Chapter 5: Lists and Arrays

Programming with Alice and Java
First Edition

by
John Lewis
and
Peter DePasquale

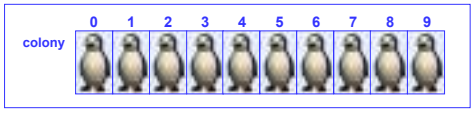
Objectives

- Store and manage objects in linear data structures called lists and arrays
- Compare and contrast lists and arrays
- Use the For all together and For all in order statements
- Change the contents of lists dynamically using built-in list methods
- Randomly choose an object in a list or array

Managing Multiple Objects

- Programming solutions need to be scaled as the size of the problem grows – solutions should be independent of the number of objects involved.
- A *data structure* holds and manages a group of objects using one variable name.
- A data structure provides a way to access the individual elements from the collection.
- Alice supports two basic data structures: *lists* and *arrays*.
- These data structures are *linear* – they keep objects in a particular order.

Linear Data Structure



- The name of this structure is *colony*, and that refers to the entire collection.
- An *index* refers to a particular object in the list or array.
- Indexes start at 0.
- Lists are unbounded in terms of size.
- Arrays are created with a fixed size.

Lists

- In this example there are ten objects moving together;
- Do together statement would require ten identical instructions;
- Instead, a list of objects is created;
- For all together statement is applied

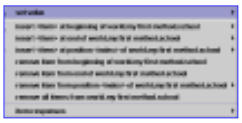
Lists (continued)

- In the For all together method, "together" refers to applying an operation to all objects in the list (all fish will turn in unison, and then they all move forward).
- Another method - For all in order – applies to every object in the list one at a time, in the order they exist in the list.

Creating a list of objects

List Methods

- List objects have several built-in methods



List functions

- When performing list operations, list elements are shifted to make room for new items or to close the gap after removal.

Arrays

- Arrays are created the same way lists are.
- Arrays have a fixed size after they are created.
- The For all together and For all in order statements cannot be applied to arrays.
- Arrays are more efficient in terms of how much memory they take up and how fast they can access individual elements.
- The rule of thumb: Use an array when there is a need to access individual elements by their index values and when there is no need to change the elements stored in the array.

Arrays (continued)

Two integer variables, index and previous are used to keep track of mole movements

More Tips About Using The Alice Environment

- It is possible to save objects and their behavior in one world, and then bring them into another one. The import option can be used for that purpose.
- There is the *opacity* property of an object and it determines how much the user can see through the object. This property allows objects to fade away, as well as to fade them in.
- A texture map is an image that is "wrapped" tightly around an object to give its surface a new look.
- Any graphic file an be imported: .gif, .jpeg, .bmp, or .tif

Summary

- Lists and arrays are data structures that hold and manage a group of objects using one variable name.
- The elements stored in lists and arrays can be accessed using a numeric index, which starts at 0.
- When performing list operations, list elements are shifted to make room for new items or to close the gap after a removal.
- An array is generally more efficient than a list, but it has a fixed size.