

Pixel relationships

- Neighbours of a pixel
- Connectivity
- Distance Measures

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1

Neighbours of a pixel

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

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2

4-neighbours of P

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

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3

Diagonal neighbours

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

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4

8-neighbours of P

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

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5

Connectivity

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

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6

4-connectivity

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

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7

8-connectivity

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

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8

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

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9

Distance Measures

- Euclidean distance
- City block distance
- Chessboard distance

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10

Euclidean distance

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

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City Block Distance

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

$$\begin{array}{ccccccc} & & & & & & 2 \\ & & & & & 2 & 1 & 2 \\ & & & & 2 & 1 & 0 & 1 & 2 \\ & & & 2 & 1 & 2 & & & \\ & & & & & & & & 2 \end{array}$$

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12

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

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13

Preprocessing

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14