Subject: Re: Help: Weighted quadratic fitting under IDL?
Posted by landsman on Wed, 15 Mar 2000 08:00:00 GMT
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In article <8amb67otd1@peabody.colorado.edu>,
bgibson@spitzer.colorado.edu (Brad K. Gibson) wrote:
> Vmax - 5*log(v) = a[m15-1.1] + b[m15-1.1]^2 + c
>

Orear (1982, Am.J. Phys, 50, 912) give the following solution for fitting a polynomial with errors in both X. and Y. One uses standard fitting techniques (e.g. POLYFITW or Craig Markwardt's MPFIT) with the error only in the Y coordinate, but with the Y error replaced by an effective variance.

err^2 = erry^2 + ((dy/dx)*errx)^2

In the case of a quadratic y = a*x^2 + b*x +c you would have

err^2 = erry^2 + ((2*x*a +b)*errx)^2

Now the coefficients a and b what you are trying to find, so that one has to iterate. Start by fitting with only the Y errors, solve for a and b, then compute the effective variance and redo the fit. Continue as necessary.

Now before any statisticians lurking in the group start gagging, I should say that the above algorithm is *not* correct. I believe that the Orear paper was criticized for its use of a Taylor approximation in deriving the accuracy of the effective variance method. But the correct method of dealing with errors in both coordinates is a real bear even in the linear case (e.g. http://idlastro.gsfc.nasa.gov/ftp/pro/math/fitexy.pro) and I suspect that dealing with a quadratic would be much more complicated. And the effective variance method is certainly better than simply ignoring the X errors, and provides an intuitive way of giving low weights to data points if either X error or the Y errors are large.

Its been a while since I looked at this problem, so others may have more current information.

-Wayne Landsman landsman@mpb.gsfc.nasa.gov