

3D Laser Scanner

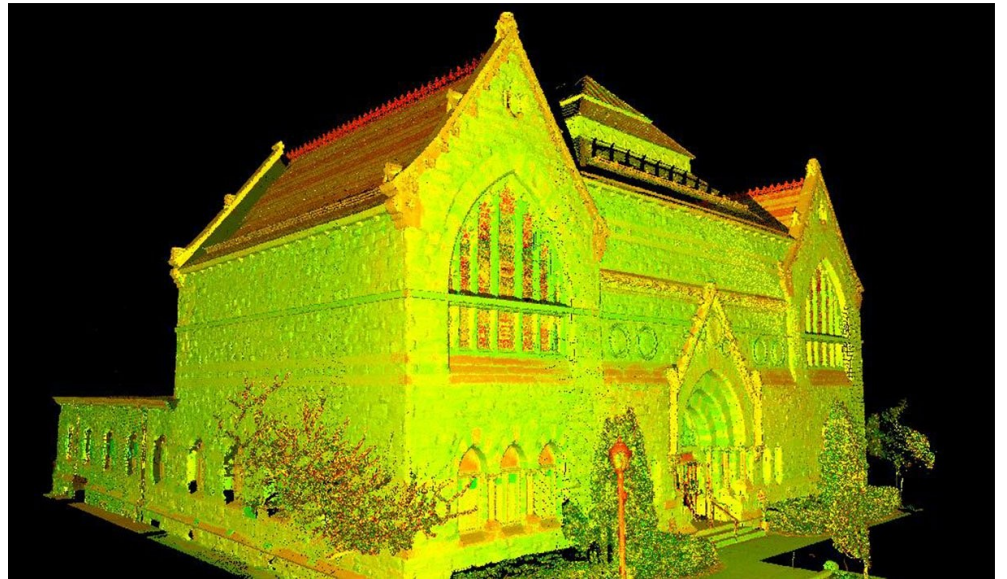
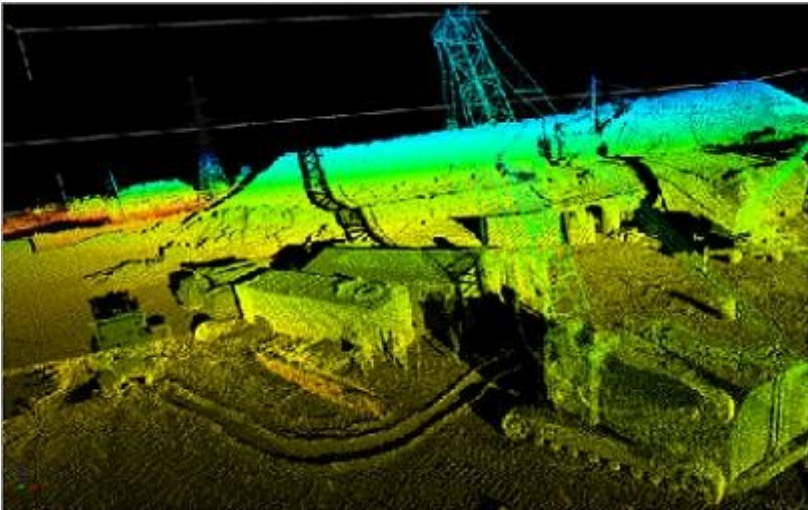
*Lecturer: Berchuk V.Y.
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Plan

- 1. Definition;*
- 2. Parts of the instrument;*
- 3. Optical distance measurement methods
in terrestrial laser scanners;*
- 4. The principle of operation;*
- 5. Tripod;*
- 6. Setting up the instrument;*
- 7. Types of terrestrial laser scanners;*
- 8. Application.*

Definition

Laser Scanning - is the process of shining a structured laser line over the surface of an object in order to collect 3-dimensional data. The surface data is captured by a camera sensor mounted in the laser scanner which records accurate dense 3D points in space.



Definition

A 3-D scanner is an imaging device that collects distance point measurements from a real-world object and translates them into a virtual 3-D object.



