Homework 5 (Due: 28th Dec.)

(1) What are the roles of (a) admissibility criterion and (b) scaling function for continuous wavelet transform design? (10 scores)

(2) What are the vanish moments of (a) the sinc wavelet, (b) the 18-point coiflet wavelet, and (c) $G(f) = (1+\exp(-j2\pi f))^5\cos(\pi f)/32$ where $G(f)$ is the discrete-time Fourier transform of gk defined on page 415? (15 scores)

(3) What is the maximal possible frequency for a discrete sequence h_k where k = …, 0, 1, 2, 3, ….? (5 scores)

(4) Why the complexity of the 1-D discrete wavelet transform is linear with N? (10 scores)

(5) (a) What is the advantage of the symlet? (b) What is the advantage of the curvelet compared to the original wavelet? (10 scores)

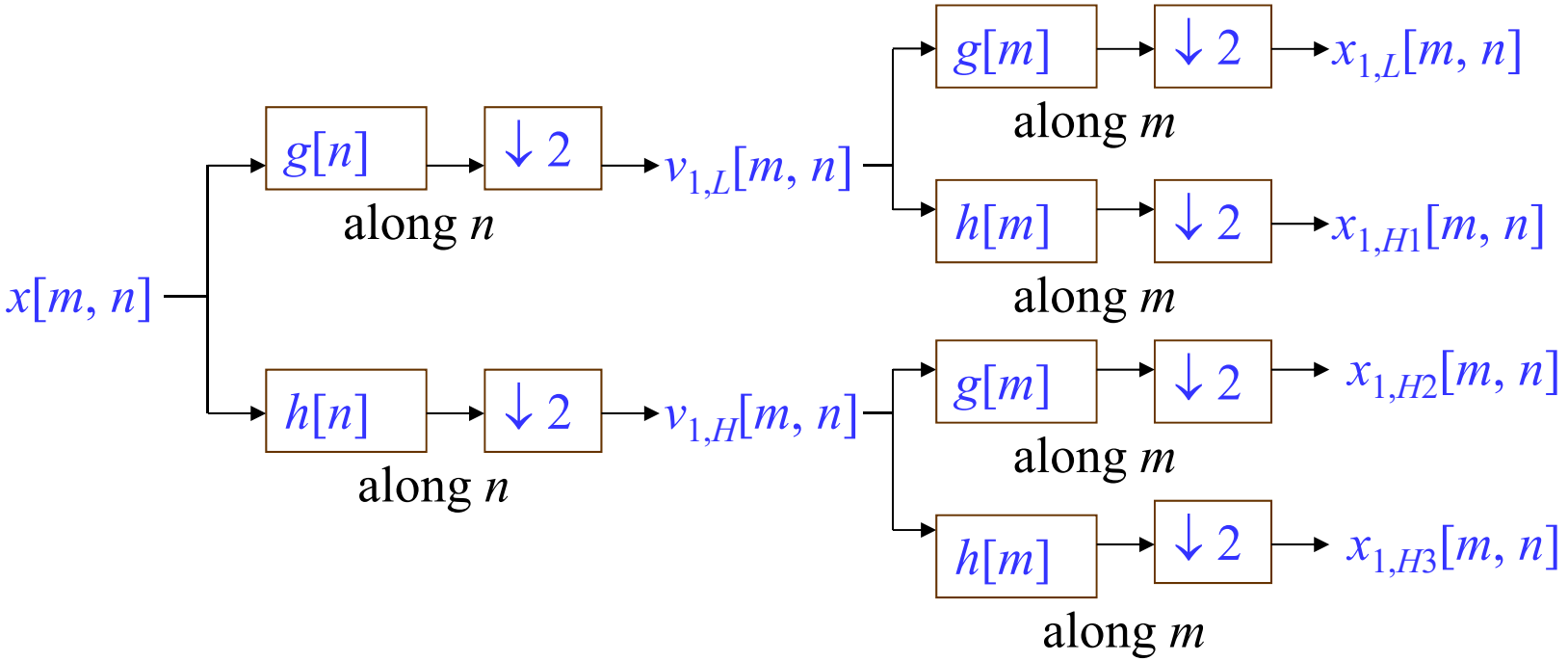
(6) Why the wavelet transform is useful for (a) adaptive filter design and (b) pattern recognition? (10 scores)

(7) For a two-point wavelet filter, if $g[0] = 3/5$, $g[1] = a$, and $g[n] = 0$ otherwise. Determine a if (a) $g[n]$ is a quadratic mirror filter and (b) $g[n]$ is an orthonormal filter. (10 scores)

(8) (a) Write a Matlab or Python code for the following 2-D discrete 10-point Daubechies wavelet.

x = double(imread('filename'))

[x1L, x1H1, x1H2, x1H3] = wavedbc10(x)



(b) Also write the program for the inverse 2-D discrete 10-point Daubechies wavelet transform.

x = iwavedbc10(x1L, x1H1, x1H2, x1H3)

The code should be handed out by NTUCool. (30 scores)

(Extra): Answer the questions according to your student ID number.

(ended with 1, 2, 3, 4, 6, 7, 8, 9)