Medical Imaging

Image Reconstruction System and Method to Reduce Artifacts from 3-D Cone-Beam CT Systems

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The Wisconsin Alumni Research Foundation (WARF) is seeking commercial partners interested in developing a system and method for producing 3-D medical images from any cone-beam computed tomography (CT) scan that are significantly free of image artifacts due to missing data.

Overview

Conventional CT scans utilize a fan-shaped X-ray beam source and a detector array to acquire data for 2-D medical imaging. The source and detector array are situated on opposite sides of the patient and rotated to acquire data from multiple angles. 3-D CT imaging systems utilize a cone-shaped X-ray beam source and have a single scan path of either a circle or arc. The biggest disadvantage with the single scan path is that data often are missing. These incomplete data sets result in images with artifacts, or image inconsistencies, which can degrade the overall diagnostic quality of the image.

Image reconstruction methods that reduce the effects of, or remove artifacts completely, have been developed for small cone-beam angles up to roughly five degrees. However, in large cone-beam angle processes like helical CT imaging and flat-panel detector CT imaging, these image reconstruction methods are insufficient.

The Invention

A UW–Madison researcher has developed a system and method for producing 3-D medical images from cone-beam CT scans that are significantly free of image artifacts due to missing data. The system includes a computer readable storage medium that carries out the method of improving the image.

The system takes the incomplete data acquired from a CT scan and creates an image of the volume of interest with artifacts attributed to the missing data. This image is optimized a desired amount and then reprojected onto a virtual scan path that acquires virtual data to take the place of the missing data. The originally acquired data and virtual data are combined to produce an improved image with a significantly reduced amount of artifacts. Furthermore, the optimization step, the reprojection step and the second reconstruction step can be done iteratively with a predetermined amount of iterations or until the resultant reconstructed image meets a desired image quality metric.

Applications

- Any 3-D CT imaging using a cone-beam X-ray source

Key Benefits

- Reduces artifacts due to missing data

- Not limited by cone-beam angle, extended data acquisition processes or cumbersome image reconstruction algorithms

Additional Information

For More Information About the Inventors

- Guang-Hong Chen

Tech Fields

- Medical Imaging : CT

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