Subject: Re: signal processing package for IDL
Posted by dpkemp on Sat, 25 Jul 1992 14:23:50 GMT
View Forum Message <> Reply to Message

In article <ghsu.711219193@critical> ghsu@critical.nswc.navy.mil () writes:
> I am interested in finding procedures for signal processing (design of
> filters, filtering, etc), similar to the signal processing toolbox for
> matlab), for IDL. Is there something like that in existence? Is
> there such package available for pvwave? Any pointer will be
> appreciated.
>
Don't get your hopes up. Filter design is probably best done by
a specialized application (there are lots of them), but it would be
nice to do the actual filtering in PV-wave.

Unfortunately, the technical support person I talked to at PVI didn't
know anything about filters, not even the vocabulary. I asked if there
was any primitive to support Infinite Impulse Response (variously known
as Auto Regressive, or Recursive) filters, and this person didn't know
what I was talking about.

FIR filtering is, of course, supported by PV-wave's convolution operation,
but there doesn't seem to be any operation for doing recursive filters
without doing it sample-by-sample with an explicit loop - horribly slow.

Question for the net: Am I missing something in the documentation?
IIR is a term used by DSP people, AR is used by statistics people. Is
there some other term used in Geology, or Fluid Dynamics, or whatever,
that I should have been asking for?

--
  Dave Kemp dpkemp@afterlife.ncsc.mil
 ---------- ----------
"The use of history as therapy means the corruption of history as history."
   -- Arthur Schlesinger (quote stolen from Chet Ramey, CWRU)

Subject: Re: signal processing package for IDL
Posted by dmatthews on Sun, 26 Jul 1992 20:10:52 GMT
View Forum Message <> Reply to Message

In article <1992Jul25.142350.26849@afterlife.ncsc.mil>, dpkemp@afterlife.ncsc.mil (David P. Kemp) writes:
> In article <ghsu.711219193@critical> ghsu@critical.nswc.navy.mil () writes:
>> I am interested in finding procedures for signal processing (design of
>> filters, filtering, etc), similar to the signal processing toolbox for
>> matlab), for IDL. Is there something like that in existence? Is

>> there such package available for pvwave? Any pointer will be
>> appreciated.
>>
> Don't get your hopes up. Filter design is probably best done by
> a specialized application (there are lots of them), but it would be
> nice to do the actual filtering in PV-wave.
...
If you don't have to do your filtering in real time, do it in the
frequency domain, i.e. take the Fourier transform of the data,
multiply the result by the desired transfer function, and transform
that result back to the time domain. It's faster and easier to understand
than filtering in the time domain directly.

Dr. David L. Matthews, IPST, Univ. of Maryland, College Park MD 20742-2431
Telephone (301)405-4830 Internet dmatthews@uap.umd.edu
FAX (301)314-9363 NSI/SPAN UMDUAP::DMATTHEWS

Subject: Re: signal processing package for IDL
Posted by ritscher on Wed, 29 Jul 1992 13:53:20 GMT
View Forum Message <> Reply to Message

In response to the above two postings:
>> I am interested in finding procedures for signal processing (design of
>> filters, filtering, etc), similar to the signal processing toolbox for
>> matlab), for IDL. Is there something like that in existence? Is
>> there such package available for pvwave? Any pointer will be
>> appreciated.
>>
[...]
> FIR filtering is, of course, supported by PV-wave's convolution operation,
> but there doesn't seem to be any operation for doing recursive filters
> without doing it sample-by-sample with an explicit loop - horribly slow.

The signal processing capabilities of packages such as MATLAB are glaringly
missing from IDL. Why don't we users write our own signal processing toolkit
as a set of IDL .pro files? Research Associates Inc supports this kind of
activity through their user library files.

I have written two .pro files for IIR filtering called in a similar manner to the
MATLAB filter.m and filtfilt.m files. Send mail to ritscher@crd.ge.com if you
would like me to mail you these.

Have others written signal processing routines that are in a condition ready to
be shared? If so, please send mail to me, or post their availability to this
news group or to comp.lang.idl.

