CompSci 101
Introduction to Computer Science

March 24, 2016

Prof. Rodger

Announcements

• Reading and RQ 15 due next time
• Assignment 6 out today
• APT 7 due today, APT 8 due Tuesday
  – Pick 2 hours to take it
• Today:
  – Finish from last time
  – Dictionaries – a way to organize data for fast lookup

LAST TIME:

Problem: Popular Name
• Given a list of names, determine the most popular first name and print that name with all of its last names.
• Input: Names are always two words, names are in a file. If multiple names are on the same line they are separated by a “:".
• Output: Most popular first name, followed by a “:" , followed by corresponding last names separated by a blank

Example Input File with 5 lines

Susan Smith:Jackie Long:Mary White
Susan Brandt
Jackie Johnson:Susan Rodger:Mary Rodger
Eric Long:Susan Crackers:Mary Velios
Jack Frost:Eric Lund

Corresponding Output

Susan: Smith Brandt Rodger Crackers
Example – two lists

<table>
<thead>
<tr>
<th></th>
<th>firstNames</th>
<th></th>
<th>lastNames</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>'Susan'</td>
<td>0</td>
<td>['Smith', 'Brandt', 'Rodger', 'Crackers']</td>
</tr>
<tr>
<td>1</td>
<td>'Jackie'</td>
<td>1</td>
<td>['Long', 'Johnson']</td>
</tr>
<tr>
<td>2</td>
<td>'Mary'</td>
<td>2</td>
<td>['White', 'Rodger', 'Velios']</td>
</tr>
<tr>
<td>3</td>
<td>'Eric'</td>
<td>3</td>
<td>['Long', 'Lund']</td>
</tr>
<tr>
<td>4</td>
<td>'Jack'</td>
<td>4</td>
<td>['Frost']</td>
</tr>
</tbody>
</table>

Now can we solve the problem?

- Compute those two lists that are associated with each other
  - List of unique first names
  - List of corresponding last names
- Compute the max list of last names
- Now easy to print the answer.
- See popular.py

This function generates the list of lists of corresponding last names

def correspondingLastNames(data, firstNames):
    lastNames = []
    for name in firstNames:
        lastNames.append(allLastNames(data, name))
    return lastNames

Answer questions about bit.ly/101sp16-0324-1

- Printing first names with corresponding last names
- Reading data from files
Finish

maxnum = max([len(item) for item in lastNames])
print maxnum

lastIndex = [index for (index, v) in enumerate(lastNames) if len(v) == maxnum]
print "first name with most last names is:"

Expanding the Problem

• Suppose we want to read from multiple data files
   names1.txt, names2.txt, names3.txt

  See processFiles in popular.py

Another way – list of lists
First word in each list is a first name
The rest are last names.

<table>
<thead>
<tr>
<th></th>
<th>Susan, Smith, Brandt, Rodger, Crackers</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Jackie, Long, Johnson</td>
</tr>
<tr>
<td>2</td>
<td>Mary, White, Rodger, Velios</td>
</tr>
<tr>
<td>3</td>
<td>Eric, Long, Lund</td>
</tr>
<tr>
<td>4</td>
<td>Jack, Frost</td>
</tr>
</tbody>
</table>

ACM Turing Award Winners 2015

Cryptography Pioneers Receive 2015 ACM A.M. Turing Award
Whitfield Diffie, former Chief Security Officer of Sun Microsystems and Martin E. Hellman, Professor Emeritus of Electrical Engineering at Stanford University, are the recipients of the 2015 ACM A.M. Turing Award, for critical contributions to modern cryptography. The ability for two parties to communicate privately over a secure channel is fundamental for billions of people around the world.
Dictionaries/Maps

- Dictionaries/maps are another way of organizing data
- Keys and Values
  - Each key maps to a value
  - Some keys can map to the same value
  - Can change the value a key maps to

Example

- Each student could be mapped to their favorite ice cream flavor

Implementing a Dictionary/Map

- Keys map to values
  - Create Empty dictionary
    ```python
somemap = {}
```
  - Put in a key and its value
    ```python
    somemap["Forbes"] = "Strawberry"
    ```
  - Get a value for a dictionary
    ```python
    value = somemap["Forbes"]
    OR value = somemap.get("Forbes", "default")
    ```
  - Change a value for a dictionary
    ```python
    somemap["Forbes"] = "Chocolate"
    ```

How is dictionary different than a list?

- List – have to search for name first
- Dictionary – each key maps to a value
- getting name (or key) is automatic! Fast!
More on using a Dictionary/Map

- Get all the keys (as a list)
  - `listKeys = somemap.keys()`
- Get all the values (as a list)
  - `listValues = somemap.values()`
- Other methods
  - `clear` - empty dictionary
  - `items` - return (key,value) pairs
  - `iteritems` - return (key,value) pairs more efficiently, *iterator – must use with for*
  - `update` - update with another dictionary

Change Astrachan’s value

somemap[“Astrachan”] = Coffee Mocha

Value could be a set or list
Back to Popular Name Problem:

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Use a dictionary/map


• Map first names to count of corresponding last names

def mapNameToNumberLastNames(data):

Use a dictionary/map

• popularMap.py

Trace example with Python Tutor

see popularMapSolnSmall.py
Use a dictionary/map

• Map first name to list of corresponding last names

def mapNameToLastNames(data):

Trace through example with Python Tutor

• See the small example popularMapSoln2Small.py

Use a dictionary/map
www.bit.ly/101sp16-0324-4

• Map first name to set of corresponding last names

def mapNameToSetLastNames(data):

Compare

• Using two parallel lists?
• Using one dictionary/map
• Which dictionary is most useful to solve the most popular name problem?