Subject: Re: Anisotropic smoothing operations
Posted by Jaco van Gorkom on Thu, 26 Apr 2001 10:25:32 GMT
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Ben Tupper wrote:
> How can I smooth a 2d image with a rectangular (rather than square)
> smoothing window?

Your post presents the answer rather completely already, with demo code and all. Like you, I use CONVOL for this. I have been wanting to write up a general routine, allowing for fractional smoothing window widths, circular/elliptical smoothing windows, etc., but I never really got round to it. I must have all the elements spread somewhere through my codes by now, though. I might post
it in future.

> ...
> Is there a way to make CONVOL treat missing data as SMOOTH does?

What I do is set all NaN values in the input array to zero, do the smoothing with CONVOL, and divide
the result by a similarly smoothed version of the original FINITE(InputArray). Where this division is one by zero, the output element should be NaN, which you might want to set it to by hand to avoid
the arithmetic error thing. If you want to bother.

Cheers,
Jaco

Jaco van Gorkom e-mail: gorkom@rijnh.nl
FOM-Instituut voor Plasmafysica "Rijnhuizen", The Netherlands

Subject: Re: Anisotropic smoothing operations
Posted by Ben Tupper on Thu, 26 Apr 2001 17:15:22 GMT
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Jaco van Gorkom wrote:

>> ...
>> Is there a way to make CONVOL treat missing data as SMOOTH does?
>
> What I do is set all NaN values in the input array to zero, do the smoothing with CONVOL, and divide
> the result by a similarly smoothed version of the original FINITE(InputArray). Where this division
> is one by zero, the output element should be NaN, which you might want to set it to by hand to avoid
> the arithmetic error thing. If you want to bother.

>

Hello,

That's a good idea. I'm not sure how to implement it in my situation.

I am using a routine for building a 2d grid from scattered data. The grid is initialized with a user defined MISSING value (in my case, NAN.) The data is sprinkled over the grid then smoothed with the
moving boxcar. This sprinkle/smooth sequence is repeated a number of times. Using SMOOTH, the NANs
are replaced by (real) smoothed values as the influence of the scattered data values grows outward. It
is possible (likely) that there will be NANs remaining on the grid after the sprinkle/smooth iterations
have been completed. These areas will be in the regions of the grid where the original data values are
sparse. That is the effect I would like to achieve.

Thanks,

Ben

--
Ben Tupper
248 Lower Round Pond Road
POB 106
Bristol, ME 04539

Tel: (207) 563-1048
Email: PemaquidRiver@tidewater.net

Subject: Re: Anisotropic smoothing operations
Posted by Craig Markwardt on Thu, 26 Apr 2001 18:41:01 GMT
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Ben Tupper <pemaquidriver@tidewater.net> writes:
...
>
> That's a good idea. I'm not sure how to implement it in my situation.
>
> I am using a routine for building a 2d grid from scattered data.
> The grid is initialized with a user defined MISSING value (in my
> case, NAN.) The data is sprinkled over the grid then smoothed with

> the moving boxcar. This sprinkle/smooth sequence is repeated a
> number of times. Using SMOOTH, the NANs are replaced by (real)
> smoothed values as the influence of the scattered data values grows
> outward. It is possible (likely) that there will be NANs remaining
> on the grid after the sprinkle/smooth iterations have been
> completed. These areas will be in the regions of the grid where the
> original data values are sparse. That is the effect I would like to
> achieve.

Question by an idiot: couldn't you use KRIG2D/TRIANGULATE/TRIGRID for this? They're designed to take irregular points to a regular grid and filling in the gaps.

Craig

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Craig B. Markwardt, Ph.D. EMAIL: craigmnet@cow.physics.wisc.edu
Astrophysics, IDL, Finance, Derivatives | Remove "net" for better response
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Subject: Re: Anisotropic smoothing operations
Posted by Ben Tupper on Thu, 26 Apr 2001 22:31:14 GMT
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Craig Markwardt wrote:

>
> Question by an idiot:

You are decidedly not an idiot. You must have meant 'for' not 'by'.

> couldn't you use KRIG2D/TRIANGULATE/TRIGRID for
> this? They're designed to take irregular points to a regular grid and
> filling in the gaps.
>
Yes and no. This is my same old question about gridding data that a ship collected along a 300km long straight line. The ship stopped every 10-20km and dropped a thermometer into the water, measuring temperature (and other things) every 0.5m.

KRIG2D: I would love to use this, but (a) it is very slow for more than 300ish data points and (b) I really don't know how to set the input parameters so they have a physical meaning.

TRIGRID: This is what we have been using... because the temperature casts are

different lengths the triangulation introduces interpolation where it is unreasonable to expect any, thus we have to introduce ad hoc masking. This is identical to the problem Liam encountered recently using MODIS data. In general terms, this method works (when we mask) for measurements of fields that have soft and sharp gradients (temperature, salinity) but not so well for spikes and discontinuities (pigments, plankton cells per unit volume, doughnut crumbs per unit volume.)

A while back, when I called the newsgroup-hotline for help, quite a number of nice ideas were suggested. We are simply exploring some other techniques. Liam provided two different approaches: inverse distance weighting and region growing (that is the one we are trying now.) You had suggested coming up with a response function that 'follows' each cast line downward. We haven't tried that yet

We have seen nice results with the region growing (repeated smoothing) method, except that the smoothing window must be square. In the water column, vertical gradients are sharped than horizontal ones; hence the desire to using a rectangualr smoothing window. I thought, ever the optimistic programmer, that I would just slip the CONVOL function in the place of SMOOTH. Bonk.

Actually, Jaco, hit on something, the counter (counts the number times a cell/pixel has been sampled) holds the key. FIRST, start with the entire grid as ZERO rather than the user defined MISSING value. At the end of the sprinkle/smooth iterations, simply examine the counter cells that hold '0', these will be filled with the USER defined MISSING value.

Something like the following is pretty much what the code that Liam sent me does (except it uses SMOOTH instead of CONVOL). I would add the missing check at the end.

```
grid = FltArr(nx,ny)
count = fltarr(nx,ny)
kernal = replicate(1.0, winX, winY)
scale = total(kernal)

For i = 0, n_iterations-1 Do Begin
   ;sprinkle
   grid[dataX, dataY] = dataZ
   count[dataX, dataY] = count[DataX, dataY] + 1.0

   ;smooth
   grid = CONVOL(grid, kernal, scale, /edge_truncate)
   count = CONVOL(count, kernal, scale, /edge_truncate)

EndFor
```

```
    ;check for missing values
A = where(count eq 0.0, missing_count)
If missing_count GT 0 Then Grid[A] = missing
```

Thanks,

Ben

--
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