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Software development for cardiac excitation conduction and tension development

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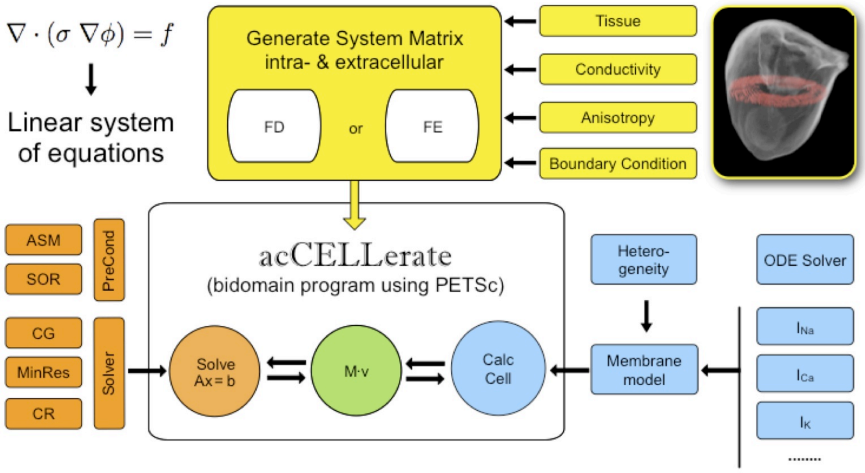
In this project, different numerical and analysis tools are developed regarding cardiac electrophysiology and tension development (see also www.ibt.kit.edu/acCELLerate.php). The simulation tools reach from single cell electrophysiology and tension development up to whole heart simulations including the body surface potentials. Furthermore, parameter identification procedures have been developed in order to adjust the parameters of the models to fit measurement data. All these methods are implemented modularly and efficiently using parallelization strategies. The analysis tools are capable to extract information from single data sources like the transmembrane voltage or 3D data like the action potential duration distribution across a whole heart. Furthermore different programs to identify predisposition factors for arrhythmias have been developed.
Our further goals are to develop methods in order to incorporate microscopic effects of other tissue types than cardiomyocytes e.g. fibroblasts to better understand the pathophysiological changes that occur during e.g. ischemia. Additionally, the time critical components of the software framework will be adjusted to run on GPU architectures in near future. This will allow building a high-through-put procedure to test the arrhythmogenic effects of new drugs in an early development stage by using computational models of human myocytes.



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- DL Weiss et al. Modeling of Cardiac Ischemia in Human Myocytes and Tissue including Spatiotemporal Electrophysiological Variations. *Biomedizinische Technik* (54), 107-125, 2009
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