AbstractID: 5478 Title: Statistical Analysis of Respiratory Motion and Knowledge Discovery

Purpose: Quantified characterization and better understanding of tumor respiratory motion is valuable for understanding of respiration, motion-included treatment planning, online prediction, and real-time control algorithm for dose delivery in image guided radiotherapy. There are two goals of this work: (1) to discover the correlation among various motion variables so that we can understand patient respiratory better and (2) to build an analytical system for online motion modeling and prediction during real-time treatment delivery.

Method and Materials: Statistical analysis of tumor respiratory motion has been performed over 48 real patient data. Quantified information of different motion characteristics, including amplitude, frequency, velocity and the mean positions are computed over different granularities. Sample granularities include a breathing state, a breathing cycle, a treatment session, a patient and the whole patient population. Association rules among different motion characteristics are mined and formulated.

Results: We have implemented the software packages for statistical analysis and correlation presentation. Quantified motion information have been computed and displayed. The spatio-temporal changes of these properties are studied. Knowledge of respiratory motion and the underlying physiological explanation have been exploited. The probability distribution functions of various correlations among different properties have been calculated and visualized.

Conclusion: Different statistical analyses over a set of tumor motion characteristics have shown that there are some general rules regarding tumor motion. The analytical results help us to obtain new knowledge and to understand the physiological actions of tumor motion and to treatment moving tumor more efficiently.

Conflict of Interest (only if applicable):