



Statistical Atlases and Computational Models of the Heart: First International Workshop, STACOM 2010, and Cardiac Electrophysiological Simulation ... (Lecture Notes in Computer Science)

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Recently, there has been considerable progress in the construction and application of cardiac atlases and computational models which integrate heart shape, function, and physiology. Several major initiatives have identified computational and morphological atlases as a major infrastructural platform, for instance the Physiome project and the European Virtual Physiological Human project. Non-invasive cardiovascular imaging plays an important role in defining the computational domain, the boundary/initial conditions, and tissue function and properties. Hence, one of the most important current challenges in the field is the development of robust and effective methods for the parameterization and personalization of these computational models using only minimally-invasive clinical imaging. However, in order to evaluate the model output and achieve clinical practicality, such personalized models have to be both augmented with and compared to generic knowledge on the healthy and pathological heart. This knowledge can be acquired through the building of statistical models of the heart. Several efforts are now established to provide web-accessible structural and functional atlases of the normal and pathological heart for clinical, research, and educational purposes. We believe all these approaches will only be effectively developed through collaboration across the full research scope of the imaging and modeling communities. Integrative models of cardiac function are important for understanding disease, evaluating treatment, and planning intervention. To provide a focus for the developing array of techniques which underpin the application of these models in the clinic a simulation challenge was included in the workshop. The goal of this challenge was to compare strategies for the personalization of different cardiac computational models with experimental data. A completed dataset was provided in advance, containing the cardiac geometry and fibre orientations from MRI as well as epicardial transmembrane potentials from optical mapping.

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