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
• Bug in Alice 2.0 –
  – Random numbers don’t always work correctly with integers – use real numbers and use <, <=, > or >=, but not == or != and it works ok
• Alice 2.2 works fine with random numbers

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

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

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

Example

• Create another event for the bunny to say how many times it has hopped.

• We need a variable to store the number of times the bunny has hopped. What type of variable, local or class variable?

Create class property (variable)

• Create variable to keep track of number of times hopped

• Increment it each time bunny hops
Now have bunny say how many times hopped?

- Add an event

```
When Space is typed, do {bunny say "Times I have hopped is more..."}
```

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

```
When Space is typed, do {bunny say "Times I have hopped is joined with none"}
```

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

```
Times I have hopped is joined with bunny.numberTimesHopped as a string
```

- Now Play! Hop bunny then press space

Reflection

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

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

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”
- Right click on this event and change it to:

`When the world starts, do Nothing`

- Minimum distance for move forward is 0
Fish Demo (cont)

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

```plaintext
While the world is running
Begin: <None>
During: goldfish.randomMotion min = -0.2 max = 0.2
End: <None>
```

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

Classwork today

• Event handlers
• Random values
• Variables

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

• NO LOOPS