

OPTIMISATION OF SCANNER PARAMETERS FOR DUAL ENERGY MICRO-CT

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Abstract

In an X-ray Computed Tomography (CT) image two materials of a different composition can have a very similar grey value, making them practically indistinguishable. This is due to the fact that the linear attenuation coefficient μ is the product of the local mass attenuation coefficient μ/ρ (which is both energy and material dependent) and the local density ρ of the material. Since the mass attenuation coefficient of a chemical element is uniquely dependent on the photon energy, a distinction between two different materials with similar grey values can be made by combining information from scans performed at two or more different X-ray energies. This technique is called Dual Energy CT (DECT).

DECT yields very good results if a monochromatic X-ray source is used such as a synchrotron beam. However laboratory based CT scanners use polychromatic X-ray sources in combination with integrating detectors with an energy dependent efficiency. Therefore, the reconstructed μ -values are averaged over the energy spectrum of the X-ray beam and the spectral sensitivity of the detector. This greatly complicates the choice of the appropriate scanning conditions for application of DECT methods.

A GPU based program for simulating realistic radiographic projection images has recently been developed at the “Centre for X-ray Tomography” of the Ghent University (UGCT). The program takes into account the polychromatic behaviour of a laboratory based CT setup. (see poster contribution by Dhaene J. et al.) A tool in this program, the UGCT *Setup Optimiser*, can be used to select and optimise the scan environment in terms of scanning parameters such as tube voltage and filtration materials, to achieve the best signal to noise ratio (SNR) in the projected images. A method has been developed and integrated into the UGCT *Setup Optimiser* to identify optimal scanning conditions for the application of DECT. This method and the obtained results will be presented.

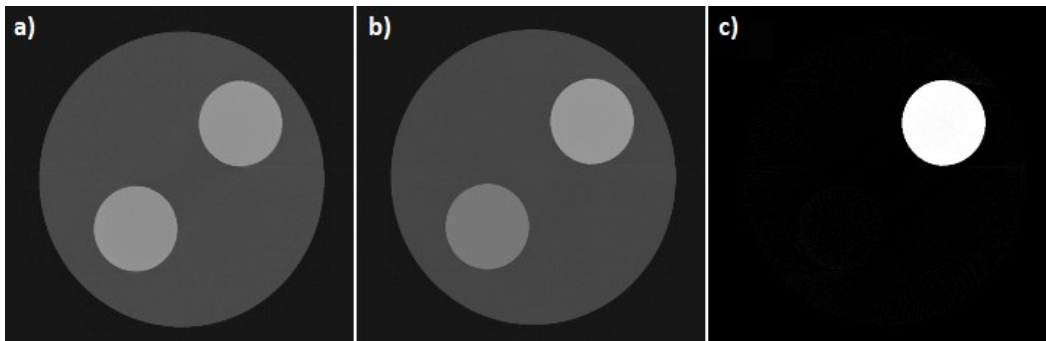


Figure 1: H2O phantom containing a PTA and KBr solution simulated at 2 different energies (a and b). Using three-material decomposition [1] the PTA solution can be identified (c).

References

[1] Granton P.V. et al., Med Phys. 35(11):5030-42 (2008)