CSE 473/573 Fall 2007 Oct 18 2007

Name___________________________________

Midterm Exam

Instructions: anwer all 3 questions in the bluebook provided. 50 min, open book, notes.

1. (a) Sketch a 4x4 binary image whose T-pyramid representation and quadtree representation are exactly the same. You do not have to give the representations, just the image.

(b) Sketch a 4x4 binary image whose run-length code is the longest possible for any 4x4 binary image. You do not have to give the code, just the image.

(c) Sketch a 4x4 binary image containing a single 8-connected object whose chain code representation is much longer than the run-length code of the image. Only the image is required.

2.

–1	–1	–1
–1	+1	+1
–1	+1	+1

M

0	0	0	0	0
0	5	5	5	0
0	5	5	5	0
0	5	5	5	0
0	0	0	0	0

X

Y

(a) Consider a linear filter which uses the mask **M** shown above. What kind of features does this filter find: is it an edge-finder, a line-finder, or a corner-finder? Explain your choice.

(b) Compute **Y**, the output image when the image **X** is filtered by **M**, and show your result by filling in the grey level values for **Y** in the above figure. What features has the filter "found?"

(c) Explain how you could use **M**, together with some other masks, to create a filter which would find not just features at one specific orientation, but at any orientation. Describe the set of masks you would use, and how you would use them. You need not give numerical values for all the masks you propose adding, just one or two of them.

3. **B** = { (0,0) (1,0) (2,0) (0,-1) (0,-2) }

(a) Find **Y** = **B** ⊕ **B**, the dilation of **B** by **B**. Show your result as a graph, remembering to mark the cell which is the origin of **Y** with an "ex."

(b) Find the smallest object **X** that survives 3 erosions by **B**. Smallest means least number of object pixels, and survives means that after **X** is eroded by B, and the resulting image is eroded by **B** again, and that resulting image is eroded by **B** yet again, the result still has at least one object pixel. Show your answer graphically. Explain your reasoning step by step.