ORIENTATION AND SCALE OF AERIAL PHOTOGRAPHS

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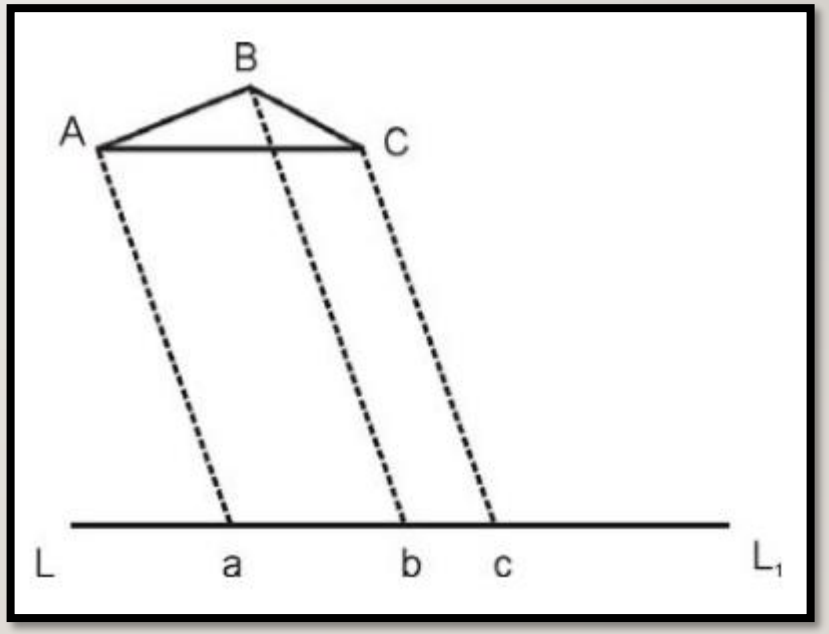
ORIENTATION OF AERIAL PHOTOGRAPH

- It is important to understand the orientation of the photograph with respect to the ground, i.e. the way the rays connect or 'project' onto the ground in relation to the ground representation.
- There are three types of projection

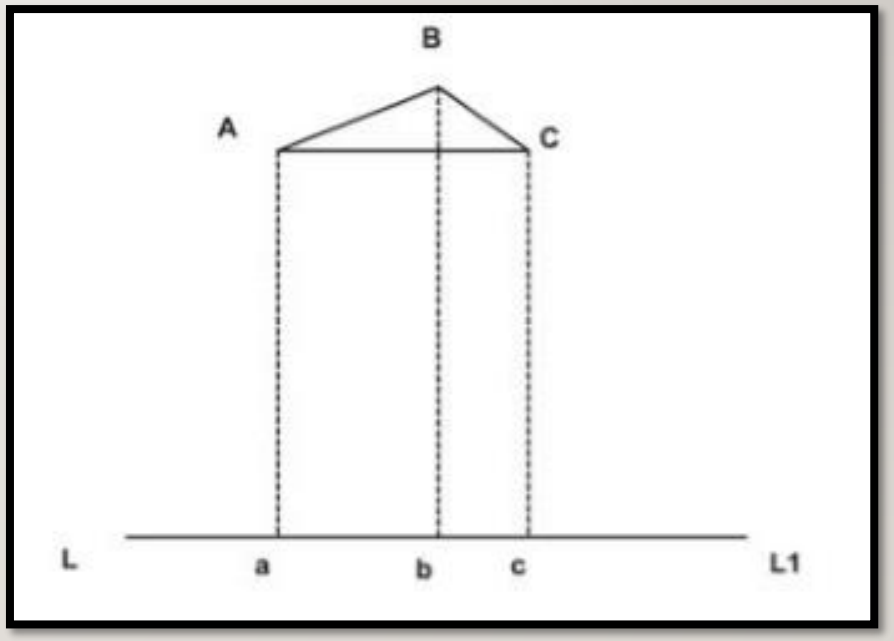
  Parallel Projection: In this projection, the projecting rays are parallel but not necessarily perpendicular. The triangle A B C is projected on L L1 as triangle a b c



