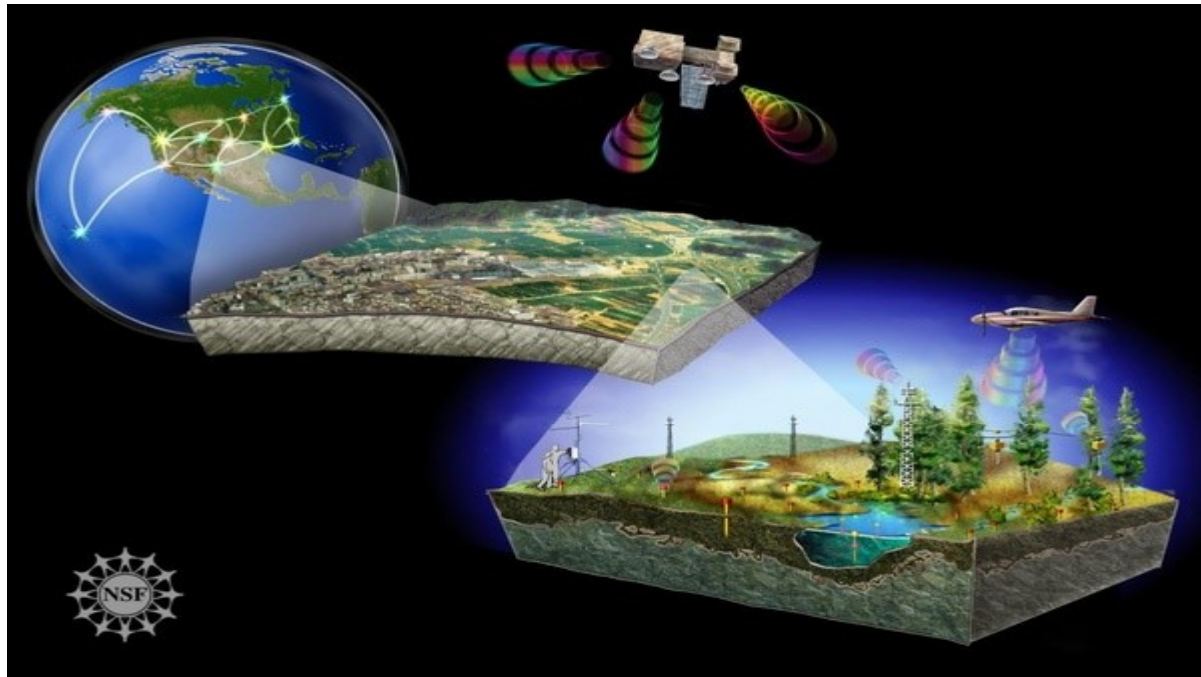


# GIS&RS



PRESENTATION PRESENT

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# PHOTOGRAMMETRY

an introduction...

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Photogrammetry is the technique of measuring objects (2D or 3D) from **photographs**

Its most important feature is the fact, that the objects are measured **without being touched.**

- Objects are measured **WITHOUT TOUCHING**.
- It is a **REMOTESENSING** technique.
- It is a close range method of measuring objects.
- It is a 3-dimensional coordinate measuring technique that uses **PHOTORAPHS** as the fundamental medium for measurement

# Brief History of Photogrammetry

- 1851: French officer Aime Laussedat develops the first photogrammetrical devices and methods. He is seen as the initiator of photogrammetry.
- 1858: The German architect A. Meydenbauer develops photogrammetrical techniques for the documentation of buildings and installs the first photogrammetric institute in 1885 (Royal Prussian Photogrammetric Institute).
- 1885: The ancient ruins of Persepolis were the first archaeological object recorded photogrammetrically.
- 1889: The first German manual of photogrammetry was published by C. Koppe.

