Preface

Recently, there has been considerable progress in cardiac image analysis techniques, cardiac atlases, and computational models, which can integrate data on heart shape, function, and physiology from large-scale databases. Integrative models of cardiac function are important for understanding disease, evaluating treatment, and planning intervention. However, a significant clinical translation of these tools is constrained by the lack of complete and rigorous technical and clinical validation as well as by benchmarking of the developed tools. For doing so, common and available ground-truth data capturing generic knowledge on the healthy and pathological heart are required. 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 work, research, and educational purposes. We believe all these approaches will only be effectively developed through collaborations across the full research scope of the imaging and modelling communities.

STACOM 2015 was held in conjunction with the MICCAI 2015 conference (Munich, Germany) and followed the past five editions: STACOM 2014 (Boston, USA), STACOM 2013 (Nagoya, Japan), STACOM 2012 (Nice, France), STACOM 2011 (Toronto, Canada), and STACOM 2010 (2010, Beijing, China). Our main goal is to provide a forum for the discussion of the latest developments in the areas of statistical atlases and computational imaging and modelling of the heart. The topics of the workshop include: cardiac image processing, atlas construction, statistical modelling of cardiac function across different patient populations, cardiac mapping, cardiac computational physiology, model customization, image-based modelling and image-guided interventional procedures, atlas-based functional analysis, ontological schemata for data and results, integrated functional and structural analyses, as well as the pre-clinical and clinical applicability of these methods. STACOM 2015 drew many submissions from around the world, with 23 papers finally accepted for presentation at the workshop. Beside regular contributions on various topics (e.g., state-of–the-art cardiac image analysis techniques, atlases, and computational models that integrate data on heart shape, function, and physiology from large-scale databases), additional efforts of this year's workshop focused on a statistical shape modelling challenge, briefly described here.

In addition to the papers presented, two keynote lectures were included in the program of STACOM 2015: Dr. Graham Wright of Sunnybrook Research Institute, University of Toronto (Canada), whose talk focused on "MRI for Guiding Ventricular Arrhythmia Management," and Dr. Mark Potse of Inria Bordeaux (France), who presented "Patient-Tailored Heart Models as a Diagnostic Modality."

Statistical shape modelling challenge: Statistical shape modeling is a powerful tool for visualizing and quantifying geometric and functional patterns of variation in the heart. Biologically, the heart exhibits great anatomical and functional variation making the encoding of these differences an interesting challenge in itself. After a myocardial infarction, the heart remodels in response to physiological challenges. The 2015

STACOM LV statistical shape modelling challenge was designed to test the hypothesis that a probabilistic model of the left ventricle can predict a patient's disease status. The goals of this challenge were to (a) establish a statistical shape model from the set of 3D shapes, and (b) develop an optimal classifier to distinguish between normal or diseased with myocardial infarct. Participants' methods could be supervised or unsupervised. Classification accuracy, specificity, and sensitivity measures were reported. The challenge provided additional insight into the methods that best describe left ventricular remodelling after myocardial infarction, attracting 11 participating groups, whose detailed methods and results are included in these proceedings. A collation journal paper including all results is planned in the near future. Preliminary results can be found on the workshop's website.

We hope that the results obtained by the challenge, together with all regular paper contributions, will act to accelerate progress in the important areas of heart function and structure analysis.

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