases. Additionally, it is well know that there are important electrophysiological differences among regions in the atria. Therefore, comparing CVs of patients in AF vs SR at a regional level will provide additional valuable information. The goal of this project is to optimise and validate an eikonal-based method to calculate CV from clinical local activation times (LAT) and analyse clinical data to find regional differences in CV from patients with and without AF.



Student Project

At the beginning, you will work on regionalising real atria from patients from the Städtisches Klinikum Karlsruhe. Additionally you will optimise and validate an already developed method to calculate CV. The method already performs very well in simulated data, but it must be improved to perform well for clinical data which frequently have measurement errors. After the method is improved and validated, it will be applied on each region. An analysis of the CV per region in patients in AF vs SR will be performed.

Skills needed

- Written and spoken English
- Motivation and interest to work on clinically relevant issues
- Experience in Python and Matlab is desirable

Research area
Computational modelling in Biomedical Engineering

Project
Cardiac modelling

Orientation
Computational modelling, software programming, cardiac simulation

Course of studies
Informatics and electrical engineering

Starting date
From now

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