- 1911: The Austrian Th. Scheimpflug finds a way to create rectified photographs. He is considered as the initiator of aerial photogrammetry, since he was the first succeeding to apply the photogrammetrical principles to aerial photographs
- 1913: The first congress of the ISP (International Society for Photogrammetry) was held in Vienna.
- 1980ies: Due to improvements in computer hardware and software, digital photogrammetry is gaining more and more importance.
- 1996: 83 years after its first conference, the ISPRS comes back to Vienna, the town, where it was founded.

# !!PRINCIPLE!!

- The main principle is “TRIANGULATION”.
- Eyes use the principle of TRIANGULATION to gauge distance (depth perception).
- TRIANGULATION is also the principle used by theodolites for coordinate measurement.

# TRIANGULATION

By taking photographs from at least two different locations, so-called "lines of sight" can be developed from each camera to points on the object. These lines of sight (sometimes called rays owing to their optical nature) are mathematically intersected to produce the 3-dimensional coordinates of the points of interest



# Aerial photogrammetry

Cameras fit to a machine that flies take pictures, and with the system, these pictures are used to generate measurements. In this case, at least two photos of the same object or surface have to be taken for statistical comparison. Specially designed planes are used for this kind of photography.

The planes are made to fly over predetermined piece of land, pointed with specific landmark edifices. The camera speed is regulated according to the speed of the plane. Also, the height of the aircraft from the land is known. Stereos plotters are used to create the base contour of the surface being photographed.

# Terrestrial photogrammetry

In this kind of photogrammetry, a camera is used in a stationary position. The camera is positioned on an elevated level. The tilt and other specifications of the camera are all controlled.

# The difference

a) Aerial photogrammetry requires a high-end infra support: specially designed and programmed planes being just one of them.

Terrestrial photogrammetry comparatively needs much less investment and technical skill to carry out.

b) The aerial kind of photogrammetry is suitable when we are trying to map a large piece of land. That is longitudinal knowledge and calculations are an integral part of this photogrammetry operation.

c) Security processes benefit from aerial photogrammetry in many cases. Finding archaeological sites also benefits from the fact that we get to see a large piece of land at one go.

Terrestrial photogrammetry is more suitable for movement related issues on a land mass that is relatively smaller than that covered in the other kind.

d) Urban planning takes advantage of both the methods. Using aerial photogrammetry, planners and designers collaborate on the best possible perspective for a specific project. An aerial view of the proposed project along with its surroundings helps to generate a clear idea about the right perspective.

Terrestrial photogrammetry, on the other hand, helps to see the interrelation between urban constructions, security issues, disaster management and many other issues benefit from this kind of analysis.

USE:-Using both kinds of photogrammetry can create a data set that will help us generate the most efficient and effective plan for any construction project.

# scale of photograph

- **Unit Equivalent** - *For example 1cm= 1km*
- **Representative Fraction**- *Expressed as a unit-less ratio, 1:25,000 or 1/25,000. This is the most common way scale is expressed in aerial photographs.*

