AbstractID: 6847 Title: The Design and Performance of a Simplified Independent Tomotherapy Treatment Planning System

Purpose:

A simplified helical-tomotherapy independent planning system (SHIPS) is developed for independent verification of the TomoTherapy Hi-ART (TomoTherapy Inc. Madison, WI) treatment scheme and to provide an alternative method to produce helical tomotherapy plans. The SHIPS software is designed to be simple, so the program can run a desktop PC, straightforward, so the delivery scheme is intuitive, and streamlined, to speed the treatment planning process. Treatment plans created with SHIPS may be used in cases where the Hi-ART's inverse planner may be unnecessarily complex. We present the design of SHIPS and compare its results against forty Hi-ART treatment plans. Several SHIPS derived tomotherapy plans are presented.

Methods and Materials:

SHIPS produces a treatment delivery scheme based on patient geometry and contours, prescription, delivery settings (e.g. pitch, field size, and modulation factor), and measured beam data. SHIPS calculates a leaf-sequencing pattern (a treatment sinogram), gantry rotation period (GRP), couch speed (CS), couch travel length (CTL), monitor units (MU), and time of treatment (T). Treatment plans used to compare against SHIPS consist mostly of prostate patients with some head and neck, pelvis, lung, and phantom cases. SHIPS is used to create example prostate, breast, and brain treatments.

Results:

SHIPS can produce conformal tomotherapy plans for imbedded (i.e. prostate), distal/convex (i.e. breast), and large/shallow (i.e. brain) targets in less than 30 seconds. When compared against Hi-ART treatment schemes, the average deviation of the calculated CTL, T, CS, and MU are, respectively, 0.08%, 0.05%, 0.37%, and 0.74%.

Conclusion:

SHIPS bypasses the Hi-ART's optimizer producing independently derived plans, quickly. SHIPS can be used for quality assurance of the entire treatment planning process. Treatment parameters generated from SHIPS agree within 1% of the Hi-ART values. SHIPS challenges the degree of which the Hi-ART's complex inverse-planning is necessary.