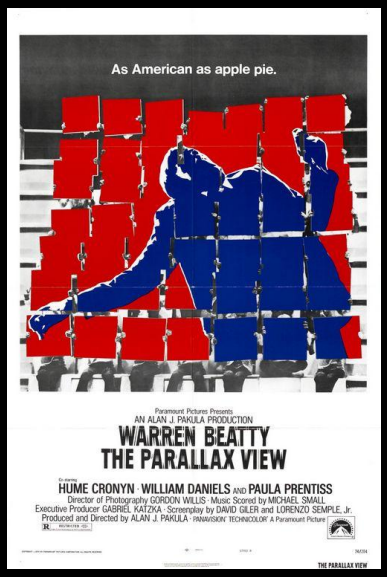
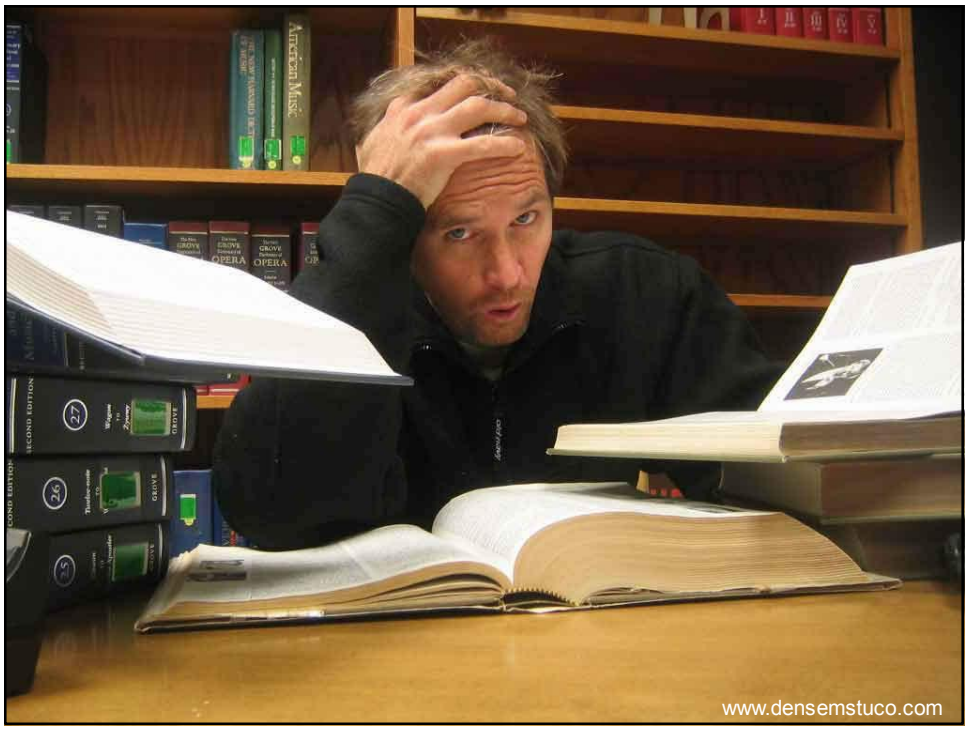
Image Parallax

Disclaimer:

The extent of my knowledge of parallax prior to this week.





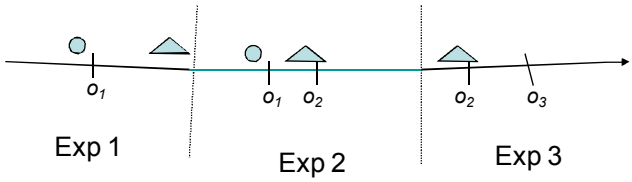
Parallax

Image Parallax (Lillesand *et al*, 2004)

"The apparent change in relative positions of stationary objects caused by a change in viewing position."

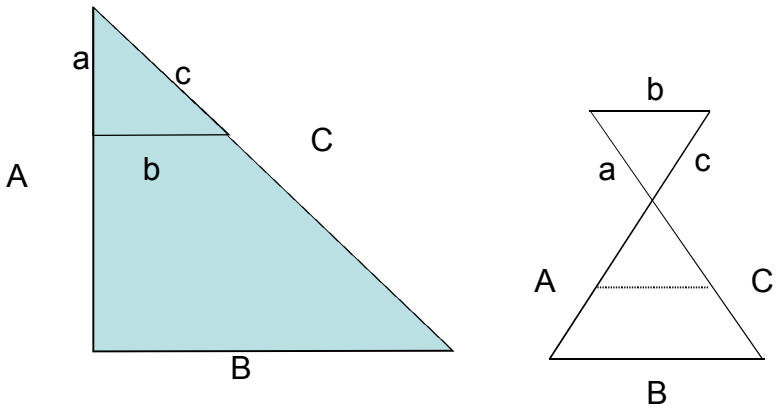
Thus, pairs of images. For photogrammetry, we use overlapped images, forming a stereopair.

