

Terrestrial 3D laser scanning

Practical aspects

ISPRS WG VI/5&SC Summer School 2007

by Gregor Bilban



- when it has to be **right**



3D laser scanning

Benefits

Lower data collection costs

Reduction or elimination of re-visits

More accurate and complete as-builds

Fast, unobtrusive scene capture

Reduced project time

Safer data capture

PCs can be used and reviewed many times



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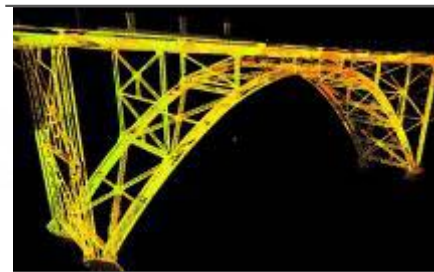
Leica
Geosystems

Terrestrial laser scanners

Types

According to distance measurement method

- ToF ranging scanners



Leica ScanStation

- Phase based scanners

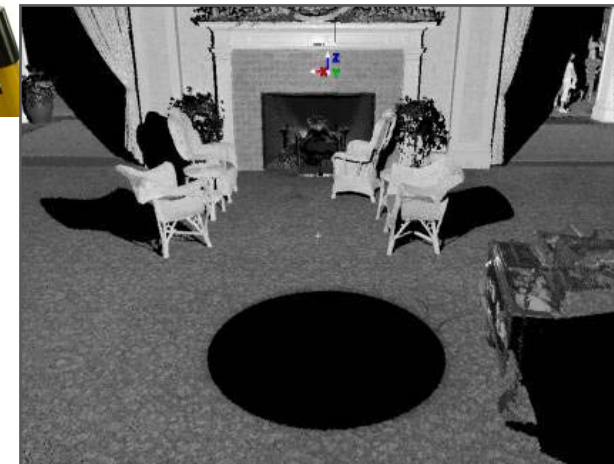
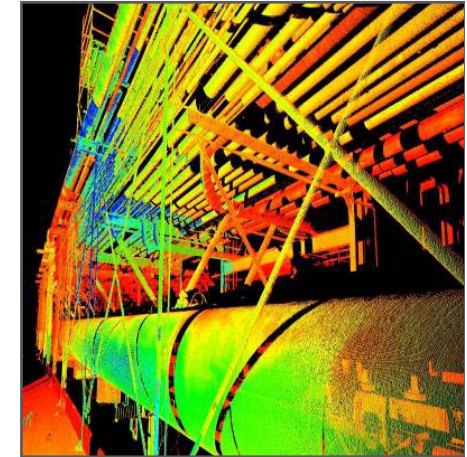


Leica HDS6000

Ultra-fast phase based laser scanner

Leica HDS6000

- Compact and integrated
- Internal replacable battery
- Integrated hard drive min. 60 GB, Ethernet, USB and Bluetooth connection
- Three scanner control options:
 - integrated side pannel
 - wireless PDA
 - full laptop control using Cyclone software
- Accuracy: 6 mm @ 25 m, 10 mm @ 50 m
- Ultra-high speed: up to 500.000 point / sec
- High resolution: 1.6 mm @ 10 m, 7.9 mm @ 50 m
- Integrated tilt sensor
- IP54 environment spec.



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Leica
Geosystems

New class of laser scanner

Leica ScanStation



- Combines 4 fundamental total station features
- ScanStation users can traverse, backsight and resection
- Applications: bridges, dams, roads, highways, tunnels, cultural heritage, large constructions, facades, monitoring & deformations, topographic surveys...



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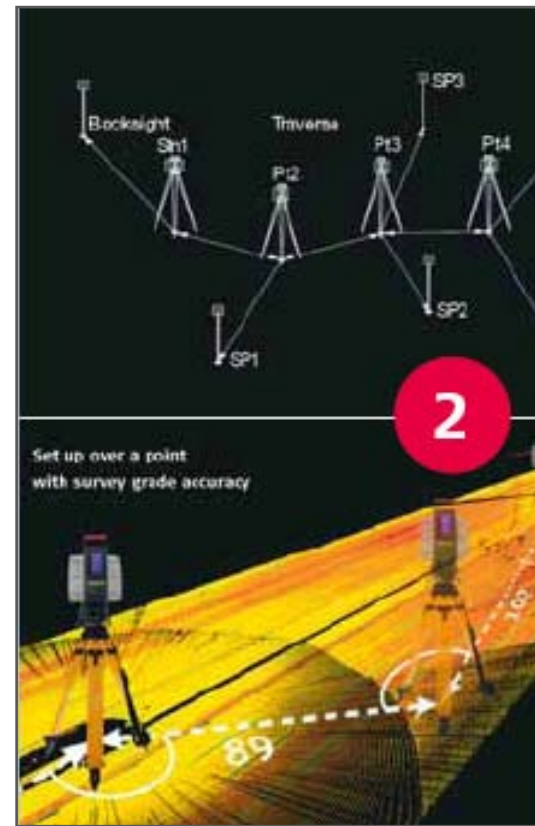


