

AbstractID: 9555 Title: Application of dual-energy techniques to helical, cone-beam CT image reconstruction

The anticipated introduction of large, area detectors into helical computed tomography (CT) scanners has spurred research on exact reconstruction algorithms that can take into account large cone-angle acceptance of these detectors. Up until now little attention has been directed to the effect of physical factors on helical cone-beam reconstruction. The polychromatic nature of x-ray sources in medical CT systems is known to degrade image quality, causing beam-hardening artifacts and loss of information due to energy averaging. This work investigates the effect of polychromatic x-rays on image reconstruction in helical cone-beam computed tomography. A linear, dual-energy post-reconstruction technique for enhancing contrast and physical information of the reconstructed images is applied. Images reconstructed from data simulated for two different x-ray energy distributions are combined to give images corresponding to: the attenuation map for a single x-ray energy, the attenuation map of soft tissue, attenuation map for bone, attenuation due to photo-electric effect, and attenuation due to Compton scattering. The monochromatic image computed from the dual-energy method may have enhanced contrast when the chosen x-ray energy is low. The tissue image by itself also may present improved contrast between different soft tissues. The photo-electric image is proportional to the atomic number  $Z$  to the fourth power; thus, the contrast between different tissues may be increased and also information on the composition of different tissues may be available. Supported by the National Institutes of Health.