# AbstractID: 7291 Title: Real-time visualization of radiation dose accumulation in lung tumors


Purpose: The focus of this work is to develop a real-time simulation and visualization method to calculate delivered dose to a moving lung tumor and to account for changes in tumor shape and location with breathing.

Methods:
Lung tumors move unpredictably depending on patient breathing patterns, thereby changing tumor location. A simulation framework is being developed to predict the amount and location of radiation doses deposited in both moving lung tumors and surrounding normal lung tissues to be used for real-time display of dose. A virtual cuboid of dimension 100X100X100 cubes is created with each cube of the dimension 1X1X1 $mm^3$. A 3D volumetric sphere representing the lung tumor is place inside the cube. The motion of the 3D sphere was modeled as linear and sinusoidal simulating lung tumor motion. A radiation treatment plan of a small lung tumor was developed in a commercial planning system (iPlan, BrainLab). Each radiation beam was extracted as a 10 $cm^3$ to match the above described cuboid. While simulating motion, the dose from each beam was accumulated to the sphere and to the cubic phantom to summate the total dose delivered. For validation, film dosimetry was performed and compared to the model.

Results:
A virtual patient was developed to represent a small lung tumor
The dose on the tumor was summed to generate real-time dose to the target for each beam independently. Films taken in a sagittal and in a coronal plane in a motion phantom compared favorably to cross sections through the cuboid.

Conclusions:
This work presents a method of simulating and modeling lung tumors in real-time and visualizing dose accumulated to them. Future developments include real-time patient motion and patient anatomy.


Conflict of Interest:

This work is supported in part by a grant from Calypso medical.