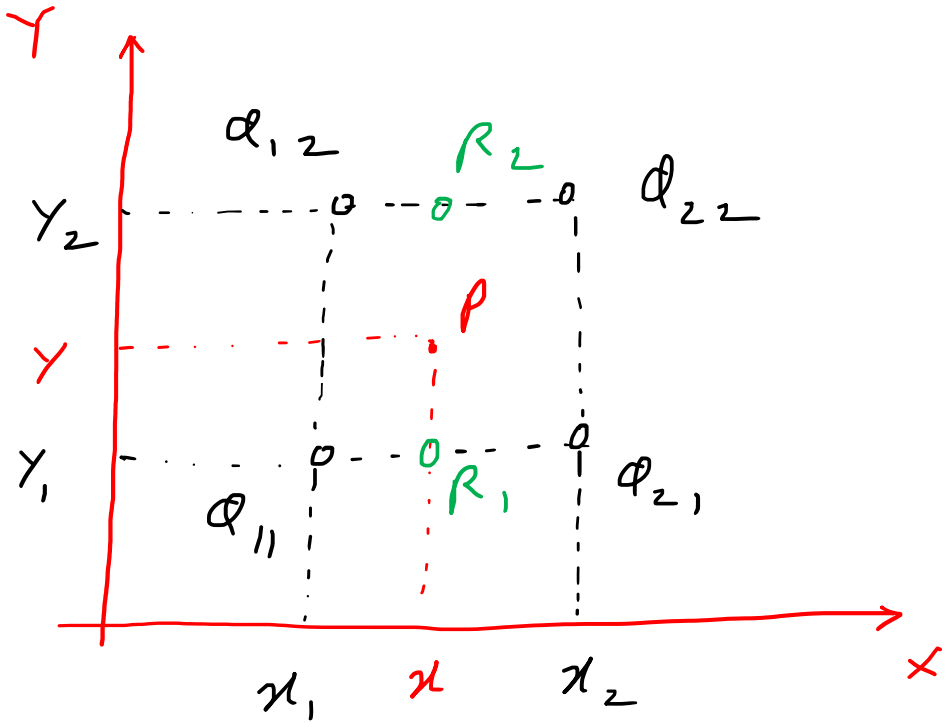
Digital Image basic operations

Interpolation & Neighbourhood

Image interpolation

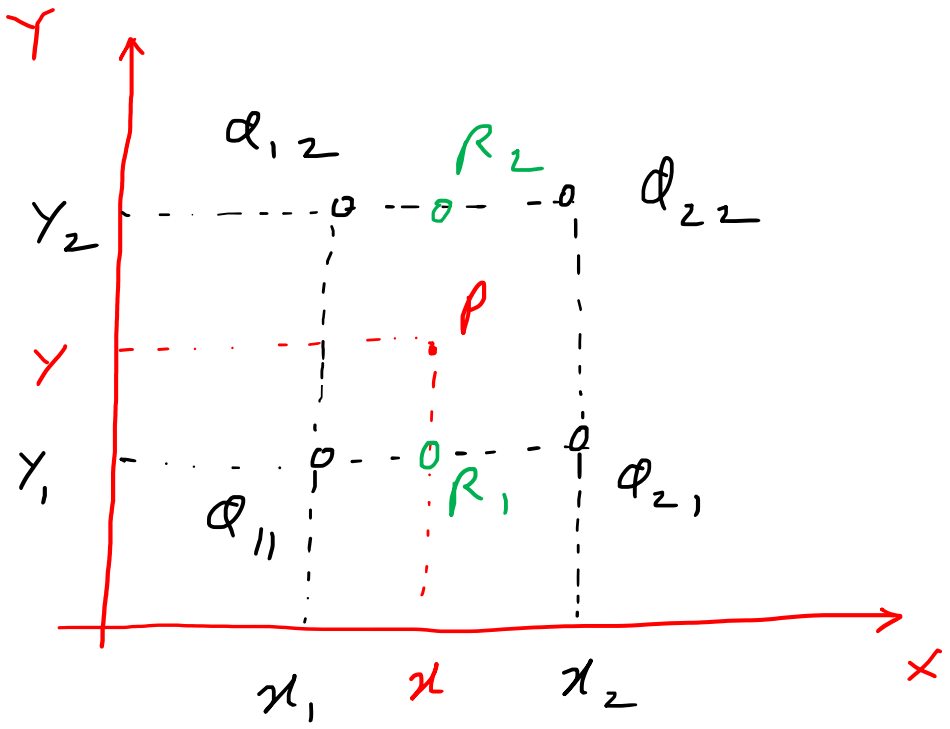
- Using known data to estimate values at unknown locations
- Nearest neighbor
- Bilinear
- Bicubic

