Binary Image Operations

morphological

Image Processing, How's

- Reducing the amount of information
- Small in size, Huge in information

Before....

197	42	101	8	58
6	235	185	219	97
79	182	145	115	29
210	154	58	33	103
97	189	28	172	201
233	137	228	30	88
150	7	144	78	147
139	209	197	48	116
142	90	53	2	71
18	148	113	31	214
91	99	48	93	88
117	149	211	225	239
89	89	202	78	145
62	161	14	56	99
75	12	93	56	199
106	186	208	169	18
194	91	63	160	189
3	35	101	42	23
227	2	36	180	170

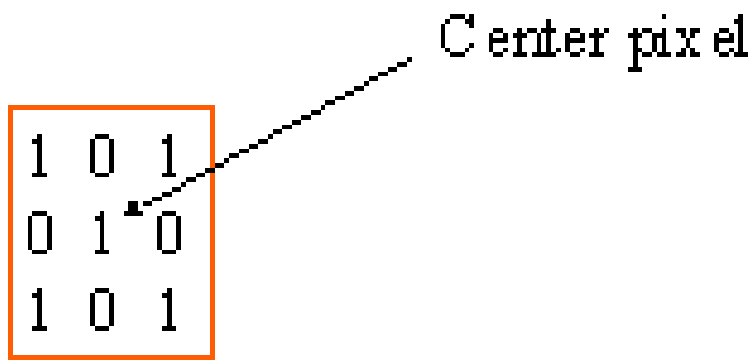
....After

0	0	0	0	195
0	0	0	0	162
0	200	0	186	111
0	201	0	11	0
0	142	0	138	0
0	210	0	80	0
0	225	0	81	0
0	0	166	250	0
0	0	72	0	0
0	0	83	0	0
0	0	72	0	0
0	0	22	0	0
0	0	0	0	0
0	0	0	0	0
181	0	0	0	0
39	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0

Morphological Binary Image Operations

Structuring elements and neighborhood

- SE is an M X N matrix of 0's and 1's.
- The center pixel is at floor(M+1/2,N+1/2).
- The neighborhood of the center pixel are all the pixels in SE that are 1.



erode and dilate

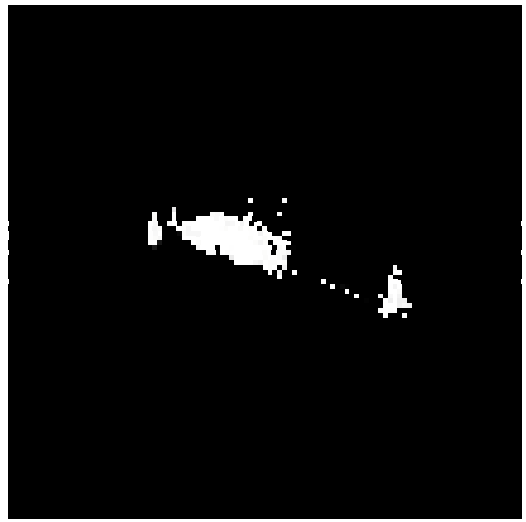
- For each pixel in the input image, examine the neighborhood as specified by the structuring element.

- For erode: If every pixel in the neighborhood is on, the output pixel is on. Tends to make objects smaller.

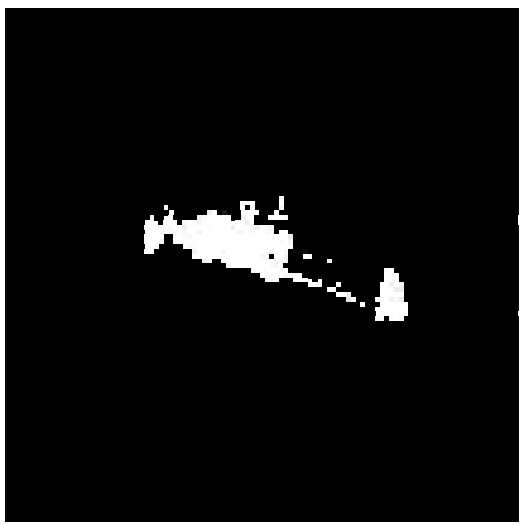
- For dilate: If any pixel in the neighborhood is on, the output pixel is on. Tends to make objects larger.