$$\text{Scale} = \frac{\text{Photo Distance}}{\text{Ground Distance}}$$

Ground Distance = 100 m

Photo Distance = 2.5 mm → convert to m → 0.0025m

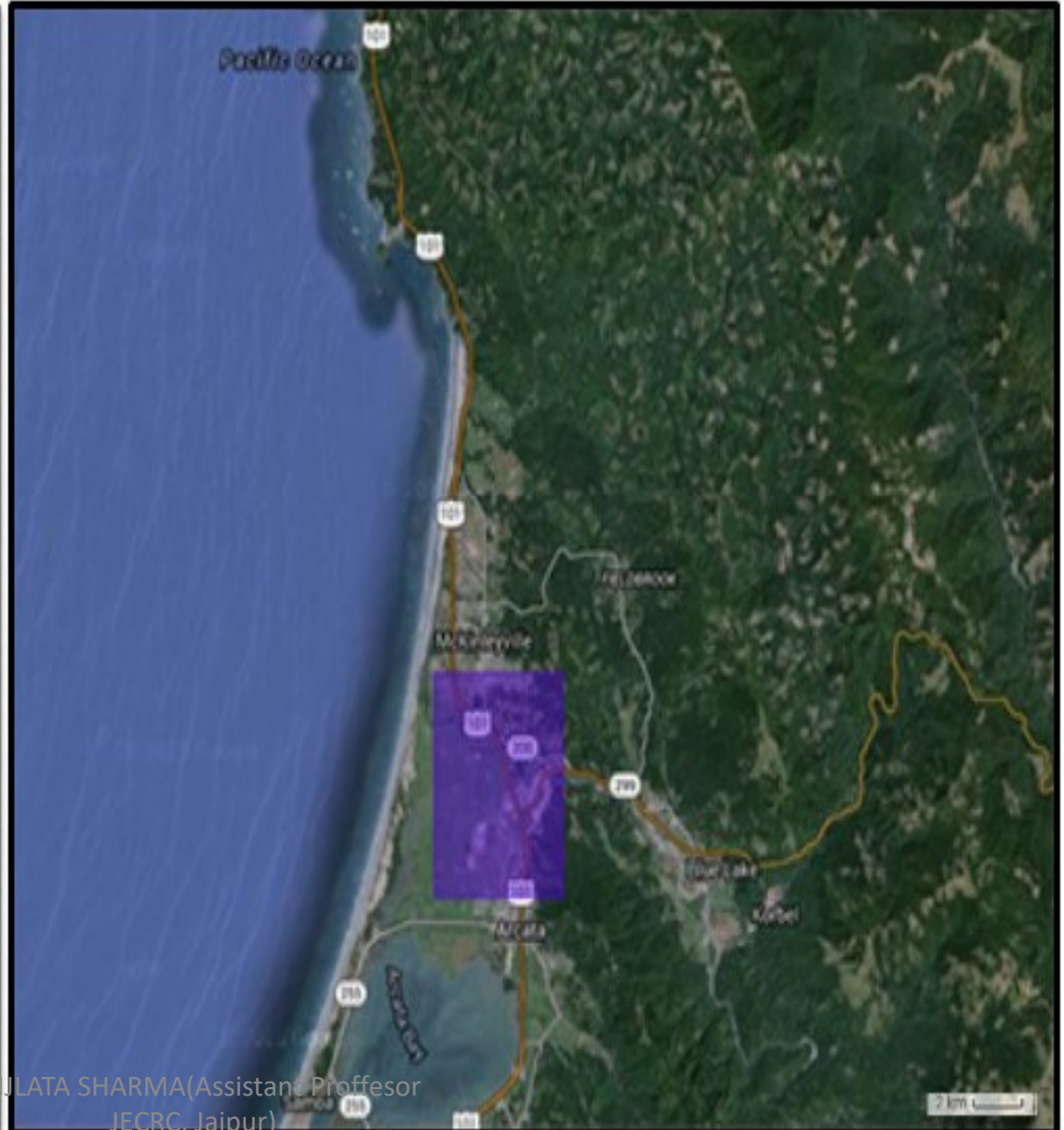
$$\frac{1}{X} = \frac{0.0025\text{m}}{100\text{m}} \rightarrow 0.0025X = 100 \rightarrow X = 100/0.0025 = 40,000$$