Leica ScanStation

4 fundamental total station features



270° x 360° FoV



2-axis compensator

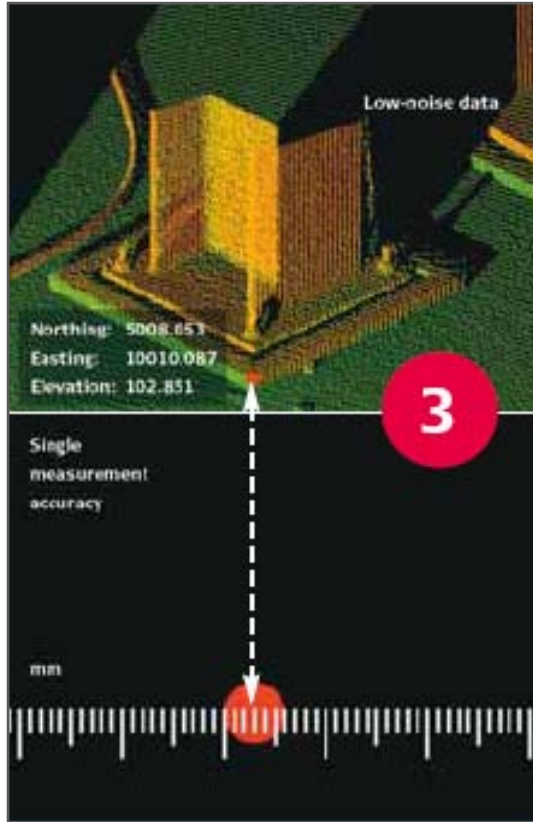


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Leica ScanStation

4 fundamental total station features



High accuracy



Practical range

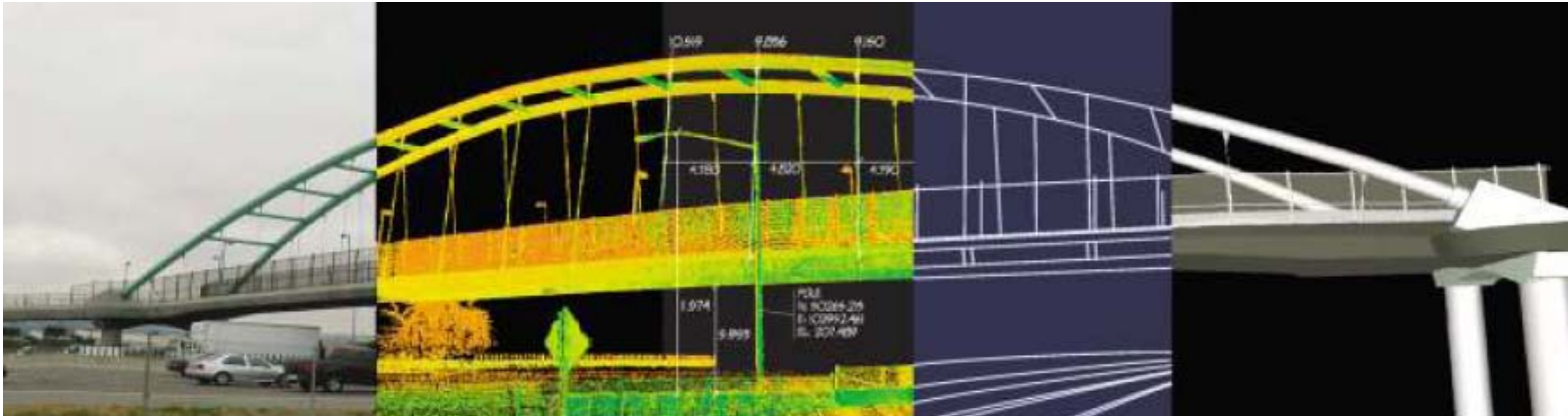


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Software

Leica Cyclone



Cyclone **Viewer**: Visualisation

Cyclone **Moduli**: SCAN, REGISTER, SURVEY, MODEL

Cyclone **COE**: Two-way data transfer

Cyclone **CloudWorx**: Point cloud processing inside CAD

ACAD, Intergraph, MicroStation, PDMS, SmartPlant

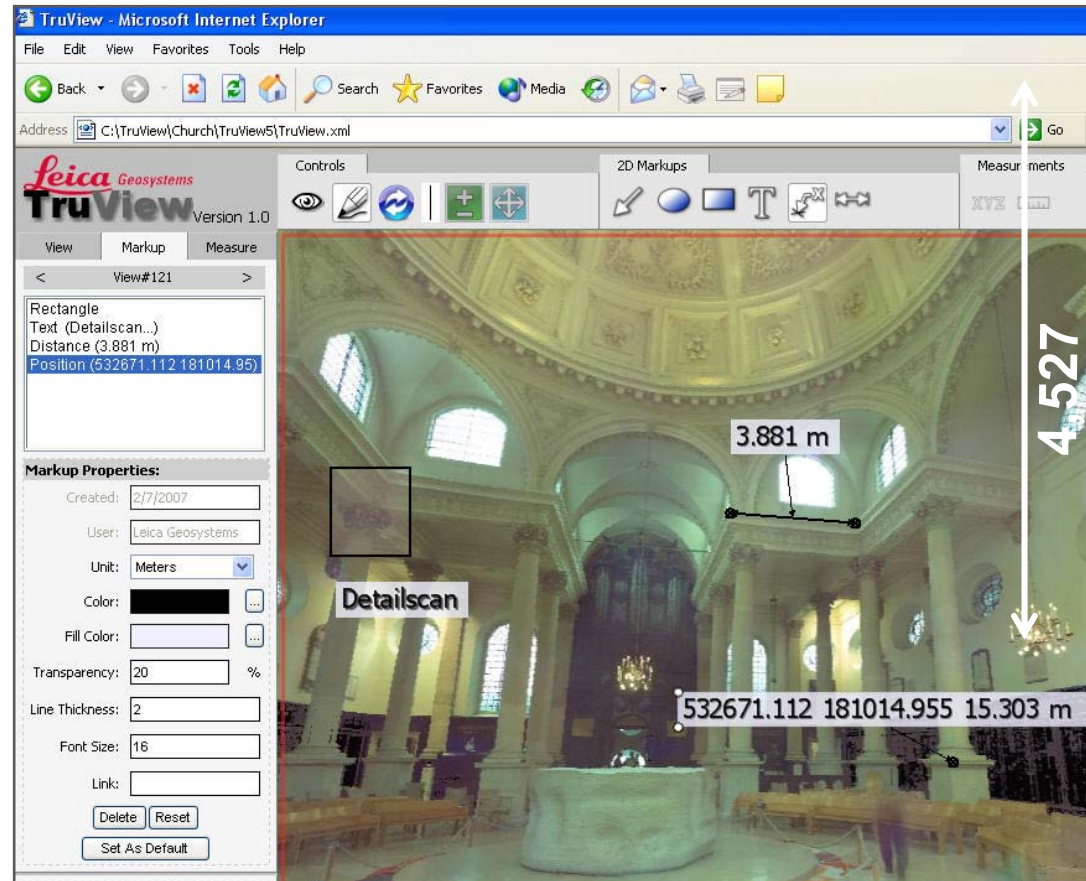


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Leica Cyclone Publisher & TrueView

- Cyclone **Publisher**
Point cloud in a format for publishing on WWW
- Leica **TrueView**
Free plug-in for Internet Explorer
 - Overview
 - Marking
 - Measuring



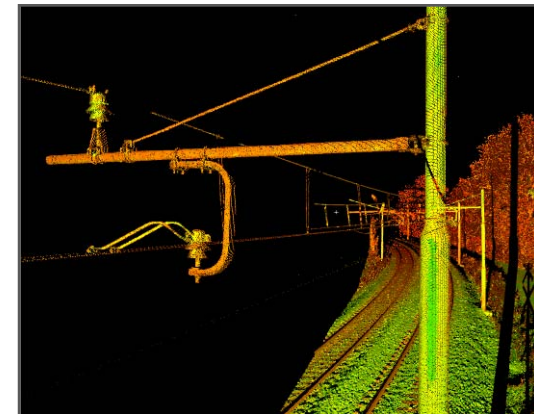
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Terrestrial Laser Scanning

Scanning process

- Scene overview, determination of scanner set-ups, setting up targets for registering and georeferencing
- Scanning
- Registering scans and georeferencing point clouds
- Processing: modelling (2D, 3D), measuring, collecting topographic data, data export



