# Chapter 1

# An Introduction to Alice and Object-Oriented Programming

## At a Glance

## Instructor's Manual Table of Contents

Lecture Notes

# Overview

There are three things about Alice that make it a more effective tool for learning programming than almost any other system of programming:

- Minimal memorization of syntax - Alice is constructed so that you do not need to learn the grammar and syntax of a strange new language and can instead focus your attention on the concepts of computer programming.
- Visualization - Alice allows you to see the effects of your programs and any changes you make to them.
- Rapid feedback - Alice provides rapid feedback, which you may get at any time by simply starting your virtual world and watching what happens.

# Chapter Objectives

After finishing this chapter, you should be able to:

- Provide a brief definition of the following terms: algorithm, computer program, object, property, method, state of an object, object-oriented programming (OOP), computer programming language, Integrated Development Environment (IDE), function, event, class, instance, instantiation, and method parameter
- Run the Alice software and locate and describe the following components of the Alice interface:World window, Object tree, Details area, Editor area, Events area, menu bar, Trash can icon, Clipboard icon, Play button, Undo button, and Redo button
- Load and play an existing Alice world
- Create a new Alice world by adding objects to a blank world, positioning them, and using simple methods to animate those objects
- Print the code for Alice methods and events
- Save an Alice world as a QuickTime movie file (*.mov)

# Teaching Tips

## Object-Oriented Programming and Alice

1. Discuss the difference between an algorithm and a computer program. Note that in order to help manage the growing complexity of computers, computer scientists developed the notion of objects and object-oriented programming. Anything that is manipulated by a computer program is an object.

2. Introduce the terms **method**, **object**, **state of an object**,**object-oriented programming**, and **computer programming language**.

3. Explain that Alice uses an object-oriented style of programming. The objects in Alice exist in a three-dimensional virtual world, much like a modern video game. In fact, the

virtual world itself is an object in Alice - it has properties and methods that can be used to manipulate those properties. Alice is similar to other modern object-oriented programming languages, such as Java, C++, or Visual Basic.

| ***Teaching Tip*** | To learn more about object oriented programming concepts, visit the following Web site: http://java.sun.com/docs/books/tutorial/java/concepts/. |
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## Quick Quiz 1

1. The values stored in the properties of an object at any given time are collectively called the ____.
   Answer: state of an object

2. True or False: Alice uses an object-oriented style of programming.
   Answer: True

3. A(n) ____ is an instruction set for programming a computer, along with the grammar and syntax for using those instructions.
   Answer: computer programming language

4. True or False: Every computer program is an algorithm.
   Answer: True

## Tutorial 1A - Exploring the Alice Interface

1. In a classroom or lab with a projector, discuss the steps involved in exploring the Alice 2.2 interface, then load and play an Alice world. Before starting, you should have a computer system with the Alice software properly installed.

2. Introduce the term **Integrated Development Environment (IDE).**

| ***Teaching Tip*** | To learn more about an Integrated Development Environment, visit the following Web site: http://java.sun.com/developer/technicalArticles/tools/intro.html. |
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### The Main Work Areas of the Alice Interface

1. Point out that the Alice interface has five main work areas: the World window, the Object tree, the Details area, the Editor area, and the Events area. Look at each of these before playing the *lakeSkater* world.

2. Introduce the term **function**.

**Other Elements of the Alice Interface**

1. Explain that in addition to the main work areas that you have just explored, the Alice interface also has two icons, three buttons, and a menu bar near the top of the screen.

**Menus**

1. Point out that the Alice interface has a menu bar at the top of the screen with four menus: File, Edit, Tools, and Help. The menus in Alice are used much less frequently than in many other computer programs. For now, you will look at only a few of the items on these menus.

# Quick Quiz 2

1. A(n) ____ is a computer program that is used to write other computer programs.
   Answer: Integrated Development Environment (IDE)

2. True or False: The Alice interface has five main work areas: the World window, the Object tree, the Details area, the Editor area, and the Events area.
   Answer: True

3. A(n) ____ is a method that returns a value, such as the distance between two objects.
   Answer: function

4. A(n) ____ consists of a condition, called an event trigger, and a method, called an event handler.
   Answer: event

## Tutorial 1B - Playing an Alice World

1. In a classroom or lab with a projector, experiment with playing an Alice world. Alice worlds fit into one of two different categories - some Alice worlds are interactive in the way a video game is; others are simply run and viewed like a movie. In either case, experienced Alice users refer to "playing" an Alice world the way most software developers talk about "running" a computer program.

2. Note that the Alice world you will play in this tutorial is the *lakeSkater* world discussed in Tutorial 1A. It is not an interactive world; rather, it is more like watching a movie of an ice-skater's performance.

