Karlsruhe Institute of Technology

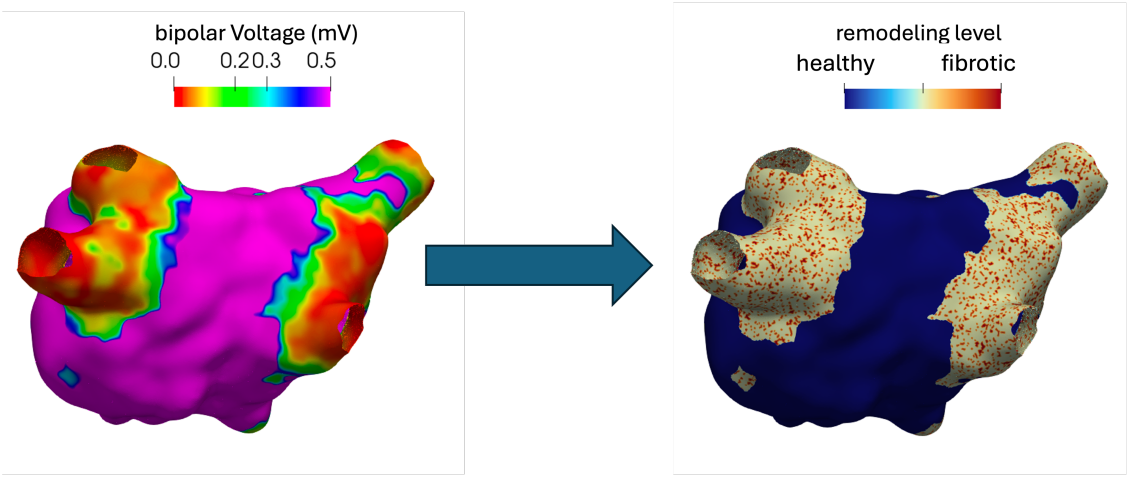
Institute of Biomedical Engineering

Influence of Continuous Low-Voltage-to-Fibrosis Mapping

Bachelor Thesis

Motivation

Atrial fibrillation is among the most prevalent cardiac arrhythmias worldwide, and personalized digital twins offer a means to analyze its underlying mechanisms and evaluate potential treatment strategies. Electroanatomical mapping (EAM) has emerged as one of the most precise methods for capturing tissue properties. In this procedure, a catheter is inserted into the atrium to directly record intracardiac electrical signals. These signals enable high-resolution characterization of tissue properties in digital models.
A key parameter in EAM is peak-to-peak voltage. This metric serves as an indicator of the spatial distribution of diseased (fibrotic) tissue in the atrium. Typically, a fixed threshold between 0.1 mV and 0.5 mV is applied, with regions below this threshold classified as fibrotic, thereby enabling localized mapping of pathological changes.



Project

This Bachelor's thesis aims to systematically investigate and compare different continuous mapping approaches for translating voltage values into representations of synthetic fibrotic tissue. The study will consider adjustments to tissue conductivity as well as the incorporation of non-conductive elements. Following this, the various modeling methods will be evaluated and contrasted based on their influence on atrial fibrillation vulnerability using simulations.

Notes

Programming experience (in Python) is advantageous but not required.

Research Area

Computational Cardiac Modeling

Course of Studies

Computer Science, Computational Engineering, BME, ETIT,...

Starting Date

As soon as possible

Posted Date

20.07.2026

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