Random walks, Plotting

6.100 LECTURE 5

SPRING 2026

Announcements

- Pset 2 due next Monday 2/23
  - use as metric whether you'd feel more comfortable in 6.100 or 6.100A

- Pset 1 checkoff due Friday 2/20

- No pre-lecture code for tomorrow's lecture

- Exam 1 next Wednesday 2/25 during class, in Walker (50-340)
  - more details to be announced tomorrow

Review functions as arguments

Funtion call mechanics: review

1. Retrieve function object

2. Evaluate arguments in order

3. **Set up frame** for function call

4. Assign parameter names in frame

5. Run body wrt frame until `return`

6. **Remove frame,** and substitute the returned object for the function call

Random walks

Last time

- Write stochastic programs
  - uncertainty in modeling processes
    - rolling dice
    - people's birthdays
  - use random module to sample outcomes

- Stochastic processes can provide insight on deterministic quantities
  - e.g., estimating pi

- Basic plotting
  - histogram of samples

Random walk model

- A **process** of random steps
  - start at a location
  - go in a random direction
  - repeat forever

- Applications
  - robot path-planning
  - web-crawling by search engines
  - ray-tracing for graphics
  - physics simulations of fluids

Plotting

matplotlib library

- A third-party module
  - ◦ installation instructions in Pset 2

- Python modules are "namespaces"
  - ◦ look like frames: map names to
  - ◦ but they are objects on the heap
  - ◦ module name is a variable in global frame, pointing to modul object on heap

- dot-notation
  - ◦ *`module.name`* → any object on the heap

- **`import matplotlib.pyplot`**

- **`import matplotlib.pyplot as plt`**

matplotlib documentation

- <https://matplotlib.org/>
  - Start with links in top bar
  - Plot types, User guide, Tutorials, Examples

- Reference pages
  - pyplot interface
  - make a figure window
    - `figure()`
  - plot data in a figure
    - `plot()  scatter()  hist()  errorbar()`
  - label and format the plot
    - `title()  xlabel()  ylabel()  xlim()  ylim()`
      `grid()  legend()`

Next time

- **So far**
  - get samples from random distributions or processes
  - average the results to form an estimate
  - plot the results to view the distribution

- **Tomorrow**
  - be more rigorous about characterizing the results
  - how good is our estimate?
  - how much uncertainty in the distribution?