## Subject: Re: Programming style

Posted by J.D. Smith on Fri, 15 May 1998 07:00:00 GMT

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Patrick V. Ford wrote:

>
> I have a general style/algorithm question.
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> I want to plot in a 3-D array an ellipsoid within an in ellipsoid where the
> voxels between the boundaries are non-zero and else where zero.
>
> The general function is $(x/a)^2 + (y/b)^2 + (z/c)^2 = 1.0$
>
> I have already done this using for loops and conditional statements but it
> occurred to me that there may be some IDL matrix-boolean logic combination
> that could accomplish this in a faster and more 'elegant' fashion.
>
> I am now open for suggestions?
>
> Thanks in advance.
>
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How about:

recast as:

Eq. 1:  $z^2+(x/e11)^2+(y/e21)^2$ $z^2=c1^2$ (outer ellipse)
Eq. 2:  $z^2+(x/e12)^2+(y/e22)^2$ $z^2=c2^2$ (inner ellipse)

let your array be nx by ny by nz.

Then:

z=findgen(nx*ny*nz)
x2=((z mod (nx*ny)) mod nx-nx/2)^2
y2=((z mod (nx*ny))/nx-ny/2)^2
z2=((temporary(z)/(nx*ny)) - nz/2)^2
array=bytarr(nx,ny,nz)
array[where(z2+x2/e11^2+y2/e21^2 le c1^2 AND z2+x2/e12^2+y2/e22^2 ge
c2^2)]=1b

Note the two ellipses are centered on the midpoint of the array and are
concentric.  This can be modified by changing the subtracted value in
each of x2,y2,z2.  Definitely faster than loops.  Elegance is in the eye

of the beholder, though.

NB:  The x,y, and z index vectors must be floats, since for 3-d
data,indices get large pretty quick.  E.g. 100x100x100 would choke with
longs (since $100^3{}^2=10^{12}=2^{39.86}$!).  This introduces some "fuzziness"
at the boundaries due to roundoff.  You can throw in a floor() statement
to eliminate this if you really want.

JD

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