Subject: Re: time vs longitude FFT
Posted by Kenneth Bowman on Mon, 29 Oct 2007 17:41:02 GMT
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In article <1193671433.271745.268030@57g2000hsv.googlegroups.com>,
knielsen73@gmail.com wrote:

> Hi,
>
> I have a time vs longitude plot and would like to do a 2-D FFT to get
> a frequency vs wavenumber plot. I used the IDL FFT but I am not sure
> what the output is...I didn't feel the IDL help was very helpful
> there. I found a post from 1998 but there were some non-defined
> functions and I wasn't exactly sure what they did.
>
> Does anybody have a good example on how to use 2D FFT in IDL or some
> good documentation?
>
> Cheers,
> Kim

The main issues with the IDL FFT (or any FFT for that matter) are
sorting out the order in which the coefficients are stored and
understanding how the sine and cosine components are represented in
a complex FFT.

My recommendation is that you create an artificial, low-resolution,
input data set that contains some simple combination of sines and
cosines and that you understand completely. Then look at the FFT.
Or you can buy my book (An Introduction to Programming with IDL),
which has a chapter that does exactly that for the 1-D case.

Ken Bowman

Subject: Re: time vs longitude FFT
Posted by R.G.Stockwell on Mon, 29 Oct 2007 18:41:20 GMT
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<knielsen73@gmail.com> wrote in message
news:1193671433.271745.268030@57g2000hsv.googlegroups.com...
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>
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> functions and I wasn't exactly sure what they did.

>
> Does anybody have a good example on how to use 2D FFT in IDL or some
> good documentation?

a little example:nx = 100
ny = 200
x = (fltarr(ny)+1) ## findgen(nx)
y = findgen(ny) ## (fltarr(nx)+1)
kx = 20.5/nx
ky = 0./ny

;image
a =cos(2*!pi*(kx*x + ky*y))

;spectrum in 2d
spe = fft(a)

kxvalues = findgen(nx)/nx - 1./2
kyvalues = findgen(ny)/ny - 1./2

!p.multi=[0,1,2]
contour,a,/fill,nlevels=14

; shift to get the normal representation,
; i.e. (neg kx, 0, pos kx)
shiftspe = shift(spe,nx/2,ny/2)

contour,abs(shiftspe),kxvalues,kyvalues,/fill,nlevels=14

Note: it is symmetric about the origin.

Cheers,
bob

Subject: Re: time vs longitude FFT
Posted by knielsen73 on Mon, 29 Oct 2007 21:14:29 GMT
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On Oct 29, 2:41 pm, "R.G. Stockwell" <noem...@please.com> wrote:
> <knielse...@gmail.com> wrote in message
>
> news:1193671433.271745.268030@57g2000hsv.googlegroups.com...
>
>> Hi,
>

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>
> !p.multi=[0,1,2]
> contour,a,/fill,nlevels=14
>
> ; shift to get the normal representation,
> ; i.e. (neg kx, 0, pos kx)
> shiftspe = shift(spe,nx/2,ny/2)
>
> contour,abs(shiftspe),kxvalues,kyvalues,/fill,nlevels=14
>
> Note: it is symmetric about the origin.
>
> Cheers,
> bob

Thanks Bob,

I works great with your example. However, when I made a wave with a wavenumber larger than 1, the scale no longer agrees. I can plot it "raw", but again, not sure how to read the values with respect to the real wave number and frequency. Here is the wave I gave as input.

;input a wave number two with an amplitude of 10.
;and eastward phase propagation of 1.7 days

```
   amp = 10.
   wave_number = 2
   wavelength = float(jmax)/wave_number
   period = 6.8333333

   for j=0,jmax-1 do begin
    for n=0,nmax-1 do begin
    data_in[j,n] = amp*sin(2.*!pi*j/wavelength - 2.*!pi*n/period) +$
     amp*.5*cos(2.*!pi*j/wavelength - 2.*!pi*n/period)
endfor
   endfor
```

Cheers,
Kim

Subject: Re: time vs longitude FFT
Posted by R.G.Stockwell on Mon, 29 Oct 2007 21:52:39 GMT
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<knielsen73@gmail.com> wrote in message
news:1193692469.369318.51960@50g2000hsm.googlegroups.com...
>> kxvalues = findgen(nx)/nx - 1./2
>> kyvalues = findgen(ny)/ny - 1./2

Note, in the above, it shows that the sampling interval is 1.
You should divide by your sampling interval there if it is not 1.

```
>     amp = 10.
>     wave_number = 2
>     wavelength = float(jmax)/wave_number
>     period = 6.8333333
>
>     for j=0,jmax-1 do begin
>     for n=0,nmax-1 do begin
>      data_in[j,n] = amp*sin(2.*!pi*j/wavelength - 2.*!pi*n/period) +$
>      amp*.5*cos(2.*!pi*j/wavelength - 2.*!pi*n/period)
```

for one thing, you are adding 2 out of phase waves here. Remove the
first term (and just use the cos).

Also, do just 1D to ensure that you are calculating the correct
period and freq.

f = 12/len
data = amp*cos(2 !pi f t)

Subject: Re: time vs longitude FFT
Posted by R.G.Stockwell on Mon, 29 Oct 2007 21:54:26 GMT
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"R.G. Stockwell" <noemail@please.com> wrote in message
news:47265628$0$497$815e3792@news.qwest.net...
>
> Also, do just 1D to ensure that you are calculating the correct
> period and freq.
>
> f = 12/len
> data = amp*cos(2 !pi f t)

oops sorry about that, i've got a 1 yr old climbing on the
laptop.

Anyways, do the example in 1D first with a simple cos,
to ensure that you are calculating the correct freqs.

Cheers,
bob

Subject: Re: time vs longitude FFT
Posted by knielsen73 on Tue, 30 Oct 2007 00:29:21 GMT
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On Oct 29, 5:54 pm, "R.G. Stockwell" <noem...@please.com> wrote:
> "R.G. Stockwell" <noem...@please.com> wrote in message
>
> news:47265628$0$497$815e3792@news.qwest.net...
>
>
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> laptop.
>
> Anyways, do the example in 1D first with a simple cos,
> to ensure that you are calculating the correct freqs.
>
> Cheers,
> bob

thanks Bob...got it!
