Subject: Bug in INTERPOLATE(/CUBIC)
Posted by landsman on Sun, 24 Sep 1995 07:00:00 GMT
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I believe that there is a bug in the output of the intrinsic INTERPOLATE function when used with the /CUBIC keyword. (I have found this problem in IDL V3.6 and V4.0.1 under both Alpha VMS and SunOS.)

What bothered me was that the use of the /CUBIC keyword never gave as accurate interpolation as either sinc interpolation or my program quadterp.pro (available in ftp://idlastro.gsfc.nasa.gov/pub/pro/math), which also does cubic interpolation using 4 neighboring points. In fact, the use of the /CUBIC keyword gave results no better than linear interpolation.

I then found that if I *averaged* the results of INTERPOLATE(P,X) and INTERPOLATE(P,X,/CUBIC), then I would *exactly* match the output of quadterp.pro. So my guess is that a step is missing from the internal algorithm for INTERPOLATE(/CUBIC).

I suspect the problem also exists for 2-d interpolation, although I have done only a quick test of this.

As example of the problem, below I interpolate the function y = exp(x), first at the grid points x = findgen(20), and then at the point x= 6.5.

```
IDL> x = findgen(20)
IDL> y = exp(x)
IDL> print,exp(6.5)             ;Print the true value at  X = 6.5
;  665.142
IDL> print,interpolate(y,6.5)    ;Linear interpolation gives a value too large
; 750.031
IDL> print,interpolate(y,6.5,/cubic) ;Cubic keyword gives a value too small
; 546.367

; But the average of the linear and cubic gives a much closer value

IDL> print,(interpolate(y,6.5,/cubic) + interpolate(y,6.5) )/2.
;648.199

;which happens to also be *exactly* equal to the output of quadterp.pro

IDL> quadterp,x,y,6.5,yy & print,yy
;648.199
```

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