

Images Provide a Thousand Measurements

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ABSTRACT

Imagery has been used in surveying and spatial applications since the early days of the camera. The advent of the digital era has seen rapid growth in the use of imagery in a variety of products. From Google Earth to NearMap, imagery has become ubiquitous in our daily lives. This presentation gives a historical context of the different use-cases and methodologies of imagery from its genesis till the present. It will also look at how spatial professionals, and more specifically surveyors, can leverage the use of imagery in their every-day workflows to maximise efficiency and help to deliver positive project outcomes.

KEYWORDS: *Georeferenced imagery, image registration, terrestrial photogrammetry, satellite imagery, web service imagery.*

Outline

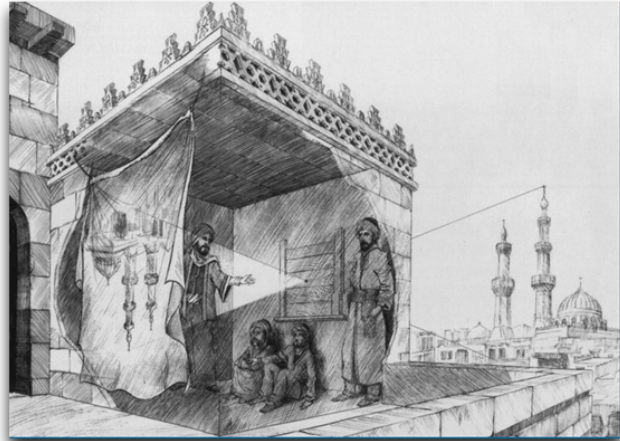
- History
- New Technology
 - Imaging Total Stations
 - Georeferenced Imagery
 - Online Image Streaming
- Neo – the software solution



History

In 1038: AD - Al Hazen of Basra is credited with the explanation of the principle of the camera obscura.

Al-Haitham, known in the West as Alhazen, is considered as the father of modern optics.



Source :
Photogrammetry by A. Dermanis



History

- In 1855, Nadar (Gaspard Felix Tournachon) used a balloon at 80-meters to obtain the first aerial photograph over a small French village.
- The first successful aerial photograph from a rocket mounted camera was taken by the Swedish inventor, Alfred Nobel in 1897.

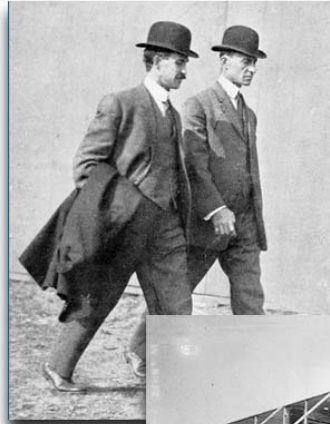


Source :
PAPA International



History

- In 1903 the Wright brothers invented the airplane and in 1909 were the first to take a photograph from a plane.
- Captain Cesare Tardivo (1870 - 1953) is thought to be the first to use aerial photography from a plane for mapping purposes. (Paper presented in 1913)



Source :
Photogrammetry by A. Dermanis



History

- During World War I, aerial photography soon replaced sketching and drawing done by observers on planes or at elevated positions.
 - The battle maps used by both sides were produced from aerial photographs, and by the end of the war, both sides were recording the entire front at least twice a day.
- Following the end of the war, the aerial camera turned to non-military purposes.
 - For many it became a successful business venture as aerial surveys were found to be faster and much less expensive than a ground survey.



Source :
Photogrammetry by A. Dermanis



History

Photogrammetry is the science of making measurements and creating 3D information from stereo images. It is a technique that has been used in some form since the 1850s.

There have been four major development cycles.

- 1) Plane table photogrammetry, from about 1850 to 1900,
- 2) Analog photogrammetry, from about 1900 to 1960,
- 3) Analytical photogrammetry, from about 1960 to 2010,
- 4) Digital photogrammetry, which is now throughout the industry.

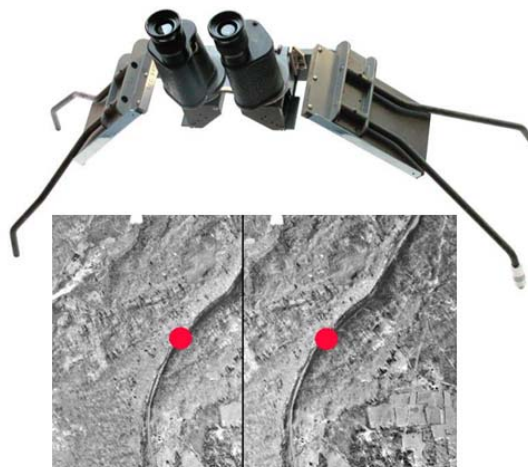
Source :
Photogrammetry by A. Dermanis



History

Analog instruments are based on the concept of stereometric vision.

