
Subject: FFT and ROTATE

Posted by [whein](#) on Wed, 03 Sep 2008 22:20:19 GMT

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Hello,

I have been wrestling with the FFT and ROTATE functions recently. One of the properties of the Fourier transform is that the transform of a rotated object is equal to the rotation of the transform of the unrotated object. To test this in IDL, I took the FFT of an nxn array (called image) and the FFT of that array rotated 90 degrees, image90 = ROTATE(image,1). Then, I sorted the real and imaginary parts of the coefficients of the results of the FFTs and compared the sorted values. I expected that the sorted list of real parts from the FFT of the original and rotated arrays would be identical, and that the same would be true for the imaginary parts. This is not the case. The sets of the magnitudes of the coefficients are equal, as expected.

I understand that edge effects can play a role, but when I rotate a square array by 90 degrees, I expect that the sets of real and imaginary values that define the coefficients to be equal.

Is this a consequence of how the FFT is calculated -- rows first then columns or vice versa? Or is there something else going on? Any help or suggestions will be greatly appreciated.

Here is some code I am using to try to wrap my head around this.

Thanks,
Will

```
pro rotFFTtest
;;load an image
fn = filepath('md1107g8a.jpg',SUBDIRECTORY='examples/data')
image= read_image(fn)
image90 = rotate(image,1)

;;display the images
tvsc1,image,0
tvsc1,image90,1

n = n_elements(image)

;;take fft of image, then get the real and imaginary parts
f = fft(image)
fr = real_part(f)
fi = imaginary(f)
```

```
;;take the fft of image90 then get the real and imaginary parts.
f90 = fft(image90)
fr90 = real_part(f90)
fi90 = imaginary(f90)

;;sort and print the real and imaginary parts
frs = sort(fr)
fr90s = sort(fr90)
fis = sort(fi)
fi90s = sort(fi90)

;;print some of the sorted coefficients
print,'fr[frs[[1:4]]]',fr[frs[1:4]]
print,'fr90[fr90s[[1:4]]]',fr90[fr90s[1:4]]

;print all of the sorted coefficients
;print,'Real','Real rotated','Imag.','Imag. rotated',FORMAT='(4A17)'
;for i = 0L,n-1L do
  print,fr[frs[i]],fr90[fr90s[i]],fi[fis[i]],fi90[fi90s[i]],FO RMAT='(4G17.13)'
end
```
