AbstractID: 6509 Title: A Three-Pass Method for Metal Artifact Reduction in Computed Tomography

Purpose: A method for the reduction of metal artifacts in computed tomography (CT) images is presented.

Method and Materials: The method consists of three steps. In the first step, standard CT reconstruction is used to obtain an initial image containing metal artifacts. This image is segmented using k-means clustering in order to obtain a binary metal-background image. The metal is forward projected to mask the metal area in the sinogram data, and the metal shadow area is bridged using interpolation. A second image is reconstructed from this sinogram using standard backprojection. Then, the k-means clustering is applied to the second reconstruction in order to identify four image regions: air, soft tissue (low), soft tissue (high), and bone. The Hounsfield value of each region is set to the mean of each region, except for the bone region where the original values are kept. We use this model image to create a metal shadow replacement by forward projection into the original sinogram. When inserting the model data into the sinogram, we make sure that the model area connects to the borders of the metal shadow. The final image is reconstructed from the sinogram in which metal line integrals are replaced by the model line integrals (third step).

Results: Artifacts, e.g. from gold seeds in the breast or prostate, hip implants, or dental fillings can be significantly reduced. In cases of large implants, the method homogenizes image intensities in the surrounding soft tissues, which is helpful for the accurate planning of radiation therapy.

Conclusions: The presented three-pass metal artifact reduction method extends a recently published method by a linear interpolation step, which improves image quality, because more accurate model images can be derived for the replacement of the corrupted metal shadow in sinograms.