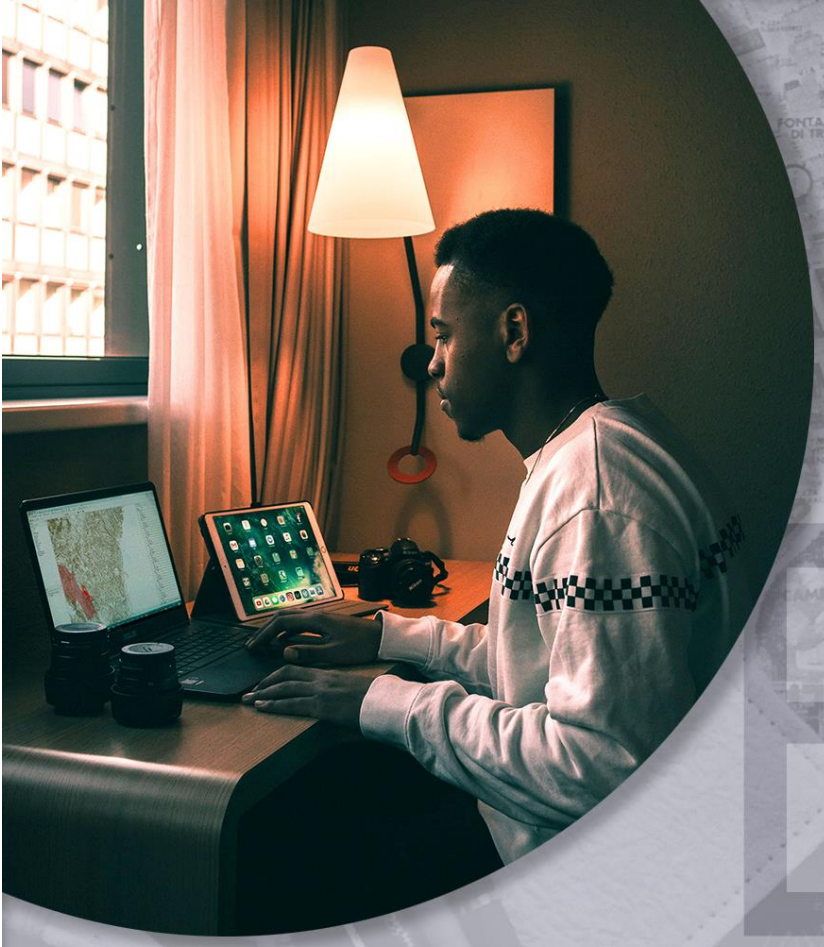

BIRGIT

BIRGIT 3D data acquisition technologies
November 2023

Erasmus+

3D Data Acquisition - 2

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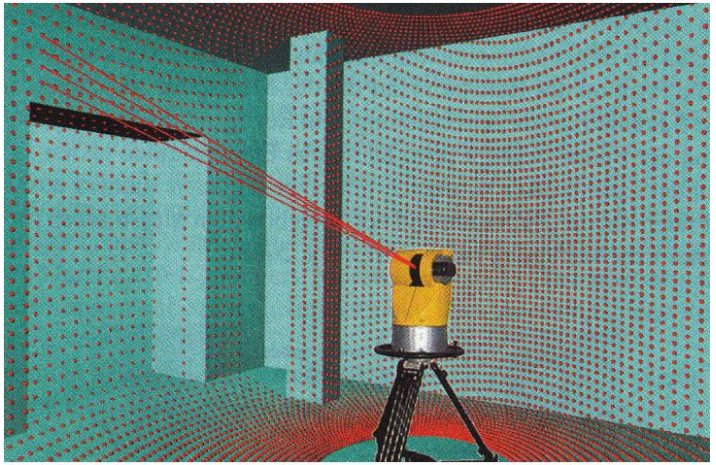
Learning outcomes

- At the end of this module, the participant is expected to be able to
  - Describe and explain 3D geospatial data acquisition technologies
  - Describe the ways of using data acquired with different sensors (UAVs, ALS, TLS, Tacheometry)

