

Clinical Performance of an Infrared CCD based Respiratory Gating System

In order to increase the effectiveness of 3D treatment planning for abdominal targets, a method must be developed to compensate for tumor motion during respiration. Various respiratory gating systems are under development that will allow the selective delivery of absorbed dose to moving target volumes during time intervals when the target volume is within the intended region. One such system is an infrared CCD based respiratory gating system under development for use with Varian linear accelerators. This system correlates the location of the target volume with a signal from an infrared CCD video camera that tracks the position of passive markers placed on the patient. During simulation, fluoroscopic images are displayed and digitally recorded in conjunction with the patient's respiration cycle. Video playback of the recorded fluoroscopic images displays only those frames located within the gating threshold. The spatial position of the target during dose delivery can be fixed by interactively adjusting the gating thresholds until organ motion is minimized in the fluoroscopic playback. During treatment, these thresholds are used by a computer control system to gate the delivery of absorbed dose by enabling and disabling the linear accelerator's gridded electron gun delay. The performance of the infrared CCD video camera, passive retro-reflective markers, simulator interface, linac gating circuit, linac electron gun delay, and linac software interface will be presented.