Rensselaer researcher wins $1.4 million NIH grant to enable faster cancer treatment planning

EurekAlert

Troy, N.Y. ? Rensselaer Polytechnic Institute Professor Richard Radke is leading a new $1.4 million study to develop novel computer automation techniques that could reduce the prep time of a promising cancer-treatment technology from several hours to a few minutes.

This promising method, called intensity-modulated radiation therapy (IMRT), is extremely effective for treating cancer. Pioneered by the Memorial Sloan-Kettering Cancer Center in 1996, IMRT delivers non-uniform doses of radiation from different angles to a tumor site, and enables a high dose to be delivered to a tumor while at the same time delivering a low dose to nearby healthy tissue.

Creating an acceptable IMRT plan, however, requires several hours of preparatory trial-and-error adjustments and optimizations to ensure the radiation administered to the tumor does not impact surrounding healthy tissue. Radke is working to simplify and automate this optimization process, which currently requires an expert human technician to manually adjust many parameters in order to best accomplish the physician's goals and specifications.

Collaborating with colleagues at the Memorial Sloan-Kettering Cancer Center, Radke and his graduate students had previously created and successfully demonstrated effective algorithms for automating the optimization of IMRT for prostate cancer, trimming the computational prep time down to five minutes using a standard desktop computer. In this new four-year, $1.4 million study, funded by the U.S. National Institutes of Health National Cancer Institute, Radke will adapt his approach, called Reduced-Order Constrained Optimization (ROCO), to IMRT treatment of tumors in the lung, head, and neck.

"For IMRT and similar new technologies to reach their full potential as life-saving tools for treating cancer, it is critical to reduce planning times down to a matter of minutes. This is the challenge we are going to tackle in our new NIH-funded study," said Radke, associate professor in the Department of Electrical, Computer, and Systems Engineering at Rensselaer. "In the longer term, we believe our proposed approach will provide deeper insight into the science of radiation dose optimization, and reduce both the subjectivity and trial-and-error aspect of radiation therapy treatment plan selection."

The new study is titled "Reduced-Order Constrained Optimization for Rapid IMRT and VMAT Treatment Planning." Extending the techniques Radke's team developed for the prostate to treat tumors in the lung, head, or neck presents a challenge, since in the latter sites many healthy, radiation-sensitive tissues are typically clustered near tumors. A further challenge is adapting ROCO to the even more

advanced technology of Volumetric-Modulated Arc Therapy (VMAT), in which radiation is continuously delivered to the patient in a smooth arc instead of at a few discrete positions.

As part of the new study, Radke will work with researchers at Memorial Sloan-Kettering Cancer Center to integrate the ROCO tools into the center's clinical treatment planning system, to refine and test the optimization improvements in an experimental, real-world setting.

SOURCE [1]

Links:
[1] http://www.eurekalert.org/pub_releases/2010-05/rpi-rrw052610.php