Subject: Using 1D FFT to decompose the provided hurricane data in terms of wavenumbers.
Posted by twiel002 on Wed, 04 Mar 2015 23:10:54 GMT
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I have 240x240 array of hurricane wind speed.

1) I need to covert to polar coordinates and plot the speed on a contour map with a radius of [-108,108], however what I have doesn't appear to be correct.

My Code:

```
Pro Projet2COORD

;;;---Reading in the data---;;;


  rows = 240
  cols = 240
  spd = FltArr(240,240)
  OpenR, lun, 'speed.csv', /Get_Lun
  ReadF, lun, spd
  Free_Lun, lun
  print, spd

  rows = 240
  cols = 240
  X = FltArr(240,240)
  OpenR, lun, 'Xdir.csv', /Get_Lun
  ReadF, lun, X
  Free_Lun, lun
  print, X

  rows = 240
  cols = 240
  Y = FltArr(240,240)
  OpenR, lun, 'Ydir.csv', /Get_Lun
  ReadF, lun, Y
  Free_Lun, lun
  print, Y

;;;---Interpolate the coordinates---;;;

R=sqrt(X^2+Y^2)
Theta=atan(Y/X)*2*!PI
spd1=Polar_Surface(spd, R, Theta)

unsmooth = CONTOUR(spd1, TITLE='Hurricane Wind Speed', $
```

LAYOUT=[2,1,1], RGB_TABLE=13, /FILL, N_LEVELS=12)

; Draw the outline of the 12 levels
outline1 = CONTOUR(spd1, N_LEVELS=12, /OVERPLOT)

2) I need to then decompose the speed into wavenumbers using a 1D FFT, however I have no idea how to plot these wavenumbers on a similar plot to the polar plot from above.
I need wavenumbers 0-3, the sum of those wavenumbers, and wavenumbers 0-9.
Any assistance is appreciated.

Subject: Re: Using 1D FFT to decompose the provided hurricane data in terms of wavenumbers.
Posted by Burch on Thu, 05 Mar 2015 15:32:21 GMT
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On Wednesday, March 4, 2015 at 5:11:01 PM UTC-6, twie...@fiu.edu wrote:
> I have 240x240 array of hurricane wind speed.
>
> 1) I need to covert to polar coordinates and plot the speed on a contour map with a radius of [-108,108], however what I have doesn't appear to be correct.

> Theta=atan(Y/X)*2*!PI

Calculating theta in this way will give you incorrect results. For instance, notice that

```
IDL> y = 1.0/2.0
IDL> x = -1.0/2.0
IDL> print, atan(y/x)
   -0.785398
```

and

```
IDL> y = -1.0/2.0
IDL> x = 1.0/2.0
IDL> print, atan(y/x)
   -0.785398
```

give the same result even though the locations are in different quadrants! You should use the two argument form of atan()

Theta = atan(y, x)

This will give you results ranging from -pi to pi. To change to 0 to 2 pi do

Theta = (theta + 2.0*!pi) mod (2.0*!pi)

-Jeff

Subject: Re: Using 1D FFT to decompose the provided hurricane data in terms of wavenumbers.
Posted by Burch on Thu, 05 Mar 2015 15:41:43 GMT
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> Theta = atan(y, x)
>
> This will give you results ranging from -pi to pi. To change to 0 to 2 pi do
>
> Theta = (theta + 2.0*!pi) mod (2.0*!pi)

Or, obviously, just combine the two lines

theta = (atan(y,x) + 2.0*!pi) mod (2.0*!pi)
