

Technology Offer

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TO 01-00680

A novel reconstruction method for Radon data: OPED (Orthogonal Polynomial Expansion on the Disk)

The Challenge

The current standard technology for image reconstruction in computed tomography (CT) is filtered back projection (FBP) which has been the dominating method for the past 30 years. Since filtering is an integrated part of this method, FBP tends to reduce the resolution in CT-images. There are further technologies which can be summarized as iterative methods. Using those the reconstruction time is prolonged compared to FBP, although the image quality might be better. OPED combines the advantages of both technologies – it is fast and accurate.

The Technology

OPED is a novel method for reconstruction of computed tomography images with a possible improvement of image quality while acquiring raw data with reduced dose. Compared to the current standard procedure FBP, OPED allows to generate a CT image with an at least comparable resolution and image quality by using about half of the required dose.

The OPED reconstruction method was developed in collaboration of Helmholtz Zentrum München (Germany) and the University of Oregon. OPED is using the information derived from a CT-scan more efficiently than FBP by describing an approximation of the image function as a sum of polynomials using Chebyshev polynomials. Doing so, and using an appropriate discretization there is a direct link between the measured Radon data and the image approximation in that form. The OPED algorithm is easy to implement. The data obtained from fan beam geometry can be easily reordered to generate data from parallel geometry, in which parallel beams in each projection are distributed according to the zeros of Chebyshev polynomials, as required by the OPED algorithm. No filters are required and no rebinning is needed. The algorithm can be applied to all kinds of Radon data such as resulting from CT, PET and SPECT measurements. Advantages of OPED were demonstrated by using the voxel model Godwin as well as by applying the algorithm to raw data offered by industrial partners.

Commercial Opportunity

Licensing opportunity in the field of medical or industrial CT

Patent situation

The portfolio currently encompasses ten patent applications (priority dates 2003-2008). These applications cover the OPED method and variations thereof as well as methods for scatter correction and noise reduction which can be used in combination with the OPED reconstruction method. In addition, imaging devices and instruments optimized for the use of OPED are claimed.

Further reading

Proc. SPIE, Vol. 6142, 61422A, Medical Imaging 2006: Physics of Medical Imaging; Xu, Tischenko, Hoeschen - A new reconstruction algorithm for Radon data

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