3. Illustrate the steps involved in playing an Alice world.

4. Illustrate the steps involved in exiting the Alice program.

## Tutorial 1C - Creating Your First Alice World

1. Explain that in this tutorial, you will create, play, and save a new Alice world. You should complete Tutorials 1A and 1B before starting this tutorial.

2. Illustrate the steps involved in creating an Alice world in which a bunny will move from the right side of the screen to the center, turn to face the camera, and then say "Hello, World!" Use Figure 1-6 to aid the discussion.

**Adding Objects to an Alice World**

1. Illustrate the steps involved in adding objects to an Alice world. Explore the galleries a bit before preparing to add objects to your new world. Use Figures 1-7 and 1-8 to aid the discussion.

**Object Classes and Instances in Alice**

1. Introduce the term **class**. Note that objects in the same class are virtually identical to each other, except that the values stored in some of their properties may be different.

2. Introduce the terms **instance** and **instantiation**.

3. Illustrate the steps involved in instantiating a *Bunny* class object.

**Positioning Objects**

1. The layout tools to the right of the World window in Scene Editor mode can be used to manipulate objects. Use Table 1-1 to aid the discussion.

**Adding Some Action**

1. The next step is to add some motion to your world. You can start with something simple - making the bunny move across the screen - and then add a little more action. Illustrate the steps involved.

2. Introduce the term **method parameter**.

3. Illustrate the steps involved in adding another *bunny say* tile to make the bunny say "Hello, Dr. Kernighan!" Save the world created.

**Closing and Reloading a Saved World**

1. Illustrate the steps involved in closing the Alice program and then opening your saved world.

## Quick Quiz 3

1. True or False: There is only one Alice object gallery: a Local Gallery provided with the Alice software.
   Answer: False

2. A(n) ____ is a group of objects with the same properties and the same methods.
   Answer: class

3. Each copy of an object from a particular class is called a(n) ____ of the object.
   Answer: instance

4. The act of adding an instance of an object class to an Alice world is called ____.
   Answer: instantiation

### Tutorial 1D - Printing Code From an Alice World

1. Explain that the code from methods and events in an Alice world can be saved on an HTML Web page, which you may then print, send as an e-mail attachment, or view like any other Web page. You can also cut and paste items from the resulting Web page to other programs, such as Microsoft Word or PowerPoint.

2. Illustrate the steps involved in saving the code from your Hello, World! project as an HTML file in the root directory on the C: disk drive.

### Tutorial 1E - Saving an Alice World as a Movie File

1. Point out that Alice 2.2 allows you to record the view in the World window while an Alice world is playing as a QuickTime Movie file (*.mov). You can view QuickTime movies on a computer with QuickTime-compatible video player software, or via a Web browser equipped with a QuickTime plug-in.

2. Illustrate the steps involved in recording the *hello world* Alice world that you created in Tutorial 1C as a movie file.

## Quick Quiz 3

1. True or False: The code from methods and events in an Alice world cannot be saved on an HTML Web page.
   Answer: False

2. True or False: Alice 2.2 allows you to record the view in the World window while an Alice world is playing as a QuickTime Movie file (*.mov).
   Answer: True

3. True or False: Alice renders and saves movie files frame by frame.
   Answer: True

## Class Discussion Topics

1. What is the purpose of method parameters?
2. How do you declare a method parameter in Alice?
3. How do you instantiate a class in Alice?
4. What is the difference between a class and an object?

## Additional Projects

1. Using the Internet as a resource, create a list of 20 standard primitive methods that can be found in Alice.
2. What do you think the following statement means? *Every object in Alice has six degrees of freedom.* Write down your thoughts in a short paper.

## Additional Resources

1. Alice download and tutorials: www.alice.org/
2. Learning to program: www.dickbaldwin.com/alice/Alice0105.htm#A_description_of_the_Alice_environment
3. Functions: www.cs.indiana.edu/classes/a201-hayn/c/2/index.html
4. Instantiating a class: http://java.sun.com/docs/books/tutorial/java/javaOO/objectcreation.html

## Key Terms

- An **algorithm** is a step-by-step process; computer programs are algorithms.
- A **class** is a group of objects with the same properties and the same methods.
- A **class of objects** is a collection of all objects that have the same properties and methods.
- Each individual object in a class is called an **instance** of that class.
- A **computer programming language** is an instruction set for programming a computer, along with the grammar and syntax for using those instructions.
- An **Integrated Development Environment (IDE)** is a computer program that is used to write other computer programs.

- A **function** is a method that returns a value, such as the distance between two objects.
- **Instantiation** is the act of adding an instance of an object class to an Alice world.
- An **object** is a collection of properties and methods that can be used to manipulate those properties.
- The data that represents the object is organized into a set of **properties**.
- **State of the object** refers to the values stored in the properties of the object at any given time.