

Solutions to Optional Homework (Lecture 11)

Problem 9.30

The key difference between the Lake and the other two features is that the former forms a closed contour. Assuming that the shapes are processed one at a time, a basic two-step approach for differentiating between the three shapes is as follows:

Step 1. Apply an end-point detector to the object. If no end points are found, the object is a Lake. Otherwise it is a Bay or a Line.

Step 2. There are numerous ways to differentiate between a Bay and a Line. One of the simplest is to determine a line joining the two end points of the object. If the AND of the object and this line contains only two points, the figure is a Bay. Otherwise it is a Line. There are pathological cases in which this test will fail, and additional "intelligence" needs to be built into the process, but these pathological cases become less probable with increasing resolution of the thinned figures.

Problem 9.32

(a) With reference to the example shown in Fig. P9.32, the boundary that results from using the structuring element in Fig. 9.17(c) generally forms an 8-connected path (leftmost figure), whereas the boundary resulting from the structuring element in Fig. 9.15(b) forms a 4-connected path (rightmost figure).

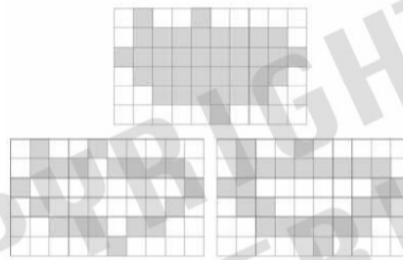


Figure P9.32

(b) Using a 3×3 structuring element of all 1's would introduce corner pixels into segments characterized by diagonally-connected pixels. For example, square (2, 2) in Fig. 9.17(e) would be a 1 instead of a 0. That value of 1 would carry all the way to the final result in Fig. 9.17(i). There would be other 1's introduced that would turn Fig. 9.17(i) into a much more distorted object.

Problem 9.51

(a) Color the image border pixels the same color as the particles (white). Call the resulting set of border pixels β . Apply the connected component algorithm (Section 9.6). All connected components that contain elements from β are particles that have merged with the border of the image.