Leica ScanStation P40

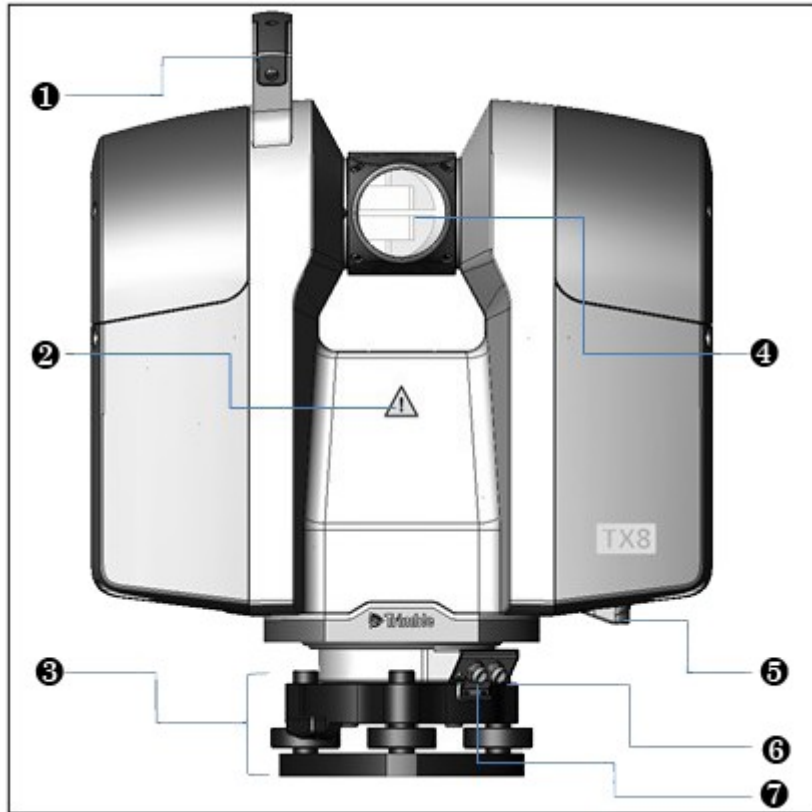
Trimble VX Spatial Station

Topcon GLS-1500

Parts of the instrument

Front of instrument

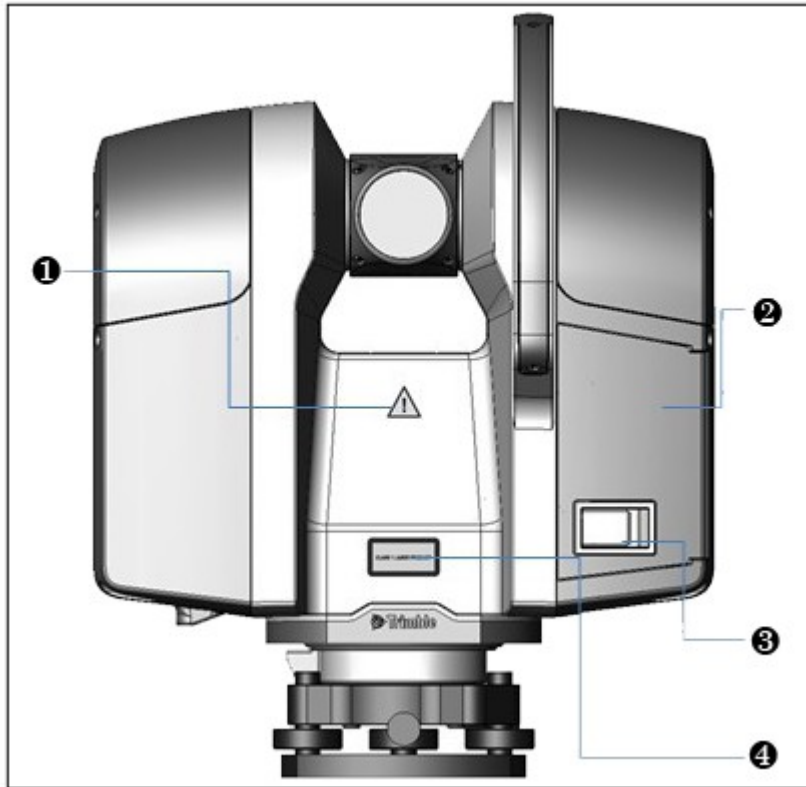
A laser scanner consists of:



- 1 - Handle;
- 2 - Hazard symbol label;
- 3 - Tribach;
- 4 - Spinning mirror;
- 5 - Bottom grip;
- 6 - limb aiming screw;
- 7 - Communication connector;
- 8 - Power connector.

