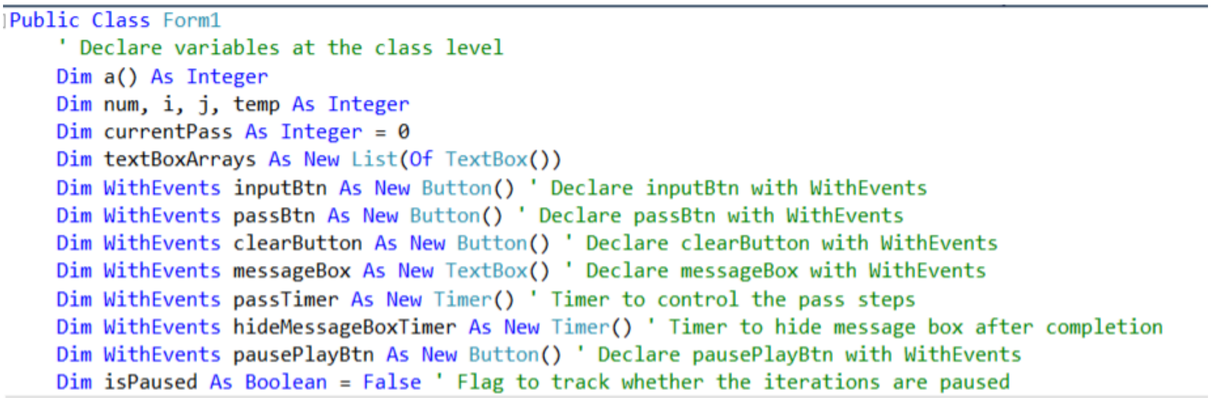
Insertion Sort Documentation

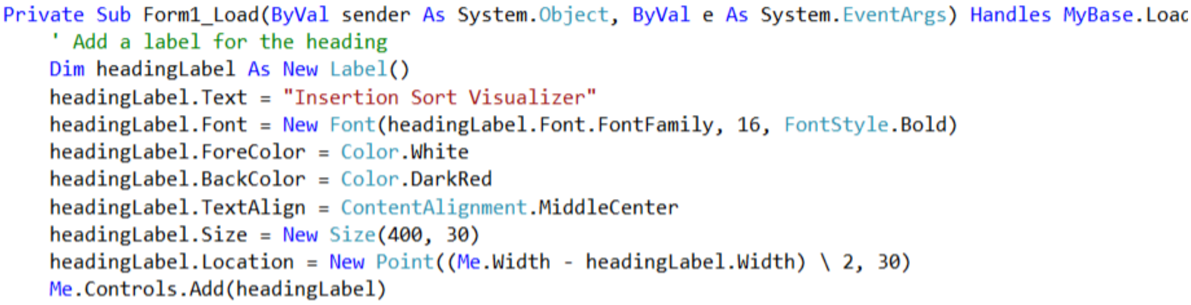
Technical documentation

Firstly, we declare all the variables at the class level for easier use throughout the code.



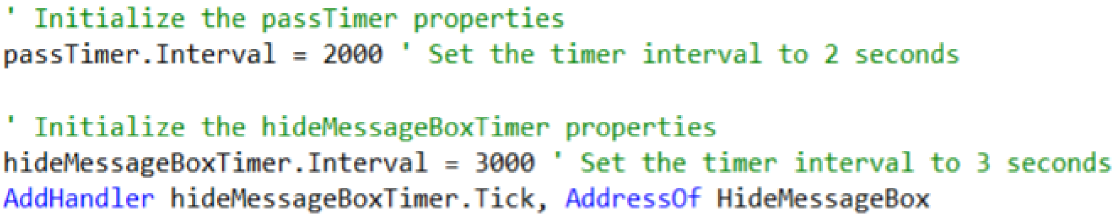
```
Public Class Form1
    ' Declare variables at the class level
    Dim a() As Integer
    Dim num, i, j, temp As Integer
    Dim currentPass As Integer = 0
    Dim textBoxArrays As New List(Of TextBox())
    Dim WithEvents inputBtn As New Button() ' Declare inputBtn with WithEvents
    Dim WithEvents passBtn As New Button() ' Declare passBtn with WithEvents
    Dim WithEvents clearButton As New Button() ' Declare clearButton with WithEvents
    Dim WithEvents messageBox As New TextBox() ' Declare messageBox with WithEvents
    Dim WithEvents passTimer As New Timer() ' Timer to control the pass steps
    Dim WithEvents hideMessageBoxTimer As New Timer() ' Timer to hide message box after completion
    Dim WithEvents pausePlayBtn As New Button() ' Declare pausePlayBtn with WithEvents
    Dim isPaused As Boolean = False ' Flag to track whether the iterations are paused
```

The following code loads the form and the subsequent buttons when the solution is ran (the properties of the buttons and heading are set accordingly).