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Scanning process

Determination of scanner and target setups

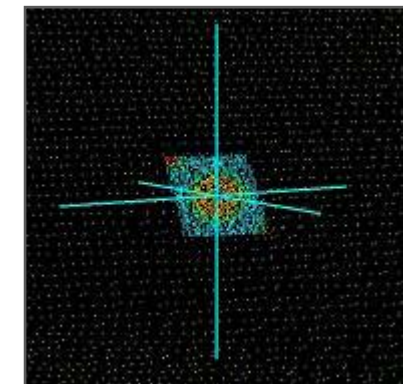
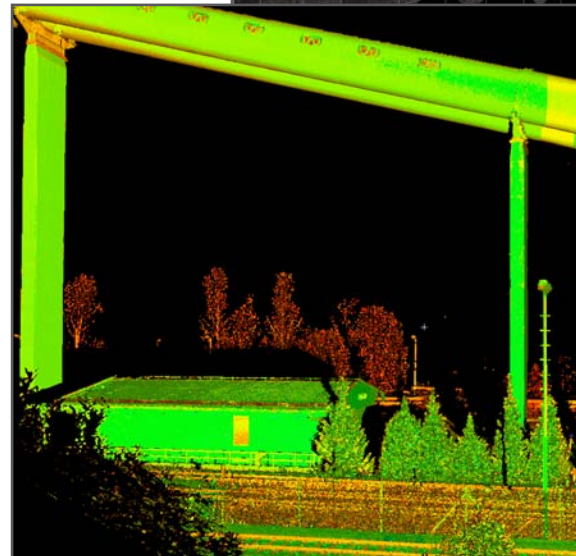
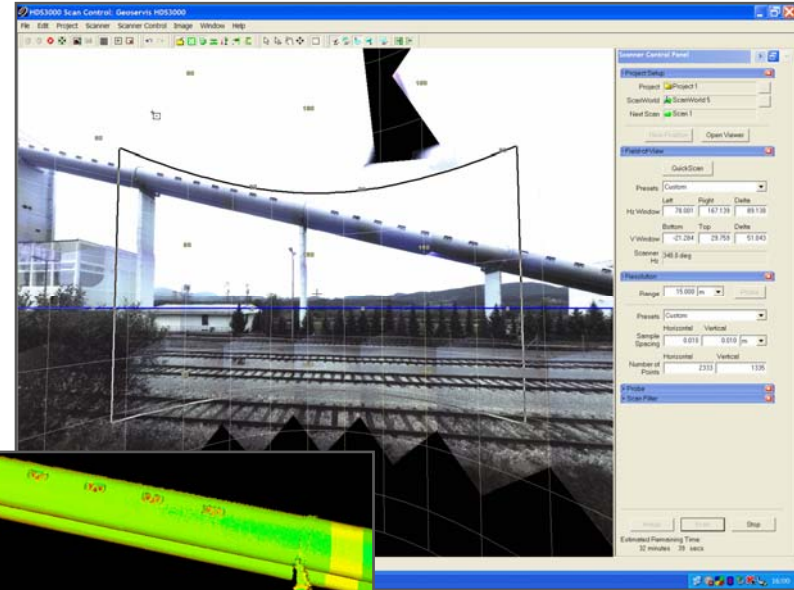
- Checking the scene, object dimensions, detail, inaccessible areas
- Scanner setups: optimal view, minimal number of setups
- Targets: optimal coverage between two adjacent scans
- Field book & notes



Scanning process

Scanning

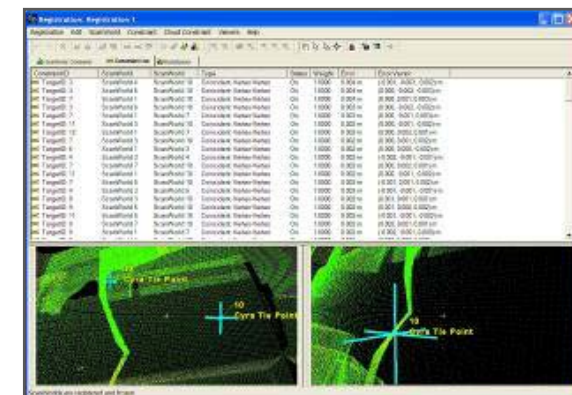
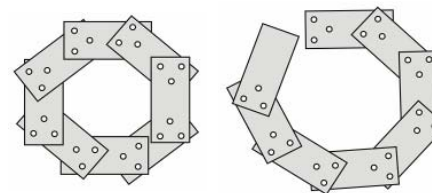
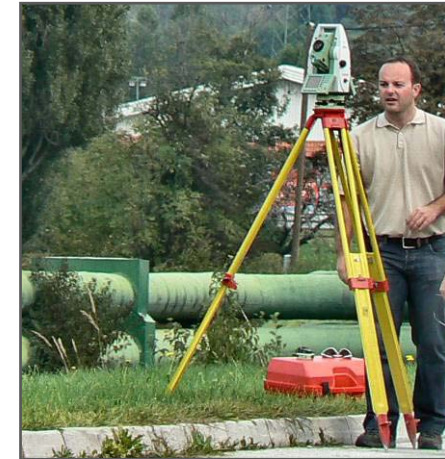
- Scanning
- Detailed scanning
- Targets acquisition
- Photographs (texture mapping and documenting)



Scanning process

Registering and Geo-referencing

- Combining scans collected at different stations using targets or cloud constraints
- Total station or GNSS measurements
- Georeferencing: using targets or using field setup methods (traverse, orientation, resection)



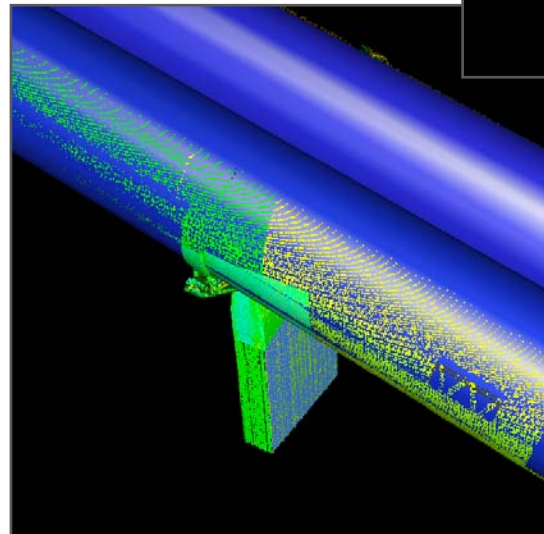
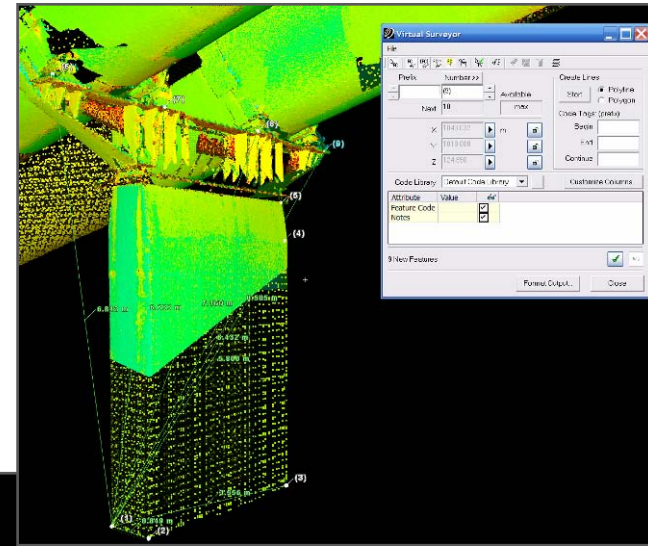
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Scanning process