2 photos are relatively oriented to produce a 3D model, where details and contours were then manually drawn.



Source :
Photogrammetry by A. Dermanis



History

The invention of the computer is responsible for the development of analytical Photogrammetry and together with computer software can produce three dimensional coordinates of points which are then used for detail plotting and contour drawing on topographic maps.

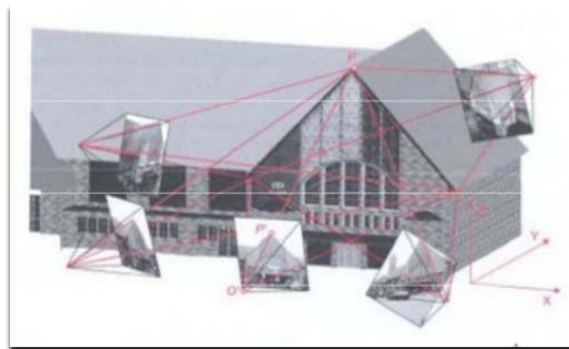


Source :
Photogrammetry by A. Dermanis



History

Terrestrial Photogrammetry deals with photographs taken with cameras located on the surface of the earth. The cameras may be handheld, mounted on tripods, or other specially designed mounts. The term close-range photogrammetry is generally used for terrestrial photographs having object distances up to about 300 m.



Source :
R.J Watson



History

Digital Cameras

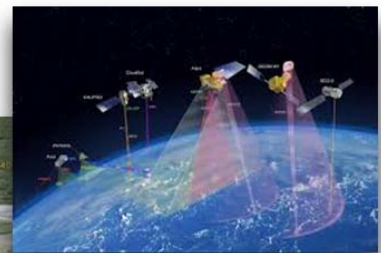
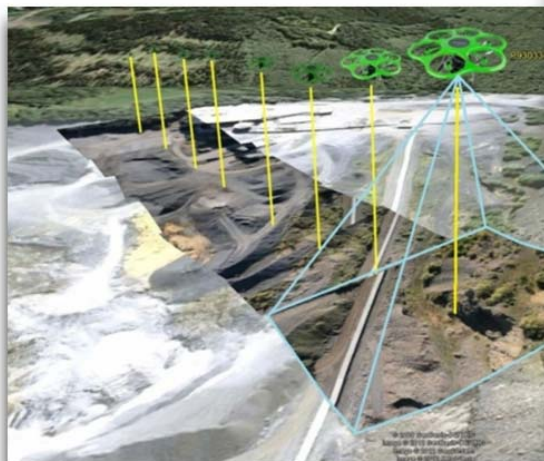
- The history of the digital camera began with [Eugene F. Lally](#)
- His 1961 idea was to take pictures of the planets and stars while travelling through space to give information about the astronauts' position.
- Unfortunately, as with [Texas Instruments](#) employee Willis Adcock's filmless camera (US patent 4,057,830) in 1972, the technology had yet to catch up with the concept.
- [Steven Sasson](#) as an engineer at [Eastman Kodak](#) invented and built the first electronic camera in 1975.

Source :
Wikipedia



New Technology

- **Imaging Total Stations**
- **UAVs**
- **Satellites**



Imaging Total Stations

Using Modern Imaging Total Stations

- Instrument locations needs to be known relatively
- Numerous photos can be taken at each set up
- 60% plus overlap must be obtained for measurements
- Image quality can depend instrument settings and end product requirements.



Benefits

- Measure to objects that are dangerous or difficult to access
- Repeat measurements now and in the future
- Measure to surfaces that reflectorless EDMs have difficulty reading
- QA on field observations or scan data.
- Historical record of what exists.