Example of erode and dilated

SE=[1 1 1
1 1 1
1 1 1]



Binary Image

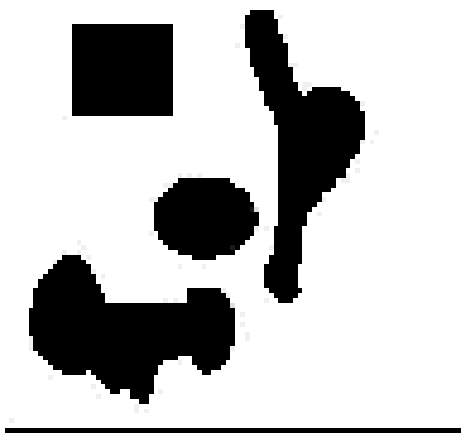


dilated

eroded

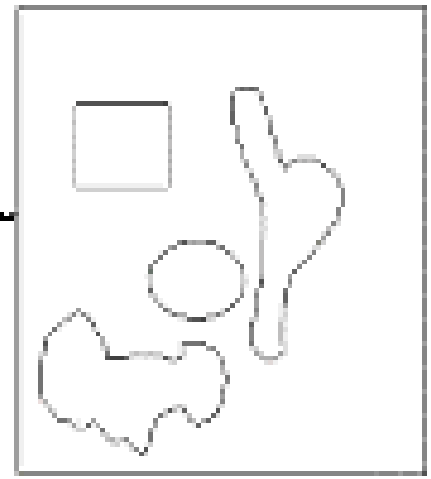
Binary image contour extraction

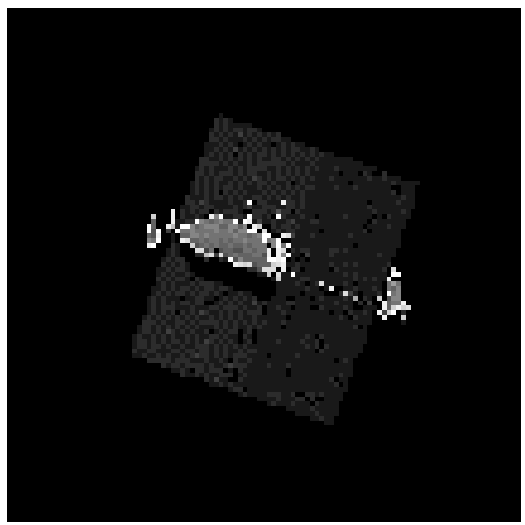
image



```
Erosed=erode(image);
Contour=
  double(image)-double(Erosed);
Contour=~Contour;
```

Contour





Satellite image with contour.

Example

- Selection of a problem
- Selection of Image Capturing tools
- Image Processing
  - ***Canny Edge Detection***
  - ***Hough Transforms***
- Putting it all together

Why?

- Monitor power level in robot's batteries
- When power goes low, interrupt actions
- Search for the wall plug
- Traverse over to it
- Plug itself to it in.

Image Processing, how?

- Currently there are many, many ways to approach this problem
  - Segmentation
  - Edge Detection
  - DPC compression
  - FFT
  - IFFT
  - DFT
  - Thinning
  - Growing
  - Haar Transform
  - Hex Rotate

Alpha filtering

DPC compression

Perimeter

Fractal

Gaussian Filter

Band Pass Filter

Homomorphic Filtering

Contrast

Sharper

Least Square Restoration

Warping

Dilation

Image Processing, how?

- Divided into two groups
  - –Reduction
  - –Interpretation

Problems

- Write program for dilation of images
- Modify it to do erosions (few types)
- Modify it to perform shift and exor operation and shift and min operation