New Algorithms and Software for Treatment Planning Problems in Intensity Modulated Radiation Therapy as presented by Shuang Luan

Christopher E. Davis - chris2d@cs.unm.edu
University of New Mexico
Computer Science Colloquia Spring 2004

March 10, 2004

Abstract

Radiation therapy technology has made great advances in the last 25 years, among them IMR. IMR therapy offers several benefits to doctors and patients. Ongoing research is advancing the art of using these advanced tools.

1 Introduction

Radiation therapy uses radiation beams to treat cancerous tumors. Intensity modulated radiation therapy, a type of radiation therapy, requires a linear accelerator (LINAC) and a multi-leaf collimator (MLC). The basic problem is that radiation must be delivered to the tumor while protecting surrounding tissue and critical structures. Not only must radiation be delivered, but ideally we would like to deliver more radiation to some areas, and less to others. To accomplish the volumetric operation, the collimator is rotated about the patient to deliver multiple vectors of radiation at varying doses.

2 "Step and Shoot"

This method of delivery is a iterative process. The basic idea is that you move the leaves, turn on the source of radiation to deliver a dose, then move the machine and repeat. The dosage maps are iteratively reduced to 0.

3 Step Leaf Sequencing : SLS

The goal is to minimize the number of set-ups and treatments that a patient receives. This is both an economic consideration and a medical consideration. You want to be able to get as many patients through in a given time as possible and cancer is capable of recovery during set-up time. On top of this, the treatments are unpleasant for the patients, so a expedient turn around is better for the patient's mind.

4 Conclusion

The improvements that Mr. Luan and other researchers at Duke are offering the medical community are amazing. The resolution of radiation therapy that we are able to deliver today is orders of magnitude better than anything that was previously available. The efforts of "Brain Lab" and other finer resolution machines offer even more potential using Mr. Luan's approaches.

5 Commentary

I thought that Mr. Luan'slides were very effective. They helped to clarify what he said and he did not seem overly tied to them for prompting. He handled all the professor's questions very well in my opinion, keeping on track and not getting flustered. On top of this, he has been the only applicant to get several hearty laughs out of the crowd. I consider that good. I got the feeling from the level of applause that the audience appreciated Mr. Luan as much or more than the previous applicants. Again, I enjoyed this applicant more than any of the previous ones.

References

[1] Luan, Chen, Zhang, Wu, Yu, (2003) "An Optimal algorithm for configuring delivery options of a one-dimensional intensity-modulated beam", IoP Select