Contribution ID: **117** Type: **Oral report**

Method of correction beam hardening artifacts in CT.

Tuesday 13 October 2020 15:05 (25 minutes)

The beam hardening effect can induce strong artifacts in CT images, which leads to severe deterioration in image quality. This work develops an effective beam hardening correction algorithm using filtered back-projection based maximum *a posteriori.*
An x-ray tube emits a continuous spectrum, which gives rise to energy-dependent attenuation of different tissues. The spectrum is not known with sufficient accuracy as a rule/ Low-energy photons are preferentially absorbed compared to photons with higher energy along the integral path of a polychromatic x-ray beam, such that the beam gradually becomes harder, i.e. its mean energy increases. Neglecting this beam hardening effect in reconstruction leads to artifacts.
The iterative approaches that suppress beam hardening induced artifacts by directly incorporating the beam hardening effect into the projection matrix in an iterative reconstruction model were proposed earlier in [1].
The proposed method can be considered as an iterative maximum a posteriori reconstruction with the beam hardening effect incorporated in the forward-projection.
The algorithm has important properties. Most other iterative approaches require prior knowledge of the energy spectrum or the material composition, which is difficult to obtain in some clinical practice cases. The proposed method does not suffer from this obstacle, and can be used when no information about the beam spectrum or the material properties is available. It based on a fact that attenuation in every voxel can be decomposed into a photoelectric component and Compton scatter component. Besides, the photoelectric component depends on atomic number very strong: total cross section is proportional to $Z^{4.5}$ and its maximum value is shifting to the more energies when Z increase. In our method, we use the database for energy dependence of the photoelectric cross section for the different materials that might induce "hardening"artifacts, such as bone, aluminum and titanium implants etc.
This method has a high computation efficiency and needs small amount of iterations to obtain a satisfying reconstruction result. With usage of high voltage or bow-tie wedges to reduce the amount of low energy photons, the iteration number can be further reduced. In addition, the proposed method performs well in terms of both the overall reconstruction quality and suppression of beam hardening induced artifacts.

1. S.Luo *et al.* Phys. Med. Biol. 62, 1810 (2017).

Primary authors: Dr DOLGOPOLOV, Mikhail (Voronezh State University); Ms BUKHONOVA, Liliya (Voronezh State University)

Presenter: Ms BUKHONOVA, Liliya (Voronezh State University)

Session Classification: Section 8. Nuclear medicine

Track Classification: Section 8. Nuclear medicine.