Scientific Papers

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SUBSPECIALTY CONTENT

Physics and Basic Science

CODE: SSE22-04
SESSION:

Physics (Cone-Beam and Breast CT)
A Practical Metal Artifact Reduction Method for Dental Cone Beam CT Scanners

DATE: Monday, December 01 2008
START TIME: 03:30 PM
END TIME: 03:40 PM
LOCATION: S403B

DISCLOSURES

K.K. - Nothing to disclose.

A.K. - Nothing to disclose.

T.A. - Nothing to disclose.

K.I. - Nothing to disclose.

PURPOSE

Dental implants require precise three-dimensional measurements of tooth and jawbone using a cone beam CT scanner. X-ray opaque metals are often used for traditional treatments such as metal fillings and crowns. It is well known that metal artifact is especially severe when multiple of irregularly shaped metals are placed in the field of view. In some cases, images have to be manually edited to exclude artifacts. The newly proposed Metal Erasing (ME) method provides an integrated and efficient solution to prevent the metal artifact.

METHOD AND MATERIALS

Individual shapes and layout of metals that produce artifact are identified using its characteristics of X-ray opacity and simple image processing techniques together with backward tomographic projection. Metal-only sinogram is calculated by forward projection of the metal-only tomogram, and identifies corrupted areas on the original sinogram. The areas are then replaced by interpolation, and filtered back projection (FBP) produces a tomogram without metals. The metals can be reproduced by overlaying already obtained metal information either in sinogram domain or in tomogram domain, utilizing linear characteristics of FBP.

RESULTS

A subject who has typical medical treatments of two metal crowns and two metal fillings is pictured using a cone beam CT scanner. The scanner produces two types of outputs, voxel data as 512 of 512x512 transaxial images, and raw data as 288 of 512x512 projection images at 360 degrees. A sinogram is composed by extracting 256th lines from 144 images at 180 degrees from the raw data. As a result, it is shown that the metal artifact is considerably reduced. Boundaries of two teeth that have metal fillings are well recovered. Boundaries of two crowned teeth placed side-by-side are lost, but recovered as metal pieces.

CONCLUSION

The performance of ME method is successfully demonstrated using a commercial CT scanner. The ME method provides realistic solution with its simplicity and small computational overhead. The experiment is only two-dimensional. However, considering the method to identify metals is a simplest example of visual hull, the ME method can be extended to cone beam CT scanners as a fully three-dimensional method.

CLINICAL RELEVANCE/APPLICATION

Severe metal artifacts experienced by cone beam CT scanner have been serious problem for dental implants. The Metal Erasing method provides realistic solution with its simplicity and small overhead.

QUESTIONS ABOUT THIS EVENT EMAIL:

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