Technology Development & Commercialization
UNIVERSITY HEALTH NETWORK
Toronto General Hospital • Princess Margaret Hospital • Toronto Western Hospital

4D CT capability for 3D CT scanners

Overview of Technology:

Researchers at the University Health Network have developed a novel approach to 4D computed tomography (4D-CT) which makes use of a series of 3D CT data sets acquired at various phases in the respiratory cycle in conjunction with a fiducial device.

Respiratory motion causes movement of structures in the thorax and abdomen and confounds accurate planning and delivery of radiation therapy. Imaging techniques that compensate for such movement currently rely on patient-specific assessment of respiratory motion performed using 4D-CT. Currently there are several approaches to compensate for such respiratory motion using 4D-CT devices but each has serious shortcomings. Some systems are not easily tolerated by the patient or have poor setup reproducibility. Imaging artifacts and uncertainties in localizing the tumor and normal anatomy can occur if there is even a minor offset when correlating and synchronizing the time stamp of separately recorded fiducial and imaging data. Other techniques require painstaking image processing of the regions of interest (ROI), which can be time consuming and are limited to the resolution of the CT scanner.

This technology does not require user interaction with any imagery, and thus can estimate true internal positions with sub-voxel accuracy by utilizing a known reference geometry. Also, this technology is capable of detecting irregularities in breathing motion during a scan, such as coughing, that do not represent a patient's typical breathing cycle, subsequently producing more reliable results. However, the greatest potential benefit of this technology is that it allows 4D imaging using current 3D equipment, including the world wide installed base of approximately 40,000 CT scanners, at a small fraction of the cost of a new 4D-CT capable scanner. In addition, this technology eliminates the necessity of complex equipment such as a electro-optical fiducial tracking systems, strain gauges or spirometry devices.

This technology is available for world-wide non-exclusive licensing.

Related Publication:

Hoisak, J.D.P., Kaus, M., Purdie, T., Jaffray, D.A. Retrospective Sorting of 4D CT Into Breathing Phases Based On Imaging Analysis of a Fixed-Geometry Fiducial. *Med. Phys*. **33(6)**, 2158-2158 (2008)

Patent:

National Phase Entry - Filed in United States, Canada, India, China, Russia, Japan and Europe - Filed May 1 2007

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