Georeferenced Imagery

We can use Aerial, Satellite or other available imagery

Georeference to project datum's using

- known project control for manual registration
- Pre registered for automatic registration (ECW, TIFF & JPG)
- Multiple images referenced
- View in 3D

Benefits

- Referenced backdrop to ground geometry data
- Ability to digitise information from images
- Use imagery from varying time periods to measure and analyse changes



Online Image Streaming

Connect to on-line image streaming services

- FREE or subscription
- Web Mercator Projection
- Internet connection required
- View in 3D



Benefits

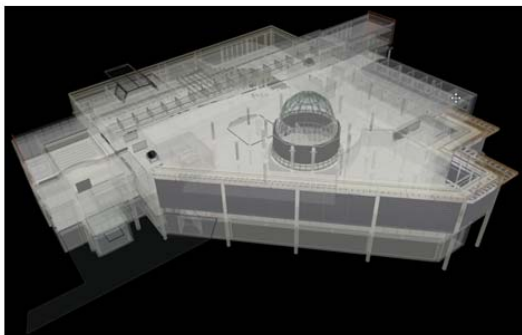
- Dynamic Image tiling
- Instant access to imagery at any location
- Ability to digitise information from images



Introducing

LISTECH Neo is new generation geospatial software, that allows you to make the most of these new technologies. It offers exciting functionality with increased productivity and ease of use.

Image Xtract – Image GeoRef – Image Connect



User Definable Attributes

Design and tailor attribute definitions to suit client needs.

- Create attributes automatically by importing from another system
- Add and edit them
- Automatically populate with default values
- Optionally increment as objects are created

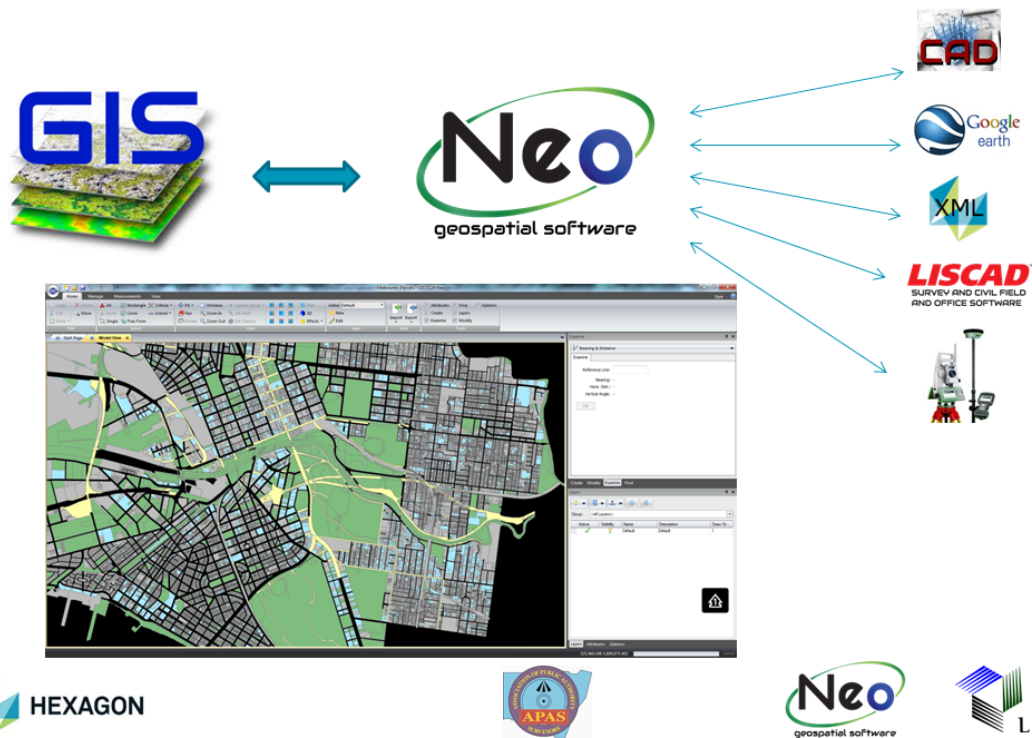
Deliver product tailored to your client needs.