Back of instrument

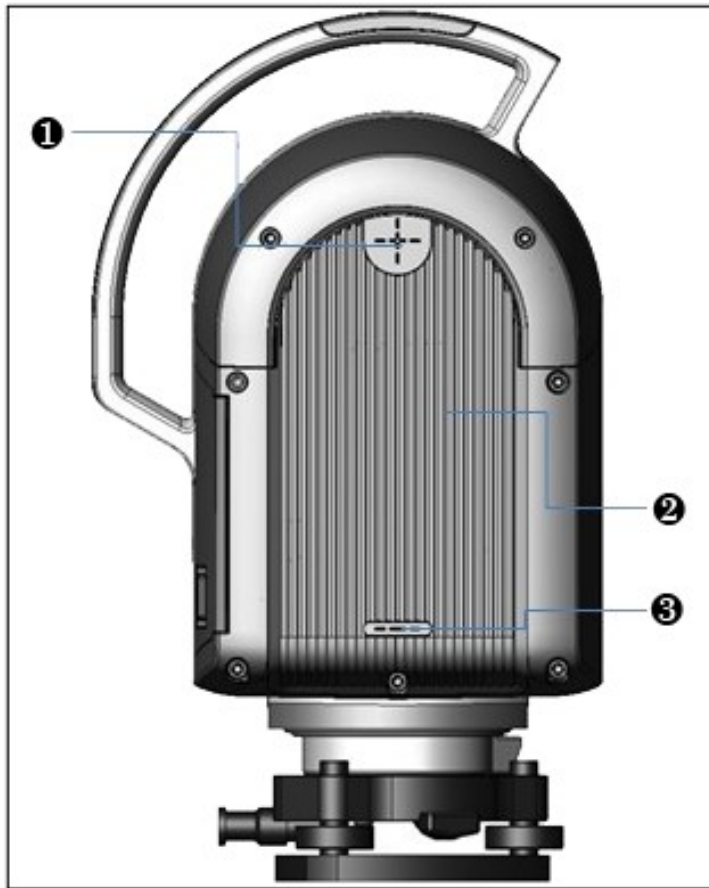
A laser scanner consists



- 1 - Hazard symbol label;
- 2 - Battery compartment door;
- 3 - Door latch;
- 4 - Laser warning label.

Left side of instrument

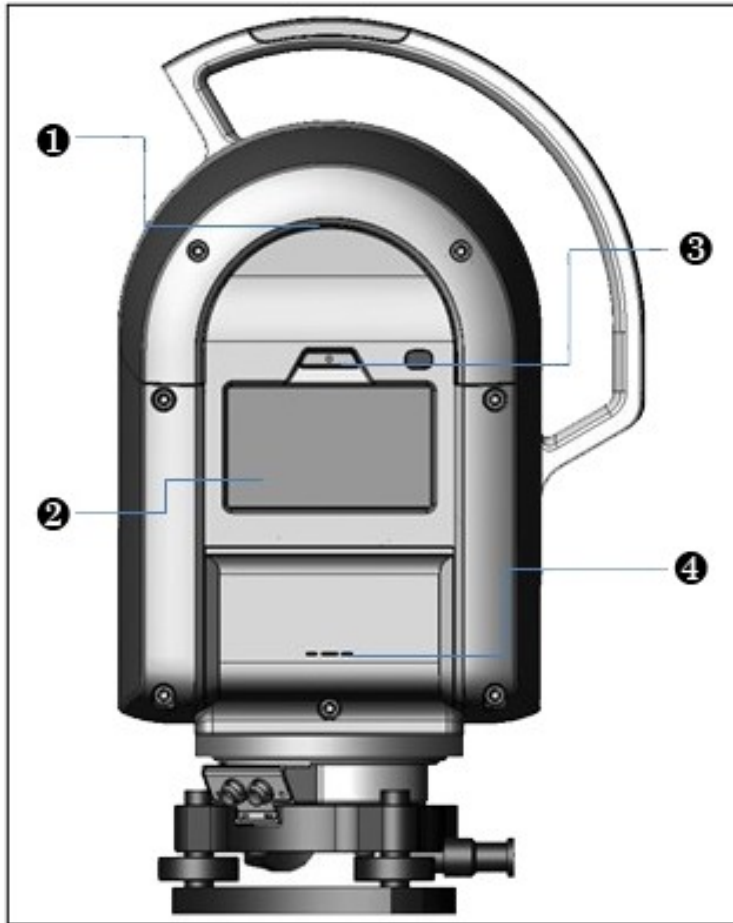
A laser scanner consists of:



- 1 - Top measurement mark ;
- 2 - Instrument housing with integrated heat exchanger;
- 3 - Bottom measurement mark.

