Subject: Re: How to perform the 1-D signal filter?
Posted by Wox on Fri, 01 Feb 2008 17:16:30 GMT
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On Fri, 1 Feb 2008 07:16:26 -0700, David Fanning <news@dfanning.com>
wrote:

> Wox writes:
>
>> Example below filters in time or frequency domain:
>>
>>
>> ; Time domain
>> freq1=2.
>> freq2=3.
>> freq3=4.
>> dtime=0.1
>> ntime=1000
>>
>> time=dtime*findgen(ntime)
>> signal=sin(2*!pi*freq1*time)+sin(2*!pi*freq2*time)+sin(2*!pi *freq3*time)
>>
>> ; Time domain Filter
>> f_low = 0
>> f_high = 2.5
>> timefilter = DIGITAL_FILTER(f_low*2*dtime, f_high*2*dtime, 50.,40)
>> signal=convol(signal,timefilter)
>>
>> ; Frequency domain
>> nfreq=ntime/2+1
>>
>> freq=findgen(nfreq)/(dtime*ntime)
>> fsignal=fft(signal)
>>
>> ; Frequency domain filter (instead of time domain filter)
>> if n_elements(timefilter) eq 0 then begin
>> steep=20.
>> freqfilter= 1./(1.+(freq/f_high)^steep)
>> fsignal*=freqfilter
>> endif
>>
>> plot,freq,abs(fsignal[0:nfreq-1])^2,xtitle='frequency',ytitl e='spectrum'
>
> Wonderful example, but I'm trying to understand this whole
> subject. Do you think you could flush this out with a little
> explanation of what you are doing and why you choose the terms
> you use, etc.? What kind of frequency filter are you constructing
> here? I don't necessarily see it doing any filtering of the signal,

> at least if I pass it the original signal, rather than the signal
> that had already been filtered in the time domain, as written
> in your example.
>
> Cheers,
>
> Confused

Ok, sorry for the confusion, but I was just illustrating that you can do the same filtering in the frequency domain as in the time domain. You do one or the other, not both at the same time. Btw, convolution in one domain becomes multiplication in the other:

filtered = signal "convol" filter
fft(filtered) = fft(signal) x fft(filter)

But I guess you already knew all this.

The filter used is the Kaiser-Bessel filter. At least I think digital_filter is using this. For the filter I constructed in the fourier domain, I'm not quit sure whether it is really identical to the KB filter, but if you plot it, it looks like a nice lowpass filter to me :-).

I'm just typing this in a hurry... Did I answer your questions?
