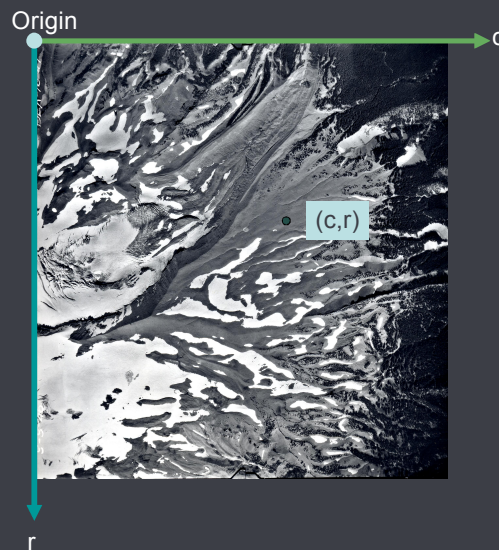


# Coordinate Systems: Pixel Coordinates

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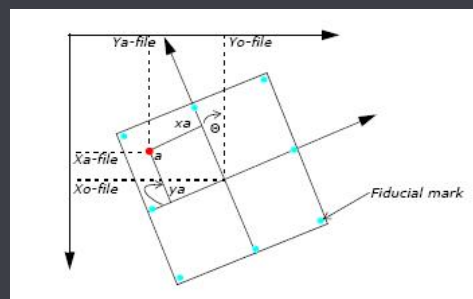
## Definition

- File coordinates of a digital image
- $(c,r)$ 
  - $c$ =pixel column
  - $r$ =row number



## Conversion

- 2-D affine transformation defines relationship between pixel coordinates and image space coordinate system
- Quality determined by RMS value



$$x = a_1 + a_2X + a_3Y$$

$$y = b_1 + b_2X + b_3Y$$

## Image Matching Technique

- Area-Based Matching Technique
  - Computes the correlation coefficient of the gray values between template window and the search window
  - Good initial position necessary for correlation windows
  - Also, good contrast between windows is needed.

$$\rho = \frac{\sum_{i,j} [g_1(c_1, r_1) - \bar{g}_1][g_2(c_2, r_2) - \bar{g}_2]}{\sqrt{\sum_{i,j} [g_1(c_1, r_1) - \bar{g}_1]^2 \sum_{i,j} [g_2(c_2, r_2) - \bar{g}_2]^2}}$$

with

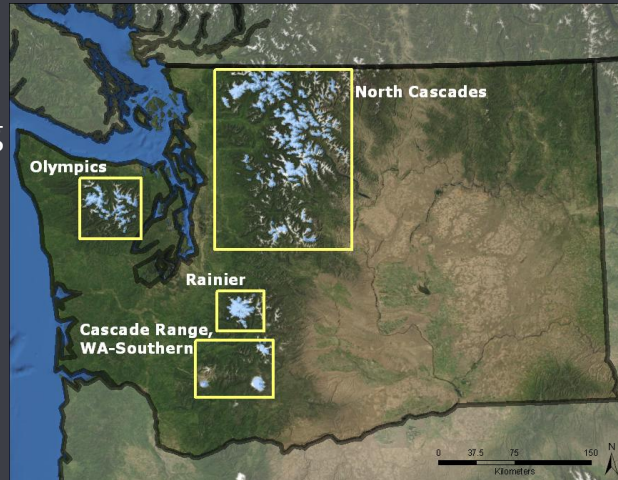
$$\bar{g}_1 = \frac{1}{n} \sum_{i,j} g_1(c_1, r_1) \quad \bar{g}_2 = \frac{1}{n} \sum_{i,j} g_2(c_2, r_2)$$

Where:

- $\rho$  = the correlation coefficient
- $g(c,r)$  = the gray value of the pixel (c,r)
- $c_1, r_1$  = the pixel coordinates on the left image
- $c_2, r_2$  = the pixel coordinates on the right image
- $n$  = the total number of pixels in the window
- $i, j$  = pixel index into the correlation window

## Other Uses

- Websites
  - Image maps
- Web mapping interfaces
  - Mouse click events



## Questions

1. What is the definition of pixel coordinates?
2. What are two photogrammetric used for pixel coordinates?
3. Where is the origin of a pixel coordinate system?
4. How is the quality of conversion between pixel coordinates and image space coordinates determined?