**Scale = 1:40,000**

***Large scale*** photographs cover smaller areas in greater detail.

**Small scale** photographs cover larger areas in less detail.

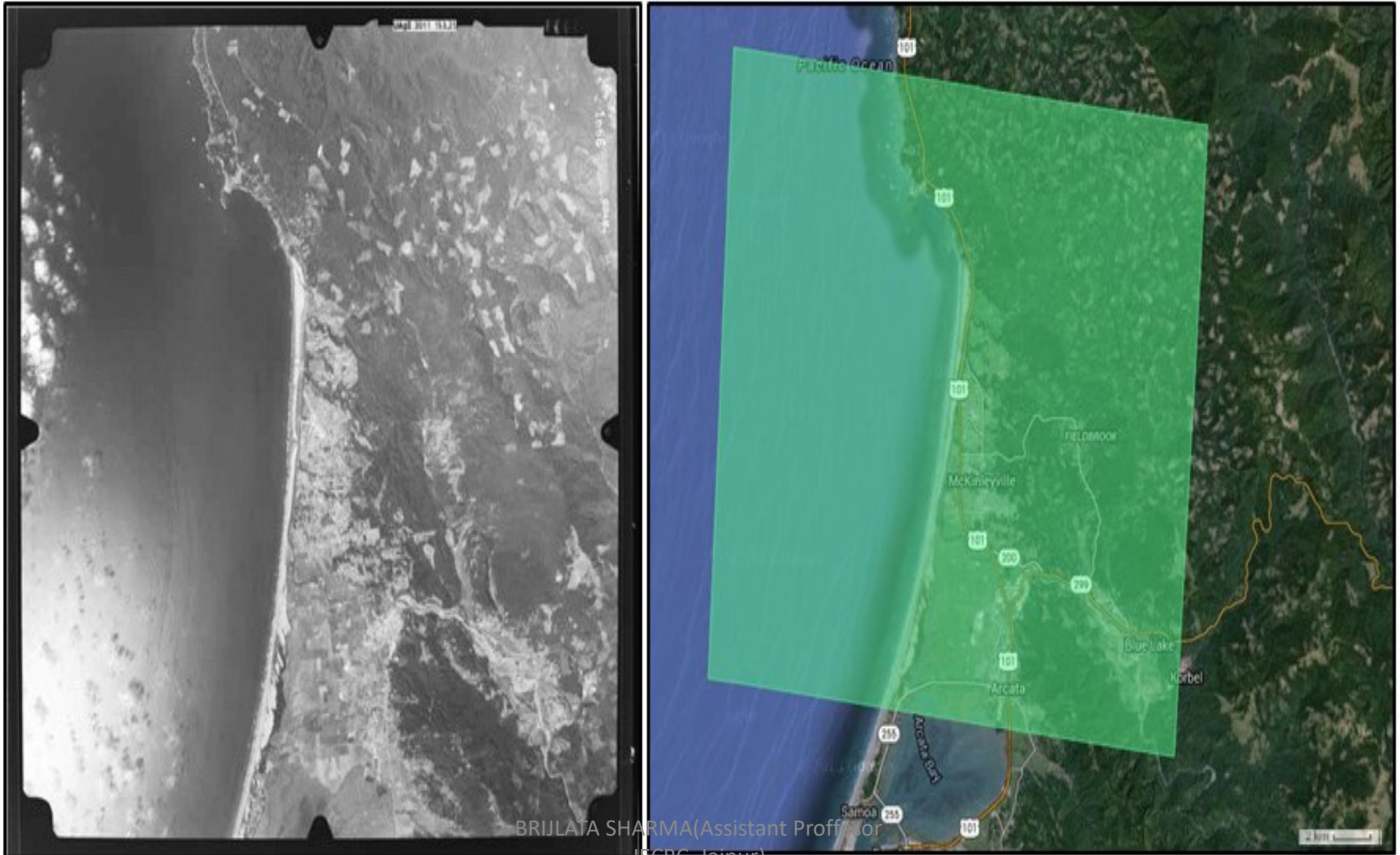
# Large Scale: 1:12,000



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# Small Scale: 1:133,3333



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# Distortion and Displacement