Parallel Projection

ORIENTATION OF AERIAL PHOTOGRAPH

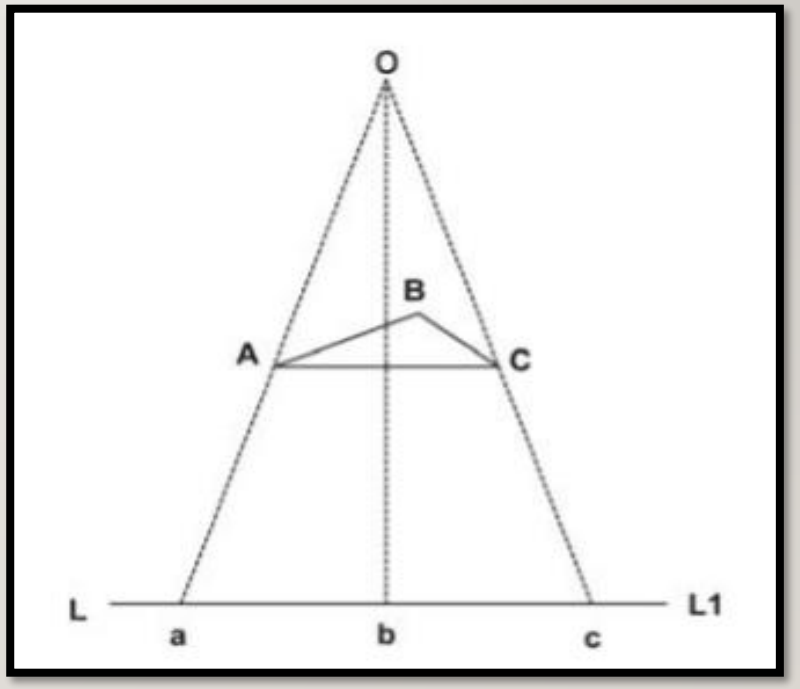
- **Orthogonal Projection**: This is a special case of parallel projections. Maps are orthogonal projections of the ground. The advantage of this projection is that the distances, angles or areas on the plane are independent of the elevation differences of the objects.
- An example of orthogonal projection where the projecting rays are perpendicular to the line LL1.



Orthogonal Projection

ORIENTATION OF AERIAL PHOTOGRAPH

- **Central Projection**: This shows an example of Central Projection. The projecting rays Aa, Bb and Cc pass through a common point O, which is called the *perspective Centre*. The image projected by a lens is treated like a central projection.
- The central projection is characterized by the fact that all straight lines joining corresponding points, i.e. straight lines joining object points to their corresponding image points pass through one point.

