

Dilation/erosion for gray-level images

- Explicit decomposition into threshold sets not required in practice
- Flat dilation operator: local maximum over window W

$$g[x, y] = \max \left\{ W \left\{ f[x, y] \right\} \right\} := \text{dilate}(f, W)$$

- Flat erosion operator: local minimum over window W

$$g[x, y] = \min \left\{ W \left\{ f[x, y] \right\} \right\} := \text{erode}(f, W)$$

- Binary dilation/erosion operators contained as special case

1-d illustration of erosion and dilation

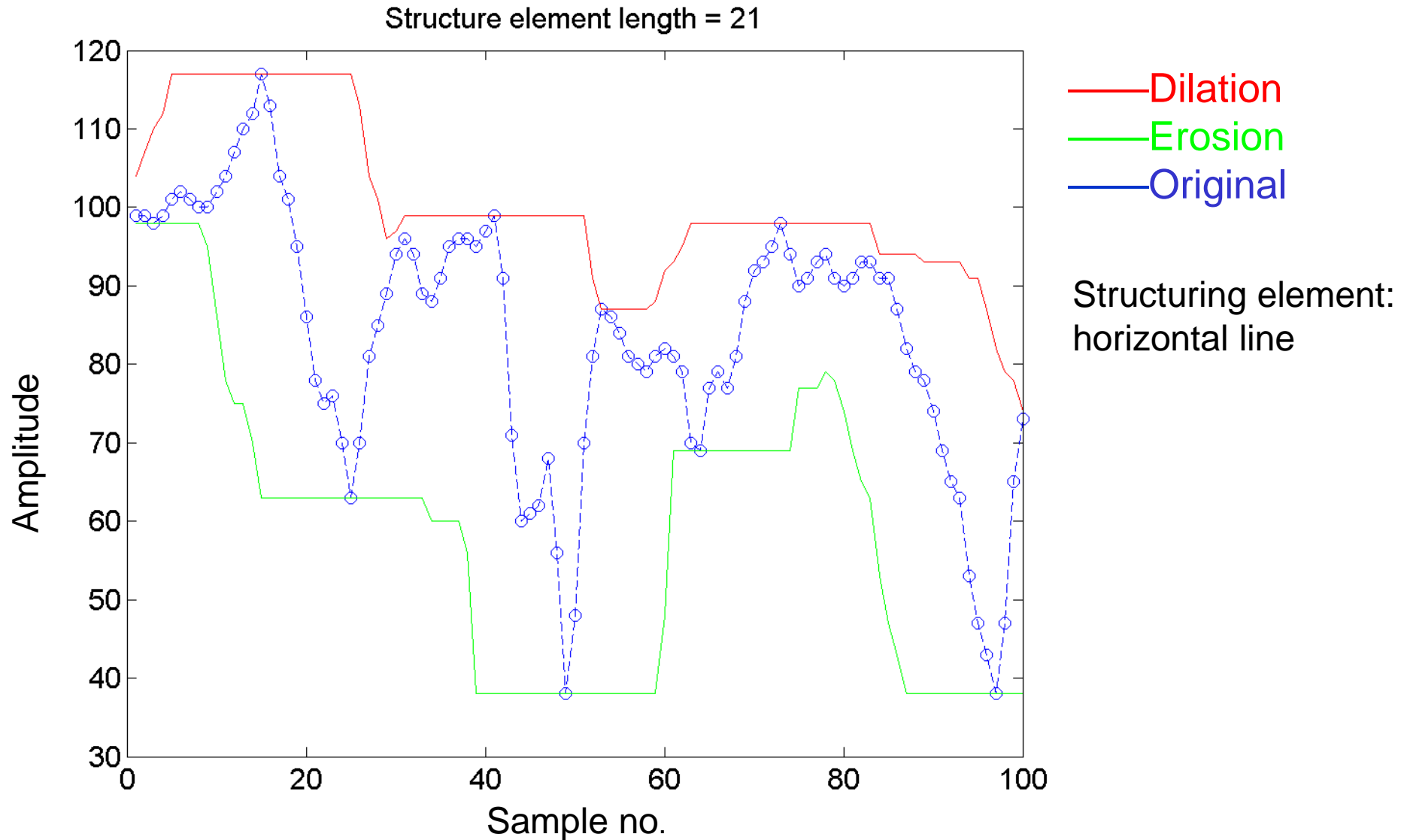


Image example



Original



Dilation



Erosion



Flat dilation with different structuring elements



Original



Diamond



Disk



20 degree line



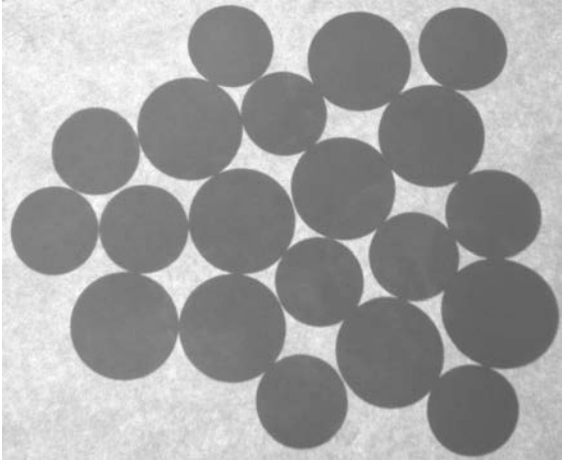
9 points



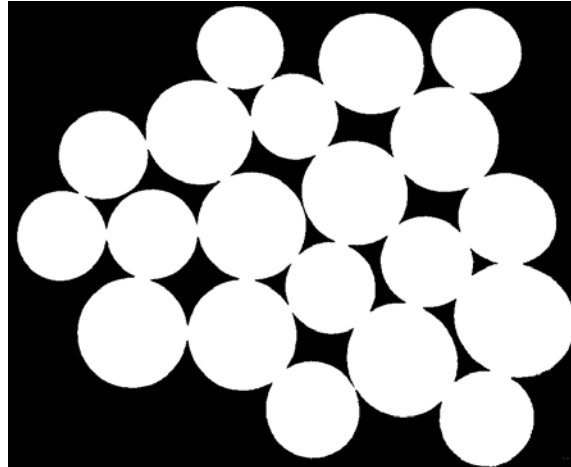
2 horizontal lines



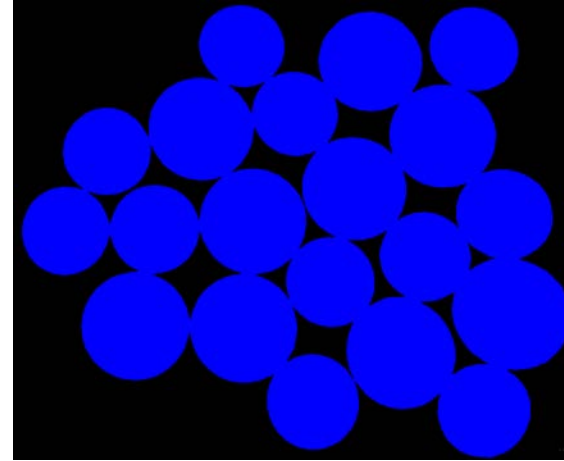
Example: counting coins



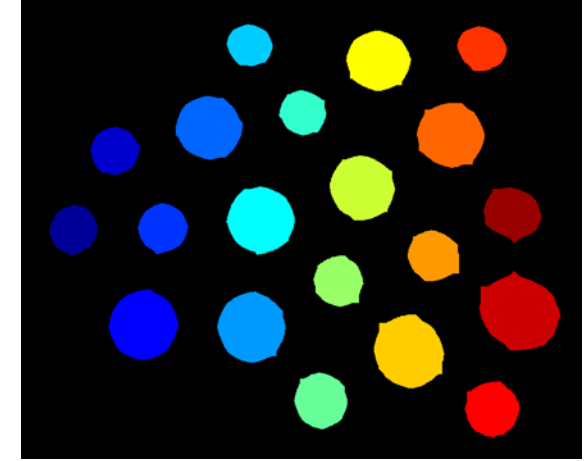
Original



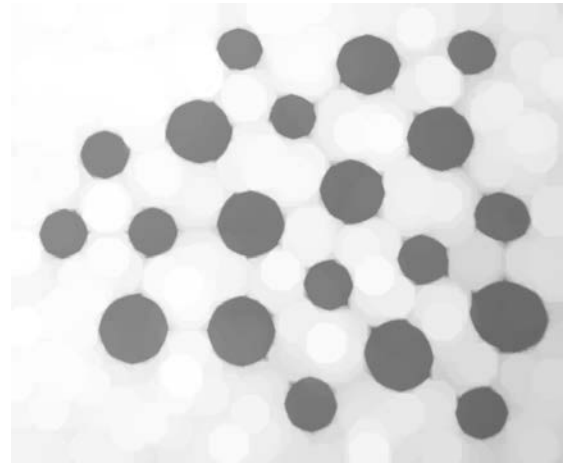
thresholded



