CSE 1530

Introduction to Computer Use II: Programming

Winter 2006 (Section M)

Topic D: Control Structures - Iteration

Monday, February 20 2006

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Overview (1):

- **Before We Begin**
  - Some administrative details
  - Some questions to consider
- **Counted Loops**
  - Introduction
  - Experimenting with counted loops
- **ListBox Control**
  - Introduction

Before We Begin

Administrative Details (1):

- **Lab Exercises**
  - You should be working on Ex 5-3 this week
    - Due February 28
  - Still have a few exercises and tests that were previously distributed but have not been picked up yet
    - If you have not picked up any exercise or test yet, you can after the lecture

Some Questions to Consider (1):

- What is a loop ?
- Why are loops important in any programming language ?
- What is a conditional loop ?
- How many forms of conditional loops are available ?
- Describe each form of the conditional loop ?
- What must we, as programmers ensure for every loop ?

Counted Loops

Introduction (1):

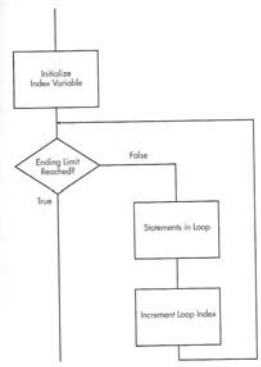
- **Recall Conditional Loops**
  - Basically, we iterate the loop statements as long as the loop condition holds
  - Useful when we do not know how many times the loop will execute
    - May execute any number of times before condition is not met
  - Many times we do know exactly how many times the loop should execute
    - In such a situation, we can use a counted loop instead

Introduction (2):

- **What Exactly is a Counted Loop ?**
  - A loop that is executed a specific number of times
  - We of course need to know how many times the loop will iterate before we start the loop!
  - Central to the counted loop is the counter variable known as the loop index that keeps track of how many times the loop has iterated
    - Value of the loop index is tested after each iteration to determine whether or not to exit the loop → if less than the number of total loop iterations then continue with next iteration

Counted Loops (1):

- **What Exactly is a Counted Loop ? (cont.)**
  - Three components
    1. Initialize the counter
    2. Increment the counter
    3. Test the counter to determine when it is time to terminate the loop



Counted Loops (2):

- **Counted Loops and Visual Basic**
  - General form (syntax) of the counted loop

```
For loopIndex = initialValue to endValue [Step Increment]
   statements of loop body
Next
```

  - loopIndex
    - Loop counter → must be a numeric value
  - initialValue
    - Initial value of loop index → may be a constant, variable, numeric value or numeric expression

Counted Loops (3):

- **Counted Loops and Visual Basic (cont.)**
  - General form (syntax) of the counted loop

```
For loopIndex = initialValue to endValue [Step Increment]
   statements of loop body
Next
```

  - endValue
    - Loop terminates when index = endValue → may be a constant, variable, numeric value or numeric expression

Counted Loops (4):

- **Counted Loops and Visual Basic (cont.)**
  - General form (syntax) of the counted loop

```
For loopIndex = initialValue To endValue [Step Increment]
   statements of loop body
Next
```

  - Step Increment
    - Step is a keyword and increment is amount to increase index after each iteration → optional and if not present default = 1
  - Next is a keyword

Counted Loops (5):

- **Counted Loops and Visual Basic (cont.)**
  - Outline of the counted loop operation
    - Prior to starting loop, index set to "initialValue"
    - Final value for the loop index is set to the value of endValue
    - After index is initialized, it is tested to see if it is greater than endValue → if not, loop statements executed, otherwise loop terminates
    - Next statement causes index to be incremented by "Increment" or 1 if no increment is specified
    - Value of index is then compared again to endValue

Counted Loop Examples (1):

- **Some Examples**
  - Lets examine some different "For" statements
    - Make sure you understand each of the following

```
For index = 2 To 100 Step 2
For countValue = startValue To EndValue Step IncrementValue
For countValue = 0 To coefficientType.ListCount-1
For index = (someValue – 5) To totalPossible
For curRate = 0.5 To 0.25 Step 0.05
For negativeCounter = 10 To Step -1
```

Counted Loop Examples (2):

- **Further Examples**
  - Some complete counted loop examples

```
Dim end = 10
Dim start = 0
For index = start To end
    text1.text = CStr(index)
Next
```

```
For index = 0 To 10
    text1.text = CStr(index)
Next
```

Counted Loop Specifics (1):

