
Subject: can you easily make "test" data volumes with simple shapes?

Posted by [Jeff Nettles](#) on Tue, 22 Jul 2003 01:16:52 GMT

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Hi folks,

I'm working with some CT data of meteorites, and have been measuring shapes of objects in the CT volume. The objects are basically spheroids, with varying degrees of irregularity, both in surface roughness and sphericity.

I've taken a bunch of random slices through one of the objects, and made some measurements of those slices (the slices are supposed to mimic what you'd see on a microscope slide). So i have, for example, histograms of the area and perimeters of those objects. Now what i'd like to do is to take a bunch of random slices through a perfectly spherical object, and slices through a very irregular object, and see how the histograms differ.

So what i'd like to do is create a data volume that contains a perfect sphere, with brightness values of >1 in the sphere and = 0 outside the sphere. Then make a very irregular one. I know i can do this the long and hard way by making a series of images of circles with increasing and then decreasing diameters, but if there's an easier way i'd sure like to do it that way. So if anyone knows of a short cut that gets me around a long day of use of either photoshop or illustrator or both, i'd love to hear it. Or better still, if anyone has some data like this already and is willing to share it, why that'd be perfect!! :D

Thanks so much for your time and hopefully your help,
Jeff

Subject: Re: can you easily make "test" data volumes with simple shapes?

Posted by [K. Bowman](#) on Tue, 22 Jul 2003 13:09:29 GMT

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In article <3f1c92c1\$1_3@news.utk.edu>,
"Jeff Nettles" <jnettle1@utk.edu> wrote:

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You can calculate the histogram of the slices through perfect spheres analytically. Assuming that you slice through the sphere randomly, the distance from the center of the sphere is a uniformly-distributed random variable, say x . From the Pythagorean theorem the radius of the resulting circular slice is just $y = \sqrt{r^2 - x^2}$, where r is the radius of the sphere. Given a distribution of the sphere sizes, r , you can find the distribution of the circumferences and areas of the slices.

For the irregular objects, you will have to make some assumptions about how to make them irregular. A fairly general approach would be to assume that the radius of the slice as a function of polar angle is given by a Fourier series, $r(\theta) = \sum_i [a(i)\cos(\theta) + b(i)\sin(\theta)]$, where a and b are random variables chosen from a particular distribution (e.g., uniform, etc.). Generate a and b using RANDOMU (for example), compute the boundary curve using a small $\Delta\theta$, sum the segment lengths to get the perimeter, then compute the area of the polygon

$$A = (1/2)((x_1-x_2)(y_1-y_2) + (x_2-x_3)(y_2-y_3) + \dots + (x_n-x_1)(y_n-y_1))$$

Regards, Ken Bowman
