Course 18.327 and 1.130
Wavelets and Filter Banks

Matlab wavelet toolbox.

Matlab Example 3

1. 1-D signal analysis
Daubechies 9/7 pair: zeros of $H_0$ and $F_0$

```matlab
>> example3
Zeros of $H_0(z)$
an =
    2.0311 + 1.7390i
    2.0311 - 1.7390i
   -1.0001 + 0.0001i
   -1.0001 - 0.0001i
   -0.9999 + 0.0001i
   -0.9999 - 0.0001i
    0.2841 + 0.2432i
    0.2841 - 0.2432i
```

Zeros of $F_0(z)$
an =
    3.0407
   -1.0010 + 0.0010i
   -1.0010 - 0.0010i
   -0.9990 + 0.0010i
   -0.9990 - 0.0010i
    0.3289

Complete Set of Daub 9/7 Filters
Frequency Responses of Daub 9/7

Single Stage Decomposition
3-Stage Decomposition

[Diagram showing a tree decomposition and data for nodes (7) or (8).]

3-Stage Decomposition

[Diagram showing a three-stage wavelet decomposition.]
Individually Reconstructed Branches

Reconstruction Error --- upcoef
Reconstruction Error --- wrcoef

Reconstruction Error --- waverec
Matlab Example 4

1. 2-D image analysis

Original Image
Wavelet Decomposition

Single Stage Decomposition
Two-Stage Decomposition

Reconstructed Branches
Global Hard Thresholding

Variable Hard Thresholding