AbstractID: 5483 Title: Data Cube Based Tumor Respiratory Motion Characterization

**Purpose:** Adequate understanding and precise characteristics of tumor motion is essential for accurate radiation dose delivery in real-time image-guided radiation treatment. We propose a data cube based approach for representing, analyzing and characterizing tumor motion information at various concept levels. More precise patient clustering and characterization can be achieved by combining the tumor motion information and the patient biomedical information.

**Method and Materials:** Based on a finite state model, a breathing cycle of tumor motion is represented by three line-segments: exhale (EX), end-of-exhale (EOE) and inhale (IN). A *data cube* is constructed to provide the means of multi-dimensional data analysis that computes summary information based on arbitrary combination of dimensions. Data navigation methods – *roll-up*, *drill-down*, *slice-and-dice* – are applied to assist in interactively selecting points of interest and navigating among the concept hierarchy. Patient clusters and motion patterns are detected with the assistance of the visualization tools and advanced data mining techniques, such as K-means clustering algorithm. In addition, we incorporate the patient biomedical information in this process to obtain more precise patient motion classification and characterization.

**Results:** Experiments have been performed on real patient data. Using our approach, summary information is generated automatically and visually displayed. Patient clustering can be easily detected manually or by clustering algorithms. Interesting motion patterns have been discovered from out preliminary results. More precise patient clustering and motion characterization are accomplished when the approach is used on the combination of motion information and patient biomedical information.

**Conclusion:** The data cube based tumor motion characterization approach not only eliminates all the manual processing on patient motion characterization, but also provides the facility to refine the patient clustering and detect interesting patterns, which will provide valuable input for better understanding of tumor motion and for effective real-time image guided radiation treatment.