CS210 Discussion

Week 5

UMass Boston

Attendance

Today

- Comparable vs Comparator
- Exercise hints
- Finish through exercise 3
  - Show us passing Gradescope tests to leave early

Comparable vs. Comparator

<u>Comparable</u>

- `compareTo()`
- An instance of the thing you're comparing
- Typically represents a 'natural' order

<u>Comparator</u>

- `compare()`
- A separate object who's purpose is to compare two others
- Typically represents an alternative order
- Must be created before it can be used

Comparable vs. Comparator

- For comparable, an object compares itself to another
- Comparison results are integers
  - < 0 if it's smaller
  - 0 if they're equal
  - > 0 if it's bigger

```
public class Dog implements Comparable<Dog>{
    3 usages
    private int age;

    public Dog(int age) {
        this.age = age;
    }

    public int compareTo(Dog other) {
        return this.age - other.age;
    }
}
```

```
Dog sparkles = new Dog( name: "Sparkles",  humanAge: 3);
Dog champ = new Dog( name: "Champ",  humanAge: 5);
StdOut.println(sparkles.compareTo(champ));
```

UMass Boston

Comparable vs. Comparator

```
private class NameComparator implements Comparator<Dog> {
    public int compare(Dog firstDog, Dog secondDog) {
        return firstDog.name.compareTo(secondDog.name);
    }
}
```

- Comparator compares two separate objects
- Comparison results are integers
  - < 0 if the first is smaller than the second
  - 0 if they're equal
  - > 0 if the first is bigger than the second

```
Comparator<Dog> nameComp = new NameComparator();
StdOut.println(nameComp.compare(sparkles, champ));
```

UMass Boston

Questions?

Six-Sided Dice

```
>_ ~/workspace/project3

$ java Die 5 3 4
Dice a, b, and c:
*   *
  *
*   *
*
  *
    *
*   *

*   *
a.equals(b)     = false
b.equals(c)     = false
a.compareTo(b) = 2
b.compareTo(c) = -1
```

- A Die object to represent the roll of a die
- Can print the die face
- Is comparable based on face value

Six-Sided Dice

- `equals` may look familiar
- Need to cast ‘other’ to Die

```
// Returns true if this die is the same as other, a
public boolean equals(Object other) {
    if (other == this) {
        return true;
    }
    if (other == null) {
        return false;
    }
    if (other.getClass() != this.getClass()) {
        return false;
    }
    ...
}
```

```
Die otherDie = ((Die) other);
return otherDie.value == this.value;
```

UMass Boston

Six-Sided Dice

- We need to return an integer
  - < 0 if ‘this’ value is less than ‘that’ value
  - 0 if equal
  - > 0 if ‘this’ value is greater than ‘that’ value
- Remember that `value` here is an integer
  - 5 – 2 = 3
  - 2 – 5 = -3

```
// Returns a comparison of this d
public int compareTo(Die that) {
    ...
}
```

Six-Sided Dice

- Switch statement
  - 1 case for each number 1 – 6
- 0 Means Die hasn't been rolled yet
  - Should print "Not rolled yet"
  - Default case

```
// Returns a string represe
public String toString() {
    ....
}
```

5 =

*				*	\n
		*			\n
*				*	\n

*				*	\n			*			\n	*				*	\n

Location

- Similar to Die
- ‘equal’ needs to check all three: name, lat, and lon
- ‘compareTo’ is based on great circle distance to Greece
  - Use `distanceTo` and a new Greece Location object

