Lab 2
Working with Stereopairs
GEPL 4490/5490
Due: 11/8/03

In the last lab, we learned how to measure heights of objects using relief displacement. This week we will explore how parallax can be used to determine heights of objects in successive vertical photos.

Seeing in stereo is the result of each of your eyes seeing objects from different angles. Our brains integrate the two perspectives provided by our eyes, to let us see depth.

We can apply this concept of a change in viewing perspective to vertical air photos, so that we may see landscapes in 3 dimensions. An <u>endlap</u> of 50% or more between successive air photos will let us see in stereo. Most <u>stereopair photographs</u> have **60%** or greater endlap.

<u>Stereoviewing Practice:</u>
A **stereogram** is comprised of two sections from overlapping photos that are properly oriented and mounted on a single page for stereoviewing with a lens stereoscope.

We typically use pocket (lens) or mirror stereoscopes to aid us in viewing stereopairs. If you are using a pocket (lens) stereoscope, adjust the stereoscope lens separation to correspond with your interpupillary distance (you can measure this in cm).

Mirror stereoscopes allow you to view each photo individually, so that you see more area in 3-D at one time. If you are working with a mirror stereoscope remember that the images will be separated by some distance and that the stereoscope should be oriented parallel to the flight line.

<u>Figure 3.4</u>

1. Stereoscopic vision using figure 3.4.
   Using "1" to designate the highest elevation, write down the depth order of the designs. It is possible for two or more designs to be at the same elevation.

Ring 6	Ring 2
_____ Marginal ring	_____ Left mountain peak
_____ Upper left circle	_____ Center mountain peak
_____ Lower left circle	_____ Right mountain peak
_____ Upper right circle	_____ The number "2"
_____ Lower right circle	_____ Marginal ring
	_____ Pencil shaped triangle

<u>Stereogram F-11</u>

2. Identify the linear feature labeled "C" on the stereogram. As we have done in the past, make a list of the characteristics of the object including things like size, shape, pattern, shadow, texture, association, and site, etc. Most of the points will be given for describing the process of identifying the object. Getting the object correct is less important and will carry less weight. Then, make a second list of possible things it could be and give reasons for why it could or could not be that thing.

Plate 84, page 84 of Aerial Stereo Photographs, Wanless, South Albemarle, North Carolina

3. What kind of film was used for these photographs?

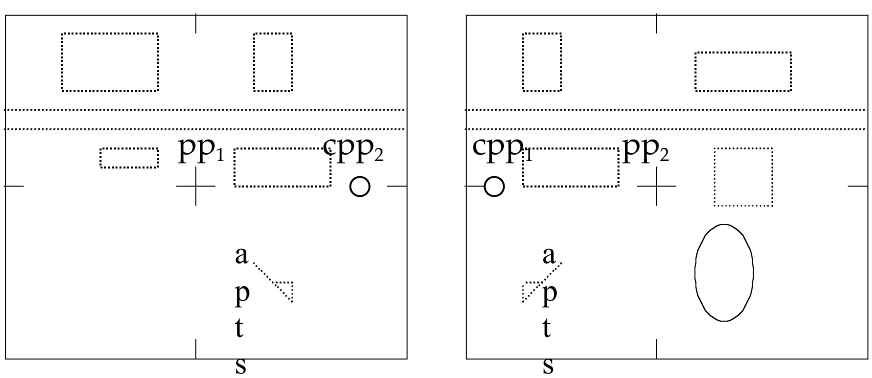
4. What kind of trees are associated with the wooded patch located at 3.4, B.1? Why do you think so?

5. Why is the texture of the wooded patch so uniform?

6. Identify the two dark circles at 3.6, A.5. As we have done in the past, make a list of the characteristics of the object including things like size, shape, pattern, shadow, texture, association, and site, etc. Most of the points will be given for describing the process of identifying the object. Getting the object correct is less important and will carry less weight. Then, make a second list of possible things it could be and give reasons for why it could or could not be that thing.

Using parallax to estimate elevation

7. Use parallax to find the height of the flag pole at a. The pictures were taken from the top of a nearby building that is 31 meters above the ground.



Large format Images of The University of Toledo.

We will prepare the large 2' by 2' photos for measuring.

When you look at your photos, make sure you orient them so that the shadows are towards you, if possible. Then, locate the **principal point** of each photograph, using the fiducial marks on the photos' sides or the photos corners.

Locate the **conjugate principal point** on each.

Draw a straight line connecting the PP to CPP on each photograph. This is the plane's flight line. Note that the length of these line segments is the **photo base**.

Align the photographs with a straight edge, along the flight line. You may need to rotate the photos a bit until they match up.

8. Calculate the height of the bell tower on University Hall.

$$h_{obj} = H \frac{dP}{P + dP}$$

where

h_{obj} = height of object
H = aircraft flying height = 7500'
dP = differential parallax, difference in displacement at bottom of object - displacement at top of

$$dP = (dB - dT)$$

object

P = absolute stereoscopic parallax at base of object often substitute average photo base length instead (pb1 + pb2)/2

9. What is the endlap of the stereopair?

10. Do you notice anything usual about this stereopair other than that they are large format? Look at the parking lots around Glass Bowl Stadium.