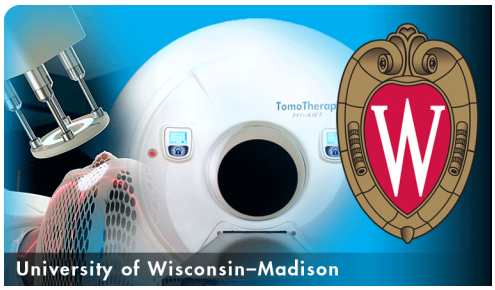
Probabilistic Least Squares Optimization for Radiation Therapy to Remove Patient Motion Effects



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The Wisconsin Alumni Research Foundation (WARF) is seeking commercial partners interested in developing a computer-implemented method for optimizing radiation therapy by providing control of independent radiation beams configured to account for the effects of patient motion.

OVERVIEW

External beam radiation therapy is a tumor treatment technique that directs one of more high-energy radiation beams to the tumor. External beam radiation systems treat tumors with multiple X-ray fan beams that can be rotated around the patient. Each beam consists of individual "beamlets" that can be controlled to treat complex tumor shapes. An alternate beam radiation therapy technique involves the use of ions such as protons to treat tumors. This technique dramatically reduces the radiation dose to healthy tissue when compared with X-ray radiation therapy using photons.

The dose intensity from protons is not uniform along the beam path and rises to a "Bragg peak" near a point where the proton beam stops completely. Controlling the placement of the Bragg peak so it is located on the tumor reduces the amount of radiation delivered to the patient's healthy tissue. Unlike X-ray radiation therapy, ions allow for separate control of the total dose of radiation (intensity) and distance the Bragg peak occurs (range).

Intensity Modulated Radiation Therapy (IMRT) treats a patient with multiple, independently controlled beamlets that are varied in intensity and range. A highly accurate IMRT method incorporates a fan beam with intensity modulation for separate beamlets in the overall beam fan. One problem with this technique is that the patient is never completely still due to breathing, digestive processes and other general movement. To realize the high accuracy of such a technique, a method for determining intensity treatment maps is needed in which patient motion is accounted for.

THE INVENTION

UW–Madison researchers have developed a computer-implemented method for optimizing radiation therapy by providing control of independent radiation beams configured to account for the effects of patient motion. The method incorporates a probabilistic linear least squares approach that quantitatively expresses patient

THE WARF ADVANTAGE

Since its founding in 1925 as the patenting and licensing organization for the University of Wisconsin-Madison, WARF has been working with business and industry to transform university research into products that benefit society. WARF intellectual property managers and licensing staff members are leaders in the field of university-based technology transfer. They are familiar with the intricacies of patenting, have worked with researchers in relevant disciplines, understand industries and markets, and have negotiated innovative licensing strategies to meet the individual needs of business clients.

motion. This information then is fed into the control of the radiation beams to remove the effects of patient motion.

The total system may include a radiation source that generates multiple rays, a shutter system to control the rays and a computer system to control the shutter system. The computer system is configured to control the radiation source and the shutter system to account for patient motion based on a probability distribution function. A total dose at each specific point in the tumor is determined based on an iterative method to give an intensity map. This intensity map then is used to deliver radiation accordingly.

APPLICATIONS

- External ion beam radiation therapy for the treatment of tumors

KEY BENEFITS

- Reduces the effects of patient motion on beam placement accuracy
- Reduces radiation dose to healthy tissue

ADDITIONAL INFORMATION

Tech Fields
Radiation Therapy - External beam therapy

CONTACT INFORMATION

For current licensing status, please contact Jeanine Burmania at jeanine@warf.org or 608-960-9846.