AbstractID: 5346 Title: An optical flow based motion tracking method using fluoroscopic video

**Purpose:**
To present an optical flow-based method for tracking tumor motion and propose a noninvasive respiratory detection method using fluoroscopic video.
**Method and Materials:**
Fluoroscopic video of a patient is acquired. Only one frame is selected as the reference frame and objects in this frame are manually segmented. The motion of a segmented object is found by computing the average optical flow of pixels within the object. Optical flow provides a two-dimensional motion vector for the displacement of pixels between two frames. The object is moved between frames by moving all pixels by the average velocity vector. Then the position of the object in the new frame is adjusted by applying a template matching algorithm. The algorithm moves the object over a search range of +/- 2 pixels. The object is placed at the position having the maximum correlation coefficient (CC) between the pixels in the original and new frames. This procedure is repeated to advance the object from frame to frame.
**Results:**
The outlines of tracked objects are viewed superimposed on the fluoroscopic videos. The outlines follow the general motion of the objects without drifting away for the approximately 30 seconds (300 images) and 8 respiratory cycles of a typical video. Objects that do not significantly deform are well tracked. The boundaries of objects that deform are not well described by the tracked outlines, however, the centroid motion of the objects is. The analysis yields the mean displacement of objects. As the distance an object moves away from the reference position increases, the CC decreases. A plot of the CC vs frame shows a sinusoidal curve with the breathing period as does the displacement plot, but with reversed phase.
**Conclusion:**
The mean motions of objects in fluoroscopic video are well tracked. The displacement and respiratory signal are also obtained.