Pixel relationships

- Neighbours of a pixel
- Connectivity
- Distance Measures

Neighbours of a pixel

- A pixel p at coordinates (x,y)
- 4-neighbours
- Diagonal neighbours
- 8-neighbours

4-neighbours of P

- The 4 horizontal and vertical neighbours
- (x+1,y); (x-1,y); (x,y+1); (x,y-1)
- $N_4(p)$

Diagonal neighbours

- (x+1,y+1); (x+1,y-1); (x-1,y+1); (x+1,y-1)
- $N_D(p)$

8-neighbours of P

- $N_8(p)$
- Four horizontal and vertical plus four diagonal neighbours

Connectivity

- Let V be the set of intensity values of pixels which are allowed to be connected
- 4-connectivity
- 8-connectivity
- m-connectivity

4-connectivity

- Two pixels p and q with values from V are 4-connected if q is in the set $N_4(p)$

8-connectivity

- Two pixels p and q with values from V are 8-connected if q is in the set $N_8(p)$

m-connectivity

- Two pixels p and q with values from V are m-connected if
  - q is in the set $N_4(p)$
  - OR
  - q is in $N_D(p)$ and the set $N_4(p) \cap N_4(q)$ is empty

Distance Measures

- Euclidean distance
- City block distance
- Chessboard distance

Euclidean distance

- $D_e(p,q)=[(x-s)^2 + (y-t)^2]^{1/2}$

City Block Distance

- $D_4(p,q) = |x-s| + |y-t|$

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        2
    2   1   2
2   1   0   1   2
    2   1   2
        2
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Chessboard distance

- $D_8(p,q) = \max(|x-s|, |y-t|)$

2	2	2	2	2
2	1	1	1	2
2	1	0	1	2
2	1	1	1	2
2	2	2	2	2

Preprocessing