Advanced Maps and Interactors

Julia Daniel for Chris Piech
CS106A, Stanford University
You’re not Chris...
HashMap Recap

key \rightarrow value
HashMap Recap

Key: (String) animal
Value: (String) animal sound

Values: "bark", "ow ow ow", "meow"
Keys: "dog", "seal", "cat"
HashMap Recap

**key**  →  **value**

- (String) animal  →  (String) animal sound
- (String) name  →  (int) phone number

![Contact app screenshot showing Micah Cratty's contact with phone number 6701678]
HashMap Recap

key          value

(String) animal       (String) animal sound

(String) name         (int) phone number

(GRect) key           (AudioClip) note
HashMaps on one slide

1. Make a HashMap

```java
HashMap<KeyType, ValueType> myMap = 
    new HashMap<KeyType, ValueType>();
```

2. Put and get values into a map

```java
myMap.put(key, value);
myMap.get(key) // returns the corresponding value
```

3. Some useful other methods

```java
int size = myMap.size();
myMap.contains(key); // returns true or false if key is in map
myMap.keySet();
myMap.remove(key); // make like a tree and leave!
```

4. Iterate using a foreach loop

```java
for(keyType key : myMap.keySet()){ // not ordered
    myMap.get(key); // do something with the key/value pair
}
```
Why is this so fast?

Humans and many other primates have three; some birds and reptiles have four photoreceptors. Certain butterflies can even have six. But the mantis shrimp has 12 different types of photoreceptors in their eyes – and scientists haven’t understood why until now. Jan 27, 2014

Study Offers Insights into Unique Color Vision of Mantis Shrimp ...
Why is this so fast?

```c
int hash(string key);
```

* Learn more in CS106B
Why is this so fast?

```
int hash(string key);
```

(but we lose sortedness)

* Learn more in CS106B*
Interactors
Where are we?

- Karel the Robot
- Java
- Console Programs
- Graphics Programs
- Text Processing
- Data Structures
- **GUIs**
- Defining our own Variable Types
Button demo

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Assignment 5: ImageShop

DUE: MONDAY, FEB 26TH, 11A.M.
YEAH HOURS: TUES. 2/20 7-8PM IN 380-380C
Adding Iteractors

• When you create an instance of any Program subclass, Java divides the window area into five regions as follows:

```
    NORTH
   /     \   EAST
W   CENTER  E
   \     /   WEST
     \  /   
     \SOUTH
```

• The CENTER region is typically where the action takes place. A ConsoleProgram adds a console to the CENTER region, and a GraphicsProgram puts a GCanvas there.

• The other regions are visible only if you add an interactor to them. The examples in the text use the SOUTH region as a control strip containing a set of interactors, which are laid out from left to right in the order in which they were added.
JLabel
JLabel label = new JLabel("Hi");
JLabel label = new JLabel("Hi");
JLabel

JLabel label = new JLabel("Hi");
add(label, SOUTH);
JTextField
JTextField field = new JTextField(10);
add(field, SOUTH);
field.setText("Good times");
JTextField field = new JTextField(10);
add(field, SOUTH);
field.getText(); // returns string in field
field.setText("Good times");
JTextField field = new JTextField(10);
add(field, SOUTH);
field.getText(); // returns string in field
field.setText("Good times");
JTextField field = new JTextField(10);
add(field, SOUTH);
field.getText(); // returns “some input"
field.setText("Good times");
JTextField field = new JTextField(10);
add(field, SOUTH);
field.getText(); // returns “some input”
field.setText("Good times");
JButton
JButton button = new JButton("Press me");
```
JButton button = new JButton("Press me");
```
JButton button = new JButton("Press me");
add(button, SOUTH);
public void actionPerformed(ActionEvent e) {
    println(e.getActionCommand());
}
All together now

Hello, Chris
Hello, world
Hello, darkness

Name: darkness
Press me
Recall the Dancing Children
Normal Program

Run Method
Normal Program

Run Method

```java
public void run() {
    for(int i = 0; i < N_Dribbles; i++) {
        dropOneDribble();
    }
}
```
Normal Program

Run Method

```java
public void run() {
    for (int i = 0; i < N_DRIBBLES; i++) {
        dropOneDribble();
    }
}
```
Normal Program

Run Method
New Listener Characters

Action Listener

Action Performed
Program Starts Running

Run Method

Action Performed

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Add Action Listeners

Run Method

Action Performed

Action Listener

```
addActionListeners();
```
Program Runs as Usual

Run Method  Action Performed  Action Listener

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Button Clicked!

