Universal Signal-to-Noise Ratio Enhancement Using PICCS Image Reconstruction

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WARF: P100275US01

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The Wisconsin Alumni Research Foundation (WARF) is seeking commercial partners interested in developing systems and methods for constrained image reconstruction that allow enhanced signal-to-noise ratios without sacrificing spatial resolution.

Overview

Signal-to-noise ratio (SNR) is utilized in medical imaging as a quantitative measure of image quality. As SNR decreases, it becomes increasingly more difficult to differentiate between important anatomical features and clinical findings. Therefore, it is desirable to provide a relatively high SNR, but all known SNR enhancement methods sacrifice spatial resolution of the image. In addition, noise texture often is changed by SNR enhancement techniques, resulting in a distorted image. A need is felt for improved SNR enhancement methods that maintain high spatial resolution.

The Invention

UW–Madison researchers have developed a universal method to improve SNR of a digital signal or image, including images produced using any medical imaging modality. The new method implements Dr. Chen's previous discovery known as "PICCS" (see WARF reference number P08127US), which allows a high quality image to be reconstructed from undersampled image data. A final image with high SNR is constructed by imparting the high SNR characteristics of a "prior image" to the target image. This prior image is created from the original image, which allows an image to be improved without actually obtaining a prior image from the patient.

The first step in the new method is re-sampling, which converts a digital signal or image into a different domain that can be inversed easily for reconstruction purposes. These domains include radon, x-ray, Fourier or wavelet transform. Next, a filter is applied to the re-sampled signal or image to generate a very low noise prior image with low spatial resolution. Then, the PICCS algorithm is applied using the prior image to reconstruct the target signal or image. The resulting final image will have similar noise characteristics as the low-noise prior image, but the degraded spatial resolution will be restored in the iterative image reconstruction procedure.

Applications

- Any imaging modality, including medical imaging, requiring SNR enhancement for pattern recognition

Key Benefits

- Reduces noise
- Preserves spatial resolution and overall image quality relative to the original image
- Allows "prior image" creation from an original image

Additional Information

For More Information About the Inventors

- Guang-Hong Chen

Related Technologies
- For more information about the PICCS method, see WARF reference number P08127US.
- For information about a method of dose reduction using PICCS, see WARF reference number P100141US01.

Tech Fields
- Information Technology : Image processing
- Medical Imaging : Other diagnostic imaging

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