

AbstractID: 1730 Title: Quality assurance of four-dimensional CT image acquisition

Several techniques have been developed to generate four-dimensional (4-D) computed tomography (CT) image data sets using a multislice helical CT scanner. The purpose of the present work is to develop a set of techniques to assess the quality of 4-D images acquired using these techniques and illuminate the limitations of 4-D CT image acquisition. A sliding platform was constructed that can be programmed to move with various periodic trajectories that simulate a patient's respiratory cycle. 4-D CT image data sets were acquired of a CT phantom (Catphan® 500, The Phantom Laboratory, Incorporated, Greenwich, NY) moving with the platform using two commercial CT scanners (MX8000 IDT, Philips Radiation Oncology Systems, Cleveland OH, GE Discovery ST PET/CT system, General Electric Medical Systems, Waukesha WI), representing different techniques for 4-D image generation. The amplitudes and frequencies of the "respiration" were varied to represent typical patient breathing patterns. Images were transferred to a commercial radiation treatment planning system (Pinnacle³, Philips Radiation Oncology System, Milpitas CA), which supported an automated image registration software package (Syntegra). Images were registered using a cross-correlation algorithm and figures of merit were assigned to the quality of registration. Relative displacements of various phases in the 4-D image data sets were compared, as were volumes and CT statistics of various inserts placed in the phantom.

Supported in part by a Sponsored Research Agreement with Philips Medical Systems