

## AbstractID: 9588 Title: An Optical Guidance System for Patient Setup in Breast Radiotherapy

**Purpose:** Breast radiotherapy, particularly IMRT, involves large dose gradients and difficult patient positioning problems. A critical requirement for successful treatment is accurate reproduction of the patient's position assumed during CT simulation and planning. We have developed an image-guided technique, which assists in accurately and reproducibly positioning the patient, by displaying her real-time optical image superimposed on a perspective projection image of her 3D CT data.

**Methods.** The Single Projection Technique (SPT) accurately determines the 3-D position and orientation of a camera from a single image acquired of a known model. A calibration jig, composed of ten identifiable points, was constructed and CT imaged to provide this model. In a preliminary study, a regular digital camera was installed in the treatment suite and used to obtain an image of the jig. The SPT then provided the coordinates and orientation of the camera. Using this information, 3D CT patient data could then be projected onto the camera's imaging plane. The CT image data would then be superimposed onto the real-time patient image using standard graphical software and displayed on a monitor. This would enable the therapist to view both the patient's current and desired positions, and guide the patient into assuming the correct position.

**Results:** The SPT can determine the position and orientation of the camera to an accuracy of 0.2 cm and 0.3°, respectively. This allows an estimated accuracy of 5 mm in the fidelity of the patient's external anatomy to the surface CT data. This includes anatomical points not easily positioned properly, such as the raised arm and breast skin surface

**Conclusion:** We have developed a method to superimpose a perspective projection of a CT image on a patient's real-time optical image. Displaying this visual information will assist in accurate setup during breast radiotherapy.