

AbstractID: 1330 Title: CT-based Estimation of SPECT Radial Position on a Hybrid SPECT-CT Imaging System

Iterative single photon emission computed tomography (SPECT) reconstruction is superior to filtered backprojection, as attenuation, scatter and imaging system resolution can be incorporated into the reconstruction model. To include the variation in gamma camera system resolution with depth, the radial distance of the collimator from the axis of rotation versus projection angle must be known, as SPECT acquisition orbits are typically non-circular, where the detectors are positioned as close as possible to the object at each angle. An algorithm has been developed to estimate collimator radial position using CT slice data, on a SPECT-CT gamma camera (Hawkeye, GE Medical Systems) which does not store such information in the projection dataset. Computer simulation of detector radial inward motion at each projection angle is performed, on a CT image created from the sum of all slices. The radial position is defined as where the CT number exceeds a preset "above air" threshold. The algorithm was tested on SPECT-CT acquisitions of an anthropomorphic phantom (ATOM, CIRS, Inc.). Optimum results were achieved with a threshold of -950 HU. Linear correlation between estimated and actual radial position was excellent for truncation-free images, with a 2.75 cm mean difference (actual - calculated), which is approximately equal to the detector object sensor-to-collimator face distance (2.54 cm). In arms down acquisitions, lateral positions were underestimated due to truncation of the arms outside the 45 cm CT reconstructed field-of-view. Still, these results do suggest that this algorithm is capable of providing reasonable estimates of SPECT radial position.