Processing point clouds

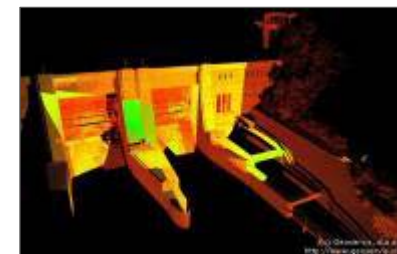
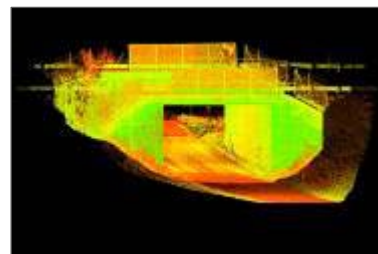
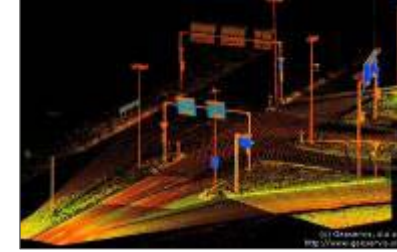
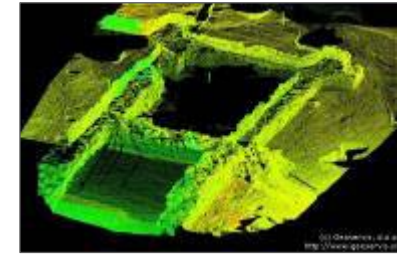
- Cleaning
- 3D model
- 2D design
- Profiles and edges
- Meshes & contours
- Volumes
- Coordinates
- Measurements
- Export



Geoservis

Our samples and experiences

- Cultural heritage
- Archeological sites
- Large structures
- Industry
- Pipelines
- Roads, tunnels
- Virtual reality
- Reverse engineering



