
Subject: Getting the errors on the fitted parameters using mpfit2dpeak

Posted by [dbarkats](#) on Wed, 13 Aug 2003 01:32:20 GMT

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Hi everyone,

I have been trying to understand the returned errors on parameters using Craig's mpfit2dpeak function. Because things just did not make sense, I decided to make some simulations:

I generated 1000 simulations of a 2d gaussian $Z_{i,j}$ where in each realization all the parameters are fixed except for one (the fwhm_x) which I draw from a gaussian distribution of known mean and sigma. For each realization, I thus feed mpfit2dpeak the $Z_{i,j}$ points as well as the errors on $Z_{i,j}$ obtained from simple error propagation. I do this 1000 times and save the return parameters as well as their errors (perror). At the end, I compare the original distribution of the fwhm_x and the recovered distribution of FWHM_X and its error. With numbers, this is what I get

-Original distribution of FWHM_X, mean=0.08 and sigma=0.01

-Mean and sigma of recovered distribution of FWHM_X, mean=0.079 and sigma=0.0097 which is fine,

BUT!!!!!!

- Mean of recovered distribution of error of FWHM_X, mean=0.000103.

In other words, the recovered error on FWHM_X is 100 times smaller than the inputted error. This is exactly why I decided to do some simulation in the 1st place. I was getting much too small recovered parameter errors.

Now I know that getting the right errors on fitted parameters is an art, but if anyone has a clue as to why this gives me such a discrepancy, I would love to hear it.

I have not yet checked to see if there is a dependance on the exact original values I entered. I have not tried to see if this effect happens with a simpler 1d gaussfit.

I include here the code used to run these simulations.

-Denis

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PRO simulated_gauss, out
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```
amp=7 ; input amplitude
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```
sigmax=0.01
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```
sx=randomn(seed,1000)*sigmax+0.08 ; input FWHM_X
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```
sy=0.1 ; input FWHM_Y
```

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x=0.5*findgen(100)/100-.25      ; input x grid
y=0.5*findgen(100)/100-.25      ; input y grid
out=fltarr(2,1000)              ; to save the output fwhm_x and
err
g1=fltarr(100,100)              ; 2d_gaussian
g1err=fltarr(100,100)           ; error on 2d_gaussian
for k=0,1000 do begin            ; loop over 1000 realizations
  print,k, sx(k)
  for i=0,99 do begin
    for j=0,99 do begin
      e=exp(-0.5*((x(i)/sx(k))^2+(y(j)/sy)^2))
      g1(i,j)=amp*e
      g1err(i,j)=sigmax*(x(i)^2/sx(k)^3)*g1(i,j)
    endfor
  endfor
endfor

;contour, g1, x, y, /fill, nlevels=40
fit=mpfit2dpeak(g1,a,x,y, error=g1err, perror=aerr) ; do the 2d_fit
print,a, aerr
;contour, fit, x, y, /overplot, color=white
; ploterror,g1(50,*), g1err(50,*), psym=2
; oplot, fit(50,*), color=200 &pause
; ploterror,g1(*,50), g1err(*,50), psym=2
; oplot, fit(*,50), color=2000 &pause
  out(*,k)=[a(2),aerr(2)]
endfor
END
;#####

```