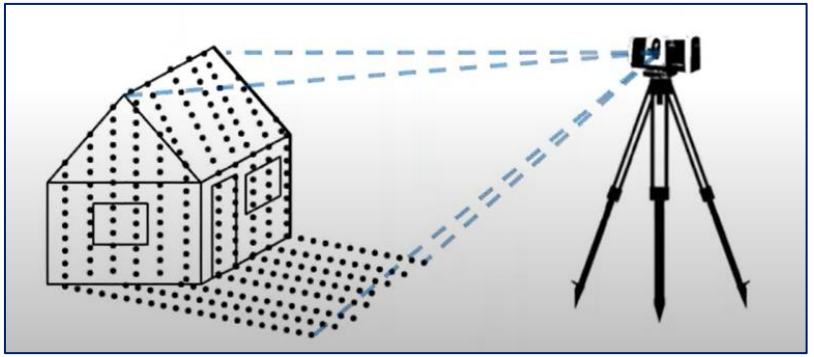
3D Data Acquisition

- Tacheometry
- Photogrammetry
- **3D Laser scanning**

- The Laser (*Light Amplification by Stimulated Emission of Radiation*)
  - is an amplification of light by stimulated radiation
  - creates and amplifies coherently electromagnetic (infrared, ultraviolet and visible), the most common monochromatic-narrow directional radiation
  - the main characteristic of this light is the ability to focus on a point of small diameter (< 1 mm) which is impossible in natural light

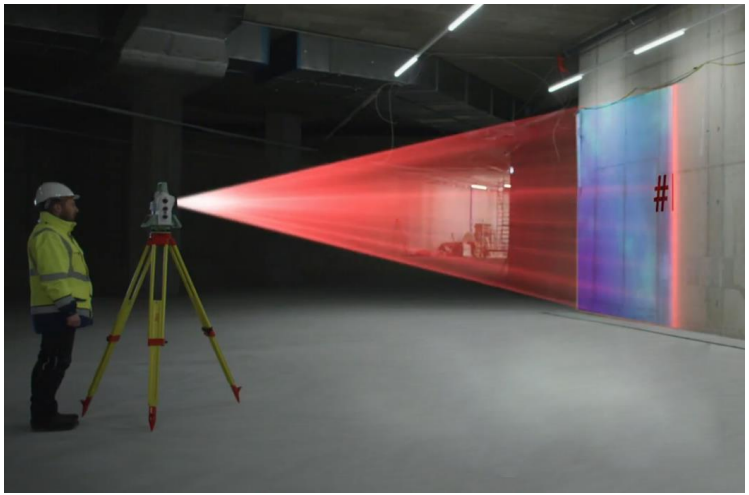


- **laser scanning** is an efficient/advanced/automated geospatial data collection method
- laser scanner does not observe a point of interest as in the “classic” geodesy
- all available points of the selected area/object are recorded that create a three-dimensional point cloud at the end of the scan (3D point cloud)
- the common name for this method of data collection is LiDAR (Light Detection and Ranging)



3D Laser scanning

- **LiDAR (Light Detection and Ranging)** provides high resolution of 3D geospatial data + big data
- the principle of work is based on emitting a laser beam and measuring the time of its path after reflection from a particular object
- versatile and innovative solution



Types:

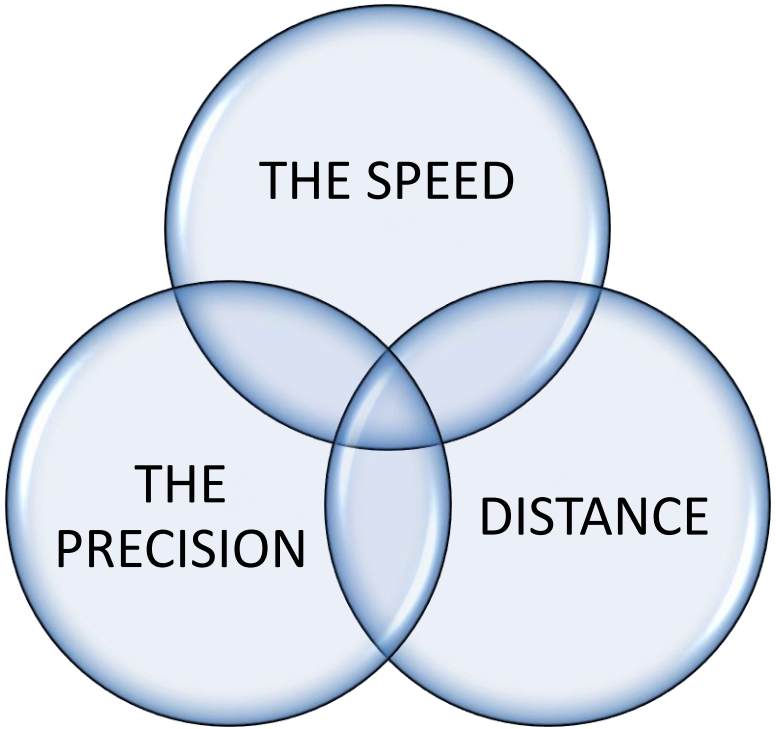
- Terrestrial Laser Scanner (TLS)
  - ✓ laser scanner is also known as terrestrial/terrestrial LiDAR
  - ✓ usually placed on the tripod to perform static laser measurements
  - ✓ have the highest accuracy among all types of scanners available on the market
- Airborne Laser Scanner (ALS)
  - ✓ refers to a laser scanner installed on an aircraft or unmanned aircraft
  - ✓ accuracy of air scanners is relatively low due to their mobility
- Mobile Laser Scanner (MLS)
  - ✓ manual scanners/mounted on the platform and moving at “higher speeds”
  - ✓ handhelds are relatively smaller in size and less weight, so they can be easily transported from one place to another

