
Subject: Re: creating elliptically shaped images
Posted by [Craig Markwardt](#) on Mon, 24 Nov 2003 17:37:23 GMT
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mruschin@hotmail.com (mark) writes:

> I'd like to form an image which has an elliptical shape and where all
> the pixels within this ellipse have values corresponding to any given
> function that I would specify, the simplest example being a uniform
> image (i.e. a value of 1 for all the pixels in the ellipse). Is there
> any nice way to do this in IDL or MATLAB other than looping through
> all the pixels and determining whether any given one lies within the
> ellipse?

You really have two questions. One is, how do I make a 2D function, and the other is, how do I mask it to an elliptical shape? The answers are close to the same for both. Making a 2D function is usually very simple, as long as you expand your X and Y vectors to be 2D as well.

Let's say you have an N X-pixels and M Y-pixels, so your desired array is `IMG = fttarr(N,M)`. You would have a N-vector called X which labels the X pixels, and an M-vector called Y which labels the y pixels.

Further suppose you have a

```
; Expand X and Y to full 2D arrays
```

```
XX = X # (fttarr(m)+1)
```

```
YY = (fttarr(n)+1) # Y
```

```
; Define ellipse
```

```
A = ... ;; semi-major axis
```

```
B = ... ;; semi-minor axis
```

```
U = (XX/A)^2 + (YY/B)^2
```

```
;; Ellipse 'radius' function is simply U
```

```
F_ELLIPSE = U
```

```
;; Make mask - any point inside the ellipse
```

```
MASK = F_ELLIPSE LT 1
```

```
;; Make your own user function
```

```
F_USER = F(XX,YY)
```

```
;; Finally, mask it so only points inside the ellipse are there
```

```
F_USER = F_USER * MASK
```

Now, anticipating your question, if you want an arbitrary position angle and/or centroid, then you need to do a little extra work, but not much. You would replace the U = ... line above with the following:

$$C = \cos(\text{theta}) \ \& \ S = \sin(\text{theta})$$
$$XP = XX - XCENTROID \ \& \ YP = YY - YCENTROID$$
$$U = ((XP * (C/A) - YP * (S/A))^2 + (XP * (S/B) + YP * (C/WIDY))^2)$$

and then continue.

Good luck!
Craig

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Craig B. Markwardt, Ph.D. EMAIL: craigmnet@REMOVEcow.physics.wisc.edu
Astrophysics, IDL, Finance, Derivatives | Remove "net" for better response
