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Bone surface-based volume stitching in dental computed tomography with improved image quality

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This study presents an effective volume stitching method in dental computed tomography (DCT) using a bone surface-based registration with improved image quality. It consists of four main steps: (1) acquisition of two separate DCT datasets of a small field-of-view (FOV), (2) computation of a three-dimensional transformation for volumetric registration, (3) image registration, and (4) alpha blending. During acquisition of DCT datasets, the focal spot of the x-ray tube was aligned to the bottom of the detector, and one dataset to be registered was obtained with the upper part of a skull phantom in a tilted position to avoid bright shading artifacts around the sinus in the reconstructed DCT image. We performed an experiment using a commercially available dental DCT system to investigate the image quality and evaluate the effectiveness of the proposed method in DCT. The system consisted of an x-ray tube (70 kVp and 5 mA) and a CMOS flat-panel detector with an active area of 13.5 cm × 12.7 cm, and it was operated in a half-beam scan mode to increase the FOV to 160 mm (in diameter) × 90 mm (in height). Our experimental results indicate that the proposed volume stitching method was effective for obtaining homogeneous and seamless stitched images of a larger FOV in DCT.

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