3D Cardiovascular Imaging
A MICCAI segmentation challenge

Program

Morning	**9.00 - 12.30**	Presentation and distribution of the on-site testing datasets **On-site challenge:** participants will run their algorithms on this data *Include a coffee break (10.30-11.00)*
Lunch	**12.30 - 14.00**	**Lunch break** (included in the registration) Concurrent **poster session** Evaluation of the on-site challenge results by the organizers
Afternoon	**14.00 - 15.00**	**Keynote lecture** by Prof. J.C.H. Reiber (Medis, the Netherlands) "Innovations in diagnostic imaging technologies: basic principles and clinical perspectives of cardiac CTA and MRI"
	15.00 - 15.30	**Presentations from both challenges**
	15.00-15.15	"Automatic stenoses detection, quantification and lumen segmentation of the coronary arteries using two-point centerline extraction scheme", Rahil Shahzad *et al.* (BIGR, Rotterdam, NL)
	15.15-15.30	"Multi-atlas based segmentation with local label fusion for right ventricle MR images", Wenjia Bai *et al.* (Imperial College London, UK)
	15.30 - 16.00	**Coffee break** Concurrent **poster session** Participants can explain their algorithm, possibly including on-site demos
	16.00 - 16.30	**Presentations from both challenges**
	16.00-16.15	"Accurate stenosis detection and quantification in coronary CTA", Brian Mohr *et al.* (TMVSE, Edinburgh, UK)
	16.15-16.30	"Automatic right ventricle segmentation using multi-label fusion in cardiac MRI", Maria A. Zuluaga *et al.*(University College London, UK)
	16.30 - 17.30	**Presentation of the challenge results** Prize giving Closing discussion

List of accepted papers

Right ventricle segmentation challenge

"A Simple and Fully Automatic Right Ventricle Segmentation Method for 4-Dimensional Cardiac MR Images", Ching-Wei Wang, Chun-Wei Peng, and Hsiang-Chou Chen, Graduate institute of biomedical engineering, National Taiwan University of Science and Technology, Taipei, Taiwan.

"Right-Ventricle Segmentation with 4D Region-Merging Graph Cuts in MR", Oskar M O Maier, Daniel Jimenez Carretero, Andres Santos Lleo, and Mara J Ledesma-Carbayo, Escuela Tecnica Superior de Ingenieros de Telecomunicacion, Universidad Politecnica de Madrid, Madrid, Spain.

"Multi-Atlas Based Segmentation with Local Label Fusion for Right Ventricle MR Images", Wenjia Bai, Wenzhe Shi, Haiyan Wang, Nicholas S. Peters, and Daniel Rueckert, Biomedical Image Analysis Group, Department of Computing, Imperial College London, UK & National Heart and Lung Institute, St Mary's Hospital, Imperial College London, UK.

"Automatic Right Ventricle Segmentation using Multi-Label Fusion in Cardiac MRI", Maria A. Zuluaga, M. Jorge Cardoso, and Sebastien Ourselin, Centre of Medical Image Computing University College London, London UK.

"Right ventricle segmentation by graph cut with shape prior", Damien Grosgeorge, Caroline Petitjean, Su Ruan, Université de Rouen, LITIS EA 4108, France.

"Multi-Atlas Segmentation of the Cardiac MR Right Ventricle", Yangming Ou, Jimit Doshi, Guray Erus, and Christos Davatzikos, Section of Biomedical Image Analysis (SBIA), Department of Radiology, University of Pennsylvania.

"Rapid Automated 3D Endocardium Right Ventricle Segmentation in MRI via Convex Relaxation and Distribution Matching Cyrus", M.S. Nambakhsh, Martin Rajchl, Jing Yuan, Terry M. Peters, Ismail Ben Ayed.

Coronary artery stenoses detection/quantification challenge

“Vessel Segmentation Using Implicit Model-Guided Level Sets”, Chunliang Wang, Rodrigo Moreno, and Orjan Smedby, Center for Medical Imaging Science and Visualization (CMIV), Linköping, Sweden.

“Automatic detection, quantification and lumen segmentation of the coronary arteries using two-point centerline extraction scheme”, Rahil Shahzad*, Theo van Walsum, Hortense Kirişli, Hui Tang, Coert Metz, Michiel Schaap, Lucas van Vliet, and Wiro Niessen, *Quantitative Imaging Group Delft, Imaging Science and Technology, Faculty of Applied Science, Delft University of Technology, Delft, The Netherlands.

“FrenchCoast: Fast, Robust Extraction for the Nice Challenge on COronary Artery Segmentation of the Tree”, Alexander Broersen, Pieter H. Kitslaar, Michel Frenay, and Jouke Dijkstra, Division of Image Processing, Dept. of Radiology,Leiden University Medical Center, The Netherlands.

