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Subject: Curve Fitting Question

Posted by [ftdwh](#) on Tue, 14 Sep 1993 18:01:11 GMT

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The question I have is how to properly use the curvefit routine to fit a function that I am defining. It is as follows:

$$mclat = A1 + A2*\cos(mlt + A3) + A4*\cos(2*mlt + 2*A5) + A6*\cos(3*mlt + 3*A7)$$

where mclat is the magnetic co-latitude, mlt is an angular representation of the magnetic local time.(This is a Fourier fit)

I have in my data set the mclat and mlt, but I want to find the coefficients A1-A7. Can I do this using the fitting routine in IDL? If I can, what are the steps I need to follow? (As with most manuals they seem to be written for somebody who already knows what they are doing. Along that train of thought can any body recommend a book that might help those of us not fully knowledgeable in IDL)

David Hembroff  
Geophysical Institute  
University of Alaska Fairbanks  
"I R A Grad Student"

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Subject: Re: Curve Fitting Question

Posted by [Craig Markwardt](#) on Mon, 12 Nov 2012 23:51:48 GMT

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On Monday, November 12, 2012 5:56:03 PM UTC-5, Coyote wrote:

> Folks,

>

>

>

> I have a data set with two more or less Gaussian peaks in its histogram. I am not overly concerned with the shape of the peaks, or even what their maximum values are. Rather, I am interested in how I might separate these two populations by picking an appropriate threshold between them. Visually, the separation is quite clear, but it appears in a somewhat different location with each data set, thus the need for a programmatic solution.

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>

> Although I don't yet know how to do this, it occurs to me that I might be able to use Craig's MPFit program to fit some kind of double Gaussian to the data and look for the low point between the peaks. If anyone knows how to do this, I would be most grateful for pointers. Or, failing that, I would be interested in other IDL solutions to this problem. Thanks!

How noisy are the peak and non-peak regions of your histogram in the potential worst case? If

the noise in non-peak regions can never be as high as the peaks, I probably wouldn't fit it. I would probably walk in from the left and right sides one bin at a time until you find a local max in each case.

Craig

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Subject: Re: Curve Fitting Question

Posted by [David Fanning](#) on Tue, 13 Nov 2012 01:18:28 GMT

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Gianguido Cianci writes:

- > How about Otsu's method? Meant for images but works for any set of numbers.
- >
- > [http://www.cis.rit.edu/~cnspci/media/software/otsu\\_threshold.pro](http://www.cis.rit.edu/~cnspci/media/software/otsu_threshold.pro)
- >
- > If your numbers aren't integers, I'd multiply by 1000, round, run otsu, divide by 1000. That's assuming 3 sig figs are enough...

Oh, that looks promising! I'll let you know. Thanks!

Cheers,

David

--

David Fanning, Ph.D.

Fanning Software Consulting, Inc.

Coyote's Guide to IDL Programming: <http://www.dfanning.com/>

Sepore ma de ni thue. ("Perhaps thou speakest truth.")

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Subject: Re: Curve Fitting Question

Posted by [David Fanning](#) on Tue, 13 Nov 2012 01:23:29 GMT

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Craig Markwardt writes:

- > How noisy are the peak and non-peak regions of your histogram in the potential worst case? If the noise in non-peak regions can never be as high as the peaks, I probably wouldn't fit it. I would probably walk in from the left and right sides one bin at a time until you find a local max in each case.

Walking to a local minimum *\*might\** work. I can see it would

work in some cases. I might have too few pixels in some cases to avoid minimums in areas that should be in the same group. I probably could look for a minimum of some specified "width" as I walked. I'll give it a try.

Thanks!

David

--

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Subject: Re: Curve Fitting Question

Posted by [ben.bighair](#) on Tue, 13 Nov 2012 02:47:26 GMT

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On Monday, November 12, 2012 5:56:03 PM UTC-5, Coyote wrote:

> Folks,

>

>

>

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>

Hi David,

Would this work? It's a bit dated and never ran very fast, but it worked well for me.

<https://groups.google.com/d/topic/comp.lang.idl-pvwave/XIS5x dTmKPI/discussion>

Cheers,

Ben

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Subject: Re: Curve Fitting Question

Posted by [David Fanning](#) on Tue, 13 Nov 2012 03:40:47 GMT

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ben.bighair writes:

> Would this work? It's a bit dated and never ran very fast, but it worked well for me.  
>  
> <https://groups.google.com/d/topic/comp.lang.idl-pvwave/XIS5x dTmKPI/discussion>

My goodness! We are going to have a BCS-like play-off tomorrow at work. :-)

Thanks!