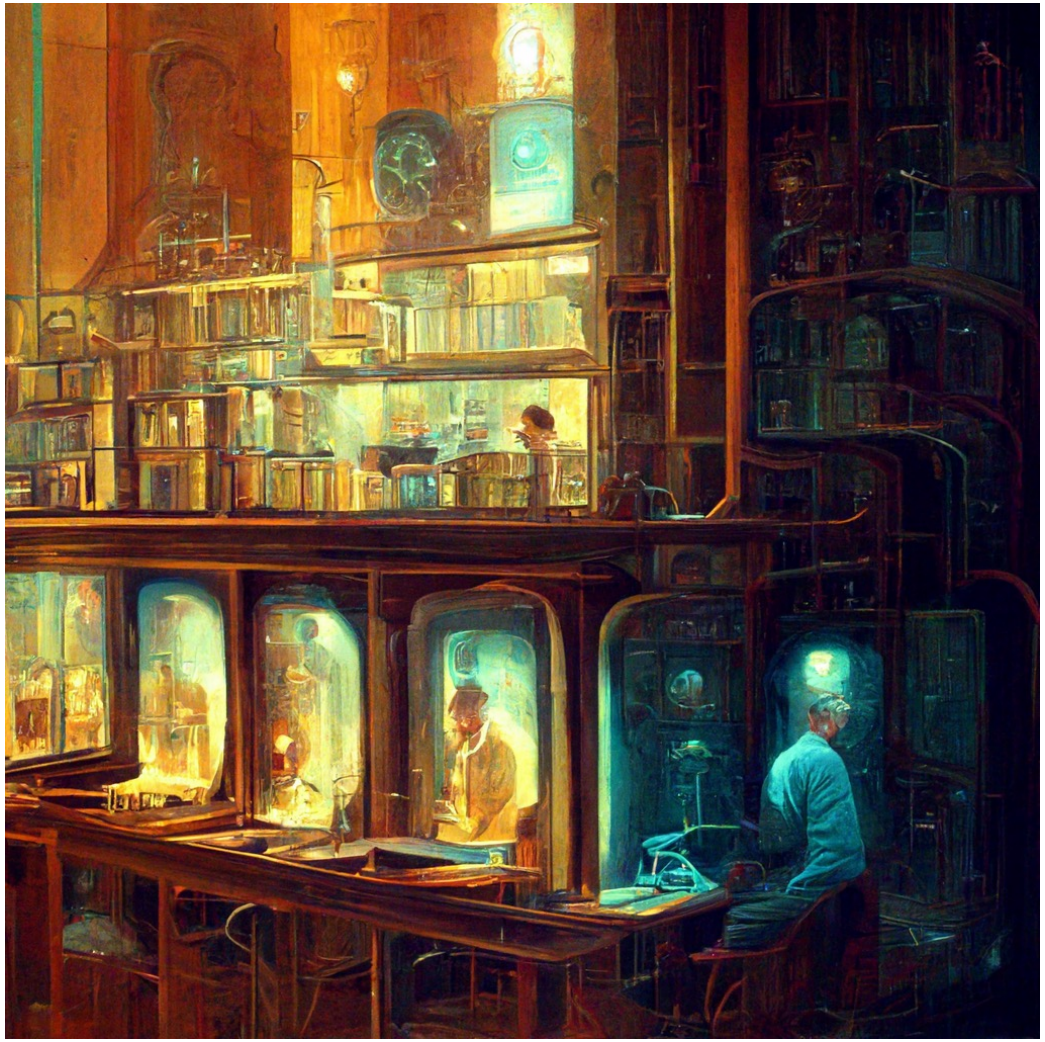
$$d = 6359.83 \arccos(\sin(x_1)\sin(x_2) + \cos(x_1)\cos(x_2)\cos(y_1 - y_2)).$$

Point3D

- A data type to represent a point in 3D space
  - (x, y, z)
- Similar to Location and Die
- Alternate comparators for each axis

```
$ java Point3D
How many points? 3
Enter 9 doubles, separated by whitespace: -3 1 6 0 5 8 -5 -7 -3
Here are the points in the order entered:
  (-3.0, 1.0, 6.0)
  (0.0, 5.0, 8.0)
  (-5.0, -7.0, -3.0)
Sorted by their natural ordering (compareTo)
  (-3.0, 1.0, 6.0)
  (-5.0, -7.0, -3.0)
  (0.0, 5.0, 8.0)
Sorted by their x coordinate (xOrder)
  (-5.0, -7.0, -3.0)
  (-3.0, 1.0, 6.0)
  (0.0, 5.0, 8.0)
Sorted by their y coordinate (yOrder)
  (-5.0, -7.0, -3.0)
  (-3.0, 1.0, 6.0)
  (0.0, 5.0, 8.0)
Sorted by their z coordinate (zOrder)
  (-5.0, -7.0, -3.0)
  (-3.0, 1.0, 6.0)
  (0.0, 5.0, 8.0)
```

Questions?



Exercise Hints

- Casting to a Die object

```
Die otherDie = ((Die) other);
```

- Die toString method should print 3 rows of 5 characters, each separated by a newline
  - i.e 5 = "* *\n * \n* *";
  - 0 = "Not rolled yet";
- Remember, you can access the instance variables of another object (so long as they're accessible)

```
public double distanceTo(Location other) {
    double otherLat = other.lat;
```

- Great circle distance for Location.java

$$d = 6359.83 \arccos(\sin(x_1)\sin(x_2) + \cos(x_1)\cos(x_2)\cos(y_1 - y_2)).$$

- Euclidean distance for Point3D.java
  - $\sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2 + (z_1 - z_2)^2}$

UMass Boston