

AbstractID: 2062 Title: Reliable Real-time Tracking in Fluoroscopy for Image Guided Radiotherapy

Tumor motion due to respiratory or cardiac function can be accurately estimated by tracking the position of a surgically implanted radio-opaque marker using x-ray fluoroscopy. Under favorable imaging conditions, reliable tracking is easily achieved using standard pattern matching methods. However, standard methods fail in common clinical scenarios due poor signal-to-noise ratio, ambiguous background anatomy, or occlusions. This paper describes a set of methods that can be used to reliably track an implanted marker despite poor quality images and structured occlusions. First, we address the problem that cylindrical markers change shape when they rotate through the use of a parameterized template and weighted cost function. Next, we show how to overcome tracking problems caused by static occlusions such as a reference graticule. Then, we show how to use intensity tracking and truncation to reduce problems caused by intensity variations in the background anatomy. Finally, we show how to use a Kalman filter together with on-line covariance estimation to reduce the risk of loss of track. These methods provide a significant boost in tracking reliability over standard methods, while meeting real-time processing requirements.