AbstractID: 11027 Title: A fast and robust dynamic tracking method of the moving deformable targets in the fluoroscopy image sequence for image guided radiotherapy

Purpose: To develop a robust dynamic tracking technology on the continuously acquired fluoroscopy for precise positioning of a moving deformable target volume in the 3D conformal radiotherapy (3DCRT). **Method and Materials**: A novel one-step forward prediction based collaborative trackers are utilized to achieve both temporal consistency and failure recovery in dynamic tracking of the fluoroscopy image sequence. The robustness to complex background and weak edges is obtained from the learned discriminative detector and boundary classifiers. The temporal consistency is preserved by the template tracker. Instead of building specific models for different organs or different imaging modalities, all the major steps in this algorithm are based on learning. **Results**: This technology was tested and evaluated on clinically acquired fluoroscopy of patients who were under radiation therapy treatments. The tested data sets consisted of three complete sequences of the fluoroscopy lung image on which the target volumes not only moved but also changed in shape and size. As demonstrated in the supporting materials, the method can successfully track both the tumors located in the thorax and upper abdomen, even though they exhibited significant respiratory induced motions and deformation. Moreover, the tracking speed is comparable to the refreshing rate of fluoroscopy with non-observable lagging time. **Conclusion**: The one-step forward prediction based collaborative tracking technology has been successfully applied on the continuously acquired fluoroscopic images to track the movement and shape change of the deformable target. With the current computer technologies, this process can be automated with minimum to none human intervention. This technology has significant potentials in the gated radiotherapy and can be used to control the beam-on timing and gating window. This study is supported by Varian medical system.