

4/27/2015 -5/21/2015

Introduction to Signal Processing Practice Section

**School of Information Science & Technology
ShanghaiTech University**



信息科学与技术学院

School of Information Science and Technology



Needed Python Packages

SciPy:

- ✓ a collection of mathematical algorithms and convenience functions built on the Numpy extension of Python
- ✓ adds significant power to the interactive Python session
 - ✓ high-level commands and classes for manipulating and visualizing data]
- ✓ a data-processing and system-prototyping environment rivaling systems such as MATLAB, IDL, Octave, R-Lab, and SciLab
- ✓ link to tutorials

<http://docs.scipy.org/doc/scipy/reference/tutorial/general.html>

Matplotlib:

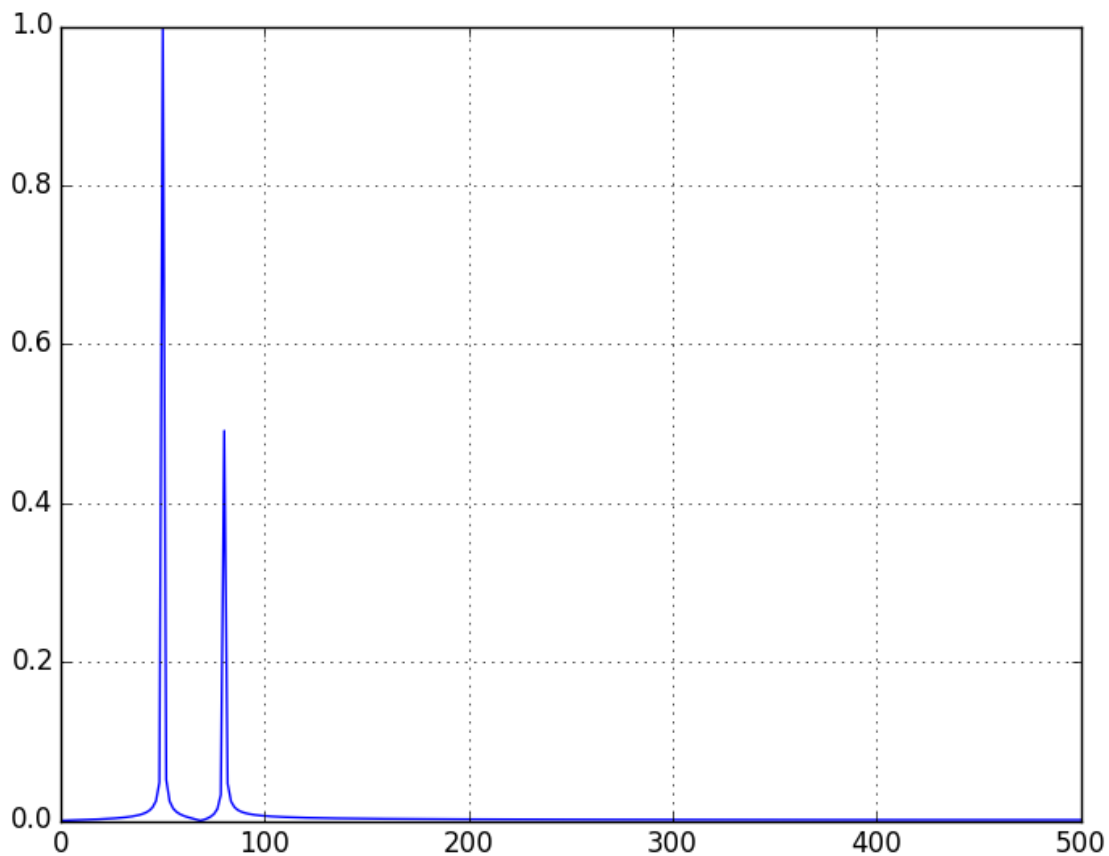
- ✓ matplotlib is a python 2D plotting library which produces publication quality figures in a variety of hardcopy formats and interactive environments across platforms.