"Parallax displacements occur only parallel to the line of flight."
(Lillesand *et al*, 2004)



Parallax equations rely on similar triangles

a/b= A/B



Similar Triangles

Assumptions: truly vertical photographs and constant flight height.

Without these conditions, the triangles drawn would not be similar.

Terms/Symbols

p_a= parallax of point *a* measured in image

f = focal length of lens

H = flight height relative to datum

B = air base, i.e. distance between exposures

L = exposure station L' = subsequent exposure station

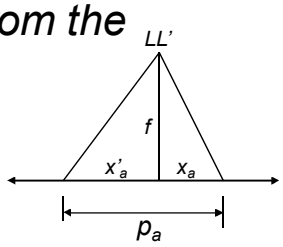
x_a = x-coordinate within left/first image

X_A = X-coordinate of feature at ground

x'_a = x-coordinate of feature within right/second image

Similar Triangles

Create a compound triangle from the exposures/photos



Then:

p_a corresponds to B (distance between 2 exposures)

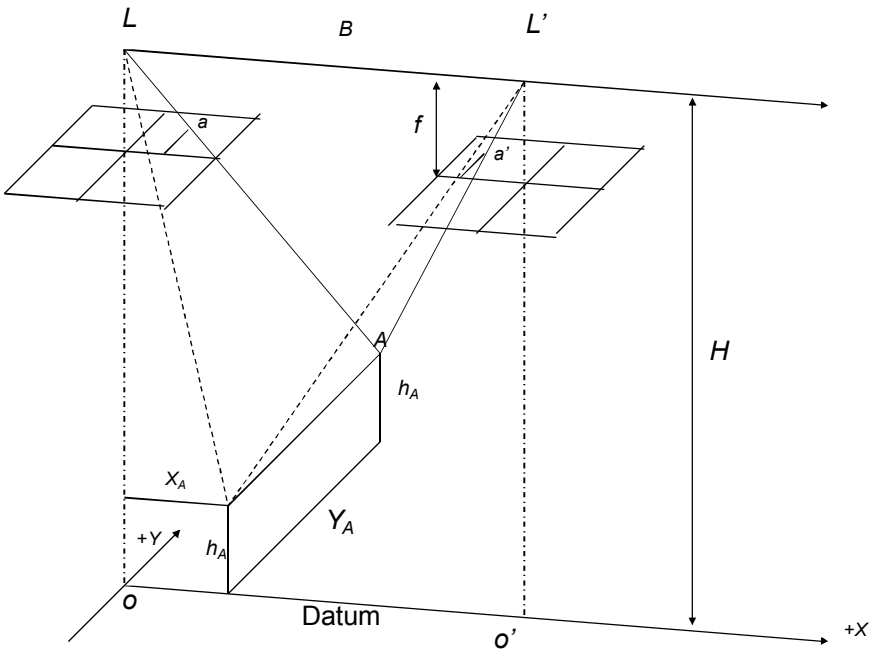
f corresponds to H- h_A (total height minus elevation of point *A*)

Leading us to…

$$\frac{p_a}{f} = \frac{B}{H - h_A}$$

$$h_A = H - \frac{Bf}{p_a}$$

h_A is the z-value of *A*



More parallax equations

$$\frac{X_A}{H-h_A} = \frac{x_a}{f}$$

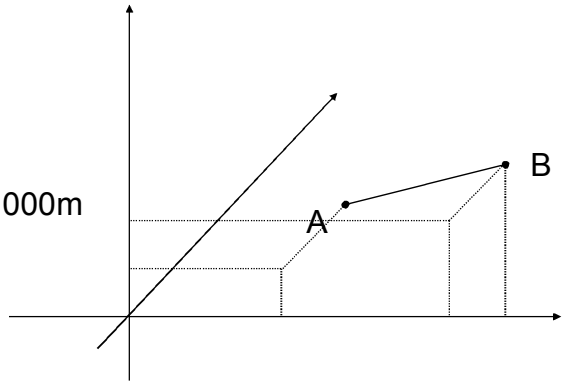
$$X_A = \frac{x_a(H-h_A)}{f}$$

remember
$H-h_A = Bf/p_a$

$$X_A = B(X_a/p_a)$$

Problem

Lens (f)= 150 mm
Flying height (H)= 1000m
Air base (B)= 800m
x_a= 55mm
x_b= 140mm
y_a= 100mm
y_b= 150mm
x'_a= -95mm
x'_b= -20mm



Find the X, Y, Z coordinates of Points A and B.

Alternative methods

- Aligning flight lines ($p = D-d$)
- Stereoscopic viewing (floating mark/parallax wedge)
- Computer: image correlation