Bilinear Interpolation



$$I(x,y) = ax + bY + cxy + d$$

Bilinear Interpolation



Horizontal

$$f(R_1) = \frac{x_2 - x}{x_2 - x_1} Q_{11} + \frac{x - x_1}{x_2 - x_1} Q_{21}$$

$$f(R_2) = \frac{x_2 - x}{x_2 - x_1} Q_{12} + \frac{x - x_1}{x_2 - x_1} Q_{22}$$

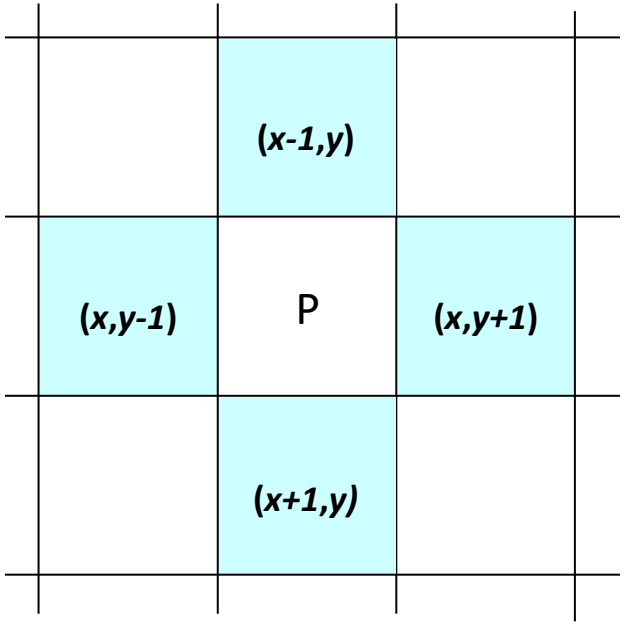
Vertical

$$f(P) = \frac{Y_2 - Y}{Y_2 - Y_1} f(R_1) + \frac{Y - Y_1}{Y_2 - Y_1} f(R_2)$$

$$I(x, y) = ax + bY + cxy + d$$

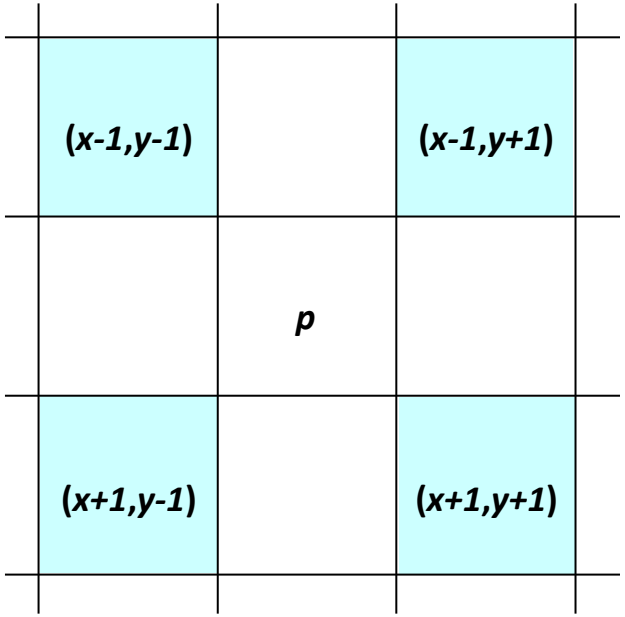
Neighbourhood

- Neighbors of pixels



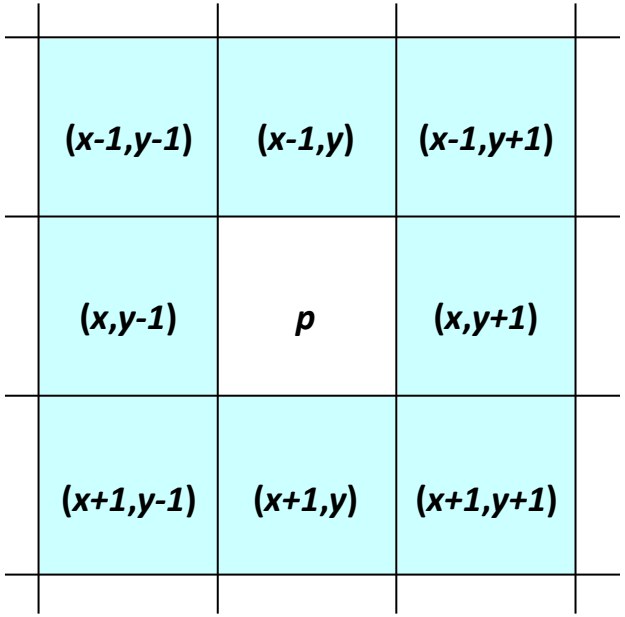
4-neighbors of *p*:

$$N_4(p) = \left\{ \begin{array}{l} (x-1,y) \\ (x+1,y) \\ (x,y-1) \\ (x,y+1) \end{array} \right\}$$



Diagonal neighbors of *p*:

$$N_D(p) = \{ (x-1,y-1), (x+1,y-1), (x-1,y+1), (x+1,y+1) \}$$



8-neighbors of *p*:

$$N_8(p) = \{ (x-1,y-1),\ (x,y-1),\ (x+1,y-1),\ (x-1,y),\ (x+1,y),\ (x-1,y+1),\ (x,y+1),\ (x+1,y+1) \}$$