Below is a 512 x 512 test image. Note the various shapes, edges, spatial frequencies, and directions.
A 2-level octave subband decomposition is applied to the test image above, resulting in the image below.

By comparing the original image to the subband decomposed image, one can identify the portions of the original image with frequencies in the high-pass frequency bands, both horizontal and vertical spatial frequency. The low-frequency subband looks like a decimated-by-4 version of the original image.
>> barb=imread('barbg.pgm'); % Read in the .pgm image “barbg.pgm”
>> imshow(barb) % Display the image ‘barb’

8-Bit Luminance Image "Barbara"

Note that the image has texture and directionality.
Form a 3-level octave sub-band decomposition.
>> [C,S]=wavelet_bior2(barb,3);
>> wavelet_plot(C,S,1,'absorb'); % Display the subband decomposed image; scale = 1.
>> title('3-Level Octave Wavelet Decomposition; Unscaled Subbands')

![3-Level Octave Wavelet Decomposition; Unscaled Subbands](image)

Figure 1. 3-level octave decomposition of the luminance image “Barbara” using the (near-unitary) 9-7 biorthogonal filter bank. Unity scaling of subbands.

The wavelet transform used to generate the decomposed image is near-unitary. The subbands are displayed using a scale factor of unity, demonstrating that there is very little energy in the higher frequency subbands.
Figure 2. 3-level octave decomposition of the luminance image “Barbara” using the (near-unitary) 9-7 biorthogonal filter bank. Subbands scaled by 10.

Figure 2 is the same as Figure 1, except that all (except the lowest frequency) subbands are scaled by 10. The detail in the higher frequency subbands is much more apparent. Note the directionality captured in the subbands that are low-frequency in one direction, and high-frequency in the other.

lp = [0.037829, -0.023849, -0.110624, 0.377403, 0.852699, ...
    0.377403, -0.110624, -0.023849, 0.037829];
hp = [0.064539, -0.040690, -0.418092, 0.788485, ...
    -0.418092, -0.040690, 0.064539];