Poster Session Afternoon (14h30 - 16h)

PHYSICS IN MEDICINE

[12/05/10 - P104]
Algorithm for recovery of temperature signals measured with pulmonary artery catheters, M. D. B. de Melo, , J. H. da Silva, *Universidade Regional do Cariri – URCA*, A. F. da Rocha, *Universidade de Brasília - UnB* ■ The objective of this work is the development of a technique for the improvement of temperature curves measured by Swan-Ganz catheters, which improves the performance of previously developed techniques. In this dissertation, brief discussions on the physiology of the cardiovascular system and on the thermodilution-based method are presented. Later, a literature review summarizes the previous works that used deconvolution operations for improving thermodilution signals. In order to lay the foundation for the deconvolution technique, we present experiments for characterizing the time response of the sensor embedded in the catheter that is used for temperature measurement. The main chapter in this dissertation presents a new iterative method for performing the blind deconvolution of the thermodilution signal, which is based on a time-domain approach. A great number of computational simulations shows that the method works well for cardiac frequencies up to 170 beats per minute, and for ejection fractions that are smaller than 0,7, and have a significant error outside these boundaries. The method is then tested with data obtained in a mechanical pulsatile simulator of the cardiovascular system, and the results show a good precision of the method, with a mean error of 8,9 %. The proposed method improved the performance of the previously reported methods, since it had a faster response, and the results are independent on the initial estimate for the sensor response.

[12/05/10 - P105]
High definition sinchrotron X-ray powder diffraction used to investigate phase diagram of kidney calculi stones, P.E. Ferreira, E. L. O. da Piedade, D. O. de Souza, C. G. P. Orlando, H. Belich, J. B. Depianti, E. F. Medeiros, M. T. D. Orlando, *UFES*, L.G. Martinez, *IPEN*, H. P. S. Correa, *UFMS* ■ The high definition sinchrotron X-ray powder diffraction (XRPD) technique was used to study the crystalline phase structural stability of human renal calculi under thermal treatment. The stones were colleted from 85 donors of Vitória City, Espírito Santo State - southeast - Brazil. A high definition sinchrotron X-ray powder diffraction was performed on one monophasic sample classified by a normal X-ray diffraction technique , which reveals that 61nucleation process developed in closed kidney cavities. A study of in situ the phase transformation of monohydrate calcium oxalate into calcium carbonate (CaCO3) was carried out by annealing of a monophasic monohydrate calcium oxalate calculi at 100o C, 150oC, 300o C, 350oC, 400o C and 500oC temperatures. A high definition sinchrotron X-ray powder diffraction data carried out from the in situ experiment indicated that there is a no structural water which occupied a interstitial grain boundary among the grains. We concluded that high definition sinchrotron X-ray powder diffraction is a important tool which can be used as suitable technique to study the phase diagram of renal calculi.

[12/05/10 - P106]
Setup of an experimental station TOMOLAB to perform X-ray Phase Contrast Imaging, T. D. Souza, J.R.L. Mardegan, D. Girardelli, C. Leite, C. Giles, *Instituto de Física Gleb Wataghin (UNICAMP)* ■ New techniques to obtain X-ray images with high spatial and contrast resolutions have been developed recently. With important applications to the medical area, these images present high contrast, edge resolution of tissues and may help to obtain a more accurate diagnosis of various diseases like tumors and lesions in the joints [1].
The conventional breast images (mammography) have poor contrast because the attenuation coefficients between the healthy and diseased tissues are very similar which can result in false diagnosis. The same happens with conventional images from cartilages and joints [2]. An incorrect diagnosis results in a bad treatment which reduces the rate of patient survival.
Phase Contrast Images (PCI) explore the wave phase shift on the sample to increase the contrast in the image and not only the absorption contrast like the conventional method. The PCI can be obtained by several methods like the DEI (Diffraction Enhanced Imaging) method, X-ray interferometers and the propagation method [3.4].
In this work we have built an experimental station to perform x-ray tomography similar to the TOMOLAB station at Elettra [5] using the propagation method with a microfocus source (5 μm).
We have obtained images of breast tissues in vitro with invasive ductal carcinoma and samples with invasive lobular carcinoma and from cartilages and joints of small animals. The first images obtained by phase contrast method have showed high contrast resolution. By adjusting the distance between the source to the sample and the distance from the sample to the detector has allowed the optimization of the contrast in these images.
[1] Arndt, U. W. et al., X- Ray Generator, United States Patent n^o US 6.282.263. Agosto de 2001.
[2] AS Zhou, A. Brahme. Phys Med 24 (2008) 129-148.
[3] Tsuji, K., et al., X-Ray Spectrometry: Recent Technological Advances, Ed. John Wiley& Sons, Ltd, (2004).
[4] Gao, D. et al., RadioGraphics 18, (1998): 1257-1267.
[5] Avaiable in: http://www.elettra.trieste.it/Labs/TOMOLAB/. Accessed on 02/28/2010.

[12/05/10 - P107]
Viability study of an AC Biosusceptometry tomograph, Paulo R. Fonseca, , *UNIFEB - Fundação Educacional de Barretos*, Ronaldo V. Matos, Murilo Stelzer, Marcelo R. Agostinho, José Ricardo A. Miranda, *Dep. Fìsica e Biofísica, Instituto de Biociências de Botucatu, Unesp - Univ. Estadual Paulista*, Oswaldo Baffa Filho, *Dep. Física e Matemática, Faculdade de*