Subject: Re: FFT confusion
Posted by jefield on Mon, 19 May 2003 15:46:19 GMT
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Kenneth Bowman <k-bowman@null.tamu.edu> wrote in message
news:<k-bowman-FF6825.10385215052003@news.tamu.edu>...
> In article <7126861e.0305150615.29c97045@posting.google.com>,
> jefield@taz.qinetiq.com (Julian Field) wrote:
>
>> Hi,
>>
>> I'd be enormously grateful if anyone could help me with this.
>>
>> I'm looking at the power spectra of "chirp" radio signals and am
>> having problems getting sensible plots. The following code should
>> generate a complex sinusoidal chirp whose frequency runs from 100 to
>> 150 Hz and then plot its power spectrum:
>>
>> However I'm getting a frequency spectrum running from 100 to *200* Hz
>> and I'm really confused. This problem has been bugging me for ages and
>> I'd be very grateful if anyone could point out my mistake(s).
>
> Your signal is not a linear combination of frequencies between 100 and
> 150 Hz. If it were you would get something like this.
>
> pro spec
> time = (2.0/1000)*findgen(1001) ; time (s). NB 1001 samples in 2s
> ; so sampling freq is 500 Hz thus
> ; Nyquist freq is 250 Hz
> i = complex(0,1)
>
> freq1 = REPLICATE(100.0, 1001) ; single frequency #1
> freq2 = REPLICATE(150.0, 1001) ; single frequency #2
>
> theta1 = 2*!pi*freq1*time ; chirp phase angle
> theta2 = 2*!pi*freq2*time ; chirp phase angle
> signal = exp(i*theta1) + exp(i*theta2)
>
> neg_freq_axis = reverse(-((250.0/500)*findgen(501)))
> pos_freq_axis = ((250.0/499)*findgen(500)) + 1.0
> freq_axis = [neg_freq_axis,pos_freq_axis] ; x-axis for plot
>
> window,2,xsize=500,ysize=250
> plot,freq_axis,alog10(shift(((abs(fft(signal)))^2),500)),$
> xrange=[0,260],$
> /xstyle,$
> xticklen=1,$
> xgridstyle=1,$

>   yticklen=1,$
>   ygridstyle=1
>
> end
>
> Even in this case you do not get perfect delta-function spikes in the
> power spectrum due to finite signal length and sampling.
>
> To construct your frequency-swept chirp, you have to use frequencies
> over a larger range than the "pure" frequencies contained in your signal.
>
> Ken Bowman

Thank you very much for your help.

Best wishes,

Julian