Numpy:

- ✓ NumPy is the fundamental package for scientific computing with Python.

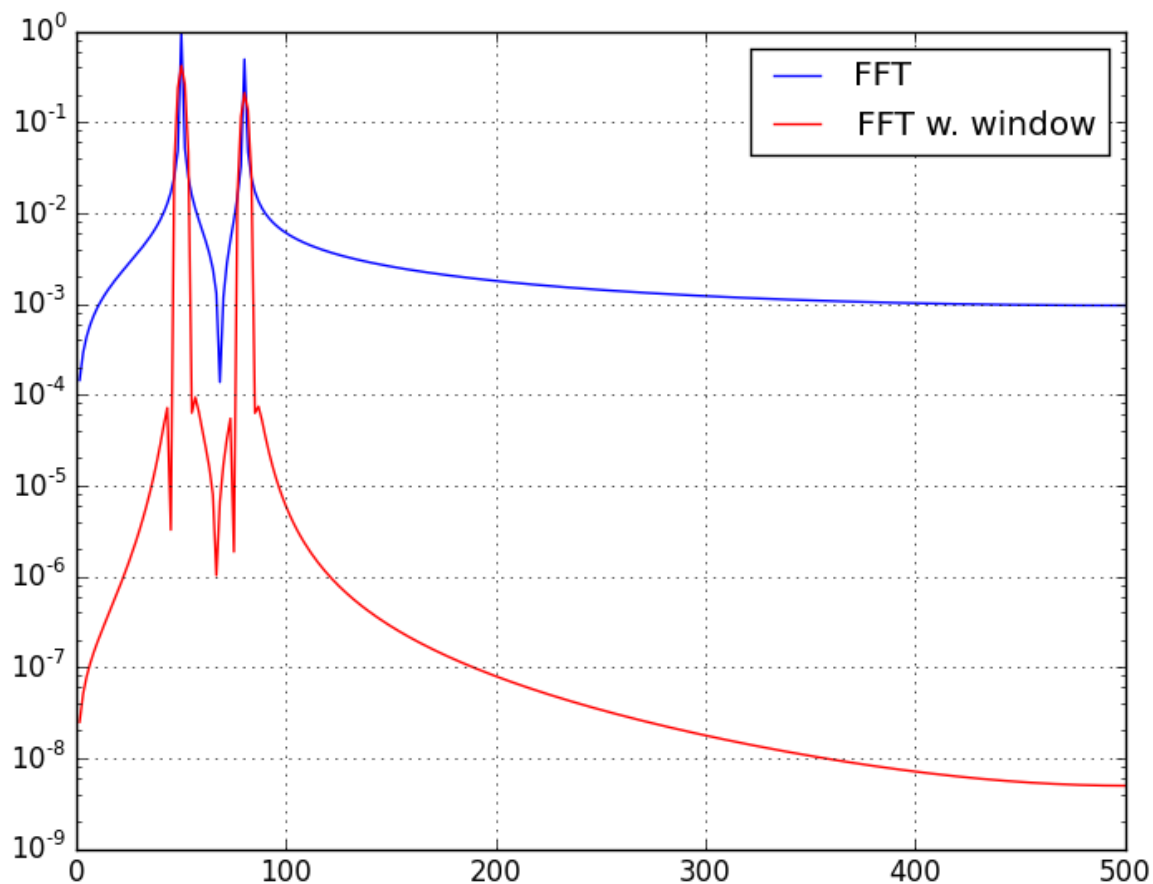


Simple FFT



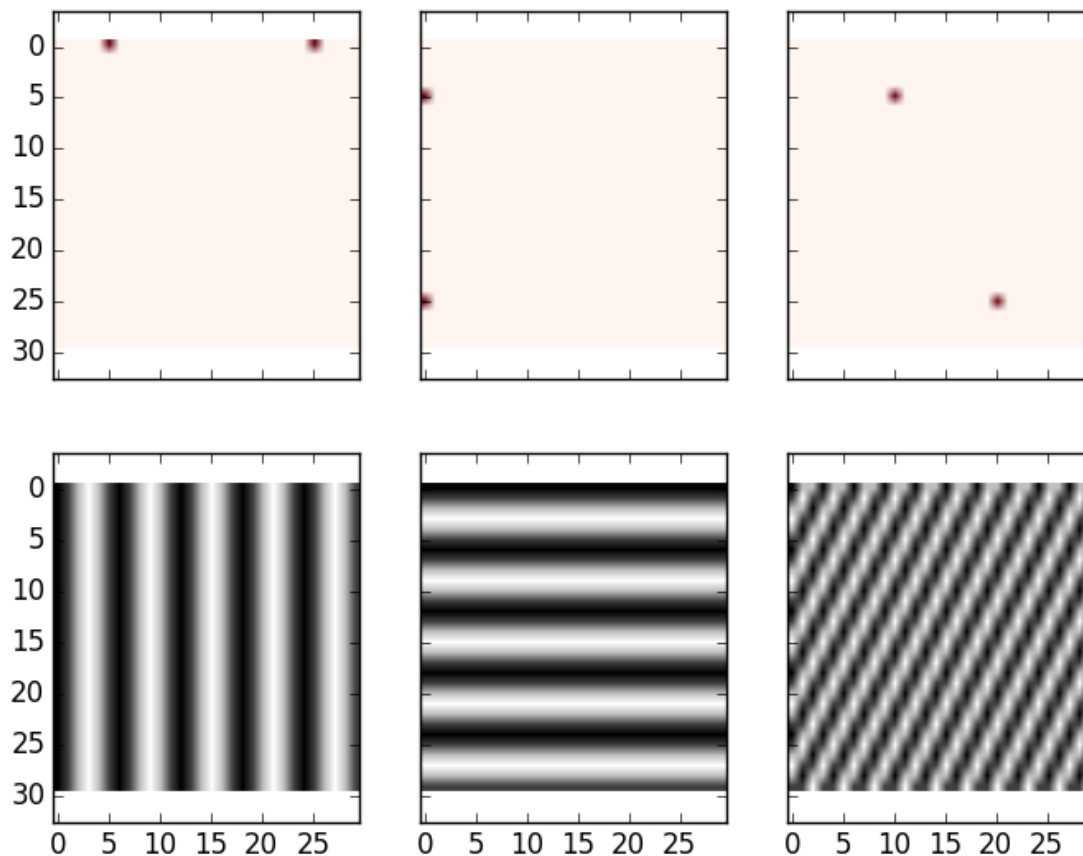