David Ritscher

GE Corporate Research and Development
ritscher@crd.ge.com

Subject: Re: signal processing package for IDL
Posted by kevin on Wed, 29 Jul 1992 22:10:48 GMT
View Forum Message <> Reply to Message

>> I am interested in finding procedures for signal processing (design of
>> filters, filtering, etc), similar to the signal processing toolbox for
>> matlab), for IDL. Is there something like that in existence? Is
>> there such package available for pvwave? Any pointer will be
>> appreciated.
>>

I have noticed that there has been a lot of interest from matlab-ites
in doing matlab-like things under PV wave CL. About half a year ago
I wrote an interface which connects matlab to PV wave via a server
running in PV wave. The result is that a user in matlab can call PV
wave functions directly from matlab without ever knowing PV wave even
exists. I emulated all of the matlab graphics in PV wave (ie plot
becomes wplot, mesh becomes wmesh, etc), as well as wrote many functions
which take advantage of PV waves superior graphics. For example, I just
finished a routine (wscroll) which takes as input a vector and displays
two plots in 1 window. The top plot is the whole vector, and the bottom plot
is a section of the vector (the section is marked by a rectangle on the top
plot). The user can scroll the bottom plot left and right using the
mouse buttons while the rectangle on the top plot tracks the position.
The user can also change the scale of the bottom plot by using the mouse
to change the size of the rectangle on the upper plot. There are some
other things it does, but you get the picture. The function wscroll
returns to matlab the section of the vector which was displayed in the
lower plot upon exiting.

Basically, anything you can do in PV wave CL, you can do directly
from matlab using the interface. The result is probably
the most powerful mathmatics/graphics package available. I talked to
someone at matlab about the interface, but they weren't interested in
it because their major thrust in future versions of matlab is to
improve their own graphics. We have a beta version of the next release
of matlab over here, and while they obviously have spent a great deal
of time improving their graphics, they still don't come close to looking
as nice or being as complete as PV wave. One problem with the new release
is that, if anything, their graphics are even slower than the old version!
Anyone who plots large vectors/matrices knows what a pain it is to sit there
and wait matlab to finish doing a plot or a mesh. PV wave is at least an
order of magnitude faster.

I also talked to a couple of sales reps at Precison Visuals about the interface. They showed genuine interest in it, but they either forgot about me or are dragging their feet. I know that there would be a lot of interest in this interface, but the PV people aren't doing anything about it. I'm not trying to sell it to them, rather I'd give it to them (if Lockheed will let me) if they would show some interest. The ironic thing is that they (the PV people) already talked to the Mathworks people about doing exactly what I've already done, but the Mathworks deep sized the idea (probably for the reason above).

If anyone out there is interested in helping me get this interface distributed via P.V., contact your local PV sales rep and tell them about the interface. If enough of their reps hear about it, I'm sure that I'll be getting a phone call from them sooner or later. Again, I'm not making any money off of this. I'm trying to give it away.

Kevin Anderson
kevin@dipl.rdd.lmsc.lockheed.com

Subject: Re: signal processing package for IDL
Posted by dpkemp on Thu, 30 Jul 1992 12:56:24 GMT
View Forum Message <> Reply to Message

In article <14663@umd5.umd.edu> dmatthews@uap.umd.edu writes:
> If you don't have to do your filtering in real time, do it in the
> frequency domain, i.e. take the Fourier transform of the data,
> _multiply_ the result by the desired transfer function, and transform
> that result back to the time domain. It's faster and easier to understand
> than filtering in the time domain directly.
>

I'm certain it isn't faster.
It may or may not be easier to understand.
I don't believe it is even possible to do exactly.

Everyone :-) knows that convolution in the time domain is equivalent to multiplication in the frequency domain, which is the basis for Fourier transform filtering. This works well if your filter has a relatively large, but finite length impulse response.

If the impulse response is short, filtering in the time domain takes much less computation than doing a forward and inverse FFT.

If the impulse response is infintely long (such as you might get with even a tiny single pole-pair filter, if the poles are near the unit circle), I don't know if it is even possible to do the filtering

using FFT's. If it is possible, then keeping track of the filter
state to enable reconstruction of the time domain signal from the
Fourier transform blocks is a nightmare.

