Subject: Re: Reverse interpolation? Posted by Craig Markwardt on Wed, 16 Aug 2000 07:00:00 GMT View Forum Message <> Reply to Message

Martin Schultz <martin.schultz@dkrz.de> writes:

```
> Simon de Vet wrote:
>> I want to get better results. Instead of finding that entry #5 is the
>> closest match to my known altitude, and using #5 as the subscript in my
>> data array, I'd like to find that, based on a linear interpolation,
>> entry #5.32850 is an exact match, and using this value in an
>> interpolation on my data array.
>>
>> I understand how to use a subscript to find an interpolated value. How
>> would I go in the opposite direction, using a value to find a subscript?
   Thanks. I hope this isn't too confusing. I'm having a bad brane day.
>>
>> Simon
>
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 Hi Simon,
>
>
    I have dealt with similar problems (vertical regridding, to
  give the kid a name), and I tend to resort on the spline routine
> in these instances. Please find attached a piece of code that I
> used to vertically regrid OH concentration fields. Just be
> careful about end effects. For this application I overwrote the
> topmostfour levels of the target grid with the values from the
> top level of the old grid.
>
          newxx = Spline(oldy, oldx, newy, 5.)
```

If you are trying to match a lot of values, then I agree that the spline interpolation is one of the best solutions. However, I have had bad experiences with the SPLINE function. It tends to have problems when the points are too far apart, and it's also pretty slow. I found the Numerical Recipes version of spline interpolation to be much better (built in functions SPL_INTERP and SPL_INIT).

If v1 is vector of values sampled at original altitudes a1, and you want to resample at new altitudes a2, then you do something like this:

```
v2 = spl_interp(a1, v1, spl_init(a1, v1), a2)
```

Now v2 has the newly sampled values. In principle a2 can be one value so even if you want a single value the spline interpolation can be useful, and even pretty fast.

IDL version 5.3 apparently has a new function called VALUE_LOCATE which can do fast search of a reference array. From there you can do a linear interpolation. The IDL Astronomy Library procedure called TABINV may do what you want. The versions that use VALUE_LOCATE and don't use it are here, and here, respectively:

http://idlastro.gsfc.nasa.gov/ftp/v53/tabinv.pro http://idlastro.gsfc.nasa.gov/ftp/pro/math/tabinv.pro

Craig	
,	craigmnet@cow.physics.wisc.edu Remove "net" for better response

Subject: Re: Reverse interpolation?
Posted by promashkin on Wed, 16 Aug 2000 07:00:00 GMT
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I'd recommend checking out VALUE_LOCATE function. Overall, solving the proportion in a triangle will be the simpliest approach (unless you want to do a more sophisticated spline as suggested by Martin), but VALUE_LOCATE eliminates the need for subtracting and finding near-zero elements of the array.

Also, once you have X, there is a library function INTERPOL that will take X for input and locate the interpolated value for you. Cheers.

Pavel

Simon de Vet wrote:

> Simon de Vet wrote:

- >> I understand how to use a subscript to find an interpolated value. How
- >> would I go in the opposite direction, using a value to find a subscript?
- > I have an idea (I used this for a similar problem with Matlab) that may
- > work. It's ackward and bulky, but I can understand it.
- > First, I subtract the known altitude from the altitude list. Some of the
- > values will be positive, and some negative. I use this to find the points

- > on either side of known altitude. I can use their subscripts as x-values
- > and their altitudes as y-values to find the equation of a line connecting
- > the two points. I can then substitute my known altitude (y value) into the
- > equation, and solve for x (the required subscript).

>

> I hope it works.

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Subject: Re: Reverse interpolation?

Posted by Simon de Vet on Wed, 16 Aug 2000 07:00:00 GMT

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I hope it works.

Simon

Subject: Re: Reverse interpolation?

Posted by Martin Schultz on Wed, 16 Aug 2000 07:00:00 GMT

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Simon de Vet wrote:

>

> I have a little problem:)

>

- > I have three sets of data a list of altitudes (which are not evenly
- > spaced, and are calculated with a long, confusing formula), an altitude
- > I want to match, and a set of data that depends on altitude (ie: entry 1
- > corresponds to altitude 1, entry 2 to altitude 2, etc...).

>

- > Currently, I am calculating the differences between each entry in the
- > altitude list and my known altitude, and using this to find the closest
- > match, who's subscript I use in the data array. However, since there
- > aren't very many values in my altitude list, the closest matches are
- > often not very close at all, and the results become inaccurate.

>

- > I want to get better results. Instead of finding that entry #5 is the
- > closest match to my known altitude, and using #5 as the subscript in my
- > data array, I'd like to find that, based on a linear interpolation,
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Cheers, Martin

```
FOR i=0,N_Elements(grid.lon)-1 DO BEGIN FOR j=0,N_Elements(grid.lat)-1 DO BEGIN
```

```
oldx = reverse( reform( newoh[i,j,*,month-1] ) )
oldy = reverse( reform( data.p ) )
newy = reform( pgrid[i,j,*,month-1] )
```

- ;; Smooth spline interpolation onto new grid newxx = Spline(oldy, oldx, newy, 5.)
- ;; Enter new values in result field resultoh[i,j,*,month-1] =

```
reform(newxx,1,1,N_Elements(newxx))
    ENDFOR
ENDFOR
[[ Dr. Martin Schultz Max-Planck-Institut fuer Meteorologie
          Bundesstr. 55, 20146 Hamburg
\prod
\prod
[[
          phone: +49 40 41173-308
[[
          fax: +49 40 41173-298
\prod
[[
[[ martin.schultz@dkrz.de
```

Subject: Re: Reverse interpolation? Posted by Craig Markwardt on Thu, 17 Aug 2000 07:00:00 GMT View Forum Message <> Reply to Message

Martin Schultz <martin.schultz@dkrz.de> writes:

>

- > I had looked into SPL INTERP and SPL INIT, but I found the
- > problem was that it does not allow for "smoothing" (more
- > correctly: controlling "the amount of tension that is applied to
- > the curve"). I certainly like the idea of controllin the
- > endpoints (which you can do only in SPL_INTERP). Are you aware of
- > a solution that can do both?

Sorry, I've never needed any extra smoothing, and I have always had control over the endpoints of my original function.

Craig Craig B. Markwardt, Ph.D. EMAIL: craigmnet@cow.physics.wisc.edu Astrophysics, IDL, Finance, Derivatives | Remove "net" for better response ______

Subject: Re: Reverse interpolation? Posted by Martin Schultz on Thu, 17 Aug 2000 07:00:00 GMT View Forum Message <> Reply to Message

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Martin

```
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[[
            Bundesstr. 55, 20146 Hamburg
[[
\prod
            phone: +49 40 41173-308
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```