Fourier Space Tomographic Image Reconstruction Method

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The Wisconsin Alumni Research Foundation (WARF) is seeking commercial partners interested in developing a new framework for image reconstruction in computed tomography (CT) that extends the parallel beam projection-slice theorem to fan beam and cone beam projections.

Overview

Most commercially available computed tomography (CT) systems employ image reconstruction methods based on the concepts of Radon space and the Radon transform. When a CT X-ray source projects a single parallel beam, the data are automatically acquired in Radon space, and thus the Fourier transform can directly solve the image reconstruction problem by applying the well-known Fourier projection-slice theorem. But when fan beam or cone beam projections are used, image reconstruction methodologies involving Radon space and the Radon transform become much more computationally complex and problematic.

The Invention

UW-Madison researchers have developed a fundamentally new framework for image reconstruction in computed tomography (CT) that extends the parallel beam projection-slice theorem to fan beam and cone beam projections. Key to the invention is a generalized projection-slice theorem (GSPT) solved by the researchers. Using this new theorem, the invention can directly construct the Fourier space of an image object during data acquisition from fan or cone beam projections, without employing Radon space. Once the Fourier space of the image object has been built, the invention allows ready reconstruction of the image by using the inverse Fourier transform.

Applications

- Reconstruction of CT images

Key Benefits

- Extends the parallel beam projection-slice theorem to fan and cone beam projections, without requiring re-binning of the fan and cone beam projections into parallel projections
- Provides a unified theoretical structure for reconstructions from fan and cone beam projection data due to the linearity of the Fourier transforms
- Achieves a uniform distribution of background noise
- Allows use of software-FFT (fast Fourier transforms) or a dedicated hardware-FFT electronic board to efficiently reconstruct images

Additional Information

For More Information About the Inventors

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Tech Fields

- Medical Imaging : CT

For current licensing status, please contact Jeanine Burmania at jeanine@warf.org or 608-960-9846