Here is how to filter L samples of a signal X, producing signal Y, using
an all-pole filter of length N, in the time domain:

```
  do i = 1, L
    y(i) = x(i)
    do j = 1, N
      y(i) = y(i) + filt(j)*y(i-j)
    end do
  end do
```

I doubt that an FFT based filter could be any easier to understand than
that (but perhaps I am left-brained and you are right-brained, and "easy"
is in the eye of the beholder :-).

My complaint with PVI is that they don't seem to realize that all-pole
filters even exist. It seems like it would be easier for PVI to add
an IIR filter primitive to PV-wave, than for MathWorks to add good
graphics to Matlab!

Mr. Anderson's package to link Matlab and PV-wave sounds excellent,
and it would be great to have it included with the PV-wave distribution,
but I'd hate to tie up *two* expensive licenses on a routine basis
just so the user could do filtering and good graphics simultaneously.

--
  Dave Kemp   dpkemp@afterlife.ncsc.mil
 ---------- ----------
"The use of history as therapy means the corruption of history as history."
   -- Arthur Schlesinger   (quote stolen from Chet Ramey, CWRU)

Subject: Re: signal processing package for IDL
Posted by thompson on Thu, 30 Jul 1992 18:47:00 GMT
View Forum Message <> Reply to Message

In article <30JUL199213510325@stars.gsfc.nasa.gov>, bhill@stars.gsfc.nasa.gov (Robert S. Hill) writes...
> In article <1992Jul30.125624.3001@afterlife.ncsc.mil>, dpkemp@afterlife.ncsc.mil (David P. Kemp) writes...
>> In article <14663@umd5.umd.edu> dmatthews@uap.umd.edu writes:

(The text has been omitted, but the topic under discussion is support for

signal filtering functions in PV-wave.)

Has anybody looked into whether IMSL/IDL supports these filtering functions?

Bill Thompson

Subject: Re: signal processing package for IDL
Posted by bhill on Thu, 30 Jul 1992 18:51:00 GMT
View Forum Message <> Reply to Message

In article <1992Jul30.125624.3001@afterlife.ncsc.mil>, dpkemp@afterlife.ncsc.mil (David P. Kemp) writes...
> In article <14663@umd5.umd.edu> dmatthews@uap.umd.edu writes:
>> If you don't have to do your filtering in real time, do it in the
>> frequency domain, i.e. take the Fourier transform of the data,
> I'm certain it isn't faster.
> It may or may not be easier to understand.
> I don't believe it is even possible to do exactly.

My experience in astronomical image processing is that S/N has to be very good before you can consider using FFT-based methods. With noisy data, it's better to work in the domain of the data.

- Bob

Robert S. Hill | Internet: BHILL@STARS.GSFC.NASA.GOV
Hughes STX Corp. | Phone: 301/286-3624

Subject: Re: signal processing package for IDL
Posted by jacobsen on Fri, 31 Jul 1992 01:13:57 GMT
View Forum Message <> Reply to Message

To the guy with Matlab-PV~WAVE hooks:
What about contacting Research Systems Inc, makers of IDL (the father and now possibly better and more bug-free peer of PV~WAVE).

Subject: Re: signal processing package for IDL
Posted by greg on Wed, 19 Aug 1992 16:30:13 GMT
View Forum Message <> Reply to Message

jacobsen@bnlls1.nsls.bnl.gov (Chris Jacobsen) writes:
> To the guy with Matlab-PV~WAVE hooks:
> What about contacting Research Systems Inc, makers of IDL (the

> father and now possibly better and more bug-free peer of PV~WAVE).

The parent has some effect on the quality of the child, but that
effect is limited after the child leaves the nest.
Give PVI some credit. We have roughly twice as many engineers as
RSI working on bug fixes & enhancements to the original product.

'nuff said.

- Greg
--
Greg Holling | Voice: (303) 530-9000
Senior Member, Engineering | FAX: (303) 530-9329
Precision Visuals, Inc. | boulder!pvi!greg
="Beam me up, Scotty - there's no intelligent life down here."=
