APPENDIX A
THE FUNCTION FIR1

```
(function [b,a] = fir1(N,Wn,varargin
                    .FIR1   FIR filter design using the window method%
  B = FIR1(N,Wn) designs an N'th order lowpass FIR digital filter   %
      .and returns the filter coefficients in length N+1 vector B   %
  The cut-off frequency Wn must be between 0 < Wn < 1.0, with 1.0   %
 corresponding to half the sample rate.  The filter B is real and   %
    has linear phase.  The normalized gain of the filter at Wn is   %
                                                          .dB 6-    %
                                                                    %
     .B = FIR1(N,Wn,'high') designs an N'th order highpass filter   %
.You can also use B = FIR1(N,Wn,'low') to design a lowpass filter   %
                                                                    %
     If Wn is a two-element vector, Wn = [W1 W2], FIR1 returns an   %
      order N bandpass filter with passband  W1 < W < W2. You can   %
        ,[also specify B = FIR1(N,Wn,'bandpass').  If Wn = [W1 W2   %
             .B = FIR1(N,Wn,'stop') will design a bandstop filter   %
                                                                    %
                                    ,If Wn is a multi-element vector%
                                ,[Wn = [W1 W2 W3 W4 W5 ... WN       %
              FIR1 returns an order N multiband filter with bands   %
                        .W < W1, W1 < W < W2, ..., WN < W < 1 > 0   %
           .B = FIR1(N,Wn,'DC-1') makes the first band a passband   %
           .B = FIR1(N,Wn,'DC-0') makes the first band a stopband   %
                                                                    %
        B = FIR1(N,Wn,WIN) designs an N-th order FIR filter using   %
        .the N+1 length vector WIN to window the impulse response   %
   .If empty or omitted, FIR1 uses a Hamming window of length N+1   %
   For a complete list of available windows, see the help for the   %
     WINDOW function. KAISER and CHEBWIN can be specified with an   %
                    optional trailing argument.  For example, B =   %
                                                ((FIR1(N,Wn,kaiser(N+1,4
                              uses a Kaiser window with beta=4. B =   %
                                                ((FIR1(N,Wn,'high',chebwin(N+1,R
     uses a Chebyshev window with R decibels of relative sidelobe   %
                                                          .attenuation%
                                                                    %
  For filters with a gain other than zero at Fs/2, e.g., highpass   %
      and bandstop filters, N must be even.  Otherwise, N will be   %
    incremented by one.  In this case the window length should be   %
                                                  .specified as N+2 %
                                                                    %
 By default, the filter is scaled so the center of the first pass   %
                                                                band
        has magnitude exactly one after windowing. Use a trailing   %
                                                           ''noscale
 ,('argument to prevent this scaling, e.g. B = FIR1(N,Wn,'noscale   %
  B = FIR1(N,Wn,'high','noscale'), B = FIR1(N,Wn,wind,'noscale').   %
                                                             You
 can also specify the scaling explicitly, e.g. FIR1(N,Wn,'scale'),   %
                                                           .etc
                                                                    %
        ,See also KAISERORD, FIRCLS1, FIR2, FIRLS, FIRCLS, CFIRPM   %
                              .FIRPM, FREQZ, FILTER, WINDOW         %
```