Subject: Re: VALUE_LOCATE tutorial
Posted by rogass on Wed, 24 Jun 2009 07:46:03 GMT
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Thank you for this nice tutorial!

Regards

CR

Subject: Re: VALUE_LOCATE tutorial
Posted by David Fanning on Wed, 24 Jun 2009 15:15:18 GMT
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Jeremy Bailin writes:

> I've taken David's encouragement to write up this tutorial on all
> the fun uses of the insufficiently-appreciated VALUE_LOCATE
> function. ;-)

Thanks, Jeremy. Now I can go hiking this weekend! ;-)

I've prettied it up a bit and made it available on my
web page:

http://www.dfanning.com/code_tips/valuelocate.html

Cheers,

David

--
David Fanning, Ph.D.
Fanning Software Consulting, Inc.
Coyote's Guide to IDL Programming: http://www.dfanning.com/
Sepore ma de ni thui. ("Perhaps thou speakest truth.")

Subject: Re: VALUE_LOCATE tutorial
Posted by Jeremy Bailin on Wed, 24 Jun 2009 22:20:45 GMT
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There's one more important application for Value_Locate that I meant
to include!

(David - you can stick this after the "Using Ranges For Partitioning" subsection)

- Using Ranges In An Interpolation Scheme -

Another convenient use of this property of Value_Locate is for interpolation. Most interpolation schemes work by fitting a low-order polynomial or similar function to the points near the desired location. How do you efficiently determine which points are the "near points"? Using Value_Locate!

The simplest example is a linear interpolation between the neighbouring points: if x[i] <= array[j] <= x[i+1] (where x is strictly increasing) then the interpolated value is:

interpolated_y[j] = y[i] * (x[i+1]-array[j])/(x[i+1]-x[i]) + y[i+1] * (array[j]-x[i])/(x[i+1]-x[i])

The trick is to figure out which i to use for a given j... but that's exactly what Value_Locate does! Here is some simple code that will calculate this interpolation (I haven't taken care to handle the edge cases correctly, but see the code of the library function Interpol for more details):

left = Value_Locate(x, array)
right = left+1
interpolated_y = y[left] * (x[right]-array)/(x[right]-x[left]) + y[right] * (array-x[left])/(x[right-x[left])

This is equivalent to Interpol(y, x, array).

-Jeremy.

Subject: Re: VALUE_LOCATE tutorial
Posted by Matt[2] on Thu, 25 Jun 2009 14:07:42 GMT
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Jeremy Bailin <astroconst@gmail.com> writes:

> There are probably two reasons why VALUE_LOCATE is underused. The
> first is that it was only introduced in IDL 5.3, well after many
> people developed their core techniques. The second is that the help
> page is somewhat opaque on what it actually does. The basic idea is
> pretty simple: given two arrays Values and Array,

I think the main reason it's not used is because it's so poorly named.

How would you find this if you just wanted to partition some data? I
can't remember who pointed it out to me first, but I do remember
thinking to myself, "Hmm, that's useful, wonder why I've never heard of
it".

Cheers,
Matt

--
Matthew Savoie - Scientific Programmer
National Snow and Ice Data Center
(303) 735-0785 http://nsidc.org

Subject: Re: VALUE_LOCATE tutorial
Posted by Kenneth P. Bowman on Thu, 25 Jun 2009 21:14:39 GMT
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In article <ywkuk530jtjl.fsf@snowblow.colorado.edu>, savoie@nsidc.org
wrote:

> Jeremy Bailin <astroconst@gmail.com> writes:
>
> I think the main reason it's not used is because it's so poorly named.
> How would you find this if you just wanted to partition some data? I
> can't remember who pointed it out to me first, but I do remember
> thinking to myself, "Hmm, that's useful, wonder why I've never heard of
> it".
>
> Cheers,
> Matt

I think they knew that if they named it SEARCH it would conflict with
thousands of user-written routines. :-)

Ken

Subject: Re: VALUE_LOCATE tutorial
Posted by Kenneth P. Bowman on Thu, 25 Jun 2009 21:21:52 GMT
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I think VALUE_LOCATE may have come out of this discussion

http://groups.google.com/group/comp.lang.idl-pvwave/browse_t
hread/thread/485e33800ea5aaf4/da3c9fd5513d8d41?lnk=gst&q

=binary+search#da3c9fd5513d8d41

back in 1998.