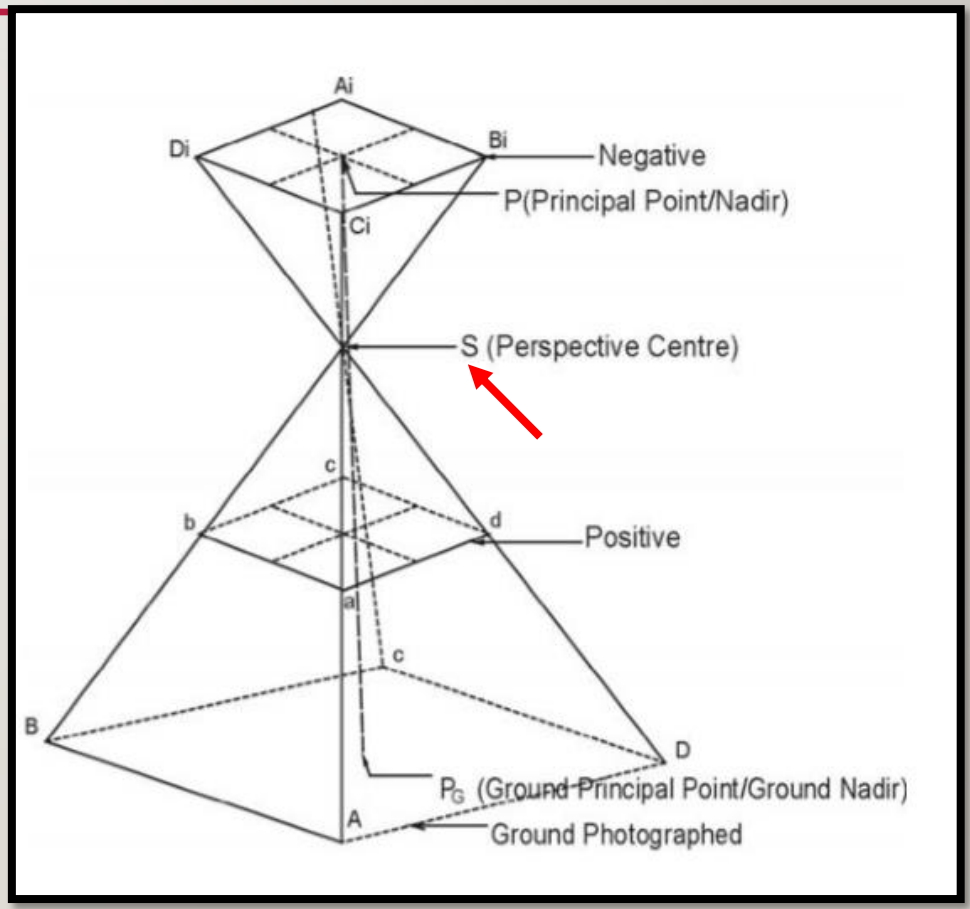


Central Projection

GEOMETRY OF VERTICAL PHOTOGRAPHS

- In this figure , S is the camera lens centre.
- The bundle of light rays coming from the ground plane converge at this point and diverge from there towards the negative (photo) plane to form images of the objects.

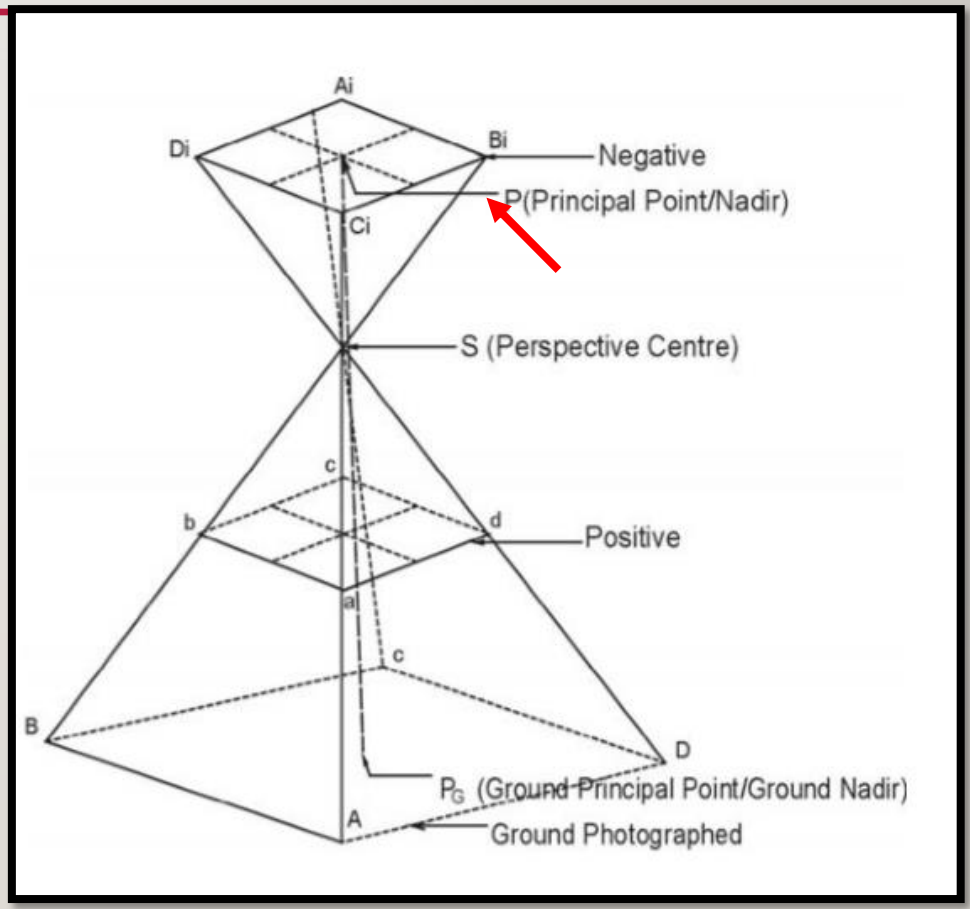
- This Figure illustrates this relationship. Straight lines AAi, BBi, CCi and DDi join corresponding points on the ground photographed and the negative plane.



