"DR-PICCS" – Dose Reduction Using PICCS Image Reconstruction Algorithms

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WARF: P100141US01

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The Wisconsin Alumni Research Foundation (WARF) is seeking commercial partners interested in developing methods for image reconstruction that produce high quality final images while reducing the radiation dose needed to obtain the images.

Overview

In imaging technologies, signal-to-noise ratio (SNR) is a quantitative measure of image quality. In medical imaging specifically, as SNR decreases, it becomes increasingly difficult to differentiate between anatomical features and other clinical findings needed to correctly analyze the image and identify a diagnosis.

Many medical imaging methods involve taking multiple image slices and using reconstruction algorithms to generate the final image read by radiologists. Reconstruction often is performed one slice at a time, resulting in a lower SNR. One way to improve SNR with this method is to increase the radiation dose used, which can elevate the possibility of harmful side effects to the patient. Currently, radiologists must develop their skills in reading noisy images obtained at the low radiation level. A method to administer low doses of radiation during imaging while maintaining high-quality final images is needed.

The Invention

UW-Madison researchers have developed a method using existing "PICCS" (prior image constrained compressed sensing) image reconstruction algorithms to reduce radiation dose while attaining quality images with high SNR. Multiple slices of an image volume are collected and then averaged together to create a single thick slice, known as the "prior image," with high SNR but lacking detailed anatomical structures. The PICCS algorithm then is used to reconstruct each image slice with the original slice thickness using the prior image. The resulting final image has the equivalent image noise variance level of the prior image, the high spatial resolution of the acquired image is preserved and the anatomical features will be detailed.

Noise variance in the final reconstructed image is improved by a factor of approximately the number of slices included in the prior image. Using this method, the patient receives a reduced dose of radiation while the radiologist acquires final images of the same quality currently attained with higher radiation levels.

Applications

- Add-on software for existing medical imaging to provide quality image reconstruction with reduced radiation dose requirements. Although first applied to CT, this concept could also be valuable for other imaging modalities such as MRI.

Key Benefits

- Improved trade-offs with factors such as radiation dose in X-ray imaging and overall scan time in magnetic resonance imaging while maintaining SNR
- Radiation reduced to one-tenth the dose currently required to be administered to patients.

- Customizable software possible for different applications and companies

Additional Information

For More Information About the Inventors
- Guang-Hong Chen

Related Technologies
- For more information about the general method of PICCS, see WARF reference number P08127US.
- For more information about an application of PICCS with radiation therapy, see WARF reference number P08125US.
- For more information about prior image reconstruction in cardiac cone-beam CT, see WARF reference number P09177US02.

Tech Fields
- Medical Imaging : CT
- Medical Imaging : MRI
- Medical Imaging : Other diagnostic imaging

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

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