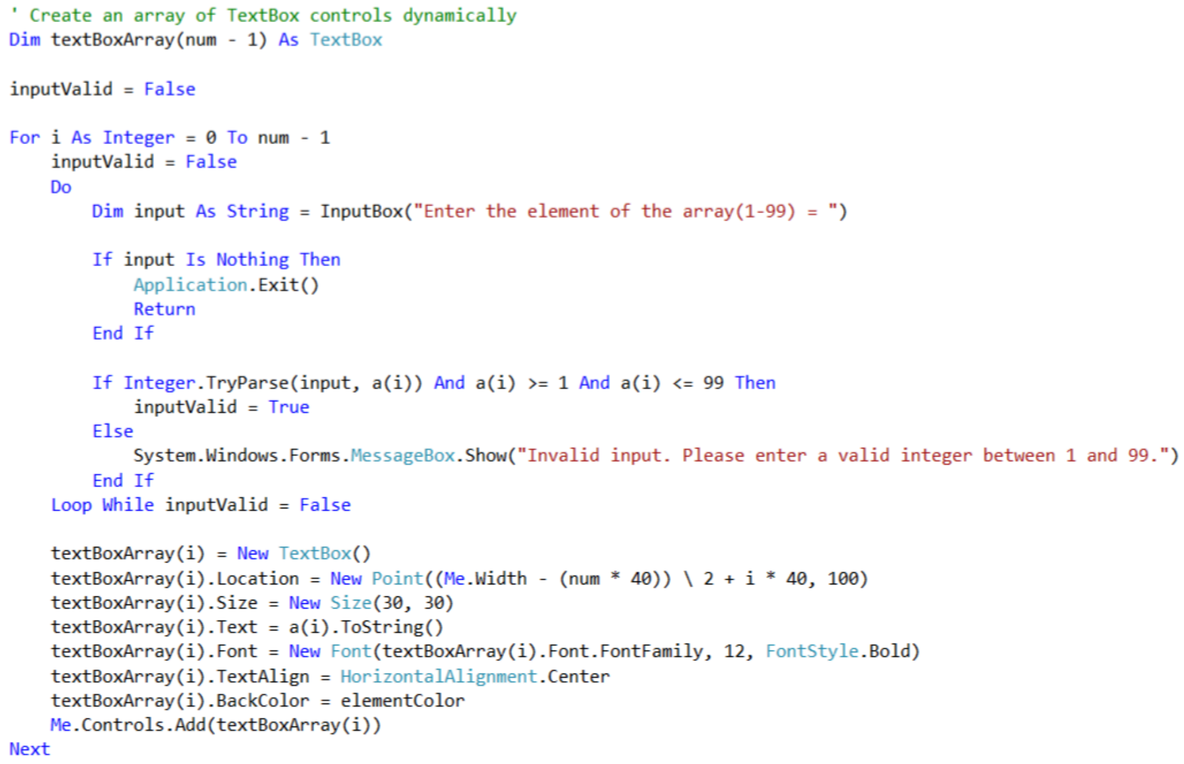
```
Private Sub Form1_Load(ByVal sender As System.Object, ByVal e As System.EventArgs) Handles MyBase.Loac
    ' Add a label for the heading
    Dim headingLabel As New Label()
    headingLabel.Text = "Insertion Sort Visualizer"
    headingLabel.Font = New Font(headingLabel.Font.FontFamily, 16, FontStyle.Bold)
    headingLabel.ForeColor = Color.White
    headingLabel.BackColor = Color.DarkRed
    headingLabel.TextAlign = ContentAlignment.MiddleCenter
    headingLabel.Size = New Size(400, 30)
    headingLabel.Location = New Point((Me.Width - headingLabel.Width) \ 2, 30)
    Me.Controls.Add(headingLabel)
```

The timers have been set to add animation effects.



