Volumetric Analysis of Multi-dimensional Images

Tech ID: 20216 / UC Case 2008-681-0

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INVENTORS

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OTHER INFORMATION

KEYWORDS

diagnostic, imaging, aneurysms, multi-dimensional, volumetric analysis, algorithm

CATEGORIZED AS

- **Imaging**
  - 3D/Immersive
  - Medical

RELATED CASES

2008-681-0

SUMMARY

UCLA investigators have identified an effective and accurate algorithm for calculating the volume and surface of irregularly shaped 3D structures from points selected on an image. This method can be used to calculate geometric information for a wide range of multi-dimensional objects and has been tested accurately on calculating the size of brain aneurysms

BACKGROUND

Ruptured brain aneurysms account for over 5% of all stroke cases with a high fatality rate. Often, these brain aneurysms went undetected or were misdiagnosed in size due to inaccurate methods of estimating volume of aneurysms. Because the risk of aneurysm rupture increases as the size of the aneurysm becomes larger, it is extremely important to have an accurate method of determining its size. Currently, methods range from segmenting images to deforming a shape of known volume to fit the target. However, these techniques are often labor intensive, time consuming, and impractical with a wide range of accuracy. Complicated shapes such as the human right ventricle cannot usually be quantified with existing technology.

INNOVATION

Researchers at UCLA have identified a modified illusory surface algorithm that uses the curvature and a few points on the surface of an irregular 3D object to accurately calculate its volume. By segmenting images given to the computer using user-selected points, the algorithm quickly and accurately obtains geometrical information about the structure with minimal user interaction. After the algorithm has calculated its estimate of the volume, a new image can be generated with the calculated data for comparison to the original image, verifying the accuracy of the calculations visually. This imaging system can segment and compute the geometry of aneurysms, tumors, thromboses, inflammations, foreign objects, organs and any other structures which can be identified in images or reconstructed into 3D objects.

APPLICATIONS

- Assist in medical clinical evaluation and surgical planning by estimating the volumes of complicated 3D shapes of targets of interest
- Objective documentation of progress of aneurysms, tumors and other 3D objects as opposed to simple visual evaluation
- Analysis of geological images, such as calculation of underground volumes of lava or oil
- Quantification of other objects with irregular shapes such as fire or smoke

ADVANTAGES

- Fast and accurate geometric analysis of an image
- Adjustable parameters for optimal geometry calculations
- Requires minimal human interaction for calculation
- Uses any type of image (MRI, ultrasound, CT, satellite, etc.) as an input
- Semi-automatic segmentation method that separates an irregularly shaped 3D target from the rest of the structure
- Knowledge of an objects volume can lead to accurate derivation of physical parameters such as mass.

STATE OF DEVELOPMENT

The method of analysis was successfully tested on brain aneurysm images. Future improvements to the algorithm will include the ability to analyze diverse aneurysm shapes and adapting the algorithm for different clinical purposes.

RELATED MATERIALS

- Dong, B., Chien, A., Mao, Y., Ye, J., Osher, S. Level Set Based Surface Capturing in 3D Medical Images. MICCAI 2008, Part I, LNCS 5241, pp. 162-169, 2008. [more]

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	8,472,685	06/25/2013	2008-681

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- Automated Comparison of 3D Images

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