Blackman Window FFT



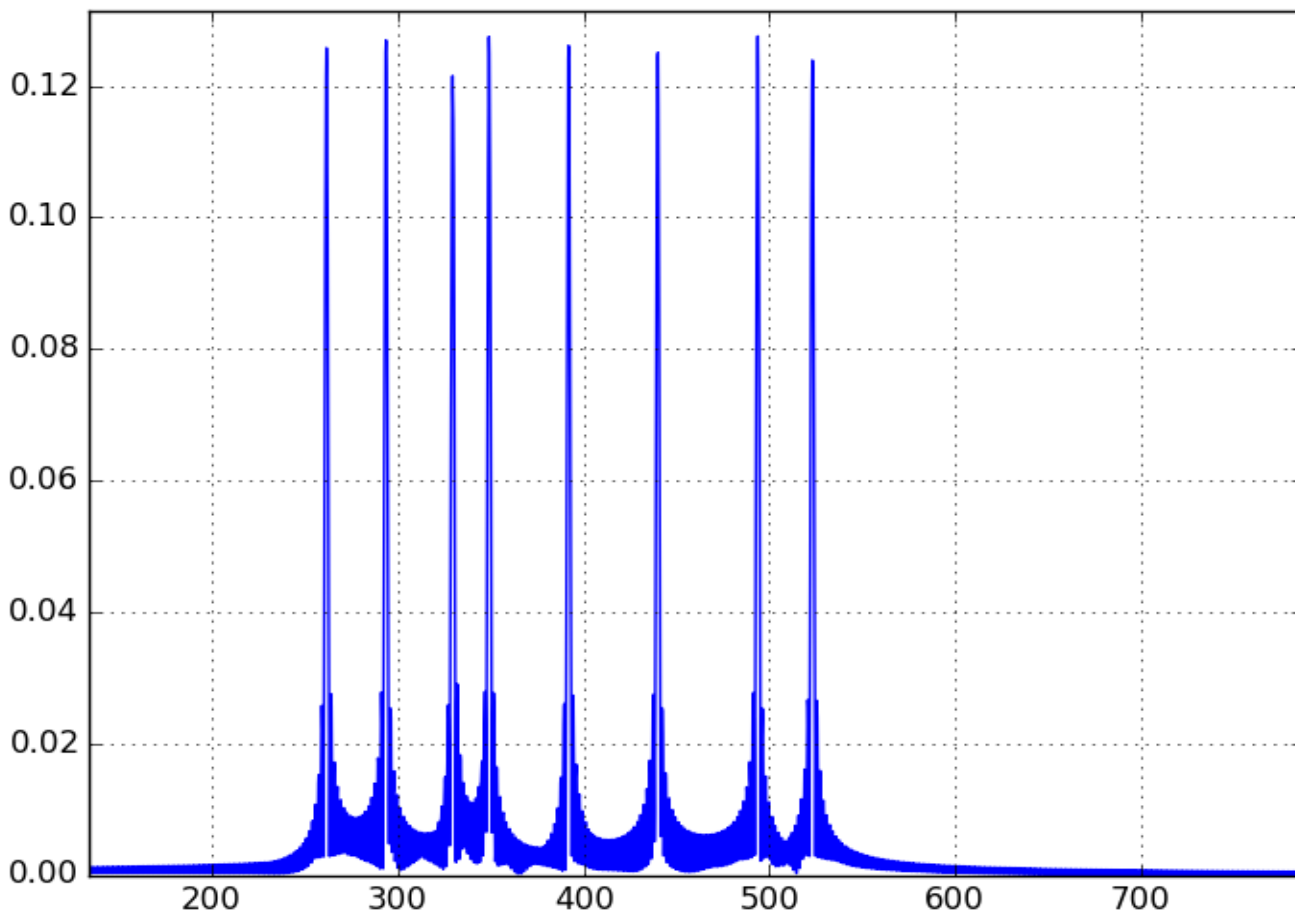


2D-FFT



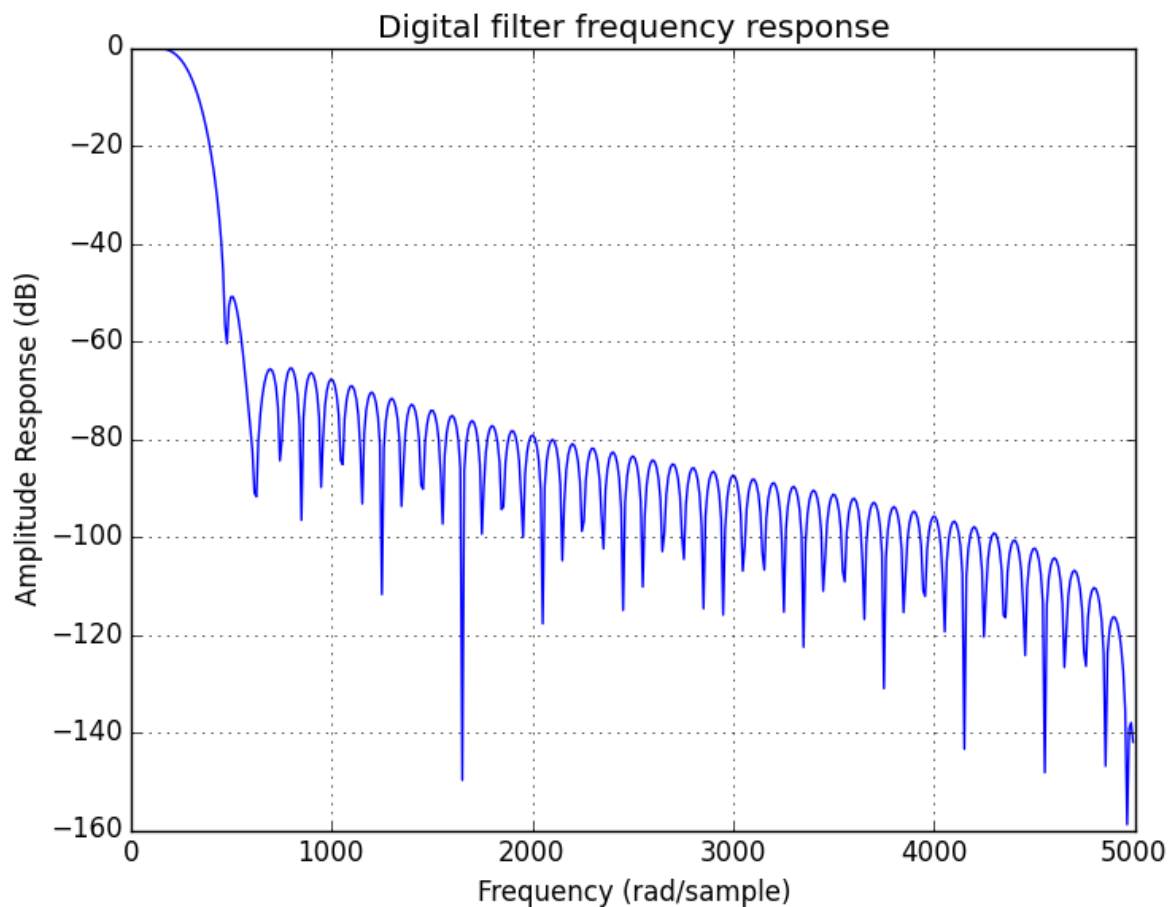


