
Subject: Re: Met Data spatial interpolation
Posted by [dan](#) on Tue, 06 Dec 1994 19:04:42 GMT
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In article <1994Dec1.115119.8178@news.dkrz.de>, m211058@regen.dkrz.de (Wolfgang Knorr) writes:

|> I was wondering whether anyone would have a program in IDL that can
|> do any kind of spatial interpolation of meteorological data, either
|> for filling gaps in gridded data sets, or to produce grid maps from
|> station data.
|> If nobody knows of any such routine, I will write one myself
|> and make it available to anyone interested. (Are meteorolgists
|> using IDL at all?)
|>
|> Cheers to all.
|>
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>	

I've written a routine which interpolates scattered data onto a regular latitude longitude grid. For each grid point where an interpolated value is desired, this routine weights the N (user defined) closest data points by great circle distance raised to a power (power is user defined, default is -1 which is an inverse distance weighting). Here it is. If you have questions, feel free to post or to email me.

```
; $ID$  
  
:+  
; Name:  
;   INTERP_SPHERE  
;  
;  
; PURPOSE:  
;   This function maps scattered data defined by  
;   (longitude,latitude,value) onto a regular, but not  
;   neccessarily evenly spaced, grid whose coordinates are  
;   also defined by longitude and latitude. The procedure searches  
;   for the N (default = 5) closest data points to each grid  
;   point and then averages these N data points weighted by  
;   distance^power from the grid point to the particular data point.  
;   Default is power=-1 which weights the points inversely by  
;   distance. All distances are along great circles on a sphere
```

```
; (the shortest distance between two points along the  
; surface of a sphere).  
;  
; CATEGORY:  
; Interpolation?  
;  
; CALLING SEQUENCE:  
; grid = INTERP_SPHERE(lat,lon,data)  
;  
; INPUTS:  
;  
; lat: The latitudes on the grid where interpolated  
; values are desired (in degrees)  
;  
; lon: The longitudes on the grid where interpolated  
; values are desired (in degrees)  
;  
; data: An array (3,ndata) where ndata is the number of  
; data points, and can be any number larger than N.  
; each row of data should contain a longitude, a  
; latitude, and a value to be interpolated.  
;  
; KEYWORD PARAMETERS:  
;  
; n: The number of closest data points to be used  
; for each grid point interpolation. Default = 5  
;  
; power: The exponent for the distance weighting function.  
; Default = -1 (weighting inversely by distance).  
; An input of power=-.5 would weight inversely by the  
; square root of the distance.  
;  
; OUTPUTS:  
;  
; grid: An array of interpolated data values. It has dimensions  
; (nlon,nlat) where nlon is the number of entries in the  
; input lon, and nlat is the number of entries in the input  
; lat.  
;  
; EXAMPLE:  
;  
; MODIFICATION HISTORY:  
;  
; written by: Dan Bergmann dbermann@lbl.gov 11/10/94  
;-
```

FUNCTION INTERP_SPHERE,lat,lon,data,n=n,power=power

```

nlat = (size(lat))(1)
nlon = (size(lon))(1)
grid = fltarr(nlon,nlat)

if (not(keyword_set(n))) then n = 5
if (not(keyword_set(power))) then power = -1

dtr = !pi / 180.

; convert lat and lon to radians

latr = dtr * lat
lonr = dtr * lon

; convert the lat and lon of the data to radians

dlatr = dtr * data(1,*)
dlonr = dtr * data(0,*)

; calculate the cartesian coordinates of the data points
; assuming a unit sphere.

xdata = cos(dlatr) * sin(dlonr)
ydata = cos(dlatr) * cos(dlonr)
zdata = sin(dlatr)

for x=0,nlon-1 do begin

    sinlonr = sin(lonr(x))
    coslonr = cos(lonr(x))

    for y=0,nlat-1 do begin

        ; calculate the cartesian coordinates of this particular
        ; grid point.

        xorig = cos(latr(y)) * sinlonr
        yorig = cos(latr(y)) * coslonr
        zorig = sin(latr(y))

        ; calculate the length squared of the cords connecting this grid
        ; point to all the data points and then sort the data points by
        ; these values.

        corddistsq = (xorig-xdata)^2+(yorig-ydata)^2+(zorig-zdata)^2

        sortdist = (sort(corddistsq))(0:n-1)

```

```

; if a data point lies directly on top of this grid point, then
; assign that value to the grid point.
; Otherwise calculate the n great circle distances and do a weighted
; average of the data values.

if ((corddistsq(sortdist))(0) eq 0) then begin

grid(x,y) = data(2,(sortdist)(0))

endif else begin

grcirdis = asin(sqrt(corddistsq(sortdist))/2.)

grid(x,y) = (total(data(2,sortdist) * grcirdis^power)) / total(grcirdis^power)

endelse

endfor

endfor

return,grid

end

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*****  

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