Dilation/erosion for gray-level images

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

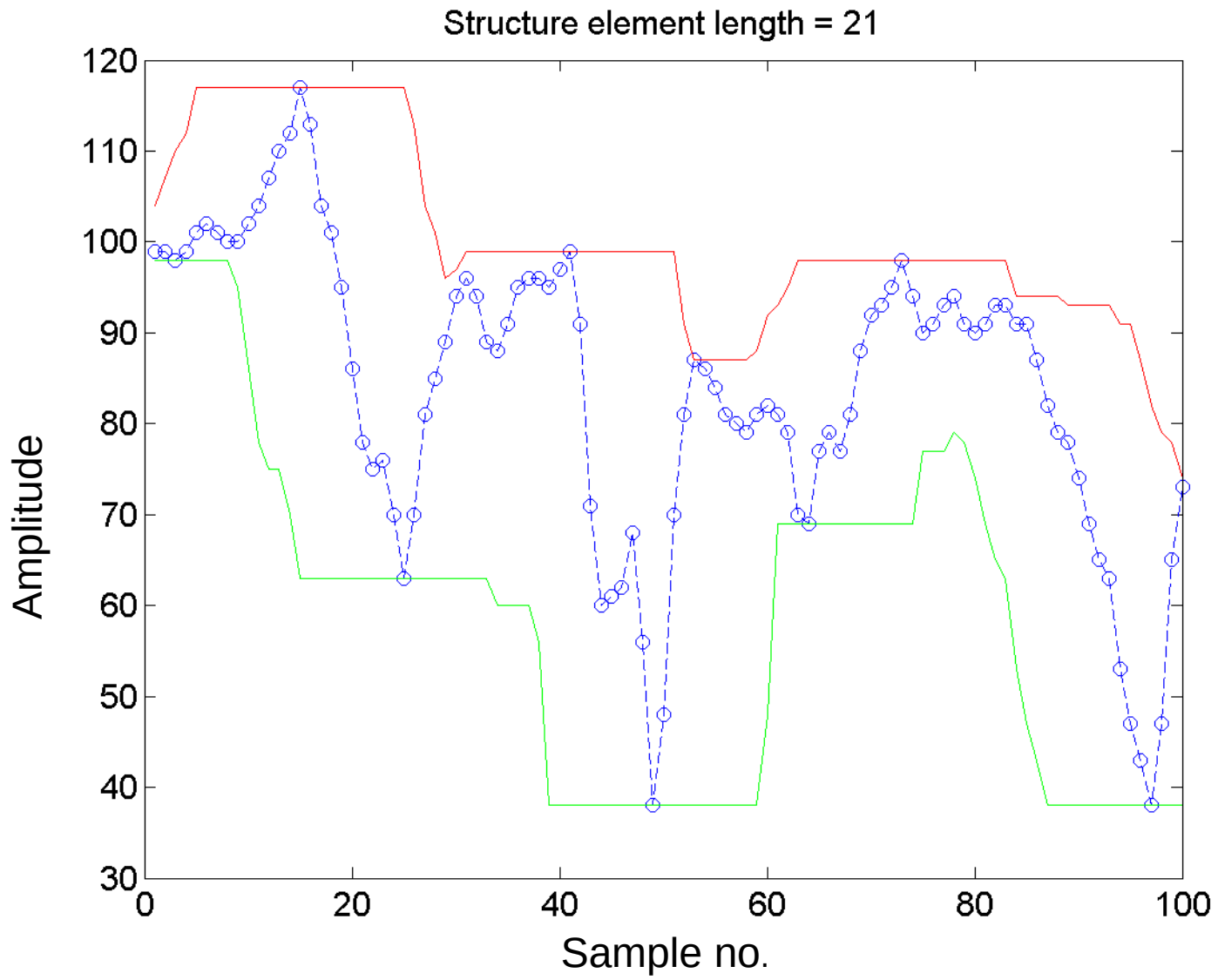
$$g[x,y] = \max\{W\{f[x,y]\}\} := dilate(f,W)$$

