Reconstruction Method for Increasing Image Resolution of Computed Tomography Systems

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Inventors: Guang-Hong Chen, Jiang Hsieh

The Wisconsin Alumni Research Foundation (WARF) is seeking commercial partners interested in developing an image reconstruction method for computed tomography (CT) systems that increases the image resolution with no hardware modifications.

Overview

Computed tomography (CT) systems are medical imaging devices that use X-rays to image a patient internally. An X-ray source sends parallel beams through the patient. The X-ray absorption/scattering, or attenuation, is measured by a detector array on the other side. The source and detector rotate around the patient to collect attenuation measurements. The data from one angle is called a “view” and a complete set of views or multiple angles is called a “scan.” The preferred method for reconstructing an image from the attenuation measurements is a technique called filtered backprojection in which the values are converted to integers that represent the brightness of specific pixels in the image.

The image resolution for CT scans is determined by the density of projection views and the density of signal detector elements. Maintaining these same densities, the image resolution can be increased by roughly a factor of two with two techniques called “quarter-detector-shift” scan and “focal spot wobbling,” but they require hardware additions to existing CT systems. Reducing the size of the detector elements increases their density and the image resolution. However, the radiation dose then must be increased to maintain a good signal to noise ratio. In addition, the cost of the detector also increases.

The Invention

UW–Madison researchers have developed an image reconstruction method that increases image resolution with no hardware modifications to the CT system. The acquired projection views are backprojected onto an image grid with a higher resolution than the supported detector element resolution. This image is reprojected to obtain the original attenuation data and additional “pseudo” attenuation data. Effectively, this samples the area of interest at a density greater than or equal to the original scan. The original attenuation data is combined with the pseudo attenuation data to reconstruct a higher resolution image than would have been achieved with only the original data.

Applications

- General X-ray computed tomography system imaging

Key Benefits

- Increases resolution of X-ray CT images
- Decreases radiation dose to the patient
- Needs no hardware modifications

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