Run Method  Action Performed  Action Listener

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Calls Action Performed Method

Run Method  Action Performed  Action Listener

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When done, Run continues.

Run Method  Action Performed  Action Listener
Keeps Doing Its Thing…

Run Method

Action Performed

Action Listener

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Button Clicked!

Run Method

Action Performed

Action Listener
Calls Action Performed Method

Run Method  Action Performed  Action Listener

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When done, Run continues.

Run Method

Action Performed

Action Listener

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Recall the Dancing Children
Two Buttons

Oh wow!
Dag, yo.
Oh wow!
something awesome

*idea credits to Keith
The XKCD Color Survey
The XKCD Color Survey

- Volunteers (online) were shown a randomly-chosen color and asked to name the color.
- The result is (after filtering) about 2.8 million RGB triplets and their names.
- What do people think the colors are?
## The File Format

<table>
<thead>
<tr>
<th>color-name</th>
<th>RGB value</th>
</tr>
</thead>
<tbody>
<tr>
<td>light purple</td>
<td>185, 110, 194</td>
</tr>
<tr>
<td>sea blue</td>
<td>24, 250, 209</td>
</tr>
<tr>
<td>navy blue</td>
<td>16, 32, 75</td>
</tr>
<tr>
<td>bluish green</td>
<td>62, 208, 104</td>
</tr>
<tr>
<td>dark blue</td>
<td>2, 0, 50</td>
</tr>
<tr>
<td>blue</td>
<td>107, 148, 220</td>
</tr>
<tr>
<td>dark blue</td>
<td>101, 68, 175</td>
</tr>
<tr>
<td>sky blue</td>
<td>7, 152, 170</td>
</tr>
<tr>
<td>teal</td>
<td>81, 166,</td>
</tr>
<tr>
<td>purple</td>
<td>130, 64, 234</td>
</tr>
<tr>
<td>blue</td>
<td>75, 49, 234</td>
</tr>
<tr>
<td>light blue</td>
<td>76, 215, 249</td>
</tr>
<tr>
<td>olive green</td>
<td>111, 145, 122</td>
</tr>
<tr>
<td>brown</td>
<td>88, 70, 1</td>
</tr>
<tr>
<td>pink</td>
<td>218, 35, 156</td>
</tr>
<tr>
<td>purple</td>
<td>154, 42, 159</td>
</tr>
<tr>
<td>navy</td>
<td>179, 67, 229</td>
</tr>
<tr>
<td>teal</td>
<td>92,</td>
</tr>
</tbody>
</table>
How to Structure Data

<table>
<thead>
<tr>
<th>Color</th>
<th>R</th>
<th>G</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>blue</td>
<td>15</td>
<td>137</td>
<td>255</td>
</tr>
<tr>
<td>red</td>
<td>166</td>
<td>14</td>
<td>7</td>
</tr>
<tr>
<td>gray</td>
<td>154</td>
<td>156</td>
<td>157</td>
</tr>
</tbody>
</table>

associate each color name with a list of colors

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How to Structure Data

<table>
<thead>
<tr>
<th>color name</th>
<th>blue colors</th>
<th>red colors</th>
<th>gray colors</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>15 137 255</td>
<td>0 0 127</td>
<td>88 88 190</td>
</tr>
<tr>
<td></td>
<td>166 14 7</td>
<td>99 55 5</td>
<td>255 0 0</td>
</tr>
<tr>
<td></td>
<td>154 156 157</td>
<td>243 242 254</td>
<td>140 143 148</td>
</tr>
</tbody>
</table>

HashMap<color name, list of colors>
HashMap<String, list of colors>
HashMap<String, ArrayList<color>>

How to Structure Data
HashMap<String, ArrayList<Color>>
Further Reading

- [http://blog.xkcd.com/2010/05/03/color-survey-results/](http://blog.xkcd.com/2010/05/03/color-survey-results/)