Figure Captions

Figure 1. Plots of the auto-correlation function \( \Phi(x) \) and Daubechies's scaling function \( \varphi(x) \) with \( L = 2M = 4 \). (a) \( \Phi(x) \). (b) \( \varphi(x) \). (c) Magnitude of the Fourier transform of \( \Phi(x) \). (d) Magnitude of the Fourier transform of \( \varphi(x) \).

Figure 2. Plots of the auto-correlation function \( \Psi(x) \) and Daubechies's wavelet \( \psi(x) \) with \( L = 2M = 4 \). (a) \( \Psi(x) \). (b) \( \psi(x) \). (c) Magnitude of the Fourier transform of \( \Psi(x) \). (d) Magnitude of the Fourier transform of \( \psi(x) \).

Figure 3. The Lagrange iterative interpolation of the unit impulse sequence with the associated quadrature mirror filter of length \( L = 4 \), i.e., \( a_1 = 9/8 \) and \( a_2 = -1/8 \). Black nodes at \( x = 0 \) indicate 1 and white nodes at \( x = \pm 1 \) have value 0. Shaded nodes have values other than 0 or 1. Note that the values of nodes existing at the \( j \)-th scale do not change at the \( (j - 1) \)-th scale and higher. The result of repeating this procedure converges to \( \Phi(x) \) as \( j \to -\infty \).

Figure 4. The expansion of the signal in the auto-correlation shell using the auto-correlation functions of Daubechies's wavelet with \( L = 2M = 4 \). The top row is the original signal. Note that the locations of edges in the original signal correspond to the zero-crossings in this representation.

Figure 5. The average coefficients on different scales (The top row is the original signal).
Figure 1:
Figure 2: