Announcements

- Read Chapter 7, Sec 1 for next time – Reading Quiz
- Assign 5 due Thur (SBoard) and Tues (program)
- 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, and 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?
• (disable this code)
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 this method
  - Like a special property, but only for 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, so same distance can be used to move down

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

- Create an event to press H and bunny hops
Set Variable to Random Value - Demo

- Distance is set to 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
- The variable should be associated with the class in some way

Example

- Create an event for hopRandom to occur when you press h.
- Create another event for the bunny to say how many times it has hopped.
- We need to keep track of the number of times the bunny has hopped. How do we do that? Where do we do that?

Create class property (variable)

- Create variable to keep track of number of times hopped
- Increment it each time bunny hops
- Where does the increment go?
Now have bunny say how many times hopped?

- Add an event

- Now we want to join another string with this, under World functions, string, drag in “a joined with b”

Bunny say how many times hopped (cont)

- We want the number “numberTimesHopped” displayed as a string.
- Drag over world function, string, “what as a string” over none, select “expressions”, then bunny.numberTimesHopped

- Now Play! Hop bunny then press space

Reflection

- When do you use local variable and when do you use class variable?

Another Example

- Create an event so that when you click on a kangaroo, every other time it hops or spins.
- What type of information do you need to save?
**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

```plaintext
fish.randomMotion
Parameters: min, max
Do together
  fish move up (or down) random distance
  fish move left (or right) random distance
  fish move forward random amount
```

- Minimum distance for move forward is 0
Fish Demo

• To call randomMotion method, create an event that will happen forever (but not interfere with anything else!)
• Create event for “When the world starts”
  
  ![When the world starts, do Nothing](image)

• Right click on this event and change it to:

  ![While the world is running](image)

• In the “During part” drag in the method and set min to -0.2 and max to 0.2

  ![goldfish.randomMotion min -0.2 - max -0.2](image)

• While the world is running, this method will repeating the random fish motion over and over again…. (more on repeating next chapter)

Classwork today

• Discuss how to
  – Event handlers
  – Random values
  – Variables

• You do not need the event “while the world is running”

• NO LOOPS