

Remote Sensing

Topic 6: Principles of Stereoscopic Vision

Chapter 3: Lillesand and Keifer
Chapters 2 and 3 Avery and Berlin
Chapter 3: Paine (also on reserve in Map Library)

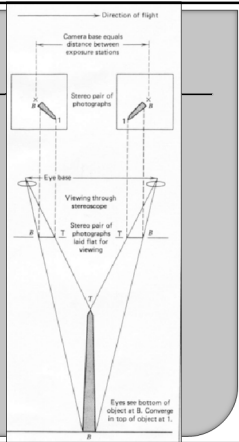
Stereoscopy

- Science that deals with the use of binocular vision to achieve a 3-D effect
- Observation from two different perspectives
 - e.g. two adjacent photos (aka stereo-pair)
 - or a stereogram

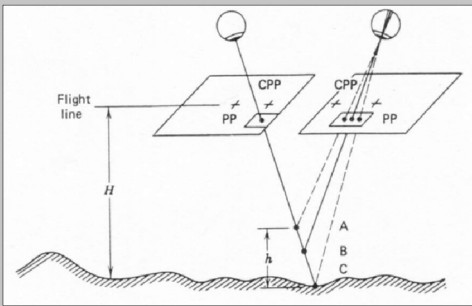


Parallax

- ◉ Refers to apparent shift in position of object
- ◉ Result of change in viewing position
- ◉ Amount depends on height!

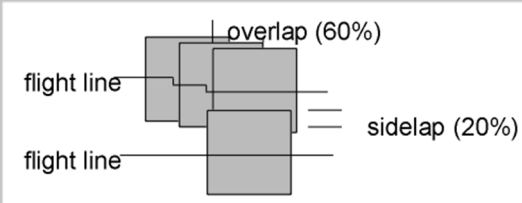


Parallax Height Determination

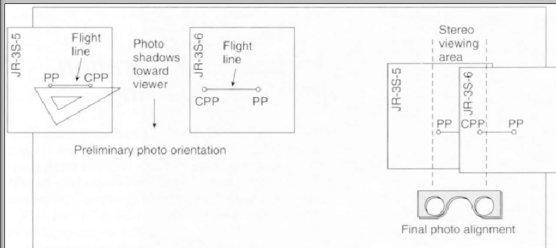




Stereo-coverage



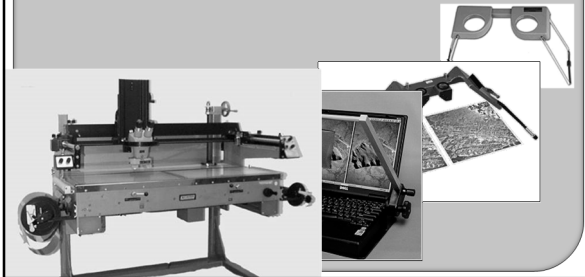
Alignment of Stereo Model



Pseudoscopic Vision



Stereoscopic Viewing



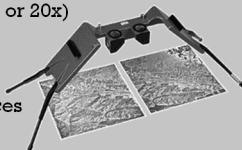
Pocket Stereoscope

- Advantages
 - Adjustable inter-ocular distance
 - Frame fixes distance from stereogram
 - Small/portable
- Disadvantages
 - Low magnification
 - Overlapping photos



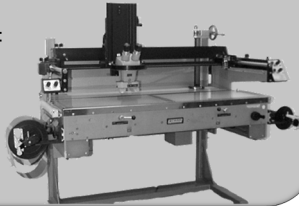
Mirror Stereoscope

- Mirrors enable entire area to be viewed without overlap
- Variable magnification (3 - 15 or 20x)
- Individually focused eye-pieces
- Scanning mirror stereoscope allows you to roam over the image without readjusting the stereo-pair



Zoom Stereoscope

- Higher magnification (2 - 64X)
- Usually designed to work with rolls of photo transparencies and incorporating a light table
- Each eye-piece rotates independently to adjust for crab



Vertical Exaggeration

- Objects have exaggerated vertical distances
- Due to exaggerated distance between successive photographs
- Varies slightly for everyone

Calculating VE

where: $VE = (AB/H) (h/EB)$
AB = air-base H = aircraft height
h = distance b/w eyes and plane of stereo model
EB = eye base

- h/EB is difficult to determine so is generally considered a constant equal to 6.5
- Therefore, this formula may be rewritten as:

where: $VE = (AB/H) (6.5)$
(AB/H) is referred to as the base-height ratio

Calculating VE

$$VE = (AB/H) 6.5$$

where: (AB/H) is referred to as the base-height ratio

Example:

Brandon Photoset Roll Number 18658 (15 photos)

$$VE = (1630 \text{ m} / 3048 \text{ m}) \times 6.5 = 3.47$$

Note : AB can also be estimated by (1-%Endlap) x Photo Width
example:

$$(1-60\%) \times 9 \text{ in.} \times \text{PSR} = 0.40 \times 9 \text{ in.} \times 20000/12 = 6000 \text{ ft or } 1829 \text{ m}$$

$$VE = (1829 \text{ m} / 3048 \text{ m}) \times 6.5 = 3.9$$

$$\text{at } 80\% \text{ endlap } AB = 0.20 \times 9 \text{ in.} \times 20000/12 = 3000 \text{ ft or } 915 \text{ m}$$

$$VE = (915 \text{ m} / 3048 \text{ m}) \times 6.5 = 1.9$$

