CompSci 4  
Chap 10  
November 8, 2011

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Announcements

• Assignment 7 is out, due Nov 22!
• Today
  – Chap 10 – variables and arrays
• Next Time: more practice with Arrays
  – No Reading quiz for Thursday
• Note: Chapter 8 is not on test 2, will cover after the Test

Review: Properties

• Where is the class?
• Where is the object?
• A class defines properties
• When an object is created it receives its own set of properties

State and Changing State

• State of object – each property stores info about the object
  – Example:
    • vehicle
    • isShowing

• State change
Class-level Variables

• New variables can be added to the properties of an object – class-level
• The value of the variable can be changed
  – The variable is mutable.
  – Can be used to track state changes.

Inheritance

• If an object (and its new variable) are saved out and given a new name, a new class is created.
  – This is inheritance!
  – The new class inherits all properties and methods of original class.
    • Did this before by adding new methods to a class and saving it out.

What is an array?

• An array is a collection of objects or information organized in a specific order
• The individual components (elements) are of the same type (all object or all number, etc.)
• Analogy – Music on your CD or Ipod
  – Collection of songs listed in order
  – CD allows you to
    • Play songs in order
    • Play songs by specifying its number
    • Play songs in random order

Arrays in Alice

• In Alice, array is a data structure to organize objects or information
• An array is not visible, it is a way of organizing
• But…. 
  – Alice has a 3D model to help you “see” the array
Example – Create a visualization of an array of people

- Add 5 people to the world
- Add an array visualization
- Not an array yet, must add people to the array
- Positions in array numbered starting with 0

Add Soldier to the Array

- Soldier moves automatically to position 1 (which is the 2cd position)!

Initialize array - Add Alice to Array in position 0

- Alice automatically moves to the 0 position!

Add RandomGuy, Skater and Rockette

- The array initialization is complete!

- Set isVisible for arrayVisualization to false
  - Array not seen
Accessing elements in an array

• Can specify an element at a particular location in the array

Array vs. List

• Array
  – Elements are ordered
  – Can access a particular element – 3
  – Use “Loop” - loop over elements – one at a time, OR every second element, etc

• List
  – Elements are not ordered
  – Use “For all in order”, “For all together” – does something to each element in the list – just don’t know the order this occurs

Repeat for all items in the array – in order

• Use “loop” – complicated version
• Note: index in loop is used in body
• What does this do?

Array Visualization vs Array without Visualization

• Array Visualization moves the objects and puts them on the numbers in the array
• Array without visualization is also possible, create a new world variable and select array (same way create a list). The array is not shown and the objects don’t move and stand in a line. This is harder to use since you cannot see which object is in which position in the array.
Swapping two elements in the array

- Swap the objects at positions 0 (fanDancer) and 3 (duckPrince)
- Add in an ObjectVisualization, this is like a variable for an object. (same folder where ArrayVisualization is)

Swapping objects at 0 and 3 (cont)

- Only one element at a time can be in a slot in the array. To swap two elements, you have to move one of them out temporarily.
- Move object at index 0 to objectVisualization (this frees up slot 0)

Swapping objects at 0 and 3

- Now you can move the item in slot 3 over to slot 0 (note the duckPrince moved over)
- Now slot 3 is empty

Swapping objects at 0 and 3 (cont)

- Now move the object that was originally in slot 0 and was saved temporarily in the ObjectVisualization, over to slot 3
Don’t Swap with Do Together!

• This does not always work because the timing may not be exact. You may end up with two elements on the same square.

Don’t Do This Way!

Swapping objects at 0 and 3 (code)

• Here is the code that corresponds to the swapping of the items in slots 0 and 3.

<table>
<thead>
<tr>
<th>Slot 0</th>
<th>Slot 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Item 1</td>
<td>Item 2</td>
</tr>
</tbody>
</table>

• This moves the item in slot 0 to a temp location, freeing up slot 0. The item in slot 3 moves to slot 0. Then the item in the temp location moves to slot 3.

Setting elements in array

• Objects in an array are called elements

• Use “let” to set a position in an array

• Using “let”: Ex., the object in slot 3 moves to slot 0.

Shuffle the array

• For each item in the array, swap it randomly with another object

• Make sure you use the swap on the previous page to swap two objects.

Don’t do this if there is already something in position 0! Move the item in position 0 away first!
SelectionSort the array

- Find the position of the shortest object
  - Swap that object with the object in position 0
- Find the position of the next shortest object
  - (Note: don’t consider slot 0, it is already in sorted order. Only consider slots from 1 on)
  - Swap that object with the object in position 1
  - Now slots 0 and 1 contain items where they belong in sorted order
- Etc…. Until the array is sorted.

Classwork Today

- Shuffle Array
- Sort Array by heights