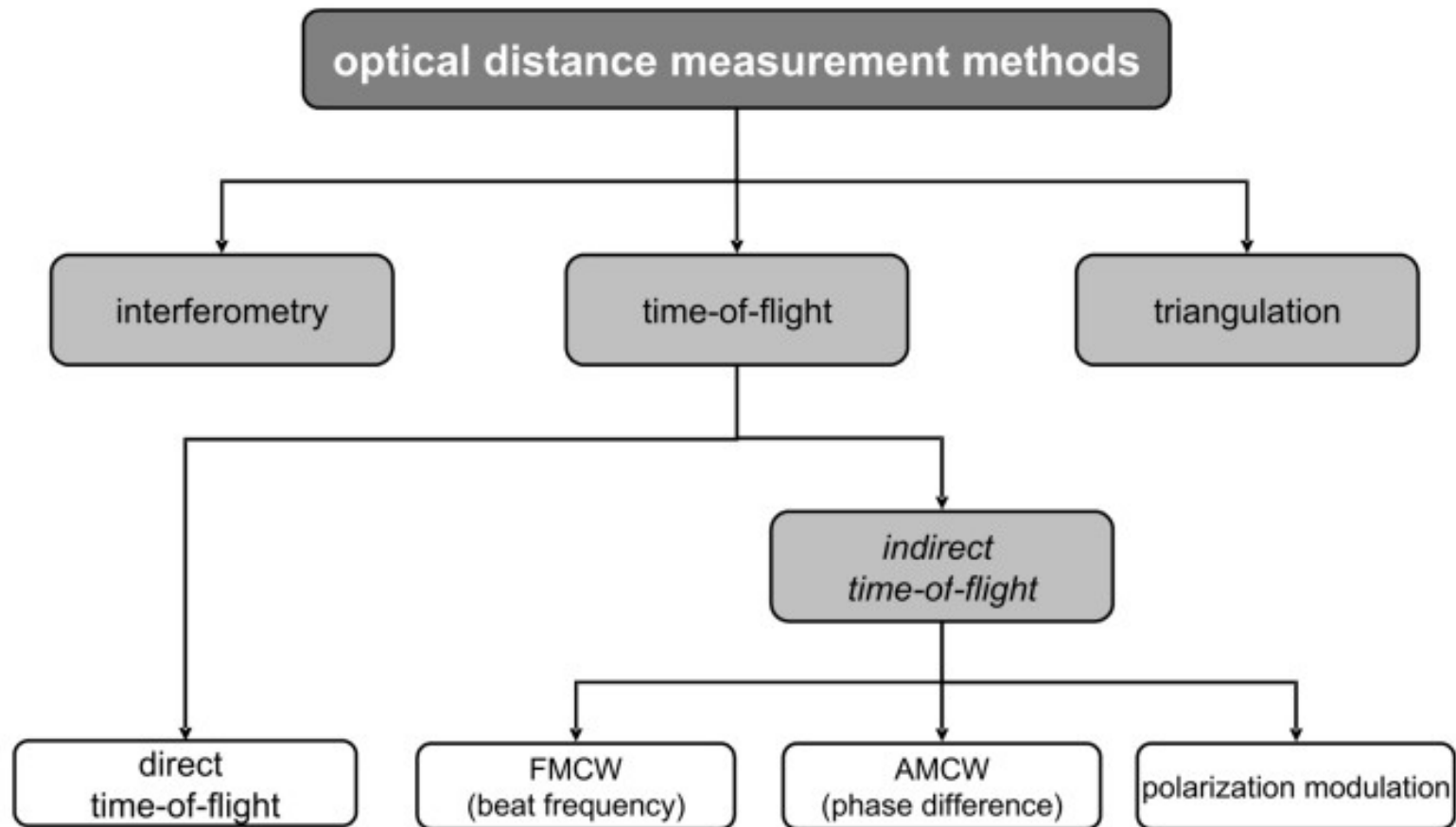
Right side of instrument

A laser scanner consists of:



- 1 - Top grip;
- 2 - Touch screen;
- 3 - On/Off key;
- 4 - Instrument height measurement mark.