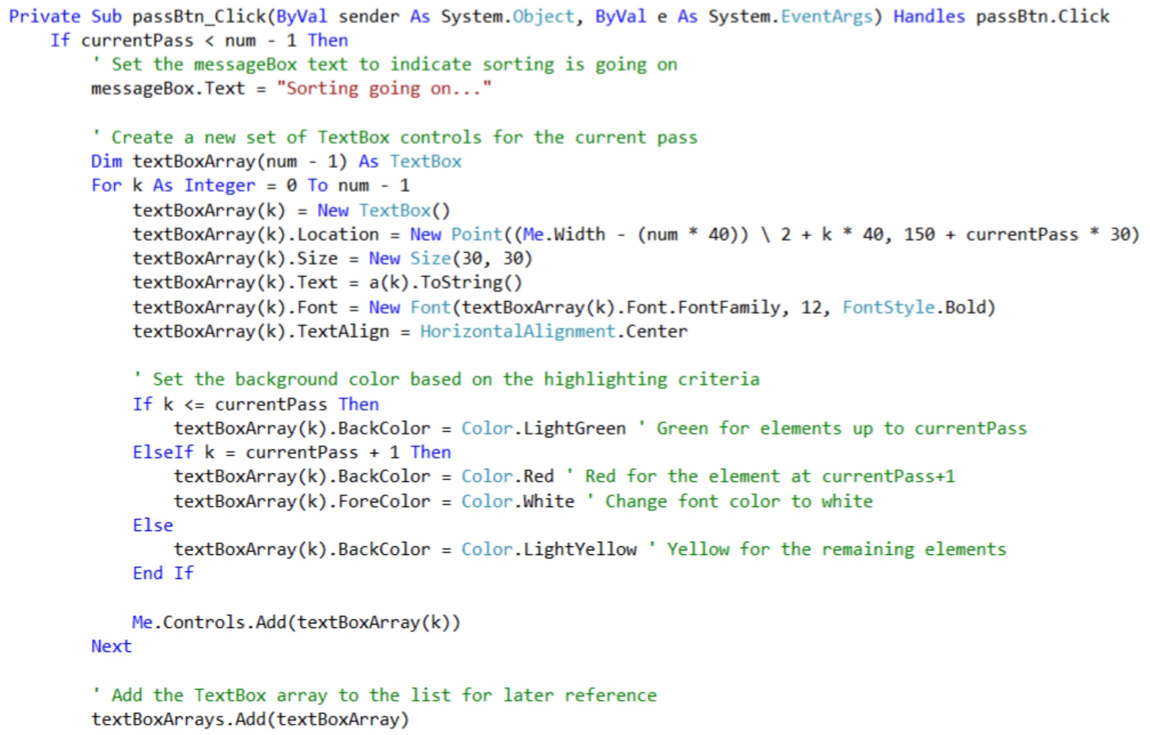
```
' Initialize the passTimer properties
passTimer.Interval = 2000 ' Set the timer interval to 2 seconds

' Initialize the hideMessageBoxTimer properties
hideMessageBoxTimer.Interval = 3000 ' Set the timer interval to 3 seconds
AddHandler hideMessageBoxTimer.Tick, AddressOf HideMessageBox
```

Now we take the number of elements in the array and the elements of the array as input from the user, which has been handled by the following code snippet. (validation implemented)