- Flat erosion operator: local minimum over window W

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

- Binary dilation/erosion operators contained as special case

1-d illustration of erosion and dilation



Structuring element:
horizontal line

Image example

Original

Dilation

Erosion

Flat dilation with different structuring elements

Original

Diamond

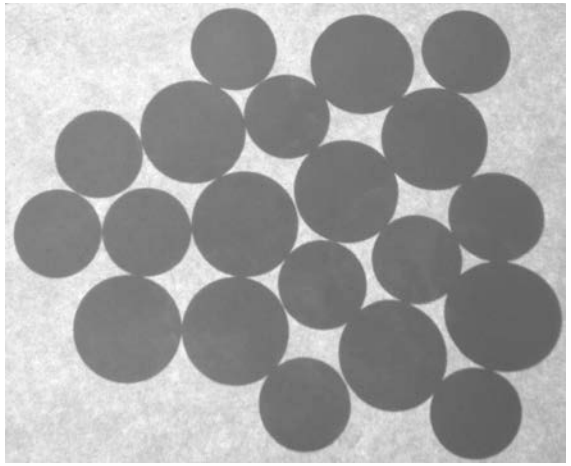
Disk

20 degree line

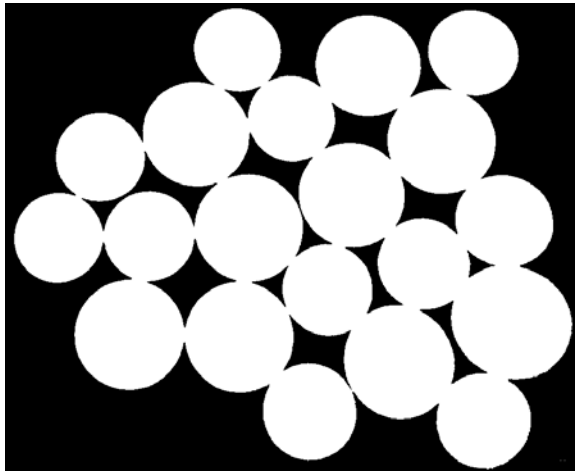
9 points

2 horizontal lines

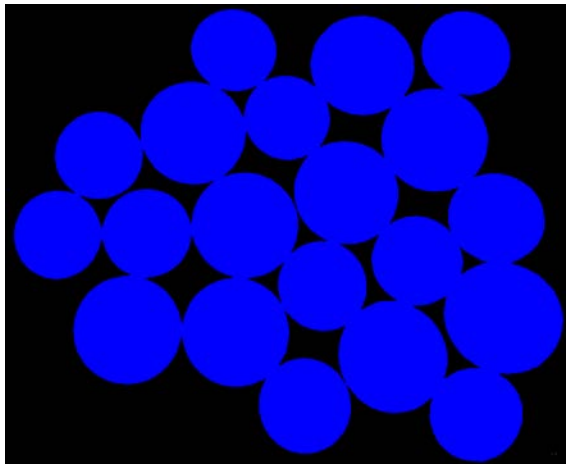
Example: counting coins



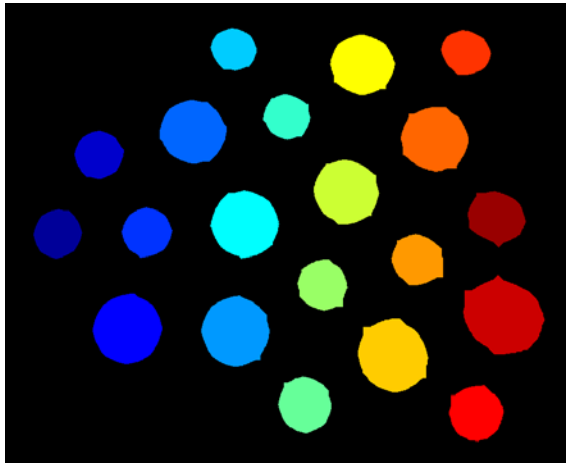
Original