Seamless Transfer



GIS Processing & Exchange

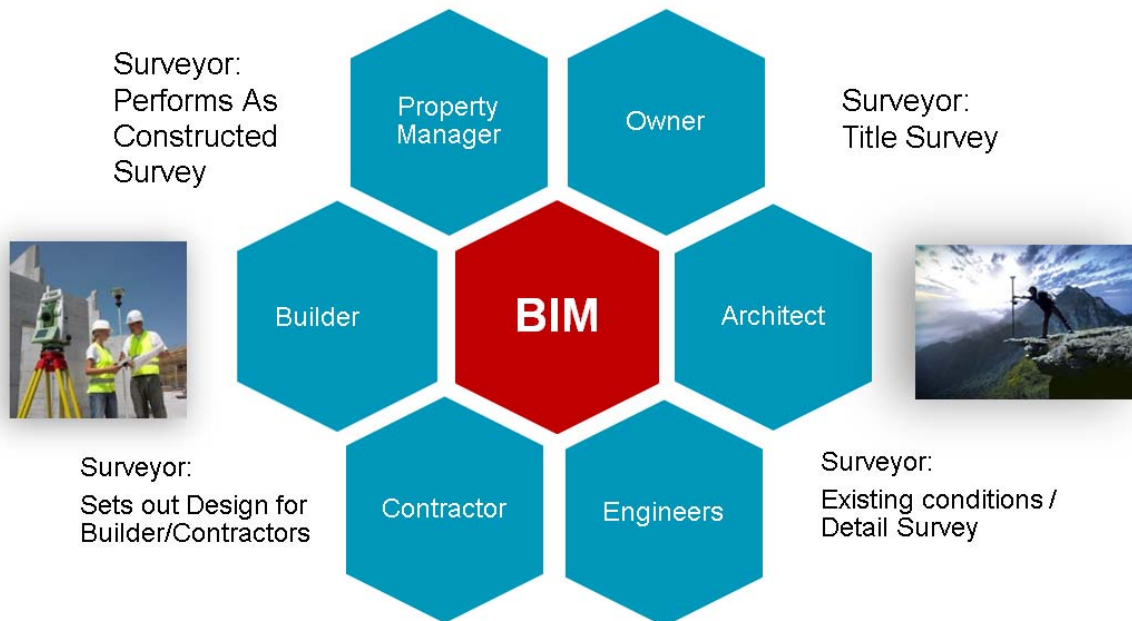


What is a BIM?

The US National Building Information Model Standard Project Committee definition:

- *Building Information Modelling (BIM) is a digital representation of physical and functional characteristics of a facility.*
- *A BIM is a shared knowledge resource for information about a facility forming a reliable basis for decisions during its life-cycle; defined as existing from earliest conception to demolition.*

BIM and the Surveyor

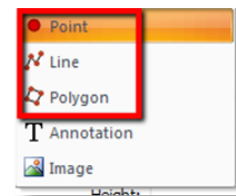
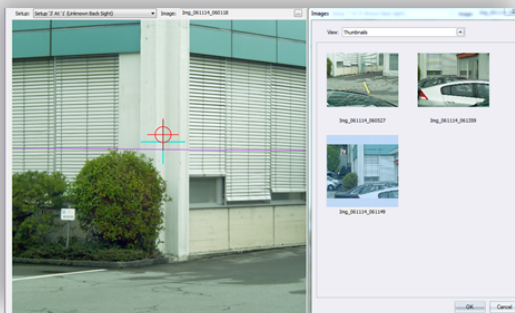


Neo Image Xtract

Create Objects from Total Station Imagery

Key Features:

- Automatic Image Selection
 - System displays all images that will compute 3D objects
- Create:
 - Points
 - Lines
 - Polygons
- EpiPolar Line
 - Makes for easy digitising on second image

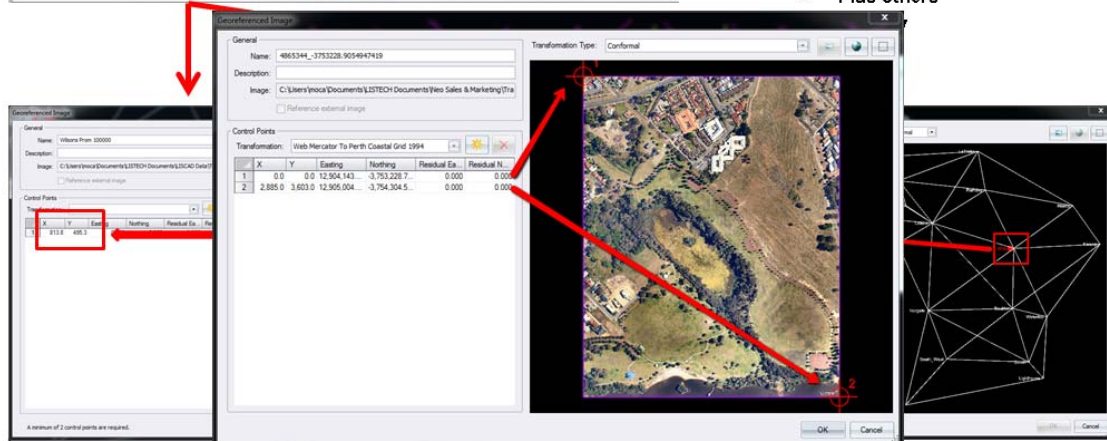


Geo Referenced Images



Geo Reference Image:

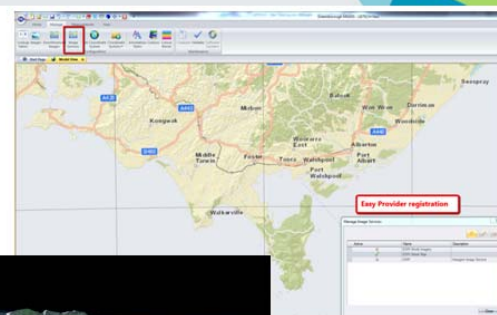
- Automatically
 - GeoTIFF
 - Jpeg World
 - ECW
 - Plus others



Neo Image Connect

Real Time connection to Image streaming services.

- HxIP
- Esri Street Maps
- Esri World Imagery
- NearMaps
- Plus others



Combine Imagery

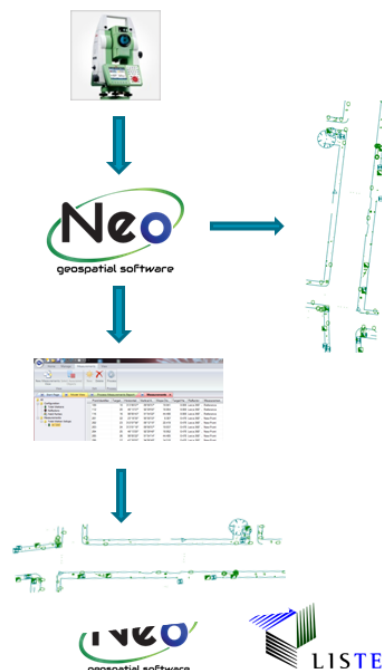
Images from GeoRef or streamed through Connect can be viewed in the same project. Could be a background map and higher resolution of a specific area.



Integrated Measurement Database

Complete control over the processing and reduction of field surveys.

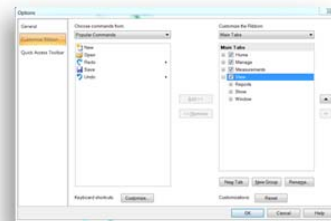
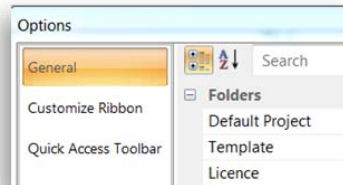
- Field data automatically imported
 - Appears in Neo as on the instrument
 - Automatic attributing
- Reprocess Measurements information
 - Update dynamically
 - Automatic Update attributing



Customisable

- **Designed for global use**

- Units
- Precision
- Display options
 - Ribbon
 - Toolbars
 - Dialogues
- Annotation styles
- Reports are configurable
- Multiple language support

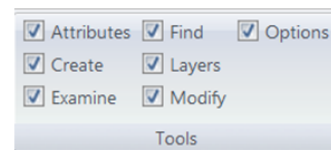


Rigorous Geodetic Computations

Rigorous geodetic computations and editing functionality

Information can be manipulated using the extensive tools available:

- Create
- Examine
- Modify
- Find

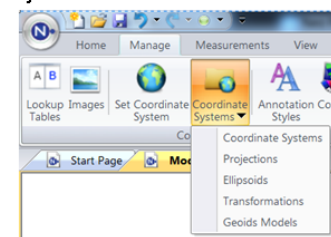


Coordinate systems may be plane or geodetic.

Transformations can be performed between coordinate systems.

Uses known Coordinate systems or user defined.

- ellipsoids,
- projections,
- transformations
- geoid models are supported.

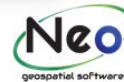


Template Based

Neo projects are template based

New projects with required customisation are created simply by selecting the appropriate template.

- Sample project templates are included,
- Custom tailored templates can be saved for future use.



Modular System

Neo is an expanding portfolio of modules,

You can purchase:

- The modules for your current needs
- Additional modules at a later date when required.

Scalable subscription licensing is also available.

- Perpetual
- Subscription



Continuous Updates

Neo is continually updated

- New features are added continuously throughout the system.
- Neo users are always aware of new features through the news section of the Neo Start page.