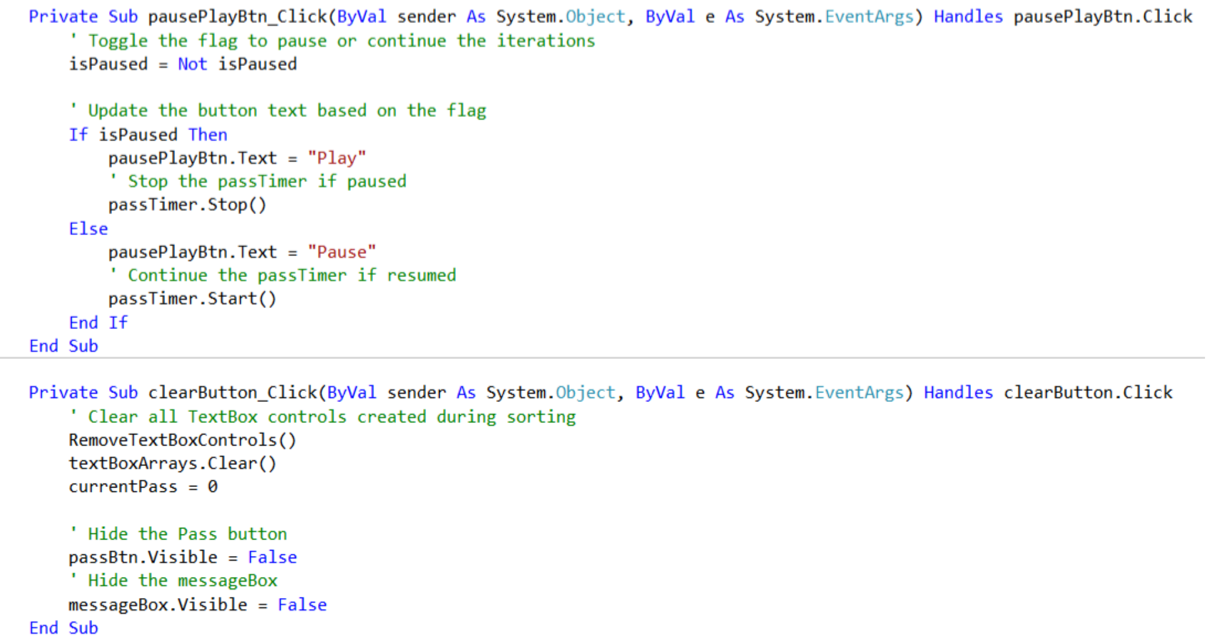
```
' Create an array of TextBox controls dynamically
Dim textBoxArray(num - 1) As TextBox

inputValid = False

For i As Integer = 0 To num - 1
    inputValid = False
    Do
        Dim input As String = InputBox("Enter the element of the array(1-99) = ")

        If input Is Nothing Then
            Application.Exit()
            Return
        End If

        If Integer.TryParse(input, a(i)) And a(i) >= 1 And a(i) <= 99 Then
            inputValid = True
        Else
            System.Windows.Forms.MessageBox.Show("Invalid input. Please enter a valid integer between 1 and 99.")
        End If
    Loop While inputValid = False

    textBoxArray(i) = New TextBox()
    textBoxArray(i).Location = New Point((Me.Width - (num * 40)) \ 2 + i * 40, 100)
    textBoxArray(i).Size = New Size(30, 30)
    textBoxArray(i).Text = a(i).ToString()
    textBoxArray(i).Font = New Font(textBoxArray(i).Font.FontFamily, 12, FontStyle.Bold)
    textBoxArray(i).TextAlign = HorizontalAlignment.Center
    textBoxArray(i).BackColor = elementColor
    Me.Controls.Add(textBoxArray(i))
Next
```

This part of the code prints the array after each pass of the insertion sort loop.



```
Private Sub passBtn_Click(ByVal sender As System.Object, ByVal e As System.EventArgs) Handles passBtn.Click
    If currentPass < num - 1 Then
        ' Set the messageBox text to indicate sorting is going on
        messageBox.Text = "Sorting going on..."

        ' Create a new set of TextBox controls for the current pass
        Dim textBoxArray(num - 1) As TextBox
        For k As Integer = 0 To num - 1
            textBoxArray(k) = New TextBox()
            textBoxArray(k).Location = New Point((Me.Width - (num * 40)) \ 2 + k * 40, 150 + currentPass * 30)
            textBoxArray(k).Size = New Size(30, 30)
            textBoxArray(k).Text = a(k).ToString()
            textBoxArray(k).Font = New Font(textBoxArray(k).Font.FontFamily, 12, FontStyle.Bold)
            textBoxArray(k).TextAlign = HorizontalAlignment.Center

            ' Set the background color based on the highlighting criteria
            If k <= currentPass Then
                textBoxArray(k).BackColor = Color.LightGreen ' Green for elements up to currentPass
            ElseIf k = currentPass + 1 Then
                textBoxArray(k).BackColor = Color.Red ' Red for the element at currentPass+1
                textBoxArray(k).ForeColor = Color.White ' Change font color to white
            Else
                textBoxArray(k).BackColor = Color.LightYellow ' Yellow for the remaining elements
            End If

            Me.Controls.Add(textBoxArray(k))
        Next

        ' Add the TextBox array to the list for later reference
        textBoxArrays.Add(textBoxArray)
```

This final part of the code adds the timer effect for animations.



```
Private Sub pausePlayBtn_Click(ByVal sender As System.Object, ByVal e As System.EventArgs) Handles pausePlayBtn.Click
    ' Toggle the flag to pause or continue the iterations
    isPaused = Not isPaused

    ' Update the button text based on the flag
    If isPaused Then
        pausePlayBtn.Text = "Play"
        ' Stop the passTimer if paused
        passTimer.Stop()
    Else
        pausePlayBtn.Text = "Pause"
        ' Continue the passTimer if resumed
        passTimer.Start()
    End If
End Sub

Private Sub clearButton_Click(ByVal sender As System.Object, ByVal e As System.EventArgs) Handles clearButton.Click
    ' Clear all TextBox controls created during sorting
    RemoveTextBoxControls()
    textBoxArrays.Clear()
    currentPass = 0

    ' Hide the Pass button
    passBtn.Visible = False
    ' Hide the messageBox
    messageBox.Visible = False
End Sub
```

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CS346 Assignment 1 Milestone 3