AbstractID: 11256 Title: A Guidance System for Optical Patient Alignment During Breast Radiotherapy

Abstract

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 optical 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 and Materials:

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 reflecting spheres, was constructed and CT imaged to provide this model. To implement our method, a digital photograph of the jig was acquired and the 2D coordinates of the spheres were found. Using this information, 3D CT patient data is projected onto the camera's imaging plane, and is displayed on a monitor, superimposed on the real-time patient image. This enables the therapist to view both the patient's current and desired positions, and guides proper patient positioning.

Results:

The SPT can determine the position and orientation of the camera to an accuracy of 0.2 cm and 0.3°, respectively. Investigations are ongoing to determine the accuracy and reproducibility of our method in terms of the dose distribution of IMRT plans. Film

measurements performed on a breast phantom will allow us to determine the spatial accuracy of isodose curves measured in several planes.

Conclusions:

We have developed a method to calibrate an optical camera system and 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. Future work will enable us to quantify the setup and dose delivery accuracy of this technique.