Medical Imaging

Image Analysis Method Normalizes Skeleton; Eases Physician Burden

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The Wisconsin Alumni Research Foundation (WARF) is helping develop the first bone-by-bone normalization method of its kind shown to decrease variation of image intensity across the skeleton.

The new approach corrects medical images to account for normal variations in different bones with respect to the uptake of a specific tracer or specific image modality. The result is a normalized image that better reveals disease location and reduces subjective interpretation.

Overview

To identify skeletal diseases a patient may be imaged using PET, CT or other methods that detect abnormal image intensity and hence the presence of disease. To identify metastasized cancer lesions, a radioactive tracer such as ^{18}F-NaF may be used. Identifying individual lesions on these types of bone scans is a time-consuming and often subjective process that makes accurate characterization of disease burden challenging. Current automated methods either underestimate disease or struggle with high false positive rates.

For physicians analyzing images, the process is complicated by the fact that different bones have different background intensities. Accordingly, as they review scans physicians must mentally discount some image regions while applying greater weight to others. The inability to rely directly on the image increases the potential for error.

The Invention

UW–Madison researchers have developed a statistically optimized regional thresholding (SORT) method, which establishes the first set of optimized bone-by-bone thresholds to detect lesions throughout the entire skeleton in NaF PET/CT images.

Their method is based on differentiating diseased from healthy signals in different skeletal regions. They developed a standardized skeleton 'template' that reduces image features related to normal physiology and accentuates features related to disease. To achieve this, they analyzed multiple healthy individuals with respect to radioactive tracer uptake and established anatomy-dependent background signal thresholds. These values can serve to statistically select the best thresholds for identifying lesions in different skeletal regions.

After the determination of thresholds, a normalized image is produced that can be more easily analyzed by the physician, having had standard variations removed so that only disease-based differences are evident. The improved image dataset may also be used for better automatic analysis of lesion size, location and change.

Applications

- Diagnosis of bone disease and lesions across the skeleton

Key Benefits

- Highlights areas of greater than normal image intensity
- Removes the effect of normal skeletal variation in the analysis of bone images
- Removes the effect of different tracer uptake rates in different bones
- Permits variations among different bones to be successfully captured and modeled
- Applicable to a range of bone diseases and disorders

Stage of Development

In a study assessing ^{18}F-NaF PET/CT scans of 37 bone metastatic prostate cancer patients, the new thresholds were found to be superior to current global thresholding methods. The image normalization created images with nearly uniform background intensity and highlighted the areas suspected to be disease. See the publication link below for more details.

Additional Information

For More Information About the Inventors

- Robert Jeraj

Related Technologies

- Find more medical imaging innovations developed by Prof. Robert Jeraj.

Publications

- Perk T. et al. 2018. A Statistically Optimized Regional Thresholding Method (SORT) for Bone Lesion Detection in 18FNaF PET/CT Imaging. Phys. Med. Biol. 63: 225018

Tech Fields

- Medical Imaging : CT
- Medical Imaging : Other diagnostic imaging

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