Filter Sound: Original



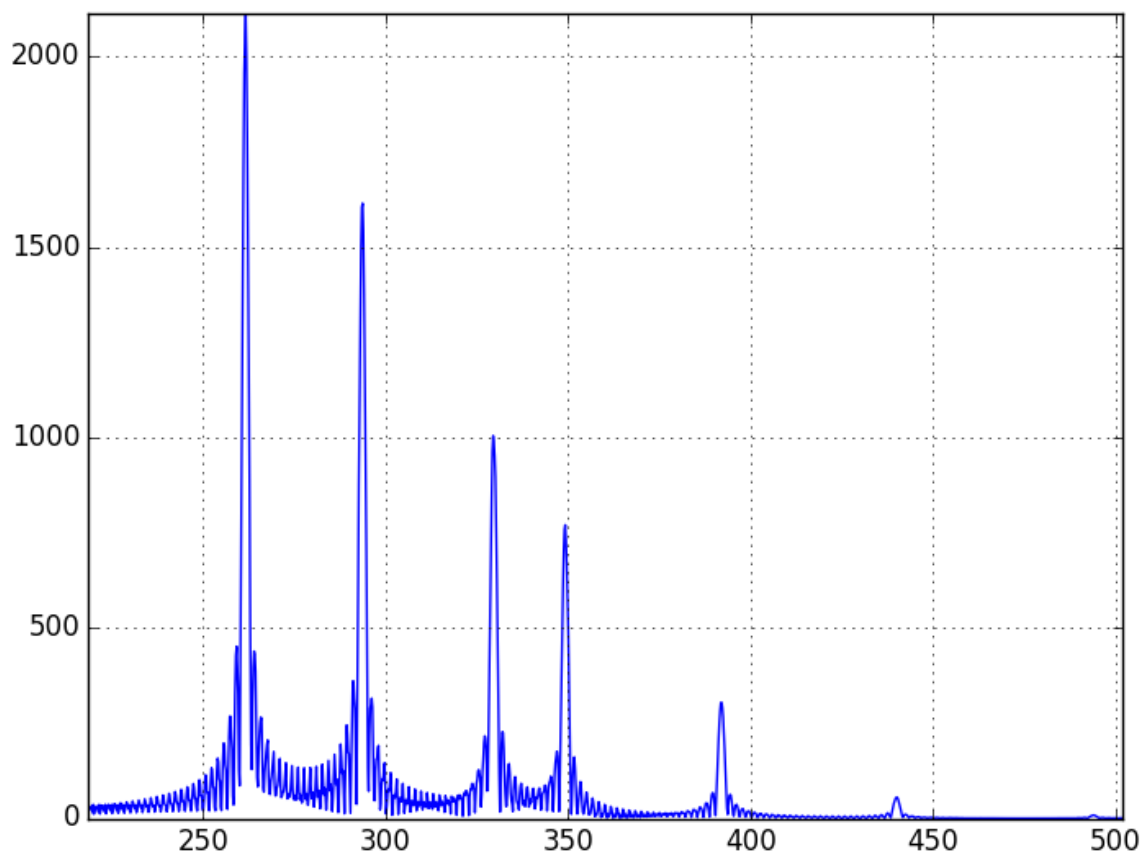


