AbstractID: 5208 Title: Integration Of 3D Stereovision System In Image-Guided Radiotherapy: A DICOM-based Method

Purpose: To seamlessly integrate a 3D stereovision system (or 3D camera in short) with complex planning and treatment systems and implement a 3D image-guided patient positioning for radiotherapy of breast cancer.

Method and Materials: A high speed commercially available 3D camera is installed on the ceiling of treatment room to capture real-time 3D surface images of patient. After transformed from camera coordinate system to treatment machine coordinate system, the real-time 3D surface image is matched with a 3D reference image which is defined in planning systems. A stack of external contours with position information from DICOM RP and RS files are re-sampled to generate a 3D reference image. Regions of interest (ROIs) of both images are defined by the PTV parameters from DICOM RP files. An Iterative Closest Points (ICP) algorithm is adopted to conduct the registration of ROIs. The parameters of patient positioning derived from the registration can be used to adjust the patient position.

Results: Outliers and noise of captured 3D surface images are automatically and effectively removed when applying PTV parameters to define ROIs. Phantom test and An institutional IRB approved clinical trial indicates a typical case of image-guided RT, including loading reference images, capturing real-time images, and image matching can be done in less than 1 min. By double checking with online EPID, a millimeter positioning accurate can be achieved without considering deformation of images.

Conclusions: This work shows the clinical potential for utilizing a 3D camera in image-guided RT. The integration of 3D camera in image-guided RT based on DICOM standard provides faster and more precise patient positioning than other image-guided RT. How to deal with the deformation of ROIs will be our research direction in future.