

**Introduction**

1. **Photogrammetry** is the science and technology of extracting reliable three-dimensional geometric and thematic information, often over time, of objects and scenes from image and range data.

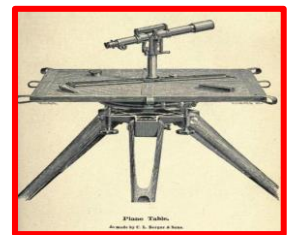
2. **Why photogrammetry?**

- Photogrammetry is used to obtain reliable measurements (XYZ) and produce planimetric and topographic maps from two-dimensional images, usually photographs, without going to the field to measure the objects.
- Photogrammetry products (e.g. maps) are considered as the reference for most GIS applications.
- Specified to cover a large area quickly.
- Specified to be lower cost than others (e.g. cheaper than geodetic survey).
- The data can be obtained easier from the image than from the fields.

3. **History of photogrammetry**

Developed at the same time of developing photography in 1851 by Aimé Laussedat, French inventor. The development started with:

- Plane table photogrammetry
- Analogue photogrammetry
- Analytical photogrammetry
- Digital photogrammetry



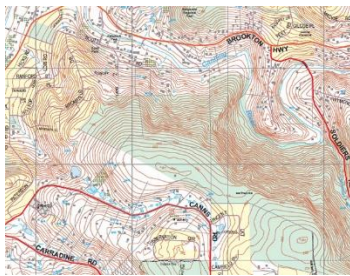
## Introduction

### 4. Field of photogrammetric application.

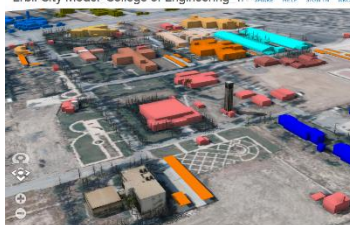
There are many uses for photogrammetric data, but generally, any application that requires a volumetric or three-dimensional set of data or topographic vector information can be considered.

Typical applications include:

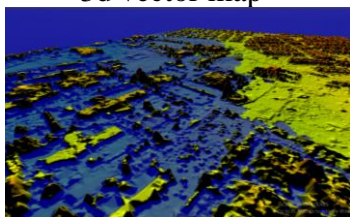
- Topographic surveying.
- Infrastructure modelling.
- 2D and 3D vector mapping.
- Visualization/animation.
- Volumetric analysis.
- Forest monitoring.
- Flood plain surveys.
- artificial intelligence,
- Medical treatment
- forensic investigation
- Archeological site documenting



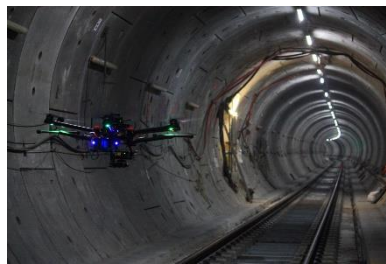
Topographic surveying



3d vector map



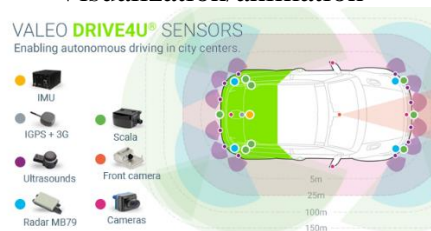
Flood plain surveys



Infrastructure modeling



Visualization/animation



Artificial Intelligence,



2d vector map



Forest monitoring



Medical treatment

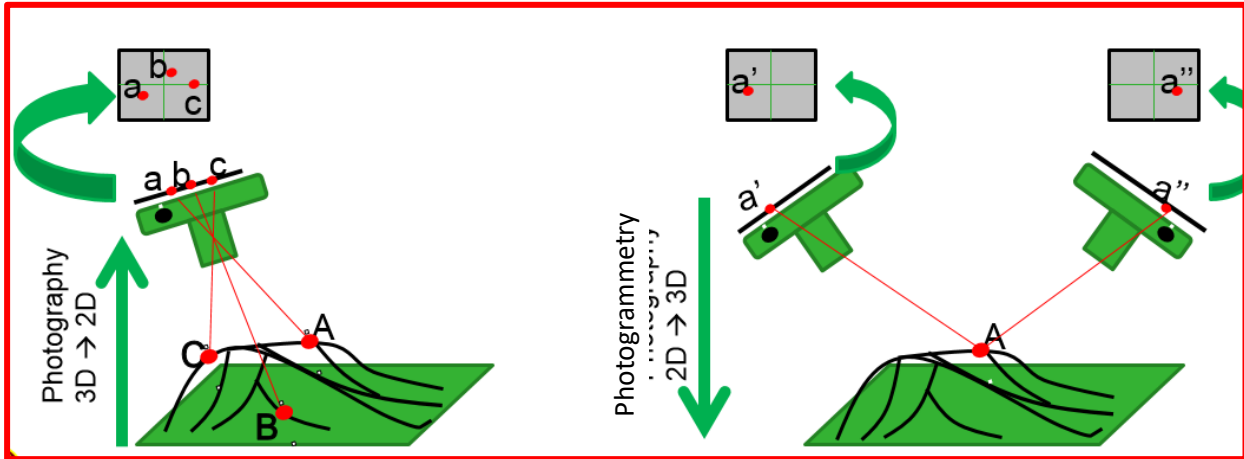
Different professional companies are interested in the field of photogrammetric surveying:

<https://www.pasco.co.jp/eng/geospatial/>

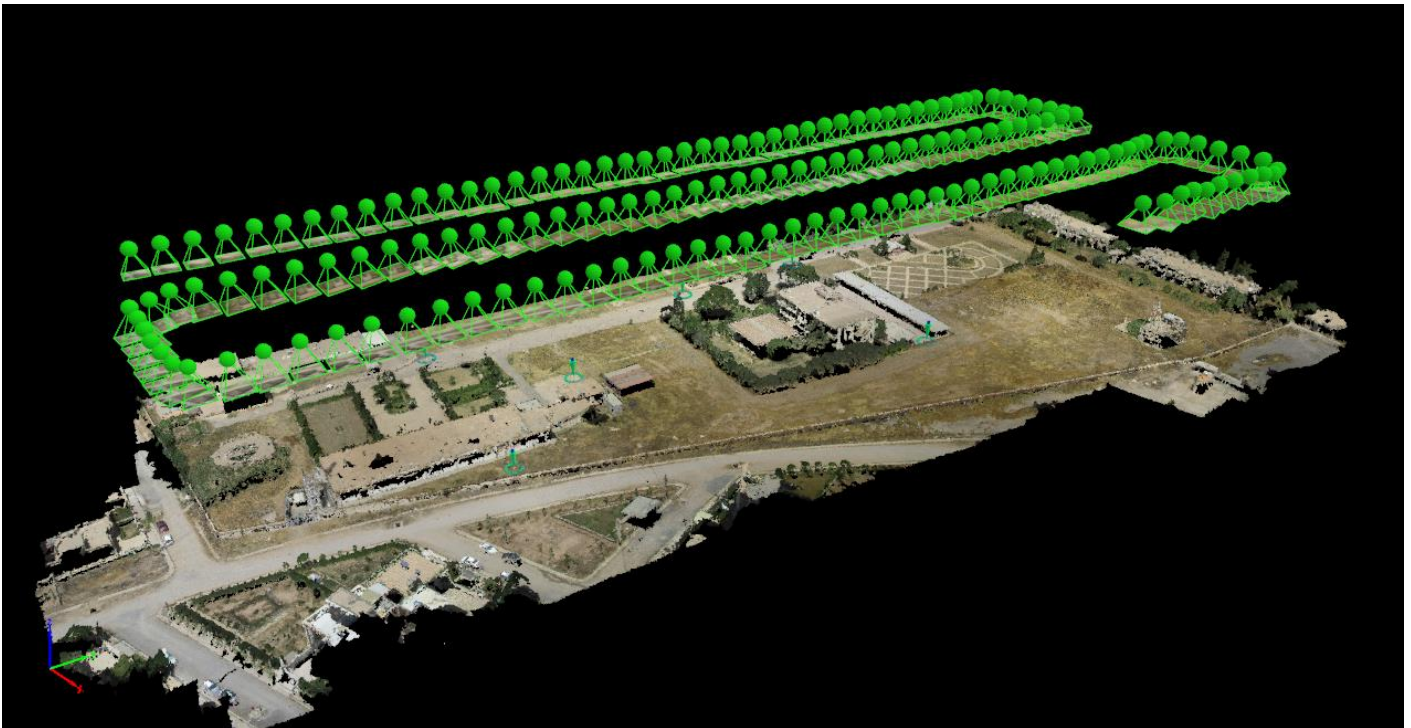
### 5. Objective of photogrammetry

It is the technique that inverts the photography process to generate object space from the imagery, consequently leading to deriving 3D coordinates from 2D coordinates.

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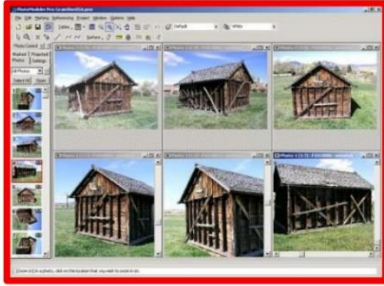
the process of 3d building extraction using a stereo imagery



### Introduction

6. Types of Photographs Different fundamental classifications of photography used in the science of photogrammetry are terrestrial, UAV, aerial and space.

**1.1. Terrestrial photographs** are taken with ground-based cameras, the position and orientation of which might be measured directly at the time of exposure.

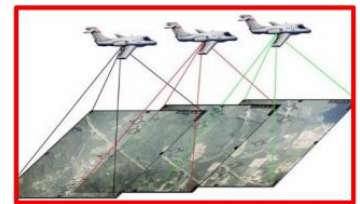


**1.2. UAV imagery** is an Unmanned aerial vehicle, specified to use the commercial camera for image capturing but at low altitude, usually less than 300m. it is either fixed-wing or rotary.

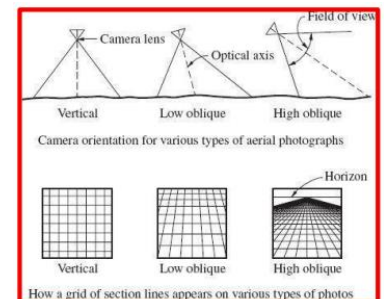


**1.3. Aerial photography** is commonly classified as either vertical or oblique.

**1.3.1. Vertical photos** are taken with the camera axis directed as nearly vertically as possible. If the camera axis were perfectly vertical when exposure was made, the photographic plane would be parallel to the datum plane, and the resulting photograph would be termed truly vertical. In practice, the camera axis is rarely held perfectly vertical due to unavoidable aircraft tilts. When the camera axis is unintentionally tilted slightly from vertical, the resulting photograph is called a tilted photograph. These unintentional tilts are usually less than  $1^\circ$  and seldom more than  $3^\circ$ .



**1.3.2. Oblique aerial photographs** are exposed with the camera axis intentionally tilted away from vertical. A high oblique photograph includes the horizon; a low oblique does not.



The below figure shows different images taken with different angles:



*Vertical photograph*



*Low oblique digital camera image*



*High oblique photograph*

**1.4.Space imagery**, images of earth collected by imaging satellite operated by governments and businesses which can be used for commercial use, it can be used in topographic purposes for large area

