Subject: Re: Image registration
Posted by thompson on Wed, 19 Jun 2002 14:45:44 GMT
View Forum Message <> Reply to Message

carsten@rad.uni-kiel.de (Carsten Liess) writes:

> Dear all,

> I am fairly new to IDL, so bear with me please.
> I have two images of the same object, only with different intensities.
> I want to create an image that displays the ratio of the two input
> images. I programmed that and it works.
> Problem is that the object I am imaging might have moved by up to 10
> pixels (at a 256*256 matrix) in between, so I need to match the
> position of these two images before I calculate their ratio. The
> movement might include translation as well as rotation.
> Is there a routine in IDL that does such an operation? Alternatively,
> does any among you have any clever suggestion how to go about this?
> Many thanks!

Carsten:

The way I've handled this problem in the past is to make a cross correlation matrix of one image against the other, and looking for where the correlation coefficient is highest. Throwing in rotation as well makes it more complicated, but in essence the problem is the same. The basic difference is that one is working with three dimensions instead of two.

In the classic problem with translation only, one shifts one image relative to the other by one pixel at a time, and then calculates the cross correlation coefficient between them (e.g. with CORRELATE). For example, if you think that the two images could be shifted relative to each other by a maximum of 10 pixels, you would build up a matrix of size (21,21) representing shifts of -10 to +10 pixels in each direction. If you display this matrix as an image, you should be able to see a clear peak representing the best match between the two images. On my data, I've been able to fit the area around the peak to get down to subpixel resolution--your mileage may vary.

If you add rotation into the mix, I would guess that the best place to proceed would be to build up an array of (N,N,M) of cross correlation coefficients, where N is the number of pixel shifts (21 in the above example), and M is the number of angular rotations you wish to explore. For each angle position (K=0,M-1), I would rotate one of the images (e.g. with ROT) and then calculate the NxN cross correlation matrix for that rotation. You would then have a three dimensional volume to examine for the peak correlation.

I hope this helps,

Bill Thompson