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Marginal Space Learning for Efficient Detection and Segmentation of 2D/3D Anatomical Structures in Medical Images

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Abstract:
Recently, we proposed marginal space learning (MSL) as a generic approach for automatic detection and segmentation of 2D/3D anatomical structures in many medical imaging modalities. To accurately localize a 3D object, we need to estimate nine pose parameters (three for position, three for orientation, and three for anisotropic scaling). Instead of exhaustively searching the original nine-dimensional pose parameter space, only low-dimensional marginal spaces are searched in MSL to improve the detection speed. In this talk, I will present MSL in detail, followed by some recent developments, e.g., constrained MSL, MSL for nonrigid shape detection, and hierarchical MSL. Live demos on various applications of MSL will be shown, including four-chamber heart segmentation in CT, liver segmentation, and 2D left ventricle detection in MRI.

Bio:
Yefeng Zheng received the Ph.D. degree from University of Maryland, College Park, in 2005 with a dissertation on handwritten document image analysis. Before that, he received the B.E. and M.E. degrees from the Department of Electronic Engineering, Tsinghua University, Beijing, China, in 1998 and 2001, respectively. After graduation, he joined Siemens Corporate Research in Princeton, New Jersey, first as a research scientist and later promoted to a project manager. Now, he is leading a team with two research scientists and a few interns working on 2D/3D object detection and segmentation problems in medical imaging. His research interests include medical image analysis, document image analysis, pattern recognition, and computer vision. He has published over 50 papers on various top journals and conferences in the above fields. There are about 30 patents under his name (including granted and pending applications), including a patent on marginal space learning based heart chamber segmentation, which recently won the Thomas A. Edison Patent Award of New Jersey R&D Council in 2011. He is a major contributor for several prestigious awards inside and outside of Siemens, including Siemens Top+ Innovation Award in 2010 and the Techno-College Innovation Award of the European Association for Cardio-Thoracic Surgery (EACTS) in 2010. As a co-developer of an Asian Optical Character Recognition (OCR) system, he won the National Scientific and Technological Progress Award (2nd class) of China in 2003. He is a senior member of the IEEE.