Python Primer 2

Numpy, Scipy and Matplotlib

Notes from last time

- Precision stuff

  - Python has 4 numeric types

    - plain integers (C long)

    - long integers (arbitrary length)

    - floating point numbers (C double)

    - complex numbers (pair of C doubles)

  - Sys.float_info

  - Sys.maxint

  - Integer division is used between plain/long integers (rounding down)

What will be covered

- Numpy overview

- Scipy overview

- Matplotlib overview

- NetCDF I/O

- Example code demonstrating use of some of these features

Numpy

- Array Creation and Manipulation

  - Indexing, reshaping, etc.

- Mathematical Operations

  - Trig functions, abs, log, etc.

- Logical Operations

  - Greater, less, isnan

- Basic Statistics

  - Means, variances, correlation

Scipy

- Fourier Transforms

- Linear Algebra

- Signal processing, sparse matrices, graphs, integration, optimization, interpolation, image processing, etc.

Matplotlib

- Line plots (including log-log and semi-log)
- Contour Plots (filled/unfilled)
- Scatter Plots
- Basemap Plots

- Quiver Plots, 3D plotting, pie charts, histograms, polar plots, correlation plots, subplot

NetCDF I/O

- There are 5 different packages presenting 3 different API's
    - PyCDF
    - Scientific.IO.NetCDF: python-netcdf or pupynere
    - Python-netcdf4 / scipy.io.netcdf
- I will show input using the scipy.io.netcdf API and package since that is what I am familiar with
- Haven't done much NetCDF output

Example Code

- Read in a NetCDF File

- Do some statistics, linear algebra (EOF Analysis) and FFT (power spectrum) stuff

- Plot some stuff: scatter plots, line plots, semilog plots, contour plots, Basemap plots

Preview for next time

- Sys
- Csv package
- Cfg package
- Namelist package (Fortran namelists)
- Use of python as a glue language
- What else do you guys want to see?