Subject: Re: FFT with NANs in an array
Posted by Kenneth P. Bowman on Fri, 21 Jul 2006 02:48:56 GMT
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In article <1153439903.349812.299130@75g2000cwc.googlegroups.com>,
adisn123@yahoo.com wrote:

> My purpose here is to get rid of low frequency by applyting high pass
> filter into my image.
> My image is quite huge (about 10,000 x 10,000 pixel size).
>
> Then, if my image has NANs, what is the reaction of FFT into that?
> What does FFT consider those NANs as?
>
> When I do FFT, it certainly doesn't give me any errors, then does it
> mean
> FFT reads NANs as some sort of data values?
>
> Thanks.

The FFT is a clever algorithm for performing a discrete Fourier transform. At bottom it amounts to a lot of dot products (additions and multiplications).

The example below demonstrates the effects of having NaNs in the input data. (The IDL FFT function must turn off floating-point error notification, which is an odd thing to do.)

Since your interest is high-pass filtering, you could use a curve-fitting routine to fit a smooth function to the data and then subtract it from the original data. There are least-squares methods and nonlinear approaches, such as Craig Markwardt's MPFIT (http://cow.physics.wisc.edu/~craigm/idl/).

Interpolating the gaps will introduce high-frequency components and should probably be avoided.

Ken Bowman

```
n  = 8
x  = RANDOMN(seed, n)
xt = FFT(x)
xx = FFT(xt, /INVERSE)
PRINT, 'No NaNs'
PRINT, 'x  = ', x
PRINT, 'xt = ', xt
PRINT, 'xx = ', FLOAT(xx)
```

```
x[5] = !VALUES.F_NAN
xt   = FFT(x)
xx   = FFT(xt, /INVERSE)
PRINT
PRINT, 'One NaN'
PRINT, 'x  = ', x
PRINT, 'xt = ', xt
PRINT, 'xx = ', FLOAT(xx)
```

```
No NaNs
x  =     -0.303949     1.09403     0.627827     1.23538     -1.09260
-0.563133   0.00560129
      1.14969
xt = (     0.269105,      0.00000)(     0.237482,    -0.231826)(
-0.253748,     0.231771)
(   -0.0403187,   -0.0762694)(    -0.459886,     -0.00000)(
-0.0403187,    0.0762694)
(    -0.253748,    -0.231771)(     0.237482,     0.231826)
xx =     -0.303949     1.09403     0.627827     1.23538     -1.09260
-0.563133   0.00560129
      1.14969

One NaN
x  =     -0.303949     1.09403     0.627827     1.23538     -1.09260
NaN   0.00560129
      1.14969
xt = (          NaN,          NaN)(          NaN,          NaN)(
NaN,          NaN)
(          NaN,          NaN)(          NaN,          NaN)(
NaN,         -NaN)
(          NaN,         -NaN)(          NaN,         -NaN)
xx =           NaN          NaN          NaN          NaN          NaN
NaN          NaN
          NaN
```