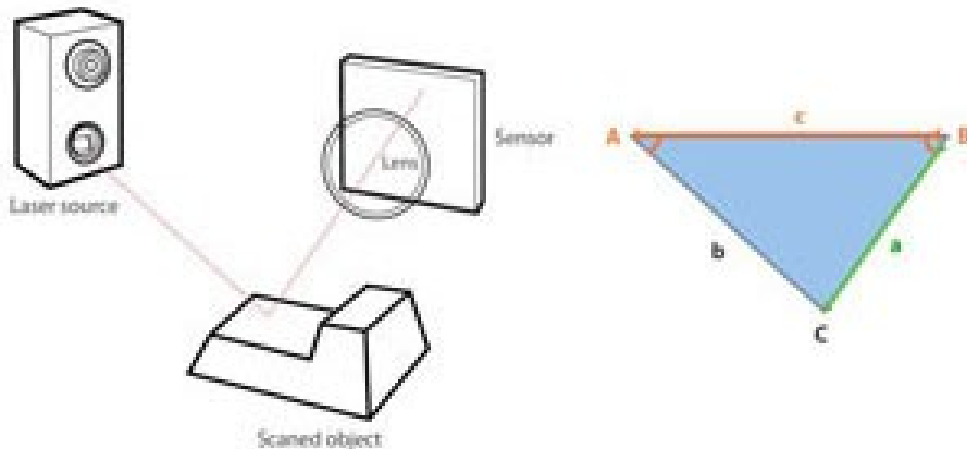
Optical distance measurement methods in terrestrial laser scanners



The principle of operation

Short-Range (<1 meter focal distance)

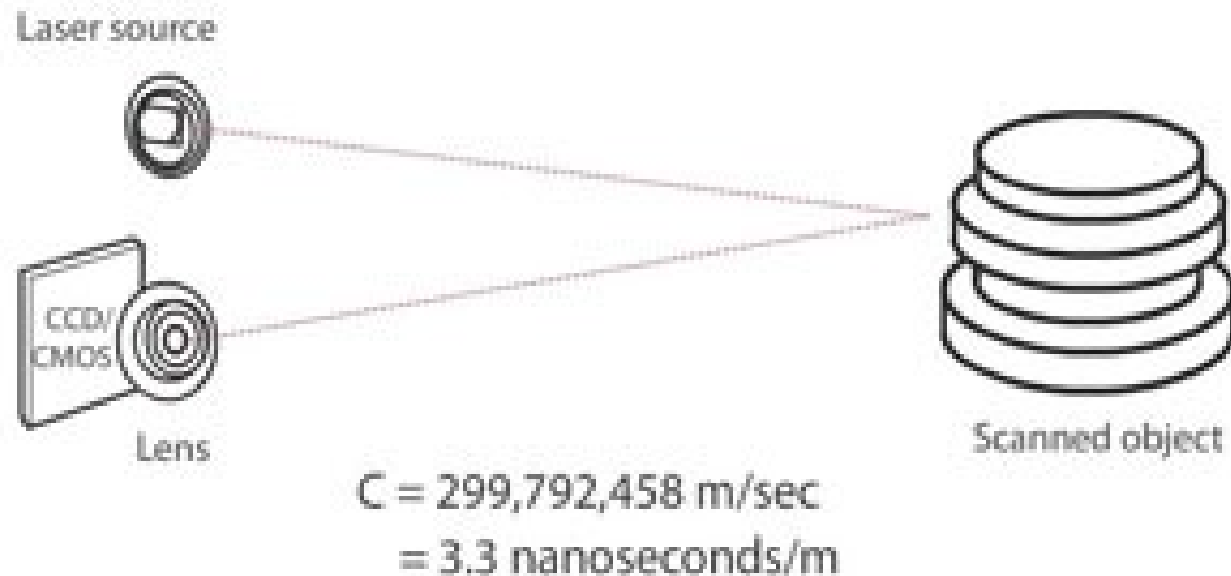
Laser Triangulation 3D Scanners



Laser triangulation scanners use either a laser line or single laser point to scan across an object. A sensor picks up the laser light that is reflected off the object, and using trigonometric triangulation, the system calculates the distance from the object to the scanner.

Mid- and Long Range (>2 meters focal distance) Laser Pulse-based 3D Scanners

Laser pulse-based scanners, also known as time-of-flight scanners, are based on a very simple concept: the speed of light is known very precisely, so if we know how long a laser takes to reach an object and reflect back to a sensor, we know how far away that object is.



Tripod



A surveyor's tripod is a device used to support any one of a number of surveying instruments, such as theodolites, total stations, levels, laser scanner.

