AbstractID: 11637 Title: Enhancement of Image Quality from Cone Beam Computed Tomography images using Entropy criteria.

Purpose: To improve the image quality of small low contrast objects and overall image quality from Cone Beam Computed Tomography using a new entropy technique.
Materials and Methods: Cone Beam CT (CBCT) images were acquired using the Catphan phantom in an Acuity Simulator. The images were acquired at 125 kVp, 80mA with 2.5 mm slice thickness. All the images were acquired in a full fan configuration. A new criterion for image enhancement was developed based on entropy behavior. For some of the images we have applied a noise reduction technique before applying the criteria.
Results and discussion:
Visualization of small low contrast objects is of significant importance for clinical treatment planning and verification. In this paper, we propose a new technique to enhance the quality of images obtained from CBCT. The technique involves measuring the entropy of the image using its histogram at different contrast levels using the definition

$$H \quad \sum P_n \log p_n \ ,$$

where P_n represents the relative frequencies of occurrence of gray levels in the image with $\sum p_n \quad 1$. The behavior of the entropy has been analyzed and studied on the phantom CATPHAN 500/600 and various types of CT images for the quality of image. Significant improvement in the quality of image was observed at the point of maximum entropy. We were able to observe low contrast objects which were not observed in the original image. Quantitative analysis of detectability, signal to noise ratio, contrast to noise ratio shows significant changes for the processed image. The method operates directly on the raw data with significantly lower computational time of 5-10 seconds per slice. We are hoping to improve this computational time.
Conclusion: We have demonstrated that using entropy criteria it is possible to improve the CBCT image quality.