Reconstructing Dynamic SPECT Images from Slow-Rotation Data

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ABSTRACT

Single photon emission computed tomography (SPECT) is a diagnostic functional imaging modality wherein the distribution of a radioactive tracer inside the body is estimated based on data acquired from around the patient by a slowly rotating camera. Conventional SPECT image reconstruction assumes that this distribution remains constant during acquisition.

In this talk we investigate imaging of a time-varying distribution of radiotracer, which results in a highly underdetermined reconstruction problem. Recovery of an accurate dynamic image from this data requires the use of additional constraints, including temporal regularization. We use simple inequality constraints to restrict the temporal behaviour of the reconstructed image. Since dynamic tracer behavior in the human body arises as a result of continuous physiological processes, changes in tracer concentration should follow a smooth time activity curve (TAC). Our algorithm promotes smoothness by constraining the concavity of the TAC in every voxel of the reconstructed image. Digital phantom simulations show that the algorithm yields more accurate images, with smoother, more consistent TACs within dynamic regions of interest.