Contribution ID: **151** Type: **Poster presentation only**

Medical and industrial applications of region-of-interest (ROI) digital tomosynthesis using deep convolutional neural network

Digital tomosynthesis (DTS) based on filtered-backprojection (FBP) reconstruction requires a full field-of-view (FOV) scan and relatively dense projections, which results in high dose for medical imaging purposes. To overcome these difficulties, we investigated region-of-interest (ROI) DTS or interior DTS reconstruction where the x-ray beam span covers only a small ROI containing a target area. In some situations of medical diagnosis, for example, in chest imaging, dental imaging, cardiac imaging, etc., physicians are interested in a local area containing suspicious lesions from the examined structure. This leads to imaging benefits such as decreasing scatters and system cost as well as reducing dose. To put this new DTS examination to practical use, an advanced reconstruction algorithm is needed because ROI-DTS measures incomplete (i.e., truncated, limited-angle) projection data where conventional FBP-based algorithms are unsuccessful in producing clinically feasible images. In common ROI-DTS, the FBP reconstructed images are often contaminated by the bright-band artifacts around the truncation edge and limited-angle artifacts due to the incomplete projection data. Several techniques have been proposed to circumvent the interior and limited angle tomography problem, including sinogram extension technique, compressed-sensing (CS)-aided, etc. However, most of the techniques are typically unstable in case of completely interior truncation and limited-angle. In this work, we propose an artifact reduction method in corrected FBP-based ROI-DTS using U-Net which is a deep convolutional neural network (DCNN) proposed for low-dose and sparse view computed tomography (CT). First, in the FBP-based algorithm, an apodizing function was applied to the original projection data before Fourier transform to smooth the truncated edges of the projection data. Second, we implemented DCNN method to extract limited-angle artifacts through mapping the DTS images and CT images. The reconstruction quality in proposed ROI-DTS images did not suffer from the problem of background-level shift due to the truncated and limited-angle projection data. We successfully reconstructed ROI-DTS images of substantially high accuracy and no truncation artifacts by using the proposed DCNN method, preserving superior image homogeneity, edge sharpening, and in-plane spatial resolution, and reducing imaging doses compared to typical full-FOV DTS images.

Primary author: Dr PARK, Soyoung (Korea Institute of Science and Technology)

Co-authors: Dr KIM, Guna (Korea Institute of Radiological & Medical Sciences); Dr LEE, Changhyuk (Korea Institute of Science and Technology); Prof. CHO, Hyosung (Department of Radiation Convergence Engineering, Yonsei University)

Presenter: Dr PARK, Soyoung (Korea Institute of Science and Technology)

Session Classification: Poster session 1

Track Classification: Applications