

Digitally Reconstructed Radiographs (DRRs) from Virtual Simulation (VS), using a CT Simulator, replace the traditional radiographs used in fluoroscopic simulation (FS). While some aspects of DRR quality are a direct function of the underlying CT data, visibility of specific anatomical structures can be enhanced by manipulation of DRR algorithm parameters. We present techniques to optimize DRRs for specific treatment sites via DRR calculation parameters available from commercial VS software. In general, these parameters either set spatial bounds for the calculation, or manipulate the relationship between Hounsfield number and effective attenuation. Additionally, this software allows the user to create composite images based on the results of two individually optimized DRR calculations. We have made the general observation that default parameters tend to produce images with low contrast of bony structures as compared to normal radiographs. While bone contrast can be increased, this tends to decrease the visibility of less dense structures. DRRs for the chest present the greatest challenge since bony structures as well as lungs, airways and the outlines of soft tissues are important anatomical landmarks which appear with sufficient contrast on traditional radiographs. We illustrate that simultaneous visualization of these structures is possible using a composite image for which the relative contribution of two individually optimized DRRs is carefully adjusted to produce a third image showing all structures. The results compare well with traditional radiographs. We conclude that this is a useful and appropriate technique for VS.