ITBS 2007

4th International Conference on

Imaging Technologies in Biomedical Sciences

From Medical Images to Clinical Information
Bridging the Gap

22 - 28 September 2007

Milos Conference Center *George Eliopoulos*
Milos Island, Greece

Pre-Conference Workshop on Brain Imaging
22nd September 2007
University Mental Health Research Institute (UMHRI, Athens)

Book of Abstracts

Sponsored by
S&B Industrial Minerals S.A. and the Greek Ministry of National Education and Religious Affairs

Noise reduction in simulated PET images using wavelet and thresholding method

B. Shalchian [1], H. Rajabi [2], H. Soltanian-zadeh [3], F. Kalantari [1]

1- PhD student, department of medical physics, medical sciences faculty, Tarbiat Modares University, Tehran, Iran
2- Assistant professor, department of medical physics, medical sciences faculty, Tarbiat Modares University, Tehran, Iran
3- Professor, department of electrical engineering, electrical and computer faculty, Tehran University, Tehran, Iran

Introduction

Medical imaging using positron emission is the second method after SPECT for tomography imaging in nuclear medicine. Although PET imaging is very useful in oncology, high noise level in these images reduces the diagnostic accuracy. Wavelet transform is one of the mathematical methods for noise reduction. It seems that using of wavelet transform may improves signal to noise ratio in PET images.

Materials & methods

In this research, we used SimSET software for simulation of PET images and we prepared images using NCAT phantom. The images were acquired using 250 million counts and in 128×128 matrices size. For reference image we acquired an image with high counts (2 milliards). Then, we reconstructed these images using programs that we wrote in MATLAB. After image reconstruction, 250 million counts image (noisy or initial image) and 2 milliard counts image (reference image) were normalized and then we used root mean square error to compare these images. Root mean square error (RMS) can show the difference between images. Then, we wrote some programs in MATLAB for de-noising. These programs were based on using of 54 different wavelets and two methods for thresholding (Global thresholding and Level dependent thresholding). Then, de-noised images were compared with reference image using root mean square error.

Results

After de-noising, RMS value between noisy and reference image in Global thresholding in the best state (for sym7 wavelet) is reduced about 91%. But in Level dependent thresholding, RMS value is dependent to other factors. In this method, by reducing ‘m’ factor (the number of the coarsest approximation coefficients), RMS reduces in both state of hard and soft thresholding and the quality of image is improved. Soft thresholding method gives better images in comparison to hard thresholding method in all of state. It seems Global thresholding has better result in noise reduction in comparison to Level dependent thresholding and the diagnostic quality of images in Global method is better.

Conclusion

Wavelet transform is useful method for de-noising in simulated PET images and it seems Global thresholding in this way is more efficient in comparison to Level dependent thresholding.

Keywords: PET imaging, SimSET, NCAT, de-noising, thresholding, root mean square error.