**Distortion**-shift in the location of an object, which changes the perspective characteristics of the photo.

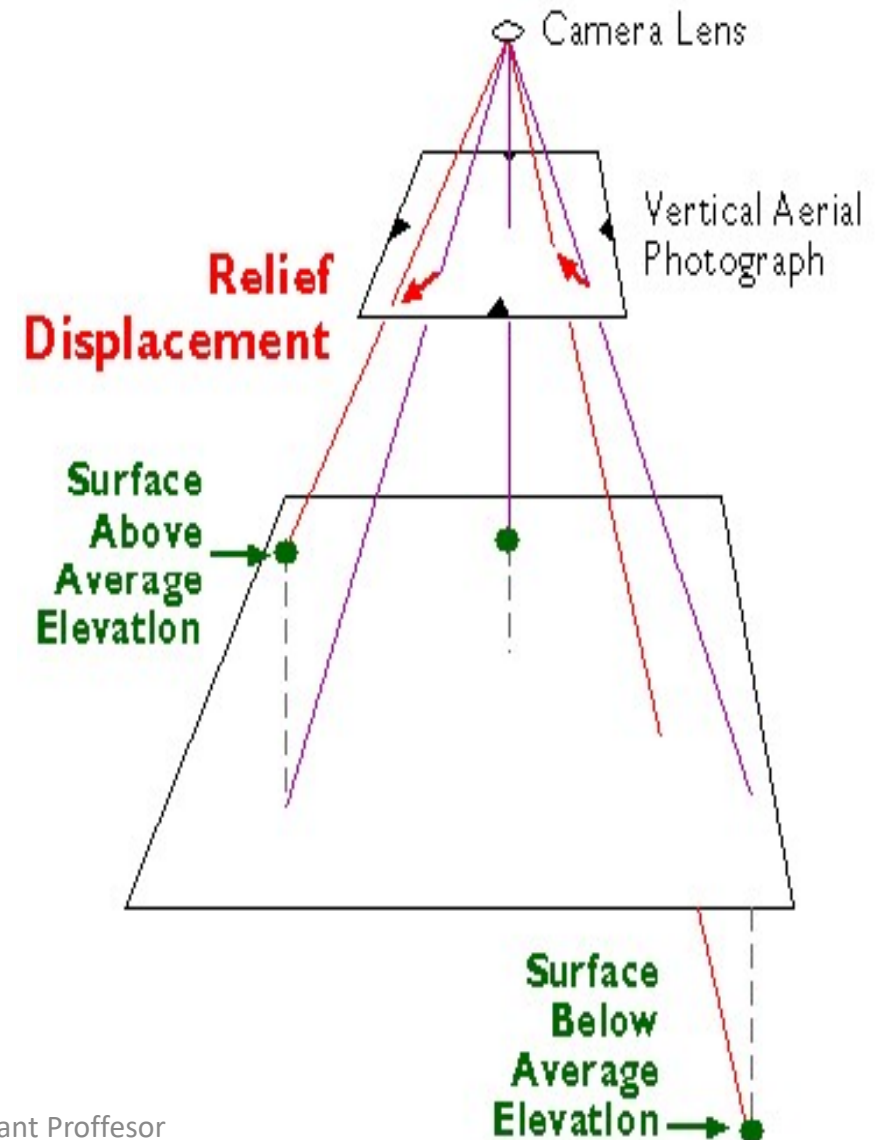
**Displacement**- shift in the location of an object in a photo, which does not change the perspective characteristics of the photo.

# Types of Displacement

1. Curvature of the Earth – negligible effect\*
2. Relief Displacement – radial from the nadir
- 3 Tilt Displacement – radial from the isocenter