Filter Sound: Filter



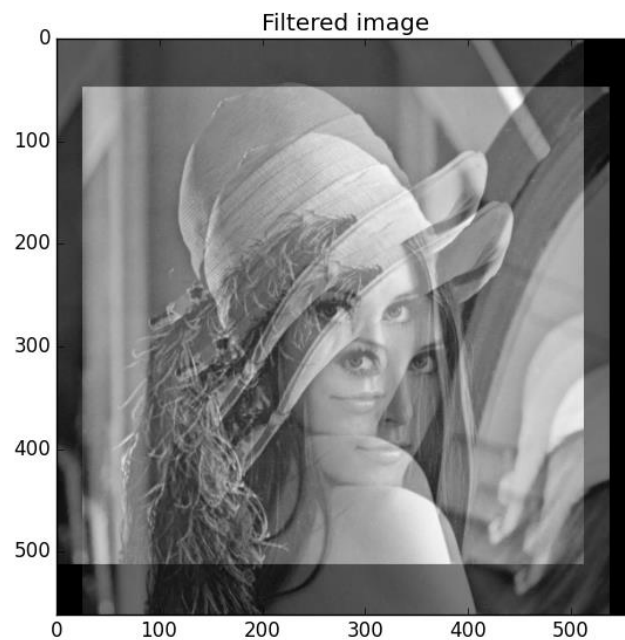
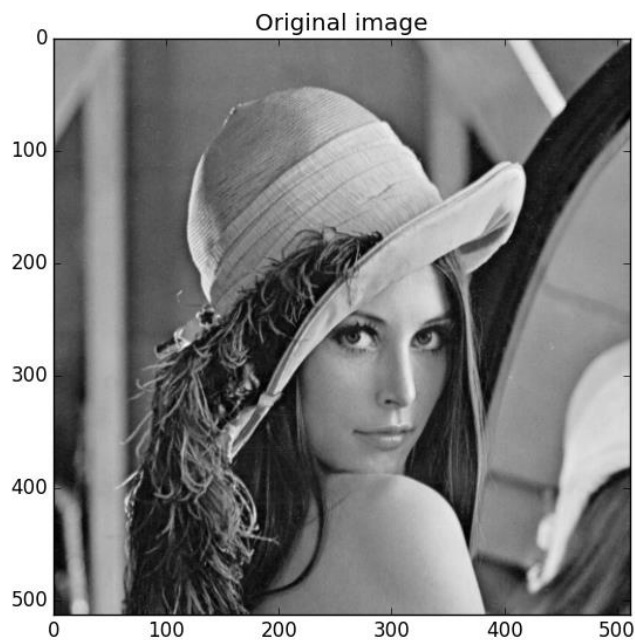


