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A STEREOTACTIC RADIOTHERAPY TREATMENT PLANNING SYSTEM

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INTRODUCTION

We have developed a PC-based treatment planning system for stereotactic radio therapy in the treatment of intra-cranial lesions. Treatment planning for stereotacti c radiotherapy is a three dimensional problem. The radiation beams, usually rotat ional arcs, are typically non-coplanar, converging from various angles toward the target[1], The 3D information of patient isobtained from CT, MR, or Angiograp hy is conjunction with stereotactic frames and fiducial markers.

The inputs of CT image data of patient is essential to meet the need of a hig h degree of spatial accuracy[2], Furthermore, in order to maintain a ghig spatial resolution of dose calculation, the number of dose points to be calculated for 3D volume is very large. However, with the rapid progress on the computer hardw are, it is becoming increasingly plausible to use a high-end PC for producing rea sonable outcomes.

METHOD

Various basic features are incorporated into our stereotactic radiotherapy planni ng system. These include a)transferring magnetoptical disk of images from the di agnostic scanner to the treatment planning computer, b)localizing the target tissu e and other patient anatomy in the stereotactic frame coordinate system, c) settin g the irradiation beam configuration in treatment machine parameters, d)computin g dose and displaying dose distribution overlapped on patients image slice and/or 3Dreformatted images, and e)evaluating rival plans using dose-volume histogram s both for tumor and the surrounding normal tissue.

System Enviroments

The planning program operated under Windows NT with Pentium III 450MHz, 256MB RAM.

The program has been developed using a data visualization tool: IDL(Reseach

System Inc, USA) for rapid development of Graphic User Interface and 3D gaph ics manipulation(Fig.1)

RESULT

Beam's Eye View(BEV) has been imp lemented in our system for choosing o ptimal treatment parameters. These para meters for an arc are the collimator ap erture size, the couch angle, and the g antry start and stop angles. The BEV i s an immediate visualization tool for se lecting the gantry and couch angles for a given collimator aperture.

Dose-volume histogram(DVH) has bee n implemented to evaluate the competi ng plans. It provides a quantitative mea sure of dose distribution to analyze and compare different beam configuration.

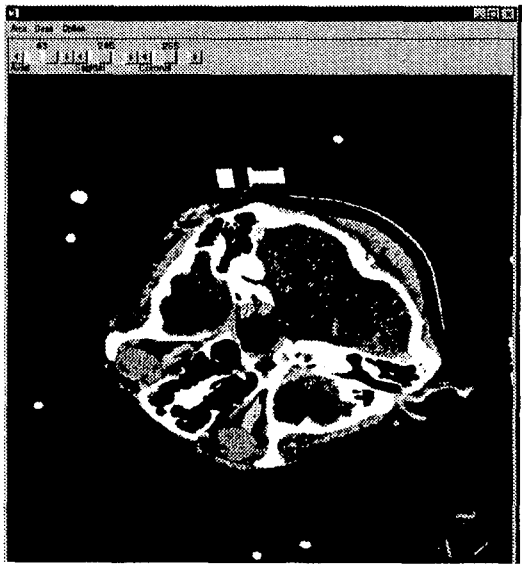

Fig. 1, A 3D viewing window includes rendered target, organs, a specific isosurface and trasverse CT image.

CONCLUSION

Our aim in this work is to develop a cost-effective stereotactic radiotherapy pla nning system. The system currently produces reasonable outcomes with respect to the hardware specification. We are expanding the system to generate other plann ing tools such as CT/MR image fusion[3] and dose optimization.

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