Decomposition

Announcements

Modular Design

Separation of Concerns

A design principle: Isolate different parts of a program that address different concerns

A modular component can be developed and tested independently

Hog

Hog Game Simulator
- Game rules
- Ordering of events
- State tracking to determine the winner

Game Commentary
- Event descriptions
- State tracking to generate commentary

Player Strategies
- Decision rules
- Strategy parameters (e.g., margins & number of dice)

Ants

Ants Game Simulator
- Order of actions
- Food tracking
- Game ending conditions

Actions
- Characteristics of different ants & bees

Tunnel Structure
- Entrances & exits
- Locations of insects

Example: Restaurant Search

Restaurant Search Data

Given the following data, look up a restaurant by name and show related restaurants.

```
{"business_id": "gclB3ED6uk6viWlolSb_uA", "name": "Cafe 3", "stars": 2.0, "price": 1, ...}

{"business_id": "WXKx2I2SEzBpeUGtDMCS8A", "name": "La Cascada Taqueria", "stars": 3.0, "price": 2}

...

{"business_id": "gclB3ED6uk6viWlolSb_uA", "user_id": "xVocUszkZtAqCxgWak3xVQ", "stars": 1, "text":
 "Cafe 3 (or Cafe Tre, as I like to say) used to be the bomb diggity when I first lived in the dorms
  but sadly, quality has dramatically decreased over the years....", "date": "2012-01-19", ...}

{"business_id": "WXKx2I2SEzBpeUGtDMCS8A", "user_id": "84dCHkhWG8IDtk30VvaY5A", "stars": 2, "text":
 "-Excuse me for being a snob but if I wanted a room temperature burrito I would take one home,
  stick it in the fridge for a day, throw it in the microwave for 45 seconds, then eat it. NOT go to
  a resturant and pay like seven dollars for one...", "date": "2009-04-30", ...}

...
```

(Demo)

Example: Similar Restaurants

Discussion Question: Most Similar Restaurants

Implement **similar**, a **Restaurant** method that takes a positive integer **k** and a function **similarity** that takes two restaurants as arguments and returns a number. Higher **similarity** values indicate more similar restaurants. The **similar** method returns a list containing the **k** most similar restaurants according to the **similarity** function, but not containing **self**.

```
def similar(self, k, similarity):
    "Return the K most similar restaurants to SELF, using SIMILARITY for comparison."

    others = list(Restaurant.all)

    others.____remove____(_____self_____)

    return sorted(others, key=____lambda r: -similarity(self, r)_____)______[:k]_______
```

```
sorted(iterable, /, *, key=None, reverse=False)
    Return a new list containing all items from the iterable in ascending order.

    A custom key function can be supplied to customize the sort order, and the
    reverse flag can be set to request the result in descending order.
```

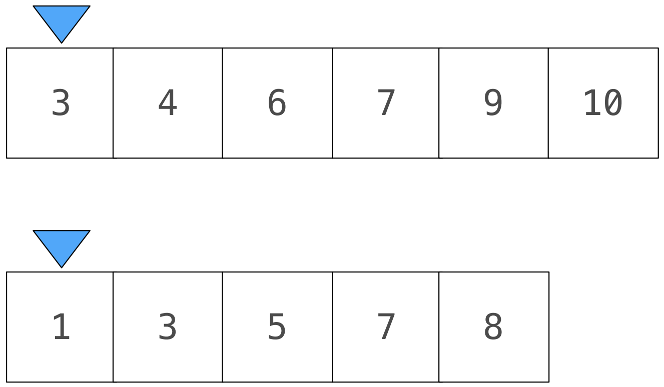
Example: Reading Files

(Demo)

Set Intersection

Linear-Time Intersection of Sorted Lists

Given two sorted lists with no repeats, return the number of elements that appear in both.



```
def fast_overlap(s, t):
    """Return the overlap between sorted S and sorted T.

    >>> fast_overlap([3, 4, 6, 7, 9, 10], [1, 3, 5, 7, 8])
    2
    """
    i, j, count = 0, 0, 0

    while       i < len(s) and j < len(t)        :
        if s[i] == t[j]:
            count, i, j =  count + 1, i + 1, j + 1
        elif s[i] < t[j]:
                           i = i + 1
        else:
                           j = j + 1
    return count
```

(Demo)

Sets

Sets

One more built-in Python container type

- Set literals are enclosed in braces
- Duplicate elements are removed on construction
- Sets have arbitrary order

```
>>> s = {'one', 'two', 'three', 'four', 'four'}
>>> s
{'three', 'one', 'four', 'two'}
>>> 'three' in s
True
>>> len(s)
4
>>> s.union({'one', 'five'})
{'three', 'five', 'one', 'four', 'two'}
>>> s.intersection({'six', 'five', 'four', 'three'})
{'three', 'four'}
>>> s
{'three', 'one', 'four', 'two'}
```