Terrestrial Laser Scanner (TLS)

Airborne Laser Scanner (ALS)

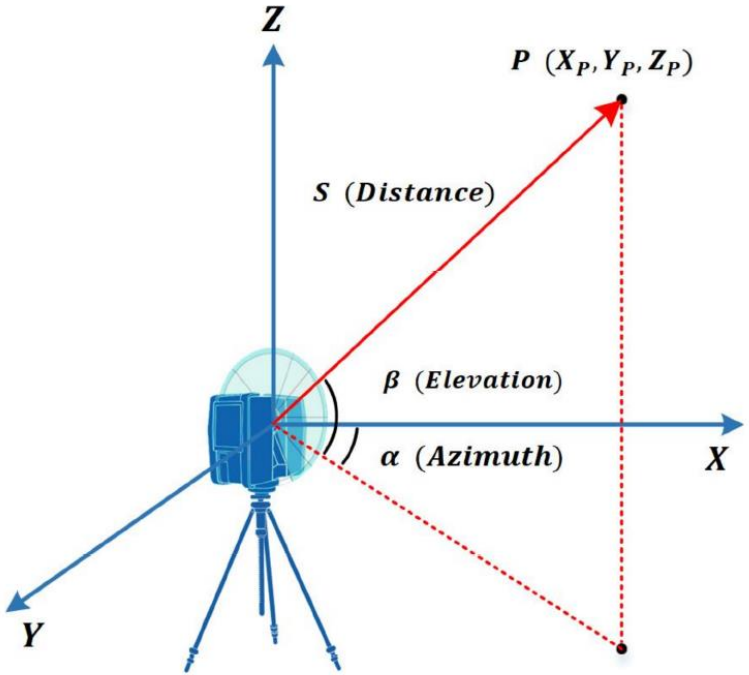
Mobile Laser Scanner (MLS)

The main characteristics of the scanner



- Terrestrial Laser Scanner (TLS)
  - the principle of operation is based on the emission of laser beam/laser rays from the instrument and the measurement of the time of its journey to a point on an object and back after reflection from a particular object
  - the wavelength of the laser beam is usually from 600 nm to 1000 nm, which ranks it into an infrared wave area
  - laser scanner is measuring the distance to the object, vertical and horizontal angle
  - when returning the beam, the intensity of the feedback signal is also measured as the RGB color record
  - the data thus collected form a dot cloud (“point cloud”) that are registered and merged into a single common model for further processing

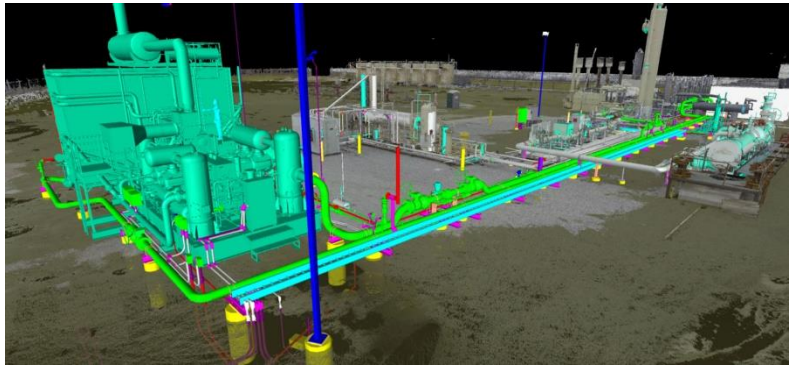
- Terrestrial Laser Scanner (TLS)