David

--

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Subject: Re: Curve Fitting Question

Posted by [Mark Piper](#) on Tue, 13 Nov 2012 16:31:09 GMT

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On Monday, November 12, 2012 5:23:53 PM UTC-7, Gianguido Cianci wrote:

> How about Otsu's method? Meant for images but works for any set of numbers.  
>  
>  
>  
> [http://www.cis.rit.edu/~cnspci/media/software/otsu\\_threshold.pro](http://www.cis.rit.edu/~cnspci/media/software/otsu_threshold.pro)  
>  
>  
>  
> If your numbers aren't integers, I'd multiply by 1000, round, run otsu, divide by 1000. That's assuming 3 sig figs are enough...

Coincidentally, we're adding an IMAGE\_THRESHOLD function in 8.2.2 that implements Otsu's method among other automatic thresholding techniques.

mp

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Subject: Re: Curve Fitting Question

Posted by [David Fanning](#) on Tue, 13 Nov 2012 23:24:20 GMT

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Mark Piper writes:

> Coincidentally, we're adding an IMAGE\_THRESHOLD function in 8.2.2 that implements Otsu's method among other automatic thresholding techniques.

Yes, this Otsu's thresholding function works great. It didn't have quite as many features as I would have liked, so I stole the main ideas and wrote up a similar program that is working very, very well with the data sets I am working with today. It even picks reasonable thresholds when the dividing line between pixel populations is not totally straightforward. Thanks for bringing it to my attention.

You can find my version of the program here:

[http://www.idlcoyote.com/programs/cgotsu\\_threshold.pro](http://www.idlcoyote.com/programs/cgotsu_threshold.pro)

Cheers,

David

--

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Subject: Re: Curve Fitting Question

Posted by [cgguido](#) on Wed, 14 Nov 2012 14:22:43 GMT

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Holy bytescale Batman!

Forget the Physics Nobel Prize: when your name is burried in the header of a program by THE David Fanning, then, you have arrived! :-) No seriously.

Btw, I have a super clumsy version of Otsu that estimates local thresholds. It runs like molasses on a cold day in January.

I loop in x and y with a given step and consider a box of size L around x,y. I then run Otsu on that box. For all the values of x,y that I skipped I proceed as follows:

Because they don't teach interpolation at stupid school, I start with the subarray with the thresholds I calculated [nx/step, ny/step]. I then use `congrid` to enlarge the subarray with the thresholds to the original image size [nx,ny]. Kinda works, I am ashamed to say.

If you wanted to get a local Otsu Threshold for each pixel how would you go about it? I was thinking it would be nice to calculate the local thresholds for a set of random points in the image, and then interpolate those. No idea how to proceed. INTERPOL? INTERPOLATE? ahhh!

Infact, you could then start chosing the points at not-so-random (more points where there is more info in the image, say).

Thoughts?

Gianguido

On Tuesday, November 13, 2012 5:24:20 PM UTC-6, David Fanning wrote:

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>
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```

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> David  
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> David Fanning, Ph.D.  
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Subject: Re: Curve Fitting Question

Posted by [David Fanning](#) on Tue, 20 Nov 2012 14:22:11 GMT

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David Fanning writes:

> Yes, this Otsu's thresholding function works great. It  
> didn't have quite as many features as I would have liked,  
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Hold off on this a minute. I've been using my version  
of the OTSU\_THRESHOLD program for a week now, and I've  
been seeing some strange results. The only thing I did  
in my program was to beef up the keywords and error handling

for the histogram itself. I didn't change the underlying code for OTSU\_THRESHOLD.

In fact, just to confirm this, I've now gone back and used the VERY same variable names, etc. But, I seem to be getting different slightly different results with the two programs.

I am trying to track this down now. In fact, I'm using the newsgroup in EXACTLY the way Helder describes this morning!

Here is what just occurred to me. One of the things I am VERY particular about (long experience, probably) is matching the data type of the BINSIZE keyword with the data type of the data going into the histogram. The OTSU\_THRESHOLD program I was using as a model didn't do this. I wonder if this is the source of the difference. Back soon! :-)

Cheers,

David

--

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Subject: Re: Curve Fitting Question

Posted by [David Fanning](#) on Tue, 20 Nov 2012 14:58:51 GMT

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David Fanning writes:

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> the data going into the histogram. The OTSU\_THRESHOLD program  
> I was using as a model didn't do this. I wonder if this is  
> the source of the difference. Back soon! :-)

Humm. There is always something strange going on with Histogram!

The difference in our two programs is that I set the MIN and MAX keywords on the Histogram call to the minimum and maximum of the data. OTSU\_THRESHOLD doesn't do this. As a result the output min and max for their histogram of byte data is 0 to 255. Mine is 1 to 50. If I use the MIN and MAX keywords to set the histogram range to 0 to 255, my results are identical.

I'm going to have to think about this. I think OTSU\_THRESHOLD has been written \*assuming\* byte data is coming in. I can't always be so trusting of the data I work with. So...humm. Any ideas?

I would have thought the OTSU threshold method would work for ANY bimodal population of values, assuming you could calculate a histogram.

Cheers,

David

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David Fanning, Ph.D.

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