Filter Sound: Filtered Sound



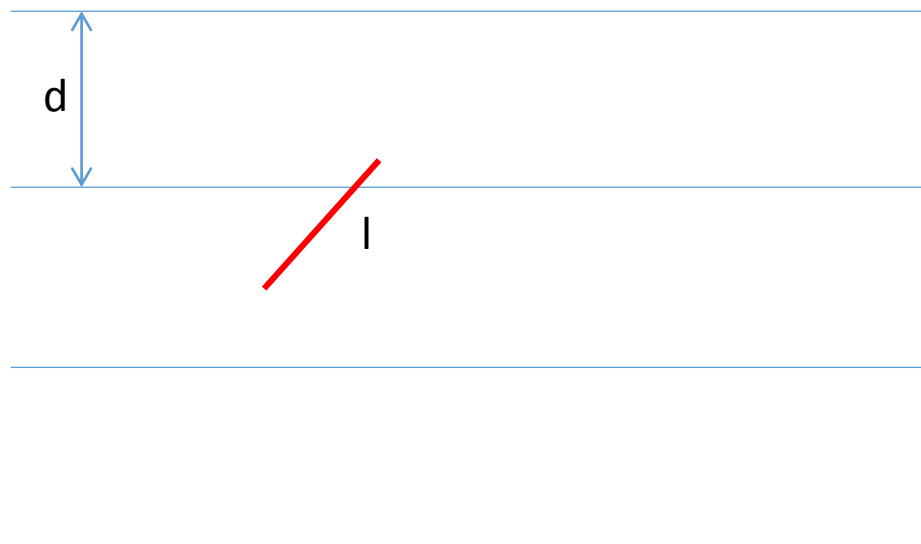


Filter Image





Compute Pi: Buffon's needle



$$P(\text{cross a line}) = \frac{2l}{d\pi}$$

*Buffon [1707-1788]
French Mathematician*

An early variant of the Monte Carlo method!



Compute Pi: Buffon's needle

In the program, you can set:

$d=2$

$l=1$

We can do random experiments
20000 times, here is what I get:

#Cross = 6349

Est. of Pi

$$= 20000/\text{\#Cross}$$

$$= 3.15$$

```
PyDev - Test/BufferNeedle.py - Eclipse
File Edit Source Refactoring Navigate Search Project Pydev Run Window Help
BufferNeedle.py
1 from pip._vendor.distlib.compat import raw_input
2 import math
3 import random
4 import numpy as np
5 import matplotlib as mpl
6 import matplotlib.pyplot as plt
7 from scipy.fftpack import fft
8 from scipy import signal, misc
9 from scipy.io.wavfile import read
10
11
12 numExperiments = 20000;

Console - PyUnit
<terminated> C:\XILIANGL\RESEARCH\PythonWS\Test\BufferNeedle.py
theta= 0.6078246849845903
x= 1.5623610716057712
theta= 1.3711088723464946
1/2*math.sin(theta)= 0.49006431159352226
y= 0.4376389283942288
x= 0.4930867114247939
theta= 1.7127518112345477
1/2*math.sin(theta)= 0.4949706143723628
y= 0.4930867114247939
x= 1.027136786684154
theta= 2.2582052826089067
x= 0.61699066391256
theta= 0.3175909545442782
x= 1.7380995457709552
theta= 1.4600599230965494
1/2*math.sin(theta)= 0.4969374936554262
y= 0.26190045422904484
x= 0.11598208454493775
theta= 2.862853079274258
1/2*math.sin(theta)= 0.13757204520343622
y= 0.11598208454493775
x= 0.7787056589148853
theta= 2.19745925669236
x= 1.3091825365990353
theta= 2.6103056432065754
#Experiments = 20000
#Cross = 6349
Est. of Pi= 3.1501023783272957
```