I101/B100
Problem Solving with Computers

By:

Dr. Hossein Hakimzadeh
Computer Science and Informatics
IU South Bend

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What do we need to learn in order to write computer programs?

- Fundamental programming constructs:
  - Variables,
  - Arithmetic operators,
  - Input and output
  - Conditionals,
  - Loops,
  - Procedures and functions,
  - Arrays (Searching and Sorting the Array),
  - Structures, classes and objects,
  - Files
Operations on an Array:

- Initializing the array
- Inserting data in the array
- Displaying the cell contents of the array
- Searching an Array
- Sorting an Array
Operations on an Array:

Initializing the array:

Dim Index As Integer
Dim Score(10) As Double

For Index = 0 To 10
    Score(Index) = 0.0
Next Index
Operations on an Array:

- **Inserting data into the array:**

```csharp
For Index = 0 To 10
    Console.Write("Enter array element ")
    Console.Write(Index)
    Console.Write(": ")
    Score(Index) = CDbl(Console.ReadLine())
Next Index
```
Operations on an Array:

- Displaying the cell contents of the array:

  For Index = 0 To 10
  Console.WriteLine(Score(Index))
  Next Index
Operations on an Array:

Searching an Array: (Linear Search)

Dim value As Double
Console.Write("Enter the value to search for:")
value = CDbl(Console.ReadLine()) 'value to search for

For Index = 0 To 10
    If Score(Index) = value Then
        Console.WriteLine("Location {0}, Found it!", Index)
    Else
        Console.WriteLine("Location {0}, Not Found..", Index)
    End If
Next Index
Consider the following Array:

- Linear Search of the array:

search(17)
Linear Search:

Dim value As Double
Console.Write("Enter the value to search for:")
value = CDbl(Console.ReadLine()) 'value to search for

For Index = 0 To 10
    If Score(Index) = value Then
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Index

(2 51 12 5 9 44 57 25 17 62 95)

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Operations on an Array:

- Binary Search

```vbnet
Private Function BinarySearch(ByVal value As Integer, ByRef TheArray() As Integer) As Integer
    Dim Low, High, Middle As Integer
    Low = 0
    High = TheArray.GetUpperBound(0)

    Do While Low <= High
        Middle = (Low + High) \ 2
        If value = TheArray(Middle) Then  'It’s a match!!
            Return (Middle)
        ElseIf value < TheArray(Middle) Then  'Search the low end of array
            High = Middle - 1
        Else
            Low = Middle + 1
        End If
    Loop
    Return (-1) 'return -1 to indicate the value was not found
End Function
```
Consider the following Array:

- Binary Search of the array:

  BinarySearch(17)

  Remember the array must be sorted first.
Binary Search:

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End Function
Operations on an Array:

- **Sorting an Array** (Bubble Sort)

  Private Sub BubbleSort(ByRef TheArray() As Integer)

      Dim Pass, Index, Hold As Integer
      For Pass = 1 To TheArray.GetUpperBound(0)
          For Index = 0 To TheArray.GetUpperBound(0) – 1
              If TheArray(Index) > TheArray(Index + 1) Then
                  Hold = TheArray(Index)
                  TheArray(Index) = TheArray(Index + 1)
                  TheArray(Index + 1) = Hold
              End If
          Next Index
      Next Pass
  End Sub
Consider the following Array:

- Linear Search of the array:

  BubbleSort(TheArray)
Bubble Sort:

Private Sub BubbleSort(ByRef TheArray() As Integer)

    Dim Pass, Index, Hold As Integer

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End Sub
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            End If
        Next Index
    Next Pass
End Sub
End of First Pass

Pass = 2
Bubble Sort:

Private Sub BubbleSort(ByRef TheArray() As Integer)
    Dim Pass, Index, Hold As Integer
    For Pass = 1 To TheArray.GetUpperBound(0)
        For Index = 0 To TheArray.GetUpperBound(0) - 1
            If TheArray(Index) > TheArray(Index + 1) Then
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        Next Index
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Hold
12

swap

Pass

UpperBound

Index

UpperBound -1
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            If TheArray(Index) > TheArray(Index + 1) Then
                Hold = TheArray(Index)
                TheArray(Index) = TheArray(Index + 1)
                TheArray(Index + 1) = Hold
            End If
        Next Index
    Next Pass
End Sub
Bubble Sort:

Private Sub BubbleSort(ByRef TheArray() As Integer)
    Dim Pass, Index, Hold As Integer
    For Pass = 1 To TheArray.GetUpperBound(0)
        For Index = 0 To TheArray.GetUpperBound(0) – 1
            If TheArray(Index) > TheArray(Index + 1) Then
                Hold = TheArray(Index)
                TheArray(Index) = TheArray(Index + 1)
                TheArray(Index + 1) = Hold
            End If
        Next Index
    Next Pass
End Sub
And so on...