GEOMETRY OF VERTICAL PHOTOGRAPHS

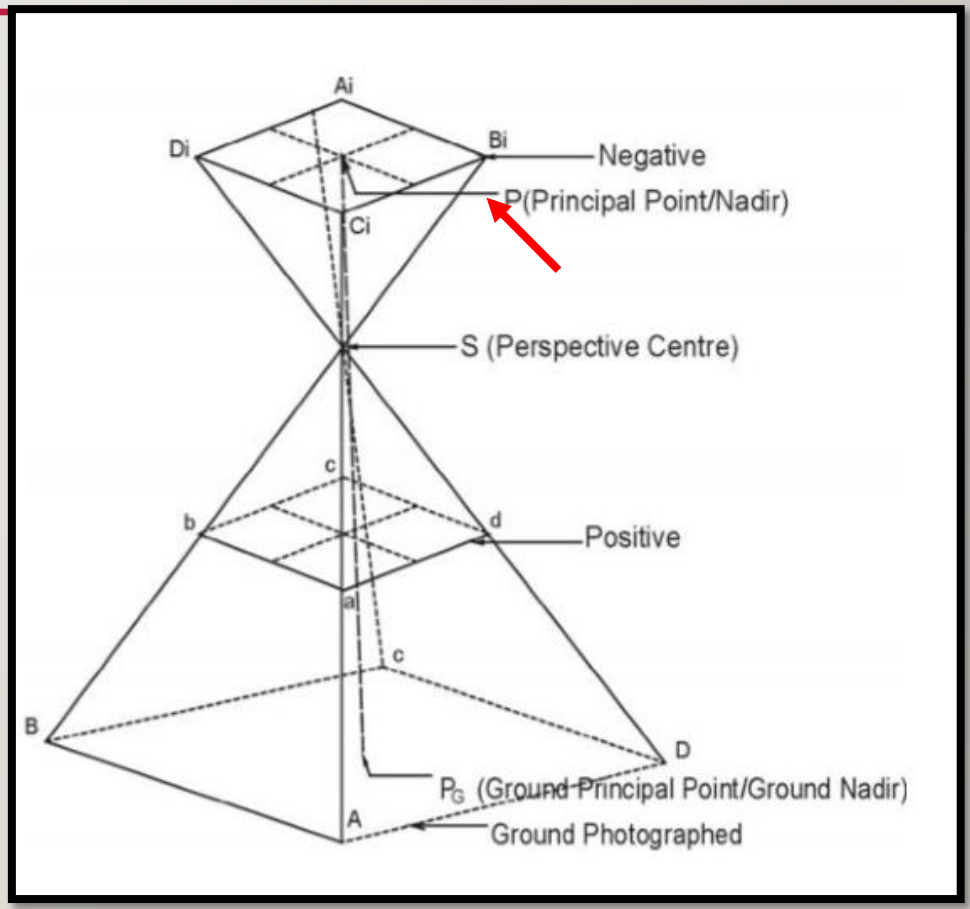
- A on the ground and Ai on the negative plane (or ‘a’ on the positive plane) is a line joining corresponding points which pass through the camera lens centre. If we draw a perpendicular from S following the camera axis onto the negative plane, the point where this perpendicular meets the negative is known as the **Principal Point** .

- If we extend the same line to the ground, it would meet the target (photographed ground) plane at PG, i.e. the ground principal point.



