AbstractID: 4676 Title: Cyberknife Treatment Setup Simulator Program

Purpose: During the setup of Cyberknife patients with extracranial tumors, it is always a challenge to tell the angles of misalignment (roll, yaw and pitch) from the two digital reconstructed radiographs (DRRs) and the radiographs from two X-ray cameras. Most of the cases, software handles the problem, but in some cases, software fails, it is because of fiducial migration or not enough fiducials to give 6D information (fiducial), or fiducial motion due to tumor motion (synchrony), or the angles are too large for the software to handle (skeletal structure tracking). When this happens, the operator needs to make the right decision fast, in order to shorten the setup time and to deliver the correct dose to the tumor. We decided to write a program to help people in this situation. This program can generate DRRs before and after each transformation. It will be a great learning tool; new users can practice how to set up a patient from a random starting position; we can't practice the setup on a live patient. Experienced users can use it to study setup, learn how the positions of different structures change relative to different rotations.

Method and Materials: Java programming was chosen to build the software. The DRRs were reconstructed from a series of CT images according to Cyberknife X-ray sources and screens configuration.

Results: A graphic user interface (GUI) with two DRRs will be presented to the user, user can choose to translate and rotate the patient, two more DRRs will be generated; and a CT slice will also show up on the GUI. The user can identify the features that have the most change in each transformation.

Conclusions: This program works as expected. It also demonstrates to the medical physics community that we can easily write programs to manipulate images.