DSP Programming – Demonstration Program 4

```
' FBankConsole - demonstrate application of filterbank to wav file
'
' Select a Console application.
'
' Use the "My Project" dialog to configure the program:
' - under the Compile tab, press "Advanced Compilation Options"
'   and change the Target CPU to "x86"
' - under the References tab, click the "Add" button then browse for
'   and select the BasicDSP.dll library.
'
' Run from Command Prompt or CYGWIN:
'   FBankConsole input.wav >output.txt
'
Imports BasicDSP
Imports BasicDSP.Filter
'
Module FBankConsole

    ' number of channels
    Private Const NCHAN As Integer = 19
    ' channel edge frequencies (Hz)
    Dim cutfreq() As Double = {180, 300, 420, 540, 660, 780, 900, 1075,
1225, 1375, 1525, 1700, 1900, 2100, 2300, 2550, 2850, 3150, 3475, 4000}
    ' output rate of filterbank (frames/sec)
    Private Const ORATE As Double = 100

    Sub Main(ByVal args() As String)
        Dim chan As Integer

        ' check arguments
        If args.Length = 0 Then
            Console.WriteLine("usage: fbankconsole input.wav")
            Environment.Exit(1)
        End If

        ' read in a WAV audio file
        Dim wv As New Signal
        If Not wv.LoadWaveFile(args(0)) Then
            Console.WriteLine("could not open file: " & args(0))
            Environment.Exit(1)
        End If

        ' build the bank of analysis filters
        Dim fbank(NCHAN) As LTISystemChain
        For chan = 1 To NCHAN
            fbank(chan) = ButterworthBandPass(cutfreq(chan - 1) / wv.Rate,
cutfreq(chan) / wv.Rate, 4)
        Next

        ' build a bank of smoothing filters at half output rate
        Dim sbank(NCHAN) As LTISystemChain
        For chan = 1 To NCHAN
            sbank(chan) = ButterworthLowPass((0.5 * ORATE) / wv.Rate, 4)
        Next
```

```
        ' process the signal sample by sample
        Dim t As Double = 0
        Dim out(NCHAN) As Double
        For n As Integer = wv.First To wv.Last
            ' for each channel
            For chan = 1 To NCHAN
                ' filter the input sample
                out(chan) = fbank(chan)(wv(n))
                ' rectify
                out(chan) = Math.Abs(out(chan))
                ' smooth
                out(chan) = sbank(chan)(out(chan))
            Next
            t += wv.Period
            ' every so often, output frame
            If (t > 1 / ORATE) Then
                For chan = 1 To NCHAN
                    Console.Write("{0,6:F02} ", 20 * Math.Log10(out(chan)))
                Next
                Console.WriteLine()
                t -= 1 / ORATE
            End If
        Next
    End Sub

End Module
```