Note: thanks to Wanda Dann and Steve Cooper for slide ideas
Announcements

• Read Chapter 7, Sec 1 for next time
• Survey from March 3
• More disk space?
• Don’t use copy to copy an object
What we will do today

• Lecture on Chap 6, Tips and Techniques
  – Random numbers and random motion

• Classwork
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 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?
Variable - in a method

• A 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

• To create a 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 variable

- distance – will store distance bunny is to move up
Setting a Variable’s value

- Drag variable down and select value

![Diagram showing bunny.hopRandom2 with distance set to 1 and options to increment or decrement by 1 with values 0.25, 0.5, 1, and 2.]

- Result

![Diagram showing distance set to 2 with set value to 2.
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

Note: Do Not use other types of variables yet!
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.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
randomMotion

- Minimum distance for move forward is 0
Demo

- To call randomMotion method, specify min and max values

```
goldfish.randomMotion min = -0.2 max = 0.2
```
Demo

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

• Change world.my first method
Classwork today – Where are methods and functions called?

1. Setup all the objects (Do not use copy!)
2. For 3D text score1 and score2
   1. AddOne – update the score
   2. Do not need ball or goals for this
3. Each goal – IsInGoal – return true or false
4. ToyBall – startInMiddle
Classwork (cont)

5. World method – moveAndCheckScore
   1. Move ball a small amount
   2. Check if ball is in goal1, if so update score1 and send ball to middle of field
   3. Check if ball is in goal2, if so update score2 and send ball to middle of field

6. Events – move ball around

7. Winner – add 2 3D texts that say “Winning!”
   1. In 5, check if there is a winning score and update
New Classwork

• Write world method RandomMove
  – Loop 100 times
    • Move ball randomly a little in 2 directions
    • If ball is in goal, then update score, move ball to middle and check winning message

• Add an event – if type R, then RandomMove