Award ID:
RP150485

Project Title:
Translating Online Adaptive Radiotherapy from Lab to Clinical Practice

Award Mechanism:
Individual Investigator

Principal Investigator:
Jiang, Steve

Entity:
The University of Texas Southwestern Medical Center

Lay Summary:

By seamlessly integrating treatment simulation and planning into treatment delivery process, online adaptive radiation therapy (ART) allows real-time treatment adaptations based on the current patient anatomy and geometry and thus holds significant promise in maximally compensating for interfraction anatomical variations and setup uncertainties. This new paradigm of radiotherapy provides an opportunity to significantly reduce normal tissue toxicity and/or to improve tumor control. Utilizing the latest graphics processing unit (GPU) technologies, we have developed a series of novel real-time re-planning computational tools which are integrated into a system called Supercomputing Online Re-planning Environment (SCORE) to facilitate online ART research. Extensive technical research has been done using SCORE. Now it is time to translate the developed online ART technologies from lab to clinical practice. Before the clinical implementation of online ART for clinical trials and/or routine treatments, a series of technical issues have to be addressed, such as: Can we achieve sufficient efficiency for online ART? How do we fit this treatment into a conventional treatment slot? What is the optimal clinical workflow? Can we skip patient specific QA? Do we need a more intensive machine QA protocol? Because of the great potential of online ART, it is worthwhile to perform pre-clinical studies to investigate its feasibility, practicality, safety, and optimal clinical workflow. The goal of this project is to perform pre-clinical studies to explore the clinical gains and address all of those technical issues, as well as to identify potential problems and seek for feasible solutions. The success of the proposed project will facilitate the translation of online ART from lab to clinical practice.