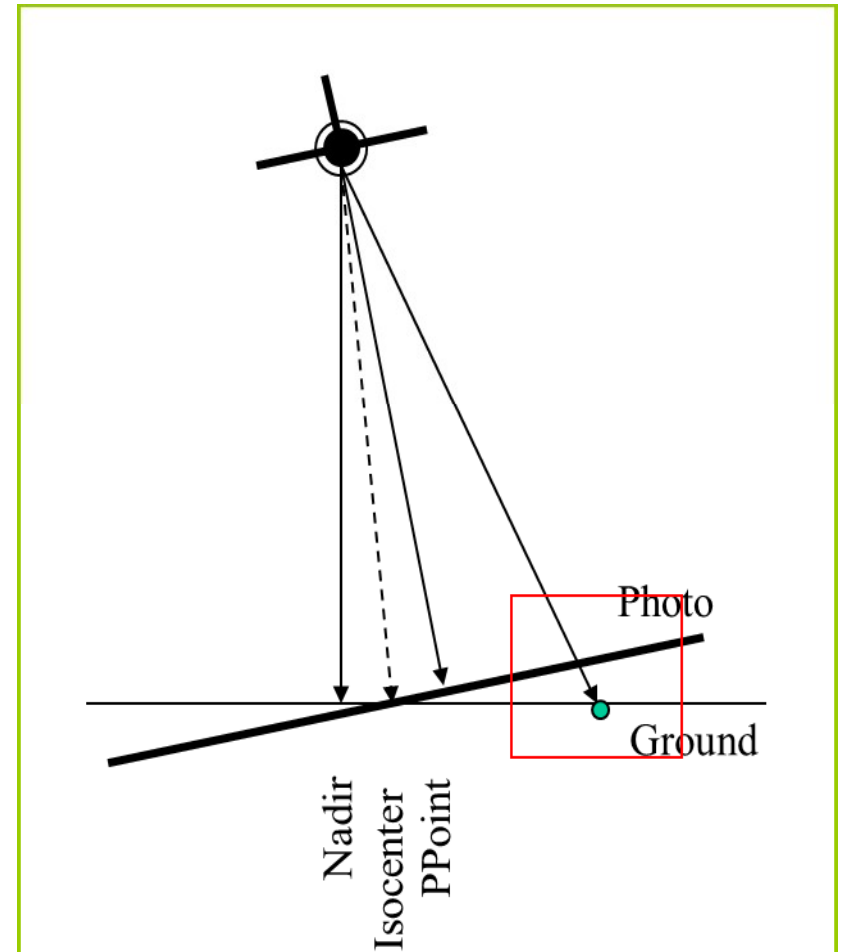
# Relief Displacement

Relief displacement is the radial distance between where an object appears in an image to where it actually should be according to a Planimetric coordinate system



# Tilt Displacement

is the shift in an object's image position on a **tilted** photo from its theoretical position on a truly vertical photo. This results from the photo plane being **tilted** with respect to the datum plane at the time of exposure. This effect is demonstrated in the diagram below



# Tilt Effect on Image Scale



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# What is stereoscopy?

‘Stereoscopy’ derives from the Greek stereos meaning ‘firm’ or ‘solid’ and skopeō meaning ‘to look’ or ‘to see’ = seeing something firm, solid, three-dimensional or 3D.

- In general life, it is known as **3D Imaging**.
- It is the technique used to create the illusion of depth in an offset image by presenting two slightly different perspectives of the same object to the eyes of the viewer.



# Stereoscopic Vision

Stereoscopic vision is also called space vision or plastic vision, is a characteristic, possessed by most persons of normal vision and is important for **ability to conceive objects in three dimensional effects and to judge distances**



# Project Planning

After the product selection process,

- Planning the aerial photography
- Planning the ground control
- Selecting instruments and procedures necessary to achieve the desired results
- Estimating costs and delivery schedules

# Flight Planning

- Success of photogrammetric project depends on acquisition of good quality pictures
- Due to weather and ground conditions, time frame for photography is limited
- Reflights are expensive and causes long delays on project
- Mission must be carefully planned and executed according to flight plan
- Consists of flight map, (where photos should be taken) and specifications

# Specifications

- Camera requirements
  - Film requirements
- Scale
  - Flying height
- End laps, side laps
- Tilt and crab tolerances

# Maps and Map substitutes and their uses

MAP:- A diagrammatic representation of an area of land or sea showing physical features, cities, roads, etc.

# Thank you

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