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Geoservis: samples

Archeology

Archeological findings in Mošnje

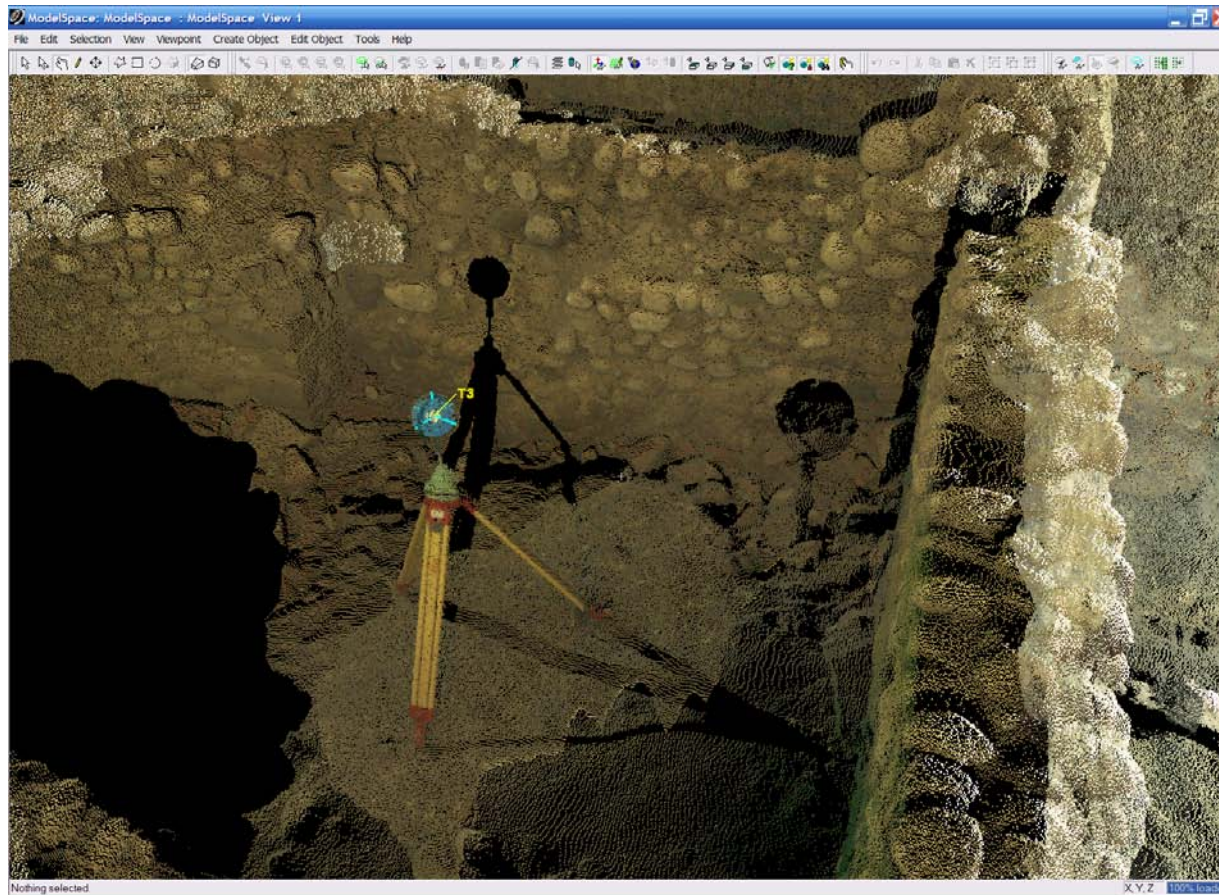


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Geoservis: samples

Archeology



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Geoservis: samples Architecture

Former gas station

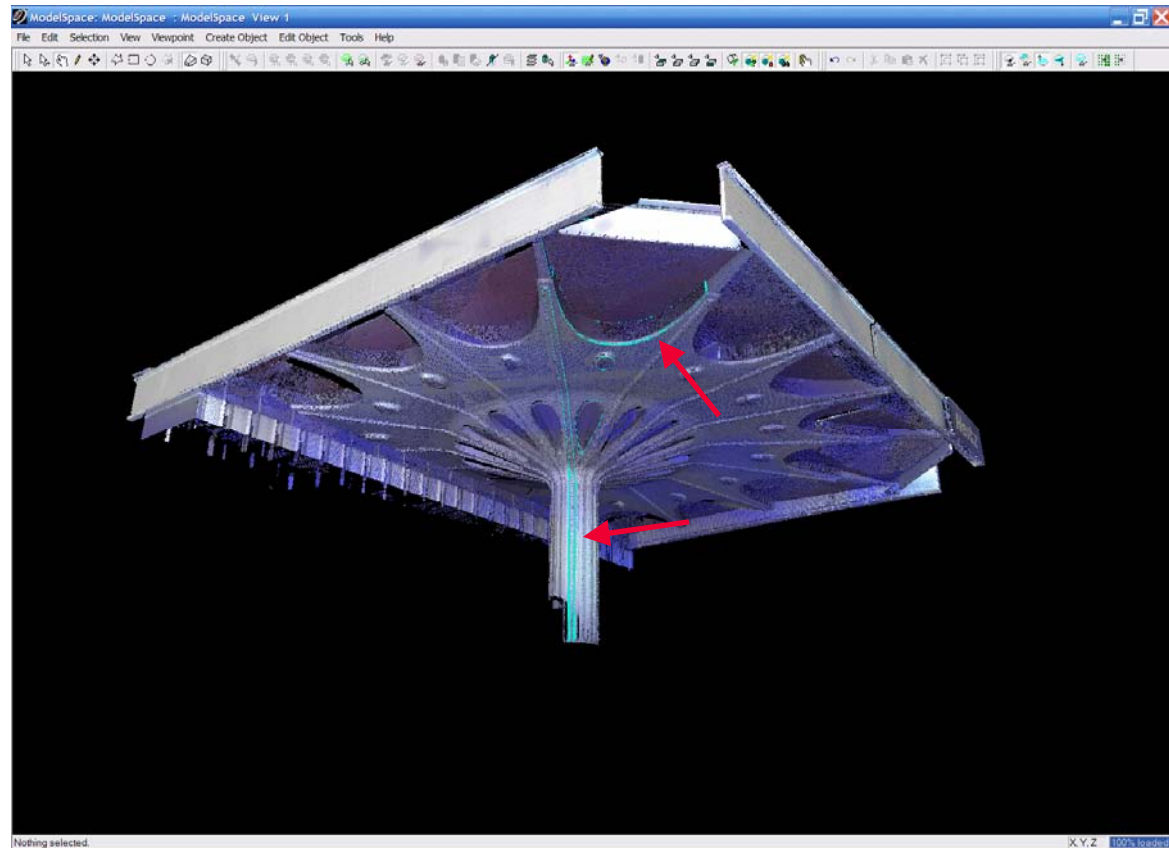


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Geoservis: samples Architecture

Registered and geo-referenced point cloud with modelled edges will allow precise as-built and reconstruction.



