

Monte Carlo image reconstruction for medical applications

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Physical effects degrading the quality of reconstructed medical images have been corrected during a while using analytical methods, applied to projections or directly to reconstructed images but those methods are still approximated.

An alternative approach is to correct those effects using iterative methods during the reconstruction of images. The principal is to model the physical and technological effects degrading the image directly in the so called projector describing mathematically the process of image creation. During the tomographic reconstruction, which consists into inverting the matrix system to estimate the distribution of the radiopharmaceutical from the measured data, parasitical effects are implicitly compensated because they are considered as full part of the process of images creation. Using this approach, one of the difficulties consists into modeling correctly the process of image creation including to it all the parasitical phenomena. Monte Carlo simulations are powerful and efficient to conceptualize and optimize detectors but also to model realistic physical phenomena occurring during nuclear medicine exam reconstruction such as single photon emission tomography (SPECT) or Positron Emission Tomography (PET).

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