Setting up the instrument

1. With the tripod in place, carefully remove the instrument and tribrach from the instrument case.

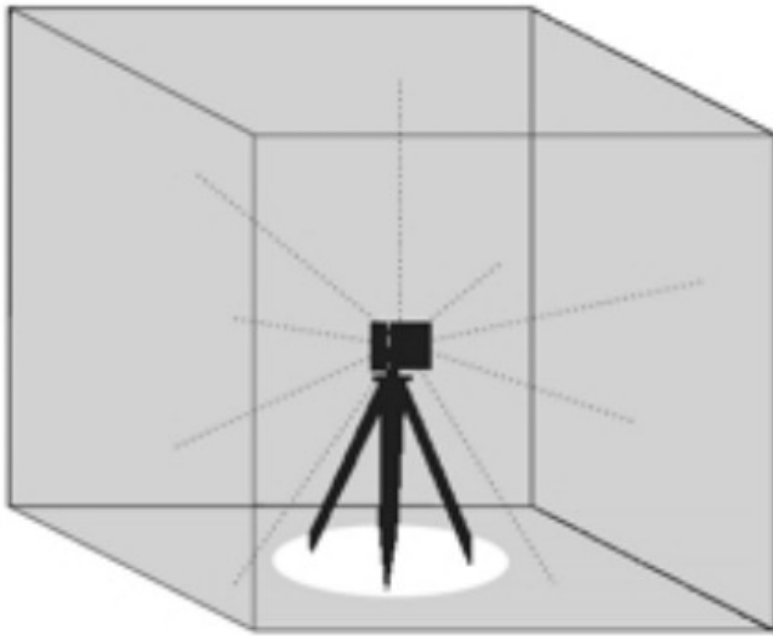


2. Place the assembly over the tribrach plate:

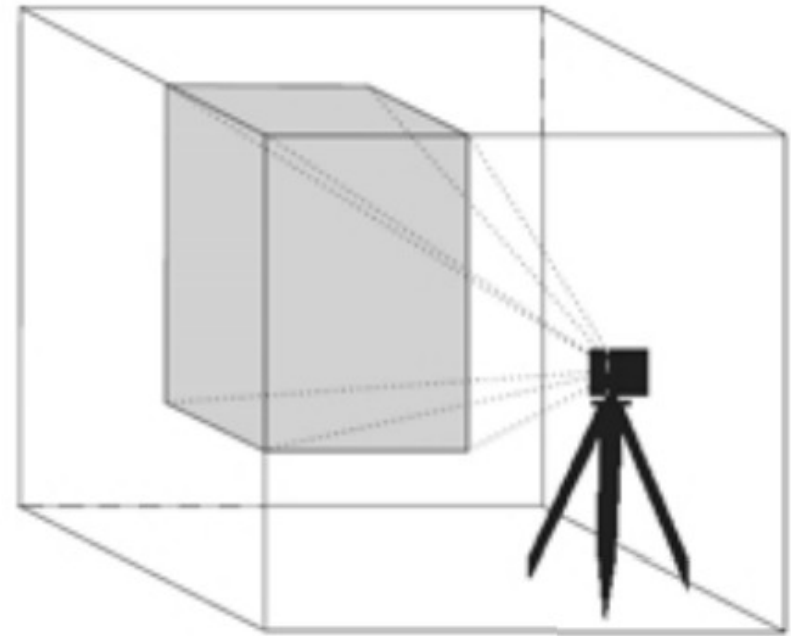


3. Secure the instrument with the tribrach clamping arm:

Different types of terrestrial laser scanners



panorama scanner

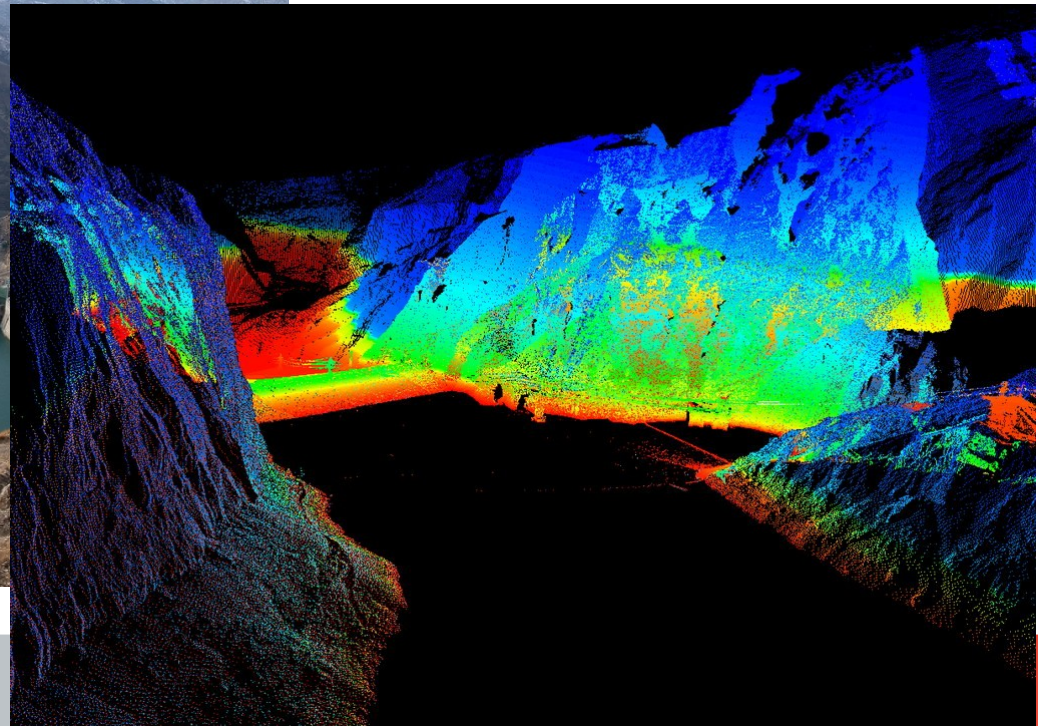
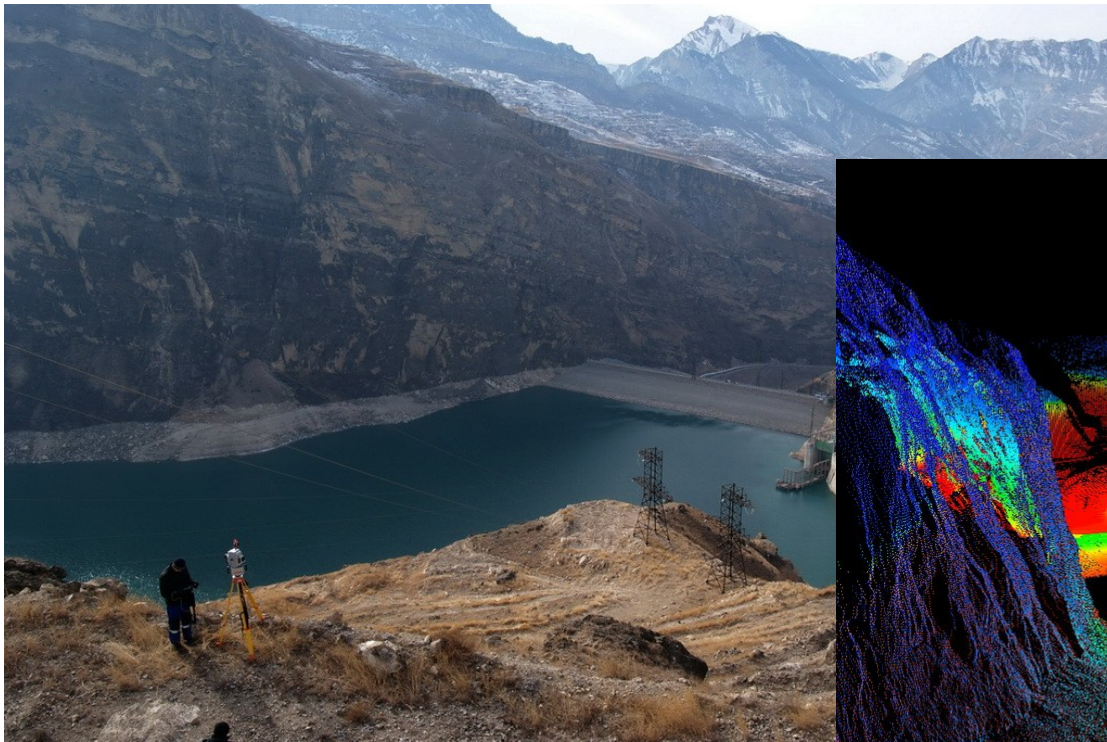


