

AbstractID: 1748 Title: Towards Tumor Tracking in the Absence of Implanted Radiopaque Markers

Due to a risk of pneumothorax, physicians are reluctant to implant radiopaque markers within patients' lungs for the purpose of radiographic or fluoroscopic tumor localization. It is, therefore, necessary to develop methods to find the tumor positional information directly, without surrogate markers. Although, in general, the contrast of tumor-to-lung is much worse than that for radiopaque markers-to-tissue, it is still great enough for tracking. The benefit of rigid, well-defined surrogates is the relative ease in which they can be tracked. Novel, creative techniques are needed to separate the tumor mass from the surrounding healthy lung tissue in fluoroscopic x-ray images. Although, the goal is a real-time direct tumor-tracking fluoroscopic system that can be utilized during treatment, a first step is the retrospective study of fluoroscopic simulator patient data. We have explored several algorithms for separating tumor motion from the stationary anatomy. The motion, itself, is exploited to reveal the tumor's positional information. Methods investigated include local intensity change, motion-enhancement by frame-averaging, feature-based template matching, and image enhancement and tumor tracking based on a state-of-the-art optical flow algorithm. When available, we also use RPM marker block tracking and diaphragm tracking for surrogate comparisons. We show that the tumor motion may be tracked in the absence of radiopaque markers, for the specific cases shown. More robust methods, coupled with better data, will be needed for a universal algorithm.

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