Subject: Confusion about the filter in time and frequency domain
Posted by duxiyu@gmail.com on Tue, 05 Feb 2008 13:39:57 GMT
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Dear all,

There is an example about the signal filter which is given in this group.
But I have some questions about it, and I hope that anyone can unpuzzle them.
The code of the example is as follows:

```
; 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)

; Frequency domain
nfreq=ntime/2+1
freq=findgen(nfreq)/(dtime*ntime)
fsignal=fft(signal)

; 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)

; Time domain Filter in Frequency domain
ntime2=n_elements(timefilter)
nfreq2=ntime2/2+1
freq2=findgen(nfreq2)/(dtime*ntime2)
ftimefilter=fft(timefilter,1); == ntime2*fft(timefilter)

; Frequency domain filter (instead of time domain filter)
steep=50.
freqfilter= 1./(1.+(freq/f_high)^steep)
fsignal*=freqfilter

; Plot
window,0
 plot,freq,abs(fsignal[0:nfreq-1])^2,xtitle='frequency',ytitl e='spectrum',title='Time
domain filtered'
```

```
window,1
plot,freq,abs((fft(signal))
 [0:nfreq-1])^2,xtitle='frequency',ytitle='spectrum',title='F req domain
filtered'
window,2
 plot,freq,abs(freqfilter)^2,yrange=[0,1.1],ystyle=1,xtitle=' frequency',ytitle='spectrum',title='Filters'
oplot,freq2,abs((ftimefilter)[0:nfreq2-1])^2,col=128
```

In this example, max(abs(fsignal[0:nfreq-1])^2) = 0.249995 and
max(abs((fft(signal))[0:nfreq-1])^2) = 0.211242.
The peak of spectra in window 0 is not equal to it in window 1.
Does this difference between them result from the arithmetical errors
of the filters?
Is there any methods to eliminate it?

> ftimefilter=fft(timefilter,1); == ntime2*fft(timefilter)
Besides, I don't know why you use the inverse transform instead of the
forward transform in IDL to caculate ftimefilter.

Du
