

Classes, Objects, and World-level Methods

Alice



Larger Programs

- As you become more skilled in writing programs, you will find that programs quickly increase to many, many lines of code.
- Games and other "real world" software applications can have thousands, even millions of lines of code.



Classes, Objects, & Methods

- Object-oriented programming uses classes, objects, and methods as basic programming components.
- These components help to
 - ✚ organize a large program into small modules
 - ✚ design and think about an intricate program
 - ✚ find and remove errors (bugs)



In our programs, we have been using...

🌐 Classes

🎬 In Alice, classes are predefined as 3D models



🌐 Objects

🎬 An object is an **instance** of a class.

Class: Frog (Uppercase name)

Objects: frog, frog1, frog2, frog3
(lowercase names)



We have also used...

🌐 built-in (predefined) methods

🤖 Examples: *move, turn to face, say*

🌐 *World.my first method*

🤖 Example:

In the Snowpeople world, we wrote program code where the snowman tried to get the attention of a snowwoman.

All the program code was written in this one method, see next slide...



World.my first method

World.my first method *No parameters*

create

No variables

creat

Do in order

// The snowman tries to catch the attention of the snowwoman by talking and blinking his eye

snowman turn to face snowwoman more...

snowman say Ahem... more...

Do together

snowwoman.head turn to face snowman more...

Do in order

snowman.head.leftEye move up 0.04 meters duration = 0.5 seconds more...

snowman.head.leftEye move down 0.04 meters duration = 0.5 seconds more...

Do in order

snowman.head.rightEye move up 0.04 meters duration = 0.5 seconds more...

snowman.head.rightEye move down 0.04 meters duration = 0.5 seconds more...

// The snowwoman blushes and turns away

Do together

snowwoman.head set color to red more...

snowwoman.head turn to face snowwoman2 more...

snowwoman.head set color to white more...

snowman.head turn forward 0.15 revolutions more...

snowman turn right 0.5 revolutions more...



Potential Problem

- The program code just seemed to grow and grow.
- If we continue to write programs this way the programs will become longer and more difficult to read and think about.



Solution

- A solution is to organize the instructions into smaller methods.
- A possible storyboard

Do in order

catchAttention – snowman tries to get the attention of the snowwoman

blink eyes – snowwoman turns to look and the snowman blinks his eyes

react – snowwoman blushes and turns away and the snowman
is disappointed



Next Step

🌐 The next step is to break down each major task into simpler steps.

🎥 Example:

catchAttention

Do in order

snowman's head turns to face camera

snowman says "Ahem"

snowman's head turns to face snowwoman

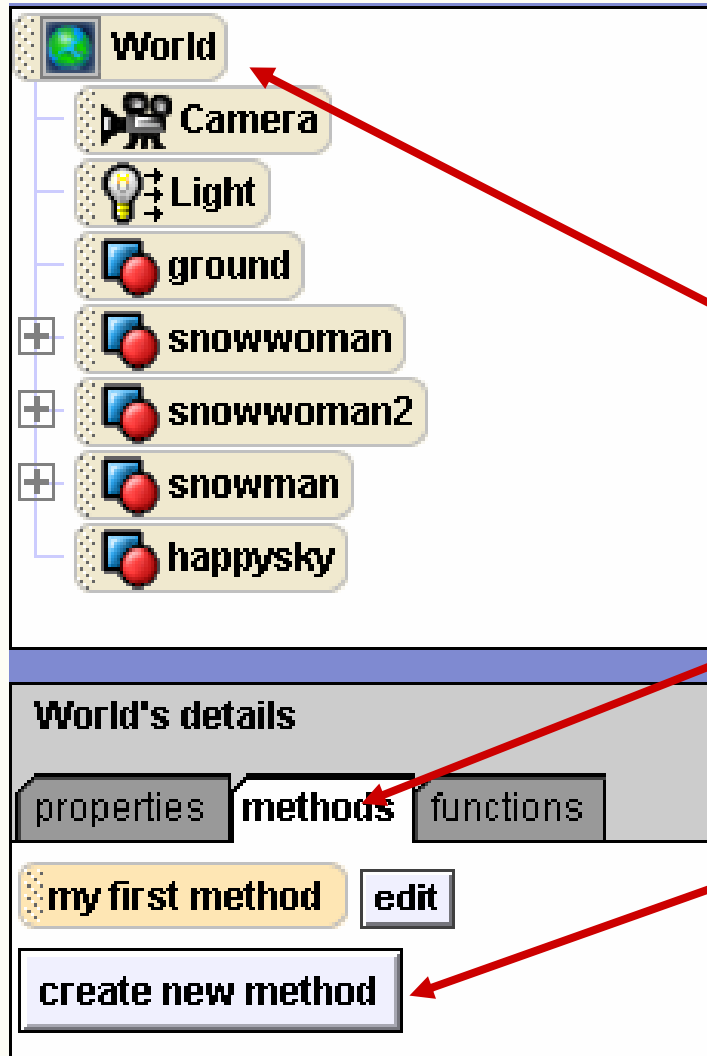


Stepwise Refinement

- The process of breaking a problem down into large tasks and then breaking each task down into simpler steps is called **stepwise refinement**.
- Once the storyboard is completed, we write a method for each task.



Demo: Starting a new method



First, to associate the new method with the World

- select the World tile in the Object Tree

- select the methods tab in the details area

- click on the "create new method" button



Demo

🌐 Ch04Lec1 Snowpeople

🌐 Concepts illustrated in this example world:

- 🤖 *catchAttention* is a **world-level method** because it is defined as a method for World and has instructions that involve more than one object (snowman, snowwoman, camera)
- 🤖 The *catchAttention* method is executed by **calling** (invoking) the method .



Why?

- 🌐 Why do we want to write our own methods?
 - 🎥 saves time -- we can call the method again and again without reconstructing code
 - 🎥 reduces code size – we call the method rather than writing the instructions again and again
 - 🎥 allows us to "think at a higher level"
 - 💡 can think *catchAttention* instead of
"turn head to face the camera, then say 'Ahem' while moving eyes up and down"
 - 💡 the technical term for "think at a higher level" is
"abstraction"



Assignment

🌐 Read Chapter 4 Section 1

📺 World-level Methods

💡 How to create them

💡 How to call them

💡 When it is appropriate to use them