GEOMETRY OF VERTICAL PHOTOGRAPHS

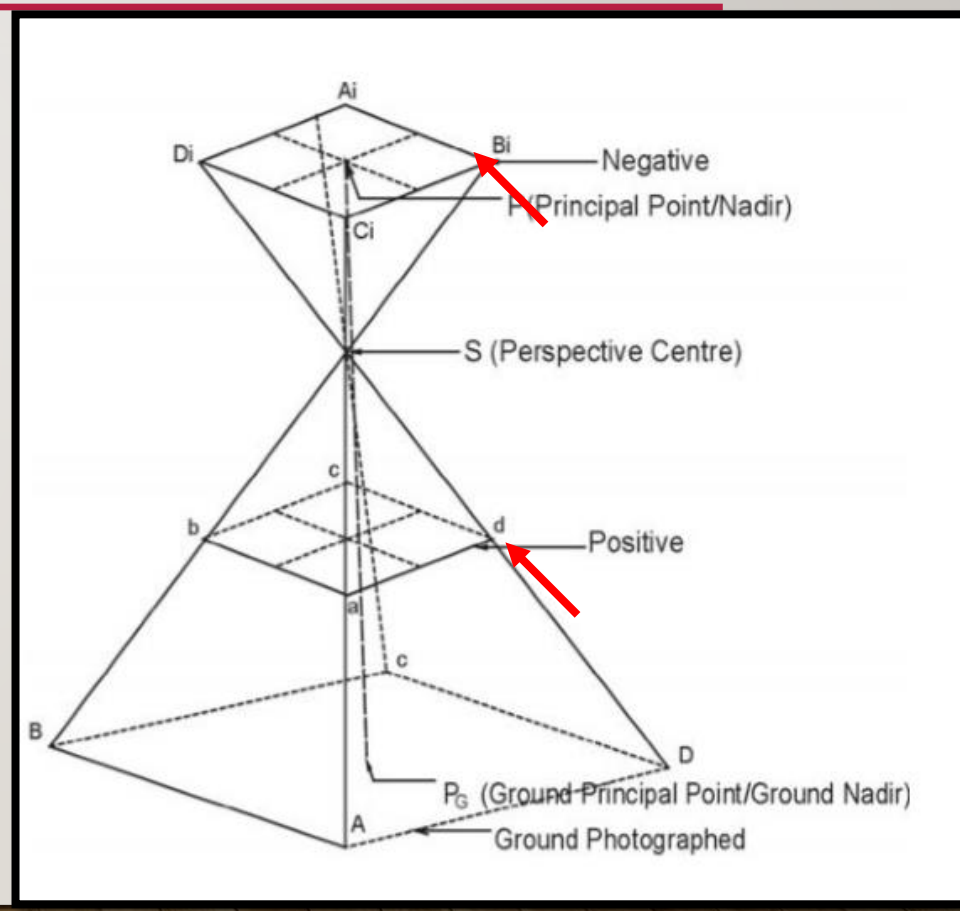
- Similarly, if we draw a vertical line (plumb line as indicated by the direction of gravity) through S, it will meet the photo negative at a point known as the nadir point and on the ground as the ground nadir point.
- Observe from figures in types of photographs that the plumb line and the camera axis are coincident for a vertical photograph while they are separable in case of an oblique or a tilted photograph.
- Thus in case of a vertical photograph, the principal and the nadir points also coincide with one another. For an oblique photograph, the angle between the camera axis and the plumb line is the tilt angle.



GEOMETRY OF VERTICAL PHOTOGRAPHS

- This figure shows both the positive and the negative planes of a vertical photograph. The geometry of the positive and the negative planes are identical.

- SP, i.e. the perpendicular distance between the camera lens and the negative plane is known as the *focal length*. On the other hand, SPG, i.e., the perpendicular distance between the camera lens and the ground photographed is known as the *flying height.*



SCALE OF AERIAL PHOTOGRAPHS

- Aerial photographs do not have a consistent scale unless they have been taken of a flat terrain. Aerial photographs need to be transformed from perspective view to the planimetric view before they can be used as map substitute. Such transformed photographs are known as **orthophotos**.
- The concept of scale for aerial photographs is much the same as that of a map.
- **Scale** is the ratio of a distance on an aerial photograph the distance between the same two places on the ground in the real world. It can be expressed in unit equivalents like

1 cm= 1,000 km(or 12,000 inches) or as a representative fraction (1:100,000).

METHOD TO COMPUTE THE SCALE

By Establishing Relationship Between Photo Distance and Ground Distance

- Ground distances of two identifiable points in an aerial photograph is available, it is fairly simple to work out the scale of a vertical photograph.
- For that the corresponding ground distances (Dg) are known for which the distances on an aerial photograph (Dp) are measured.
- In such cases, the scale of an aerial photograph will be measured as a ratio of the two, i.e. Dp/ Dg.

METHOD TO COMPUTE THE SCALE

- Method : By Establishing Relationship Between Photo Distance and Ground Distance

Problem : The distance between two points on an aerial photograph is measured as 2 centimetres. The known distance between the same two points on the ground is 1 km. Compute the scale of the aerial photograph

Solution Sp = Dp : Dg

= 2 cm : 1 km

= 2cm : 1 x 100,000 cm

= 1 : 100,000/2 = 50,000 cm

= 1 unit represents 50,000 units. Therefore, Sp = 1 : 50,000

Thank You