Announcements

- Read Chapter 7, Sec 1 for next time – Reading Quiz
- Don’t use copy to copy an object!
  
  – We will learn why later
  – Instead, import the object twice from the class folder
- Lecture on Chap 6, Tips and Techniques
  – Random numbers and random motion
  – We will also learn about variables

Random Numbers

- Random numbers are used in certain kinds of computer programs
- Examples
  – Security for web applications
  – Encryption for satellite transmissions
  – Gaming programs
- We will look at examples of using random numbers in animations

Built-in functions

- Alice provides built-in functions for generating random numbers
Example

• Move chicken forward a random amount

• The random number function returns a fractional value between 0 and 1

Demo: A range of values

• Can specify a different range of values by specifying a **minimum** and **maximum** value

• In this example, the random number will be a fractional value between 1 and 5

Demo: Integers (whole numbers)

• To generate a random **integer** value
  – Select `integerOnly` from the `more` option and make it `true`

  – Random value selected from 1, 2, 3, or 4 - not 5!

Random Hopping

• Rabbit hops (moves up) a random amount
• Rabbit comes back down to the ground, the same random amount

• What happens? How do we fix it?
Local Variable - in a method

- A *local* variable in a method
  - Stores a value
  - Has an initial value
  - Its value can be changed (set)
  - Its value can be used *only in one instance of this method*

- To create a local variable in a method
  - Click on create variable
  - Give an initial value

- To use a variable’s value
  - Drag the variable into place

Example – create a local variable

- distance – will store distance bunny is to move up

Setting a Variable’s value

- Drag variable down and select value

Use Variable’s value - Demo

- Drag and drop distance into places where you want to use its value
Set Variable to Random Value - Demo

- Distance is set a random value
- Same value is then used to move up and down

Use print to print out the value of the variable

Class Variables

- Use “create new variable” under properties to create a class variable for an object
- This “class variable” will maintain the value throughout the running of the world unless you reset it

Random Motion

- In some animations, we want an object to move to a random location. We call this random motion.
- For example, a goldfish swimming in a random motion.

Six Possible Directions

- Six move directions are possible
  - Forward, backward, left, right, up, down
- We will eliminate backward, fish do not swim backward
- To simplify code, take advantage of negative numbers
  - This instruction moves the goldfish right
Storyboard

• Only three move instructions needed
  – Up (move down if negative)
  – Left (move right if negative)
  – Forward (no backward motion)

• Two parameters (min, max) to restrict motion of fish to nearby location

<table>
<thead>
<tr>
<th>fish.randomMotion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameters: min, max</td>
</tr>
</tbody>
</table>

Do together

| fish move up (or down) random distance |
| fish move left (or right) random distance |
| fish move forward random amount |

randomMotion

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• Minimum distance for move forward is 0

Demo

• To call randomMotion method, specify min and max values

<table>
<thead>
<tr>
<th>goldfish.randomMotion</th>
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<tbody>
<tr>
<td>min = -0.2</td>
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Demo

• Repeating the random fish motion over and over again…. (more on this next chapter)

• Change world.my first method
Classwork today

- Event handlers
- Random values
- Variables

- NO LOOPS