I think I submitted an official feature request to what was then RSI, and
in my own mind I like to take credit for VALUE_LOCATE. :-)

Ken

Subject: Re: VALUE_LOCATE tutorial
Posted by ben.bighair on Thu, 25 Jun 2009 22:48:05 GMT
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On Jun 25, 5:21 pm, "Kenneth P. Bowman" <k-bow...@null.edu> wrote:
> I think VALUE_LOCATE may have come out of this discussion
>
> http://groups.google.com/group/comp.lang.idl-pvwave/browse_t hread/thr...
>
> back in 1998.
>
> I think I submitted an official feature request to what was then RSI, and
> in my own mind I like to take credit for VALUE_LOCATE. :-)
>
> Ken

Hi,

If I recall correctly, there is a function in Numerical Recipes for C
called locate() that does the bifurcation search on an ordered list
that VALUE_LOCATE does. Perhaps that is the origin of the name?

Cheers,
Ben

Subject: Re: VALUE_LOCATE tutorial
Posted by David Fanning on Thu, 25 Jun 2009 23:00:43 GMT
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ben.bighair writes:

> If I recall correctly, there is a function in Numerical Recipes for C
> called locate() that does the bifurcation search on an ordered list
> that VALUE_LOCATE does. Perhaps that is the origin of the name?

If I'm not mistaken, Al Gore had the original idea for this function.

Cheers,

David

--
David Fanning, Ph.D.
Fanning Software Consulting, Inc.
Coyote's Guide to IDL Programming: http://www.dfanning.com/
Sepore ma de ni thui. ("Perhaps thou speakest truth.")

Subject: Re: VALUE_LOCATE tutorial
Posted by ben.bighair on Thu, 25 Jun 2009 23:57:11 GMT
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On Jun 25, 7:00 pm, David Fanning <n...@dfanning.com> wrote:
> ben.bighair writes:
>> If I recall correctly, there is a function in Numerical Recipes for C
>> called locate() that does the bifurcation search on an ordered list
>> that VALUE_LOCATE does. Perhaps that is the origin of the name?
>
> If I'm not mistaken, Al Gore had the original idea for this function.
>

Hmmm. A plurality programmers thought so, too. But the software
judges overruled the will of the masses on this one, too.

Cheers,
Ben
t
P.S. I found this (http://www.nrbook.com/ub30001/nr3-3-1.pdf) but it
doesn't look like the plain old incomprehensible C that I never
figured out. Anyway, there is a routine called locate in there.

Subject: Re: VALUE_LOCATE tutorial
Posted by Jeremy Bailin on Fri, 26 Jun 2009 15:54:17 GMT
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On Jun 25, 5:14 pm, "Kenneth P. Bowman" <k-bow...@null.edu> wrote:
> In article <ywkuk530jtjl....@snowblow.colorado.edu>, sav...@nsidc.org
> wrote:
>
>> Jeremy Bailin <astroco...@gmail.com> writes:
>
>> I think the main reason it's not used is because it's so poorly named.

>> How would you find this if you just wanted to partition some data? I
>> can't remember who pointed it out to me first, but I do remember
>> thinking to myself, "Hmm, that's useful, wonder why I've never heard of
>> it".
>
>> Cheers,
>> Matt
>
> I think they knew that if they named it SEARCH it would conflict with
> thousands of user-written routines. :-)
>
> Ken

Pre-5.3, I had a homebrewed version of it called BSEARCH, that I thought was pretty efficient but which gets blown out of the water by VALUE_LOCATE!

-Jeremy.
