

X-ray Sensor Application for Geometric Calibration and Imaging Acquisition in Cone-Beam Computed Tomography System

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This paper presents how a large area thin film transistor (TFT) x-ray imaging sensor has been applied to calibrate the gantry geometry and acquire x-ray projection images in cone-beam computed tomography (CBCT) system. A cone-beam x-ray tube and TFT imaging sensor could enable imaging of entire organ in one axial acquisition using one rotation of the gantry. The gantry motion could measure, analyze, and calibrate using projection images of five pin-hole phantoms during gantry rotation. The gantry rotation error was calculated by using the difference between reference point and each rotation point after edge detection in the 2D projection image. After gantry calibration, we acquired the projection images from CBCT system for three dimensional (3D) reconstructions. The projection images for the geometric parameters and 3D reconstruction are 361 (30 frame per seconds (fps) \times 12 sec per rotation (spr)) with 10 intervals from the same procedures. In this work, amorphous silicon (a-Si) TFT x-ray imaging sensor (PaxScan 4030CB, Varian inc.) having a 397 \times 298 mm² active area with 194 (388) μ m pixel pitch and 2048 \times 1536 (1024 \times 768) pixels in full (2 by 2 binning) mode is applied. 3D reconstruction method for CBCT system uses Feldkamp, Davis, and Kress (FDK) algorithm providing fast reconstructed results.

Author: SEO, Changwoo (Korea Electrotechnology Research Institute)

Co-authors: Dr CHA, Bo Kyung (Korea Electrotechnology Research Institute); Dr SONG, Bongyong (University of California San Diego); Dr KIM, Cho Rong (Korea Electrotechnology Research Institute); Dr HEO, Duchang (Korea Electrotechnology Research Institute); Dr PARK, Justin C. (University of California San Diego); Dr YANG, Kee Dong (Korea Electrotechnology Research Institute); Dr KIM, Ryun Kyung (Korea Electrotechnology Research Institute); Dr JEON, Sung Chae (Korea Electrotechnology Research Institute); Dr LEE, Tae Bum (Korea Electrotechnology Research Institute); Prof. SONG, William Y. (University of California San Diego)

Presenter: SEO, Changwoo (Korea Electrotechnology Research Institute)

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