TECHNOLOGY

Surrogate-Based Prediction Model for Real-Time Tumor Monitoring during Radiotherapy

OVERVIEW

To ensure tumor-targeting accuracy over the course of radiation treatment while minimizing the dosimetric impact to healthy tissue, respiratory surrogate models are utilized to monitor tumor position while compensating for tumor motion. These models are developed from a training dataset of concurrent tumor positions and surrogate measurements. The relationship must remain constant for duration of treatment for accuracy; however, the accuracy degrades over time due to intrafraction changes in the tumor-surrogate relationship. Methods to improve the model accuracy during the delivery of a treatment fraction have concluded that errors can be reduced with frequent model updates (i.e. more/frequent imaging) but are not practical given the increase in exposure to nontherapeutic radiation and treatment time due to additional acquisitions. The present invention is a novel method for continuously monitoring a respiratory surrogate model of tumor motion through *exclusive analysis* of respiratory surrogate measurements.

APPLICATIONS

- Radiotherapy
- Medical Imaging
- Image-guided Radiation Therapy (IGRT)
- Surface-guided Radiation Therapy (SGRT)

ADVANTAGES

- The quality of the model can be monitored without stopping treatment to explicitly measure the tumor position.
- This method can detect increases in residual motion during the treatment, allowing the clinicians to pause treatment to collect images when necessary to ensure that tumor motion is in accordance with the internal margin for the plan.
- This method can be extended to other tumor displacement inferential approaches to minimize the imaging frequency of existing systems, thereby decreasing treatment interruptions and overall patient in-room time.
- This method also has the potential to increase the targeting accuracy of any real-time motion compensation device, including radiation gating systems.

STAGE OF DEVELOPMENT

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Additional Information

INSTITUTION

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PATENT STATUS

US Patent No. 9,433,389

LICENSE STATUS

Available for licensing

CATEGORIES

- Software + Algorithm
- Healthcare
- Methods of Treatment

INVESTIGATOR(S)

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ATTACHMENTS

- Download UMB Invention Summary-WD-2010-069.pdf

EXTERNAL RESOURCES

- Online monitoring and error detection of real-time tumor displacement prediction accuracy
- Maintaining tumor targeting accuracy in real-time motion compensation systems for respiration-induced tumor motion.

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