Subject: Re: I need to bulid a digital phantom urgently, Thanks for help!
Posted by Dick Jackson on Mon, 22 Apr 2013 21:14:38 GMT
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huiqiang.liu.37@gmail.com wrote:
> This model is like as follows: a segment of lung tissue was modeled as an
> array of randomly positioned hollowed spheres (simulating alveoli). A
> 1*1*11.6 mm3 volume was created to match the thickest lung region (11.6 mm),
> with simulated alveoli given a 75% packing fraction and a Gaussian

>
> Thank you so much. Liu

Liu,

In researching this a bit, it looks like 75% packing density is not possible with identical spheres...:
http://en.wikipedia.org/wiki/Random_close_pack#For_spheres

... but with the variety of sizes as you described, it may be possible to approach that. 75% is in fact very, very tight.

In any case, my first idea, to place spheres into a volume randomly (without overlap) until the volume is full enough, is clearly not going to work. I think there's no chance of getting close to this optimal packing by random placement. Perhaps someone out there has done this kind of thing before? Perhaps starting with a random set of spheres, and an optimization algorithm to have them push apart until they no longer overlap? I am reminded of something seen in data visualizations called force-directed graph drawing:
http://en.wikipedia.org/wiki/Force-directed_graph_drawing

These other issues (which I wrote about first) are comparatively minor!:

In order to help you, I think we need more a little more information. I guess you're looking to create a 3-D volume array of values with possibly three types of values:
- background
- sphere shell, and
- hollow sphere interior
If the spheres are hollow, we also need to know how thick the shell is (or the diameter of the interior sphere), whether a constant or perhaps a fraction of a given sphere's diameter.
Also necessary is a scale for the array, that is the physical size represented by each 3-D array element, or voxel. I'll assume the voxels are cubes.

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Cheers,
-Dick

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