Medical Imaging

Reducing Image Noise and X-ray Dose in Spectral CT

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WARF: P100364US02

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The Wisconsin Alumni Research Foundation (WARF) is seeking commercial partners interested in developing a method for improving spectral computed tomography (CT) by overcoming the tradeoff between signal size and noise.

Overview

With the advance of photon counting technology, spectral CT (multi-energy CT) has attracted lots of attention. The technique utilizes X-ray spectral information to identify and differentiate materials, like iron and calcium in vascular plaque. Such sensitivity potentially opens up many novel clinical applications.

In the technique, X-ray photons are distributed into multiple energy 'bins.' Selecting an appropriate number of bins and widths is very important. For example, a narrow bin (with fewer available photons) has better energy resolution but may produce noisy images.

Therefore, an intrinsic tradeoff exists between the selection of energy bins (number, width and placement) and noise. Simply dosing patients with more photons does not solve the problem and leads to long term radiation concerns. Clearly, overcoming the tradeoff in spectral CT is vital.

The Invention

A UW–Madison researcher and others have developed a method to improve spectral CT by allowing users to select an optimal energy bin configuration. Specifically, the width, location and number of bins can be chosen so that the best material information can be gathered without the images succumbing to noise.

In the method, the multi-energy CT system acquires a series of energy data sets. Each data set is associated with at least one energy bin. A 'conglomerate image' is created, which uses most or all of the X-ray photon data spanning the energy bins. Then, an energy series of images can be produced, with each image in the series corresponding to at least one of the data sets. In this way, noise is reduced in each energy-specific image, not just in the final processed image.

The method may employ a previously developed reconstruction algorithm known as HYPR (HighlY constrained back-PRojection).

Applications

- Spectral CT software

Key Benefits

- Better material differentiation
- Dramatic noise reduction (47-56 percent)
- Reduced photon dose to patients

- Energy bins can be flexibly chosen/optimized without paying a noise penalty.

Additional Information

For More Information About the Inventors

- Charles Mistretta

Related Technologies

- For more information about HYPR, see WARF reference number P05437US.

Tech Fields

- Medical Imaging : CT

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