Title:
A 360-degree Holographic Display System for Radiotherapy Treatment Planning

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Introduction:
Beam's Eye View (BEV) is an essential tool that is used by radiation therapists for planning radiotherapy treatment for cancer [3,6,9]. It utilizes an algorithm that reconstructs a high resolution three-dimensional (3D) image by synergistically fusing serial composite images of the body, using both computed tomography (CT) and magnetic resonance imaging (MRI).

Treatment planning using BEV allows better tumour localization and dose optimization while minimizing collateral damage to normal tissues. The current technology displays 3D images in a two-dimensional flat screen. In this paper, we introduced a 360° holographic display system to display the 3D BEV images that can potentially be used to facilitate radiotherapy treatment planning.

Holography is a technique which enables 3D images to be displayed as holograms, and this can be generated using a number of methods [1,2,4,5,8]. As shown in Figure 1, our holographic display system consists of a set of mirror plates, a rotating mirror plate, and a monitor controlled using our computer software via a computer. The hardware of the system is similar to the one presented in Reference [7].

Main Idea:
The computer software is the key to the system. First, it reads a 3D image from the BEV system and takes a number of different views from different angles. Figure 2 shows an example, in which 4 views are taken from a 3D BEV image. Next, the computer monitor displays these images in a sequence. Then, through the moving mirror plate, these viewing images are imprinted on to the mirror plate sets, which generate the holography as shown in Figure 3. Since the display is a 3D projection it can facilitate a better appreciation of the position of tumor and facilitate radiotherapy treatment planning.
In addition to the radiotherapy treatment planning, this CAD system can be used for many other applications that require 3D surrounding display, such as mechanical design visualization.

Conclusion:
For the aforementioned complex three-dimensional CT images, though, the plain screen demonstration becomes imperative. Therefore, we developed a 360° Holographic Display System for Radiotherapy Treatment Planning. Experiments with our approach, the radiotherapy planning system can be demonstrated in a 3D holographic way and that it can improve the cleavage of orientation of radiotherapy treatment.

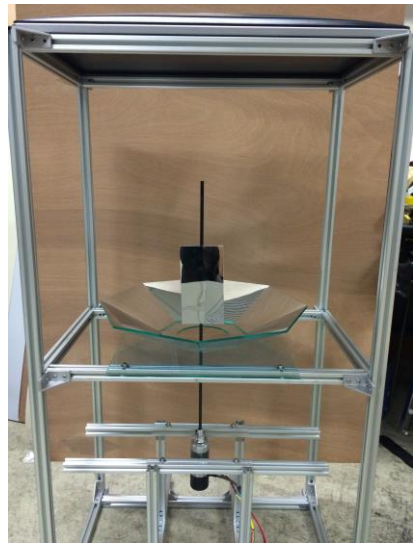
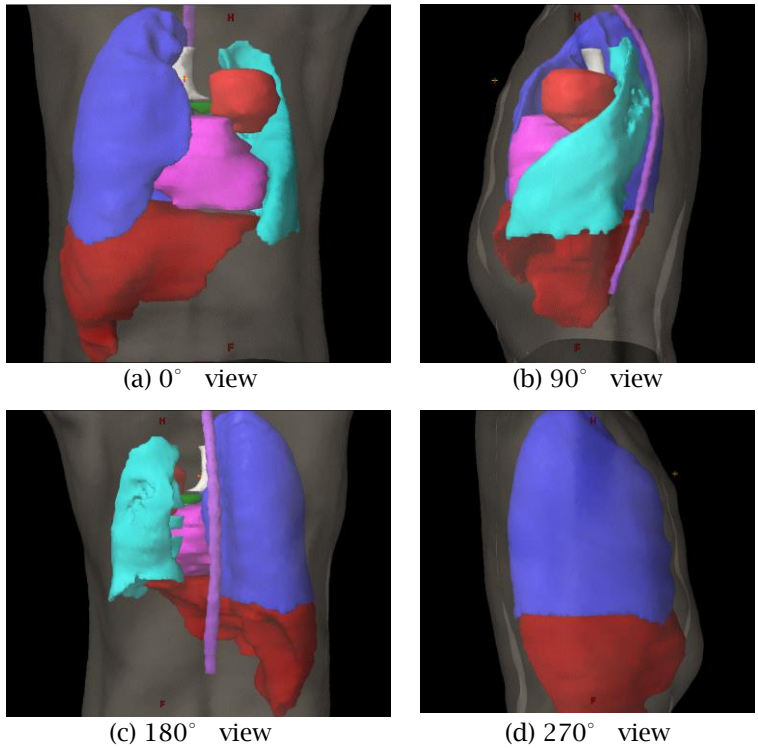


Fig. 1: The 360° holographic display system.



(a) 0° view (b) 90° view

(c) 180° view (d) 270° view

Fig. 2: A set of images extracted from a 3D BEV image.

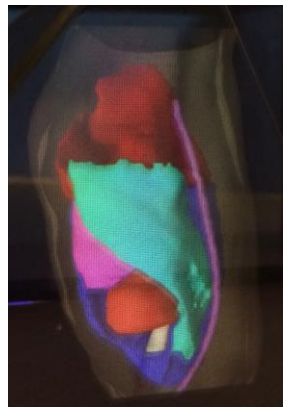


Fig. 3: The holograph display of the 3D BEV image.

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