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Geoservis: samples

Reverse engineering

Famous tank M84
at the military
barracks in Ilirska
Bistrica



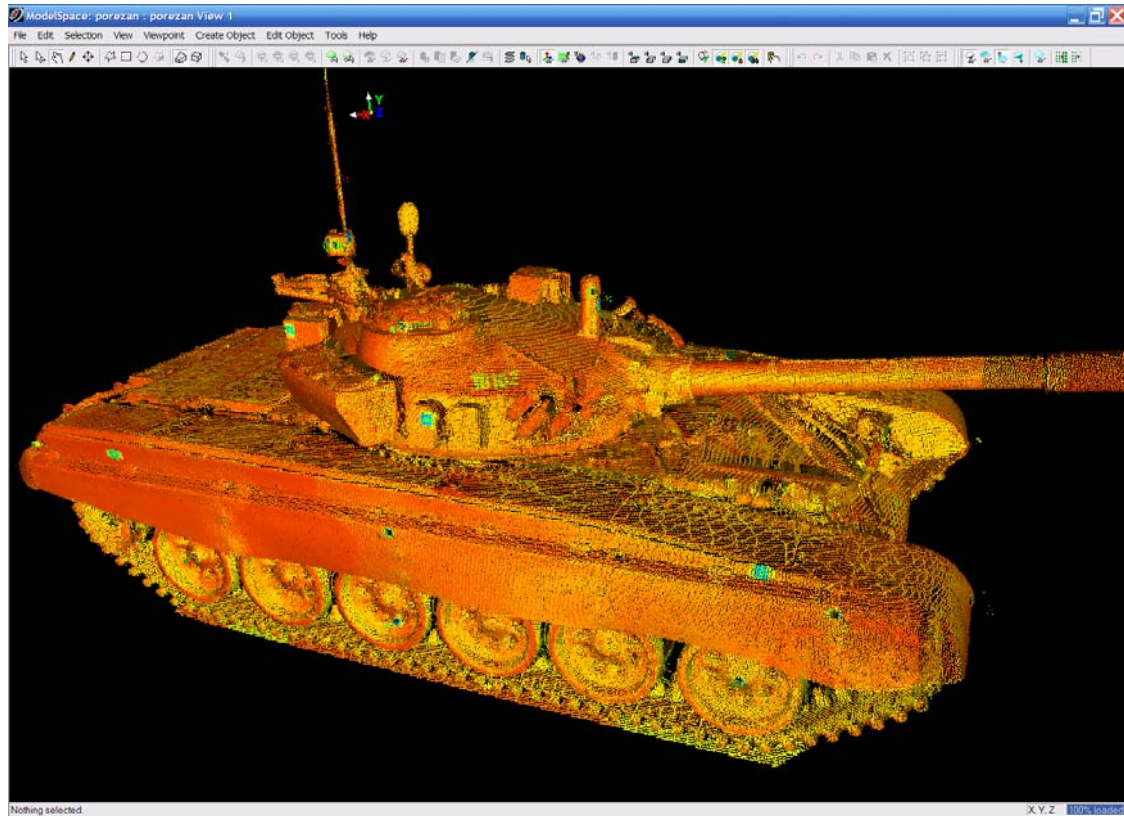
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Geoservis: samples

Reverse engineering

Point cloud with every single detail on a vehicle



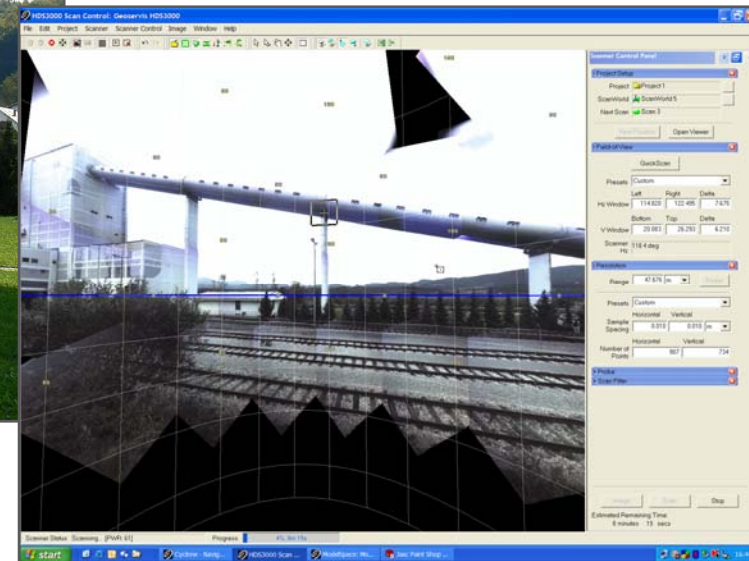
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Geoservis: samples Industry



