Physiological Data Fusion and Computational Model Personalization: Applications to Cardiology and Oncology

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Abstract:
Medical image analysis and computational modeling of physiological systems are important but usually separated research areas. Medical image analysis can provide patient-specific information to aid diagnosis, but is lack of prediction capability. Complementary image data of different physical natures and spatiotemporal quantities are also difficult to be meaningfully combined together using common image processing algorithms. On the other hand, computational models provide powerful prediction tools based on physiology knowledge obtained from ex vivo and in vitro experiments. Although they are capable of providing simulations which are quantitatively comparable to clinical measurements, their prediction capability is limited without patient-specific information. Therefore, by combining medical image analysis with computational modeling, we can overcome their limitations and benefit from their merits. By using physiological data fusion, multimodal images can be combined through computational models to provide clinically meaningful information. Computational models can also be personalized by patient-specific information to aid treatment planning and disease prognosis. Progress in applications to cardiology and oncology will be demonstrated.

Bio:
Dr. Chun Lok (Ken) Wong received his BE (with First Class Honors) and MPhil degrees in electronic engineering in 2002 and 2004 respectively, both from the Hong Kong University of Science and Technology. He received his PhD degree in computing and information sciences (CIS) from the Rochester Institute of Technology (RIT) in 2009. Dr. Wong joined the Asclepios Research Team in Inria Sophia Antipolis in France to co-lead the euHeart project from 2009 to 2011, which was a European Union project funded by 19.05 million euros. He then joined RIT as a visiting assistant professor in the PhD Program of CIS from 2011 to 2013. He is currently with the Clinical Center in the National Institutes of Health as a postdoctoral fellow. Dr. Wong’s research interests are medical image analysis, computational modeling of physiological systems, and image-based model personalization, with the concentration on cardiac diseases and tumor growth. He has around 50 publications in conferences and journals such as MICCAI, Medical Image Analysis, IEEE-TMI, and IEEE-TBME. He had three MICCAI oral presentations in 2006, 2010, and 2014, with the acceptance rates of about 5%.