

## Problem Set V

1. Write Matlab functions to compute and plot the  $L$ -level discrete wavelet transform (DWT) basis functions  $\phi^L[n]$  and  $\psi^\ell[n]$ ,  $\ell = 1, 2, \dots, L$ , given two FIR filters  $h_0[n]$  and  $h_1[n]$ .
2. Let  $p_0[n] = \frac{1}{2048}[-5 \ 0 \ 49 \ 0 \ -245 \ 0 \ 1225 \ 2048 \ 1225 \ 0 \ -245 \ 0 \ 49 \ 0 \ -5]$  as in Problem Set III.
  - (a) For every real orthogonal solution, plot the associated DWT bases  $\{\phi^L[n], \psi^\ell[n]\}$ . Any observation on how the zeros distribution affect the phase of the basis functions?
  - (b) For every real 6/10-tap biorthogonal solution, plot the analysis bases  $\{\phi_h^L[n], \psi_h^\ell[n]\}$  as well as the synthesis bases  $\{\phi_f^L[n], \psi_f^\ell[n]\}$ . Repeat the exercise for every real 9/7-tap biorthogonal solution. Report your observations on any correlation between the smoothness of the bases, the number of zeros at  $\pi$  of  $\{h_0[n], f_0[n]\}$ , and the quality of the reconstructed signals after quantization.

Due date: **October 28** in class