Documentary photo



Mosaic photo collected by the scanner
integrated digital camera

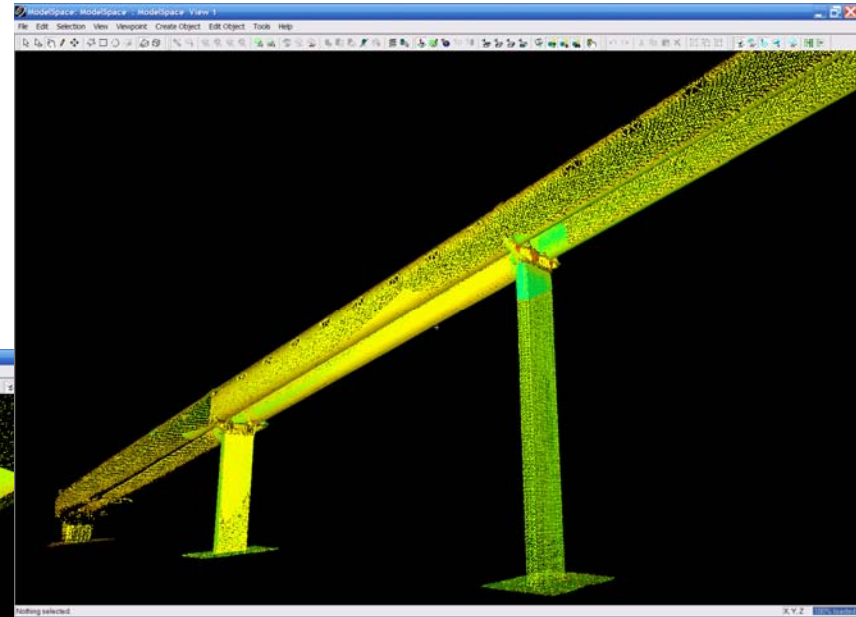
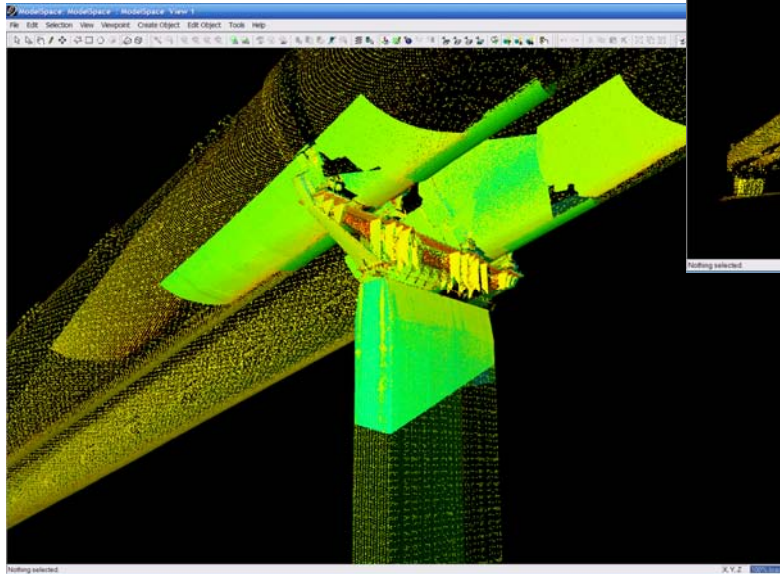


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Geoservis: samples Industry

Point cloud
- coarse and additionally
scanned detail

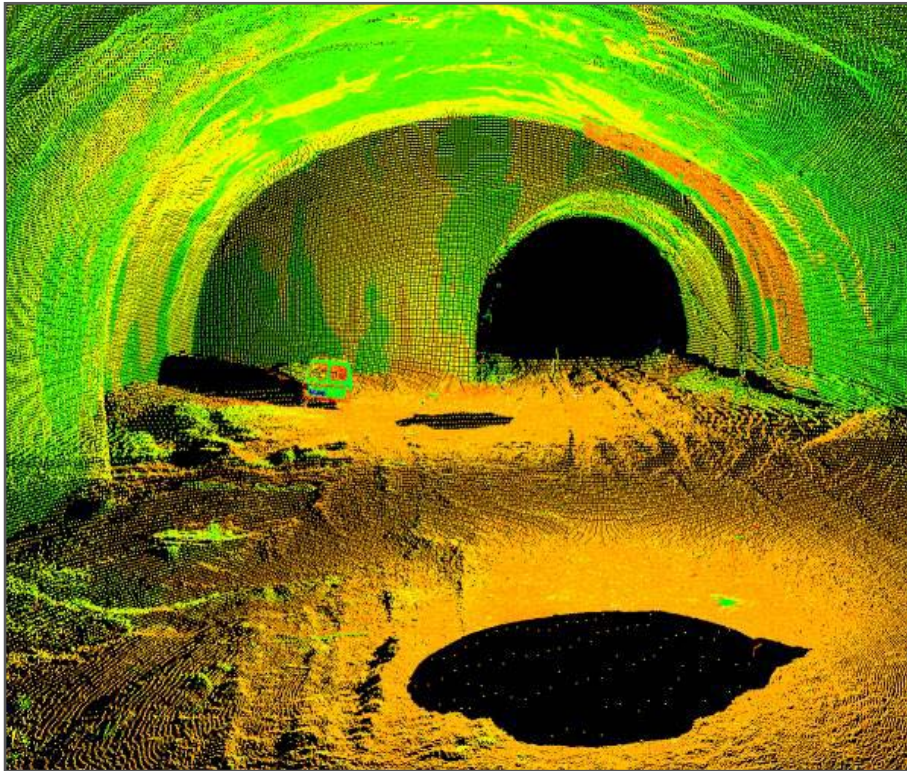


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Geoservis: samples

Roads and tunnels



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Thank you for your attention!



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