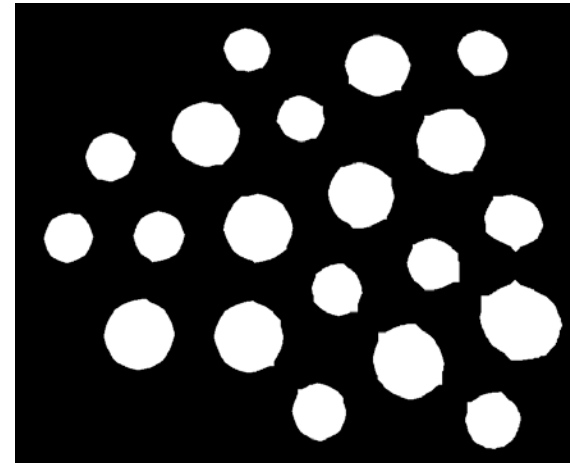
1 connected component



20 connected components



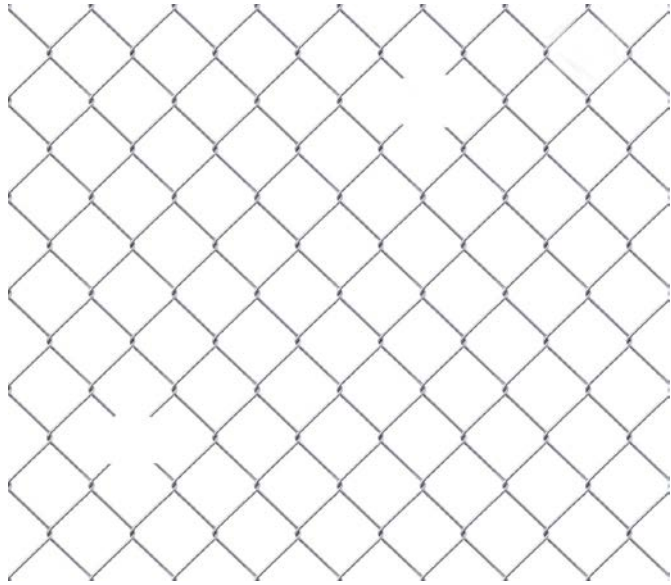
dilation



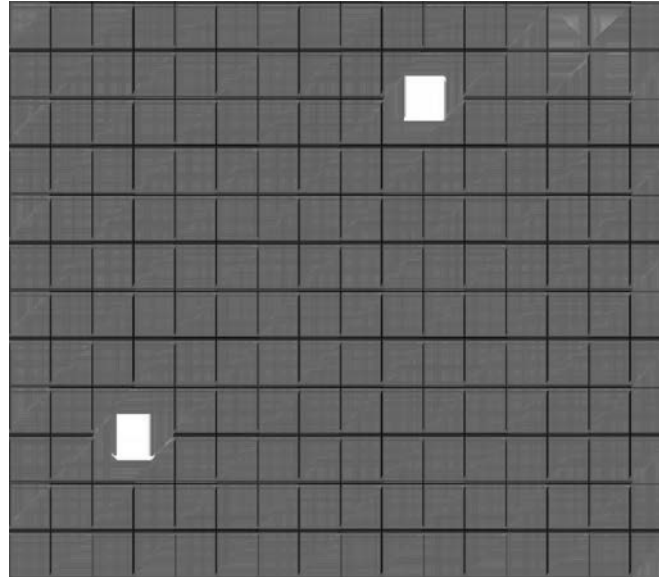
thresholded after dilation



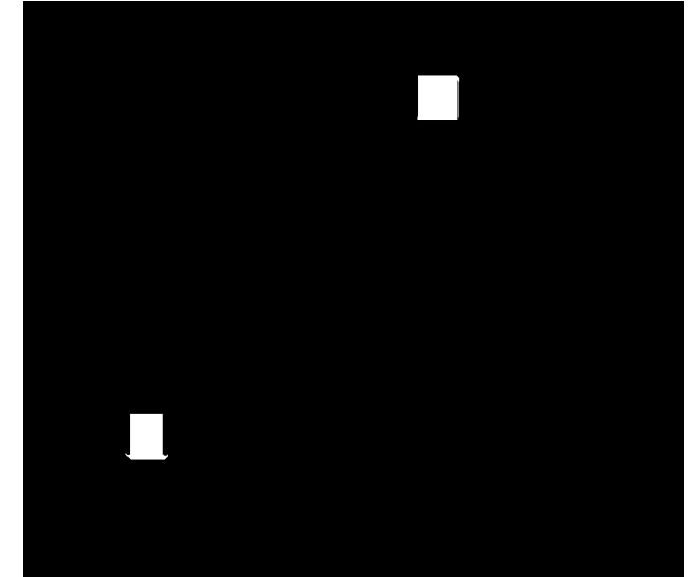
Example: chain link fence hole detection



Original grayscale image
Fence (1023 x 1173)



Flat erosion with 151x151
“cross” structuring element



Binarized by Thresholding



Morphological edge detector



original f



dilation g



$g-f$



$(g-f)$ thresholded