“Probabilistic model based evaluation of coronary artery stenosis on Computed Tomography Angiography”, Kuo-Lung Lor and Chung-Ming Chen, Institute of Biomedical Engineering, National Taiwan University, Taipei, Taiwan.

“Quantification of Coronary Arterial Stenosis by Inflating Tubes in CT Angiographic images”, Abouzar Eslami, Amin Aboee, Zardosht Hodaei, Mandana Javanshir Moghaddam, Stephane Carlier, Amin Katouzian, and Nassir Navab, Technical University of Munich, Munich, Germany.

“Automatic Detection of Stenoses in Computed Tomography Angiography”, Suheyla Cetin and Gozde Unal, Sabanci University, Istanbul, Turkey.

“Accurate Stenosis Detection and Quantification in Coronary CTA”,
Brian Mohr, Saad Masood, Costas Plakas, Toshiba Medical Visualization Systems, Edinburgh, UK.

“Coronary artery segmentation and stenosis quantification in CT images with use of a right generalized cylinder model”, Leonardo Flórez-Valencia*, Maciej Orkisz, Ricardo A. Corredor Jerez, Juan S. Torres González, Esteban M. Correa Agudelo, Claire Mouton, and Marcela Hernández Hoyos, *Pontificia Universidad Javeriana, Bogotá, Colombia.

“A Hybrid Method for Coronary Artery Stenosis Detection and Quantification”, İlkay Öksüz,Devrim Ünay, and Kamuran Kadıpaşaoğlu, Bahçeşehir University, Istanbul, Turkey.

“Automatic Coronary Arteries StenosesDetection in 3D CT angiography”, Imen Melki*, Hugues Talbot, Jean Cousty, Celine Pruvot, Jerome Knoplioch, Laurent Launay, and Laurent Najman, *Universite Paris-Est, Laboratoire d'Informatique Gaspard-Monge, Equipe A3SI, Noisy-le-Grand, France.

“Coronary Artery Stenoses Detection with Random Forest”, Matthieu Duval, Elodie Ouzeau, Frederic Precioso, and Bogdan Matuszewski, Polytech'Nice-Sophia, Nice, France.

Biography of Prof. Dr. Ir. J.H.C. Reiber

Johan H.C. Reiber received his M.Sc. EE-degree from the Delft University of Technology in 1971 and his M.Sc. and Ph.D. from Stanford University, USA in 1975 and 1976, respectively.
In 1977, he founded the Division of Image Processing (LKEB) at the Thorax center, Erasmus University in Rotterdam, and continued these activities from 1990 at the Department of Radiology, Leiden University Medical Center (LUMC) in the Netherlands.
Since 1995 he has been Professor of Medical Image Processing at the LUMC, and from 1995 until 2005 also a professor of cardiovascular imaging at the Interuniversity Cardiology Institute of the Netherlands (ICIN) in Utrecht. In 2000 he became a member of the Royal Netherlands Academy of Arts and Sciences (KNAW), Physics faculty, section Technical Sciences.
He is (co)-author of more than 625 scientific papers, and co-author/editor of 15 books. He is editor-in-chief of the International Journal of Cardiovascular Imaging, and serves on the Editorial Board of several other journals. In 2004 he became an IEEE Fellow for his contributions to medical image analysis and its applications. Other fellowships include those of the European Society of Cardiology (1988) and the American College of Cardiology (2010).
He is also co-founder and CEO of Medis medical imaging systems BV in Leiden (NL), a global provider of software packages for the quantitative analysis of medical images, in particular of the cardiovascular system.

"Innovations in diagnostic imaging technologies: basic principles and clinical perspectives of cardiac CTA and MRI"

Johan HC Reiber, PhD,
Division of Image Processing, Leiden University Medical Center, the Netherlands

Cardiac MSCT has developed over the past decade into a very important clinical tool providing a complete 3D description of the coronary tree in a short acquisition time with continuous efforts to further decrease the radiation dose. We have developed an analytical tool for the fully-automated extraction of the centerlines of the coronary tree, followed by the annotation of the individual coronary segments. In the next phase of the analysis, individual coronary segments are segmented in a combination of longitudinal and cross-sectional contour detection approaches of the lumen and the vessel wall, allowing the derivation of clinically relevant parameters about the plaque burden, including plaque composition and calcium deposits. The software has been validated on clinical materials and has demonstrated low inter-and intra-observer variabilities on the anatomical parameters.
Cardiac MRI has developed from a research tool into a widely clinically accepted tool for the assessment of the function, perfusion, infarct-sizing, and other indices of the myocardium plus the assessment of the flow into the major vessels, as well as the plaque composition of the vessel walls. Automated segmentation approaches have been developed and validated for the delineation of both the left and right ventricles, such that all the other myocardial parameters can be derived in an efficient manner. Of great interest is the combination of the various parameters such that a comprehensive report can be derived. Future will be directed towards increased workflows and the combination of the MSCT and MRI data.