camera scanner

classified by field of view

Application of terrestrial laser scanning

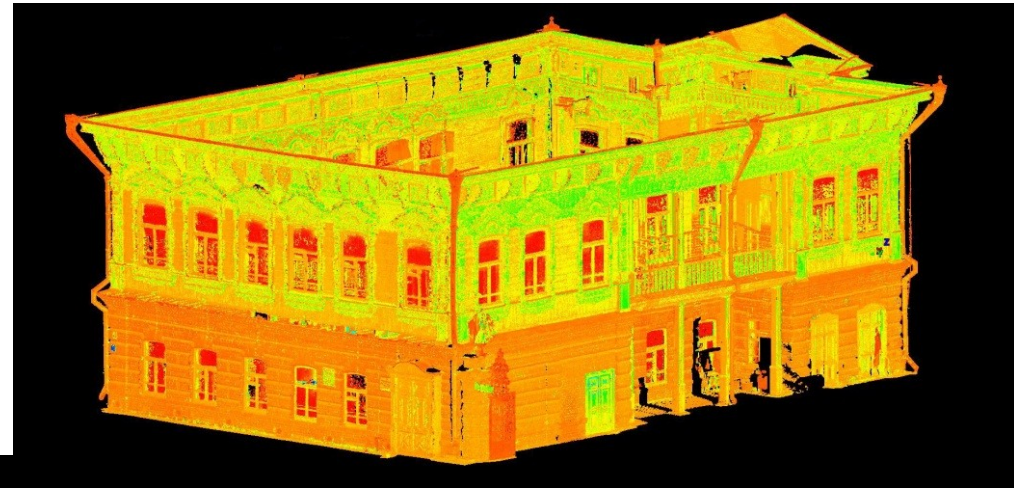
Mostly, an object has to be scanned from different view points. Afterwards, the aim is to register single point clouds to one common point cloud. This operation is called registration. Based on the registered point cloud, further information can be derived.



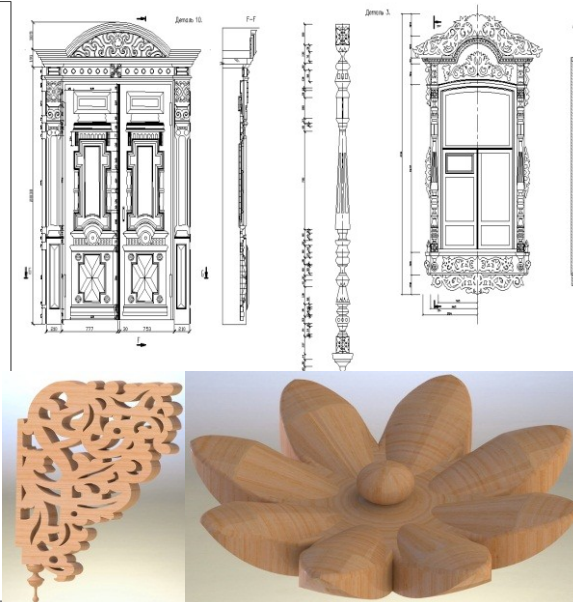
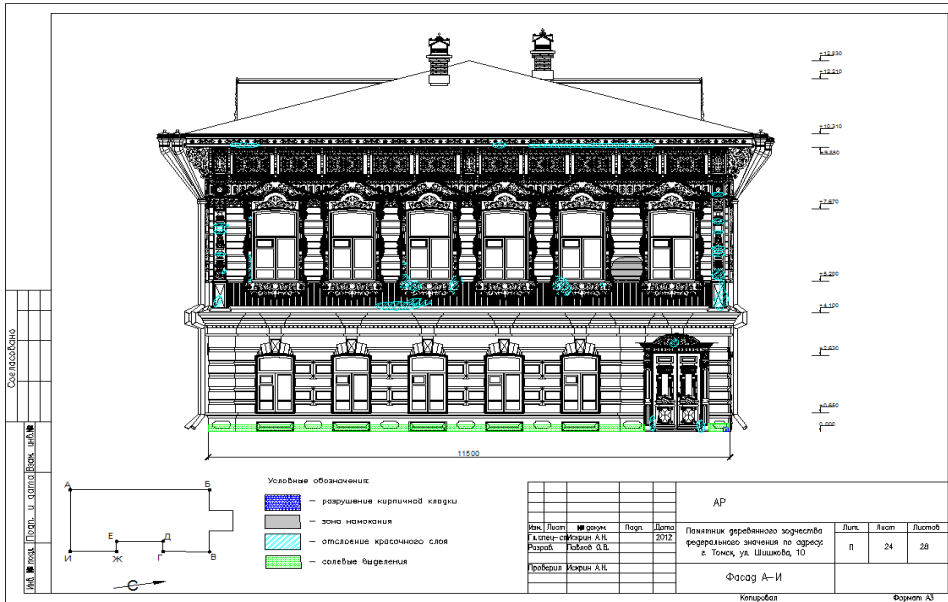
Application of terrestrial laser scanning

Scanning monuments of wooden architecture and architectural buildings of historical value

Scanning and photo fixing the actual state of the object



Application of terrestrial laser scanning



- Creating measuring drawings with the application defects
- Formation catalogs vector drawings and three-dimensional detail constructs
- Building a solid model of the object with the adjacent territory



***Thank you for
attention!***