

AbstractID: 9455 Title: Effect of Sampling along the Projection Ray Lines in Sub-second Generation of Digitally Reconstructed Radiograph (DRR) on a Personal Computer.

The ability to generate digitally Reconstructed Radiographs (DRRs) at speeds approaching real time facilitates on-line 3D setup evaluation. DRR creation on workstations used for treatment planning takes on the order of several seconds to over a minute per image. We have implemented a DRR generator on a hardware accelerated OpenGL graphics card on a conventional personal computer. In the implementation of numerical integration of electron density along projection rays, both Simpson's rule and midpoint rule have been used. While the generation of a DRR by integrating the fully sampled rays (~450 points) is relatively fast, we wish to evaluate the effect reducing the number of points sampled along the rays has on the quality of the image. As number of sample points along the ray was changed from 25 points to 450 points, DRRs were compared with a reference DRR generated from a 450-point integration by flipping the images quickly on the monitor. We observed a relatively abrupt onset of image artifacts between 100 to 150 sample points per ray. These artifacts did not affect the determination of patient setup error. Below 100 sample points, there are distortions of anatomical features in the DRR that will interfere with accurate determination of setup error. The DRR needs 0.55 sec. for 200-point integration, 0.42 sec for 150-point integration and 0.29 sec. for 100-point integration. These results indicate that it is feasible to generate DRRs of acceptable quality on a personal computer in less than a second.

Supported by the NIH RO1CA81161-01A1