- **Negative Increment (Counting Backwards)**
  - As shown in the previous examples, we can count backwards with a counted loop
    - Use a negative number for the increment and explicitly specify it with the "Step"
    - When the Step is negative, VB tests for less than as opposed to greater than

```
For index = 10 To 0 Step -1
   text1.text = CStr(index)
Next
```

Counted Loop Specifics (2):

- **Conditions Satisfied Before Loop Entry**
  - At times, final value will be reached before entry into the loop
    - Statements in the loop body will not be executed at all in such a case

```
final = 5
For index = 6 To Final
   text1.text = CStr(index)
Next
```

Counted Loop Specifics (3):

- **Altering the Value of Loop Control Variables**
  - Once we enter the body of the loop, initialValue, endValue and increment have already been set
    - But we can alter these values within the loop body → this will have no effect on the loop (the number of times the loop iterates will not change!)

No affect on number of loop iterations

```
final = 10
increase = 2
For index = 1 To final Step increase
   final = 100
Next
```

Counted Loop Specifics (4):

- **Endless Loops**
  - Although changing the initial, end and increment values doesn't affect the loop, changing the loop index can have an affect on the loop
    - Can have a loop that never ends!

Index will never reach "final" since it is set to 1 after each iteration

```
final = 10
increase = 2
For index = 1 To final Step increase
    index = 1
Next index
```

Counted Loop Specifics (5):

- **Exiting For / Next Loops**
  - Usually, a "For" loop should execute until it completes (e.g., until index reaches the final value)
    - There may be times however where we want to exit before the index reaches the final value
    - Visual Basic provides the "Exit For" statement to exit a "For" loop early
    - Typically, the End For will be part of an If statement → will allow us to exit the loop given a particular condition

Counted Loop Specifics (6):

- **Exiting For / Next Loops (cont.)**
  - Example
    - Program that continually (in a loop) takes in user input and performs some operation on it and if input is the string "Exit" then exit program

```
For index = 1 To 10
   If (txtInput.Text = "Exit") Then
      txtMessage.text = "You must enter something"
      Exit For
   End IF
Next
```

ListBox Control

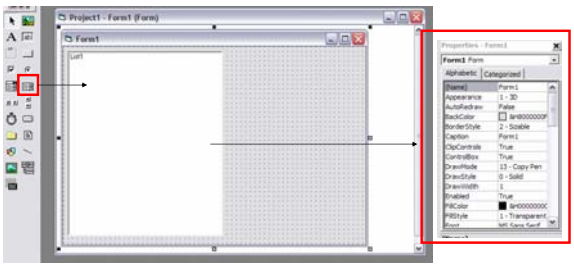
Introduction (1):

- **As an Aside**
  - Recall that an object contains properties that can be accessed, modified etc.
  - An object can also have methods associated with it
    - A method is a sub-program (think of the event handlers we know) that can take zero or more arguments and returns one value
    - Since a method is associated with (belongs to) an object, it is accessed in the same manner as an object's properties → using the "dot" notation

      objectName.methodName

Introduction (2):

- **What is a ListBox Control ?**



Introduction (3):

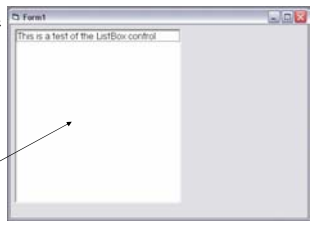
- **What is a ListBox Control ? (cont.)**
  - An object containing a list of output
    - If the data displayed in the ListBox exceeds its height, a scroll bar appears
    - Displays on each row a string value, generically called an item
    - The item must be displayed on the ListBox using the AddItem method of the ListBox

      listBoxName.AddItem(stringExpression)

Introduction (4):

- **What is a ListBox Control ? (cont.)**
  - Example → displaying a row in a listBox called List1

```
Private Sub Form_Load()
  Dim testString As String
  testString = "This is a test of the
       ListBox control"
  List1.AddItem (testString)
End Sub
```



After executing the above code segment, the following is observed in the ListBox control placed on the form

Introduction (5):

- **What is a ListBox Control ? (cont.)**
  - When we add information to the ListBox (via the "addItem" method), the new information is appended to the next line
  - But what if we don't want to append and wish to start "clean" → there is a method to clear the ListBox of any information it may currently hold thus allowing you to "start fresh"
    - The method to clear the ListBox is "Clear()" and takes no arguments → ListBox.Clear()

Live Demos (1):

- **"Live" Examples of Counted Loops and ListBoxes**
  - Lets look at some simple examples of working with counted loops and Listbox controls in Visual Basic