High-Resolution 4D-CT for Lung Cancer Image Guided Radiotherapy

Guorong Wu
IDEA research lab, University of North Carolina, Chapel Hill

Abstract

In this talk, I will present my recent work on novel approaches for improving the accuracy of dose delivery in the image-guided lung cancer radiotherapy. Currently, 4D-CT, which is able to provide full lung/tumor motion by acquiring 3D image at each respiratory phase, has been popularly used to determine the margin for radiation fields during the treatment planning. However, due to considerable radiation dose, generally only a free-breathing 3D-CT is acquired at each treatment day for patient setup, which is done by registration with other free-breathing 3D-CT taken at the planning day. However, without knowing the exact tumor motion at the treatment day, the accuracy of patient setup may be limited. Thus, to ensure the targeting of tumor, a large treatment field margin still has to be applied. Although it is well known that a small margin of radiation fields can lead to less treatment complications, the margin cannot be safely reduced without knowing lung/tumor motion at the treatment day. I will describe our work to improve dose delivery in the image-guided lung cancer treatment by innovatively solving the challenging problem of reconstructing the 4D-CT (and further estimating 4D lung/tumor motions) from a single free-breathing 3D-CT acquired at the treatment day. In this way, we can more precisely localize the moving tumor from the reconstructed treatment day 4D-CT.

Dr. Guorong Wu received his Ph.D. degree in computer science and engineering from Shanghai Jiao Tong University, Shanghai, China. He is currently with Image Display, Enhancement, and Analysis Research Laboratory, The University of North Carolina at Chapel Hill. His research interests are image registration and machine learning in medical image analysis. He has published more than 70 papers in the top-tier journals and conferences. Also, he has developed 9 image processing software, which are widely used in neuroimaging community with >10,000 downloads from >20 countries. Especially, he organized the MICCAI workshop on Machine Learning in Medical Imaging (MLMI) in 2013.

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