

# Re: Nonlinear Mapping – Object to Image Space

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- *From:* Jim Klein <[jameseklein@xxxxxxxxxxxxxx](mailto:jameseklein@xxxxxxxxxxxxxx)>
  - *Date:* Thu, 28 Jul 2005 03:34:48 GMT
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mpate@xxxxxxxxxxxx wrote:

>I am familiar with collinear mapping from object to image space where  
>we can map point to point, lines to lines, and planes to planes through  
>an optical system.  
>  
>I would like to find the nonlinear? mapping where we can map from say  
>an elliptical object to the corresponding image space shape, or a  
>cylinder object surface shape to the corresponding image space shape.  
>  
>Have googled around a bit looking for answers but didnt find much.  
>What is this field of math/mapping called?  
>Any online or book references would be appreciated.

Hi,

Don't be alarmed. I will try to produce a helpful answer. Really, I have thought about this problem a lot.

Given that you have an optical design program or optical raytrace program (or you wrote your own) that can specify an image point in terms of the to be determined starting object location, this problem is in theoretically easy to solve.

The software takes the final image location (like on a focal plane) and iteratively uses the targeted relative aperture stop surface location and iteratively finds the object space position that the ray must start from so that the ray hits the location on the image plane desired. Sounds difficult but it is no more complicated than HS Algebra. It is a double nested loop.

As far as I know, no one has commercially solved the problem ( except paraxially which is easy and non–iterative) except yours truely. FRED solves it but FRED is not an optical design program.

I'd love to send you the software to do this, but if I did, I would get into a lot of lawyer trouble and loose my pension from the last Aerospace company I worked for.

## Re: Nonlinear Mapping – Object to Image Space

Think about it. It needs to be a double iteration so that the ray hits the correct position at the image plane and at the aperture stop surface.

The cheap solution is to reverse the optical system and trace from the image plane through the desired stop position and out to the object (not the image) location. You can do that with any commercial program.

Jim Klein

If this is confusing, send questions to jameseklein@xxxxxxxxxxxxxx

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