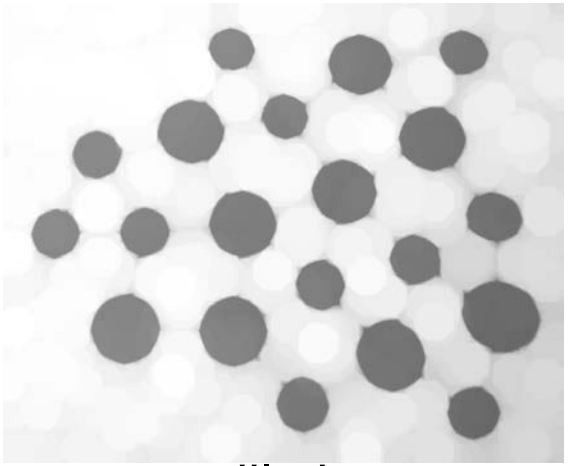
thresholded



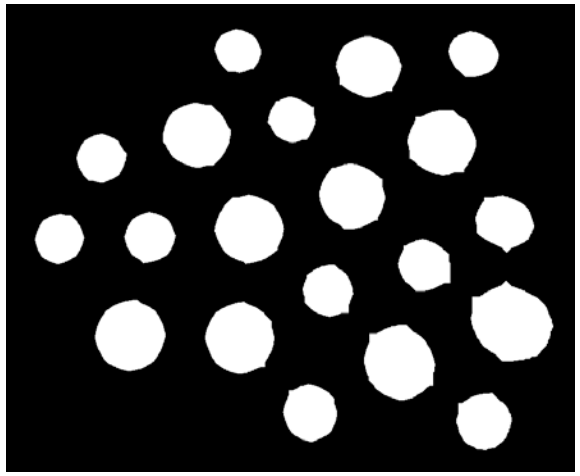
1 connected component



20 connected components

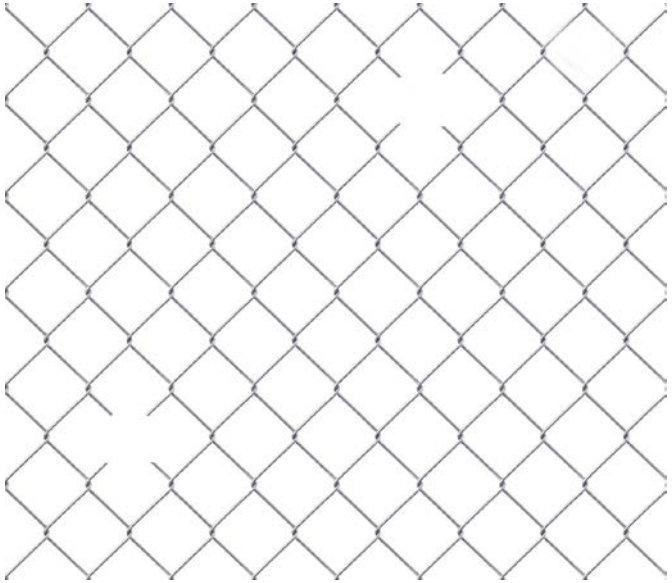


dilation

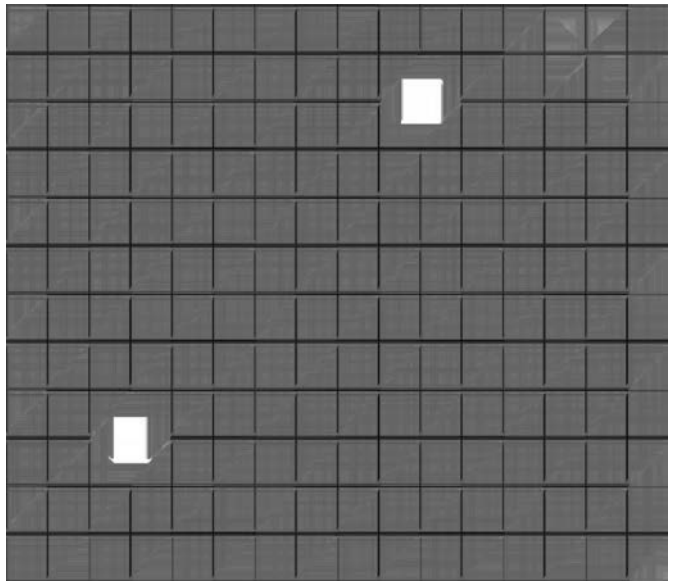


thresholded after dilation

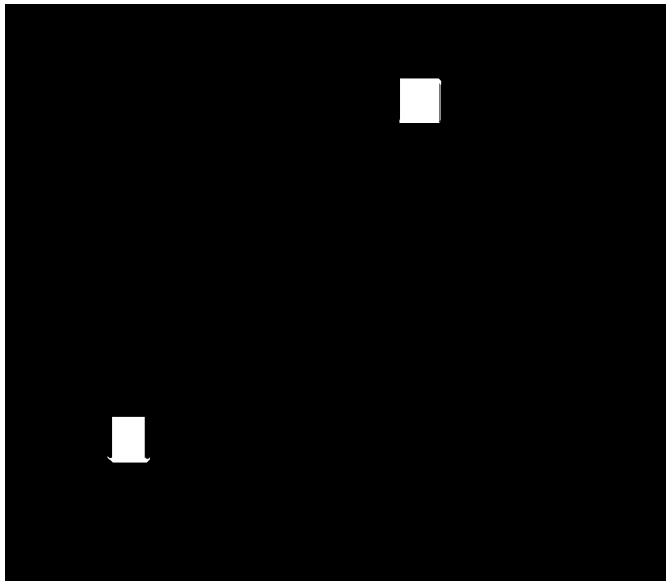
Example: chain link fence hole detection



Original grayscale image
Fence (1023 x 1173*)*



Flat erosion with 151x151
“cross” structuring element



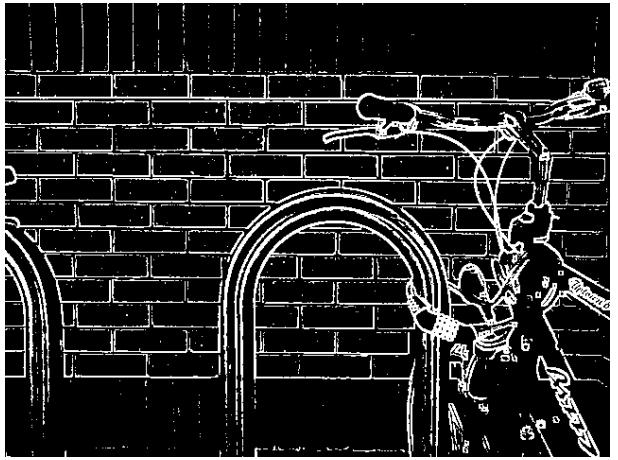
Binarized by Thresholding

Morphological edge detector

original f

dilation g

g-f



$(g$-$f)$ thresholded