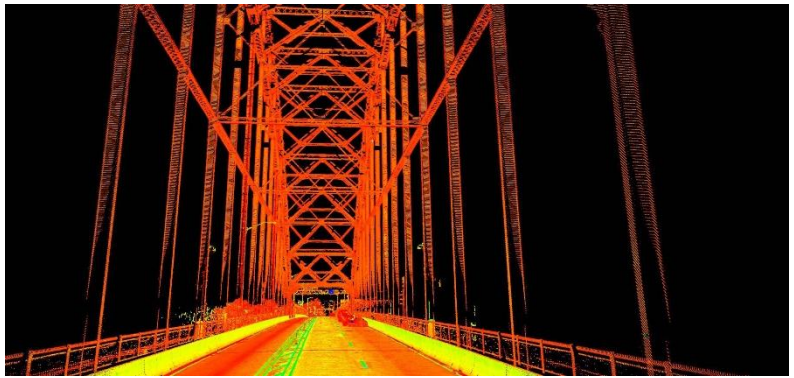


- Georeferencing
  - georeferencing for laser scanning defines the transformation of data from a local instrument system into an official coordinate system of an object where dot clouds collected from all points of view are aggregated to allow further data processing
  - laser scanning technology creates a point cloud of millions of data points containing information that is used to create the most accurate 3D image of space and all objects in it - all points have their own coordinates

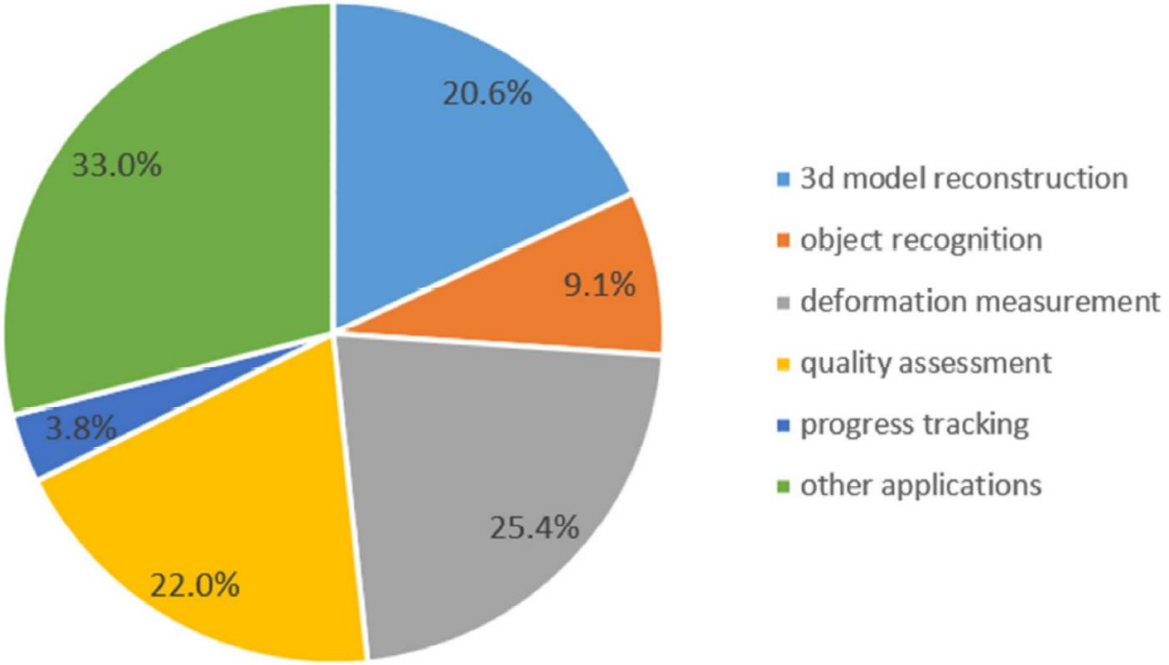
Usage

- architecture
- civil engineering
- BIM
- agriculture
- archaeology
- infrastructure
- 3D video games
- reconstruction of accidents
- healthcare
- ....





Application in Architecture, Engineering & Construction (AEC) Industry (2021)



Pros and cons (3D Laser scanning)

- speed - saving time
- accuracy
- no contact
- reduced field costs
- safety
- integration with other business processes (detailed documentation)
- errors reduced to min.
- BIM (data acquisition)

- hidden geometry
- vectorisation...
- weather conditions (light)
- initial costs (instrument + hardware)
- cost-effectiveness
- accessories (3D screen)
- new software - new education...

Thank you for your attention

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Some logo’s and links to web site and social media here

This project has been funded with support from the European Commission. This publication [communication] reflects the views only of the author, and the Commission cannot be held responsible for any use which may be made of the information contained therein.