Two-Dimensional Deformable Phantom, A Device For Quantitatively Verifying Deformation Algorithms

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BRIEF DESCRIPTION

UCSF inventors have created a prototype for a deformable phantom that realistically models both soft tissue and bony structures from a transverse slice of an actual patient CT.

FULL DESCRIPTION

As interventional radiology has become more widespread and diverse in its application, a major need has emerged for improved methods to accurately model the distortions to tissue that occur both within a single treatment session (e.g. during injection of therapeutic agents or catheter insertion during brachytherapy) and across longer time frames (e.g. tracking tumor dynamics in response to long term treatment). If, for example, the extent and location of a tumor relative to other anatomical landmarks could be tracked in a CT scan across radiation treatment sessions with high quantitative precision, this would lead to highly targeted treatment with limited exposure to healthy tissue.

Deformation algorithms are mathematical entities intended to predict the specific nature of anatomical distortions transpiring between radiological images in a time series. One promising technique for calibrating these algorithms is the implementation of a deformable phantom, which is a physical model of the tissue of interest. In this technique, radiopaque markers are embedded in the phantom at defined locations and CT images are taken before and after deformations. Changes in the locations of these markers are then compared to changes predicted by the deformation algorithm. While presently available phantoms can provide a quantitative comparison of actual and predicted deformations, the mere presence of the markers in the CT images perturbs the deformation algorithms.

UCSF inventors have created a prototype for a deformable phantom that realistically models both soft tissue and bony structures from a transverse slice of an actual patient CT. The apparatus includes components allowing simulation of tissue distortion via events such as tumor invasion and catheter insertion. The main advantage of this technology over previously existing phantoms is that the prototype uses non-radiopaque deformation markers. Thus, these markers do not perturb the deformation algorithms, which allows for a more reliable test of algorithm accuracy. Additionally, the transparent nature of these markers permits them to be placed with high

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OTHER INFORMATION

CATEGORIZED AS

- Imaging
  - Medical

RELATED CASES

2011-032-0

density to provide accurate measurements of the entire distortion field.

SUGGESTED USES

Quality assurance of deformation algorithms for use on various tissue distortions, including tumor shrinkage, catheter insertion, and weight loss.

ADVANTAGES

Higher resolution and simplified visualization of the entire distortion field

No perturbation of deformation algorithms

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	9,398,889	07/26/2016	2011-032

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