



Field Activity

Some Considerations on SLAM Technique Integration for
Historic Buildings

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SAPIENZA
UNIVERSITÀ DI ROMA

INTERNATIONAL WORKSHOP
DIGITAL INTEGRATED STRATEGIES TO SAFEGUARD
HERITAGE CONSTRUCTION TECHNOLOGIES
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Università
di Catania

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FOR HERITAGE SCIENCE

SLAM!

Simultaneous Localisation and Mapping



Camera

Digital
Photogrammetry



Sensors

- x Visual SLAM
- x LiDAR SLAM

LiDAR

Light Detection
And Ranging

Mobile Mapping System

IMU

Inertial
Measurement
Unit

SLAM

Simultaneously
Localization
and Mapping

SLAM!

Simultaneous Localisation and Mapping



Range: 100 m

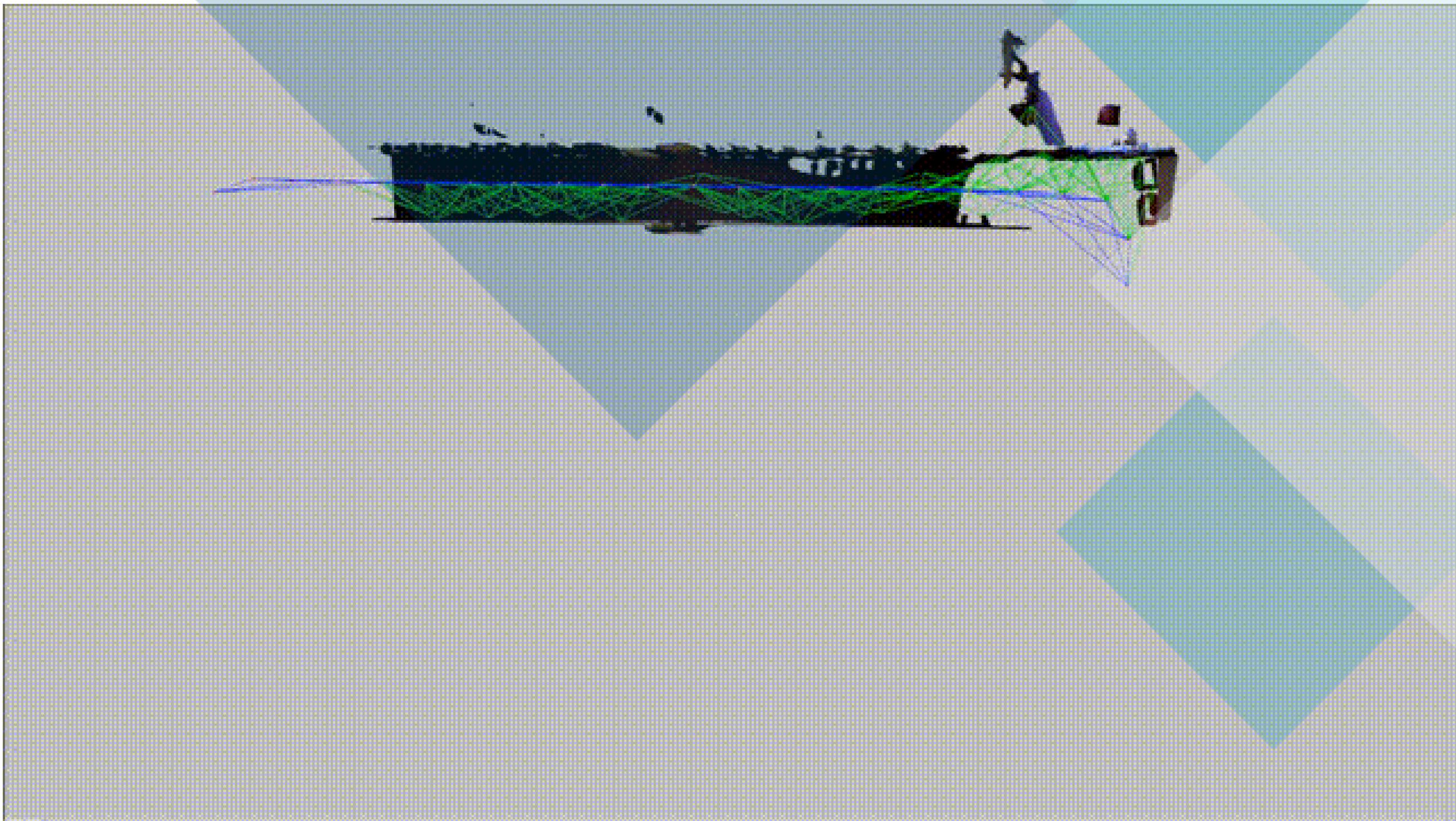
Resolution: 300,000 dots/second

Relative accuracy: up to 6 mm

RT (Optional): You can see your survey in real time from your phone

ZEB VISION: colorize the point cloud in 4k

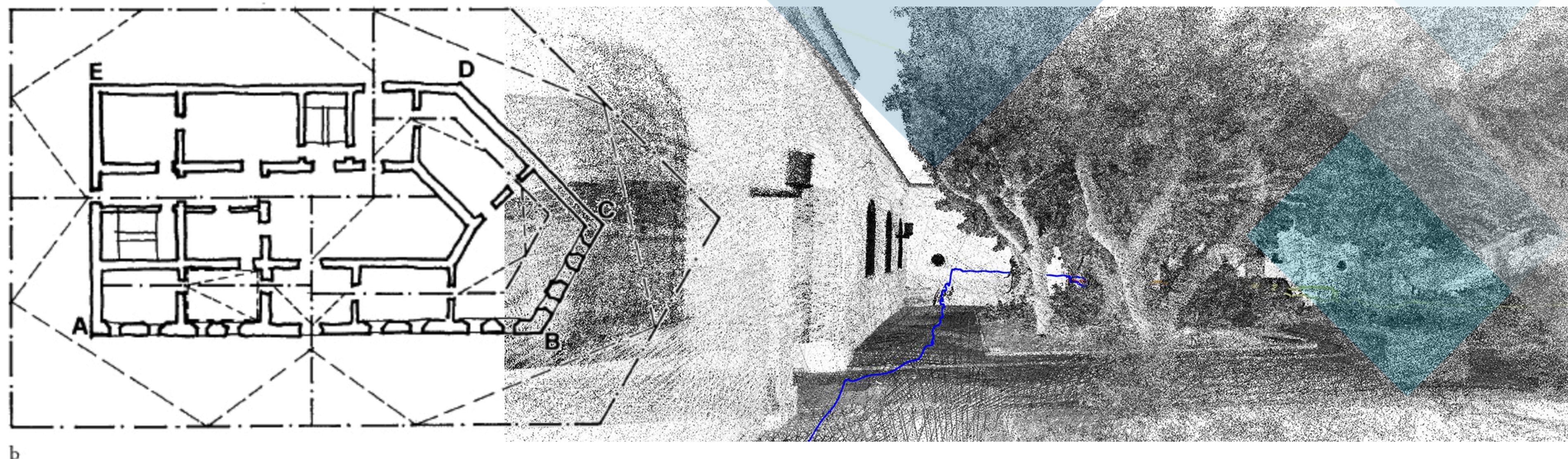
Drift Problem



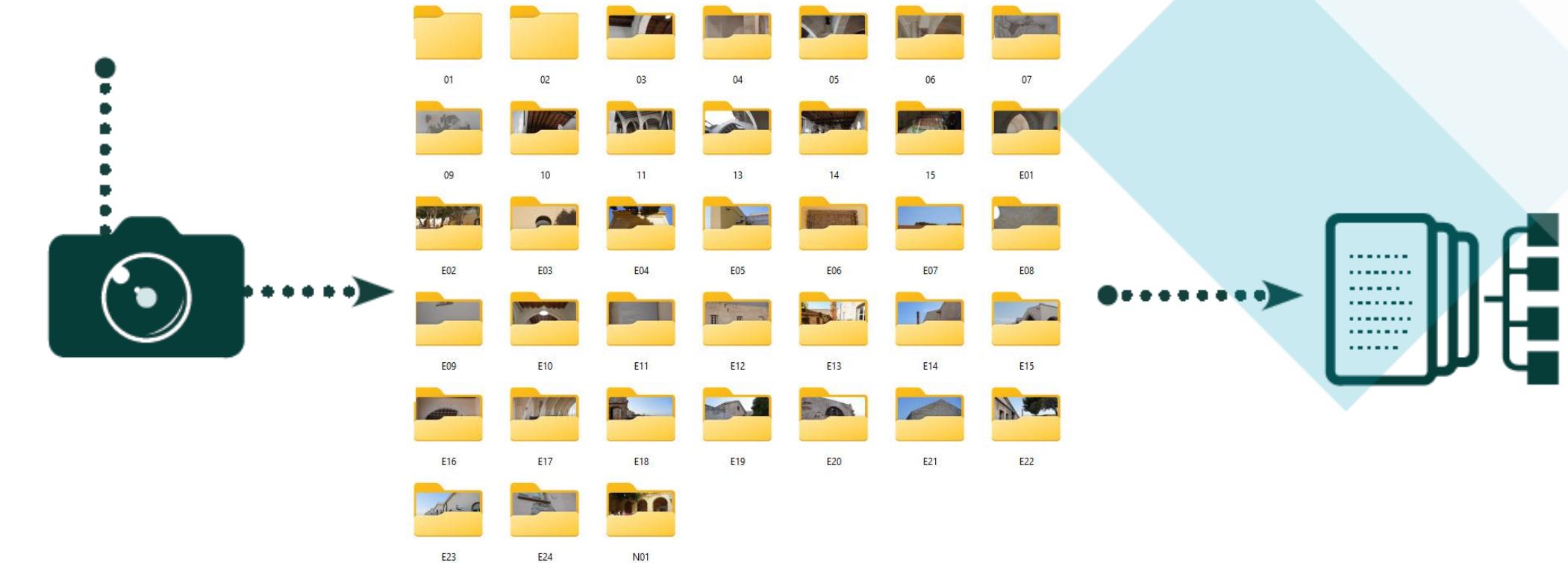
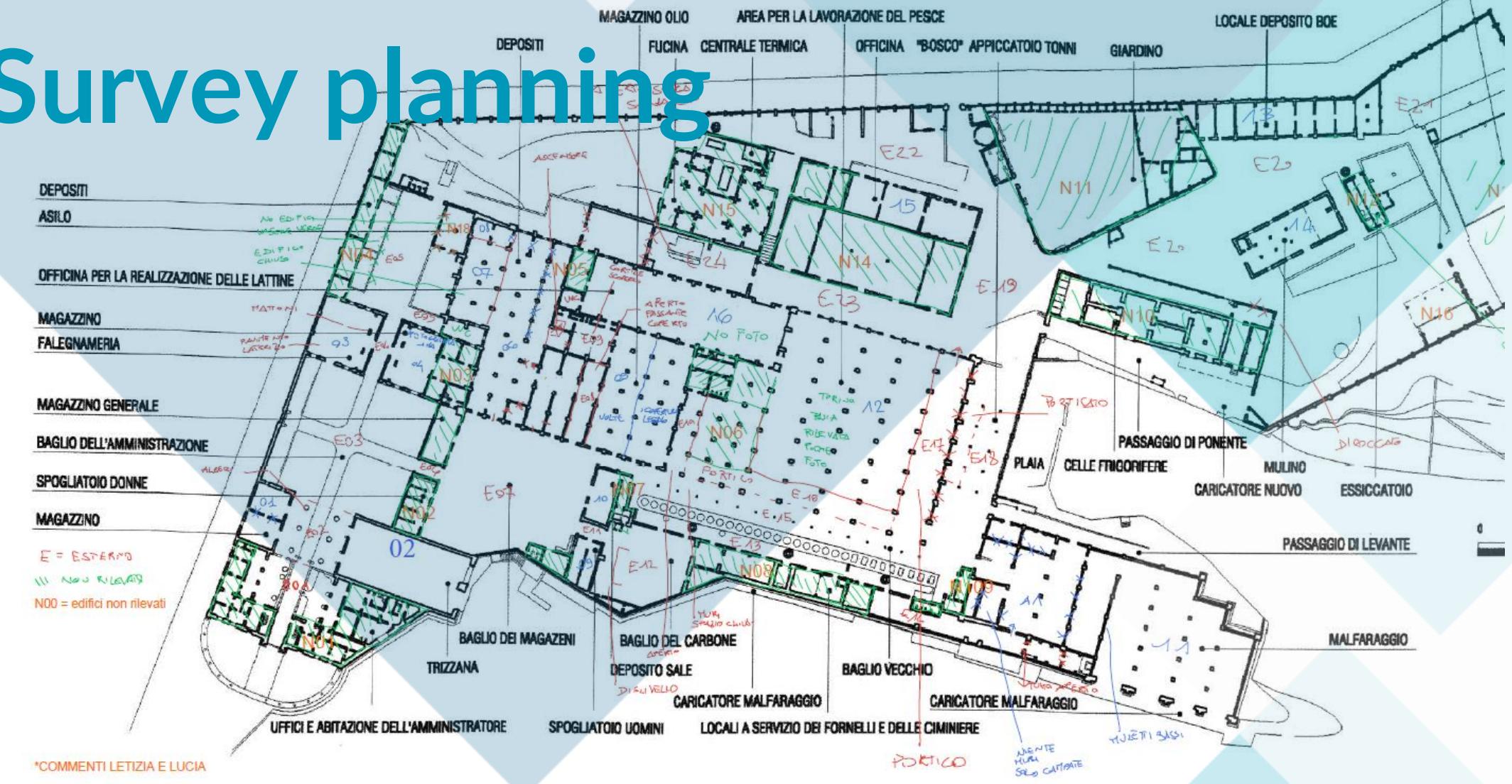
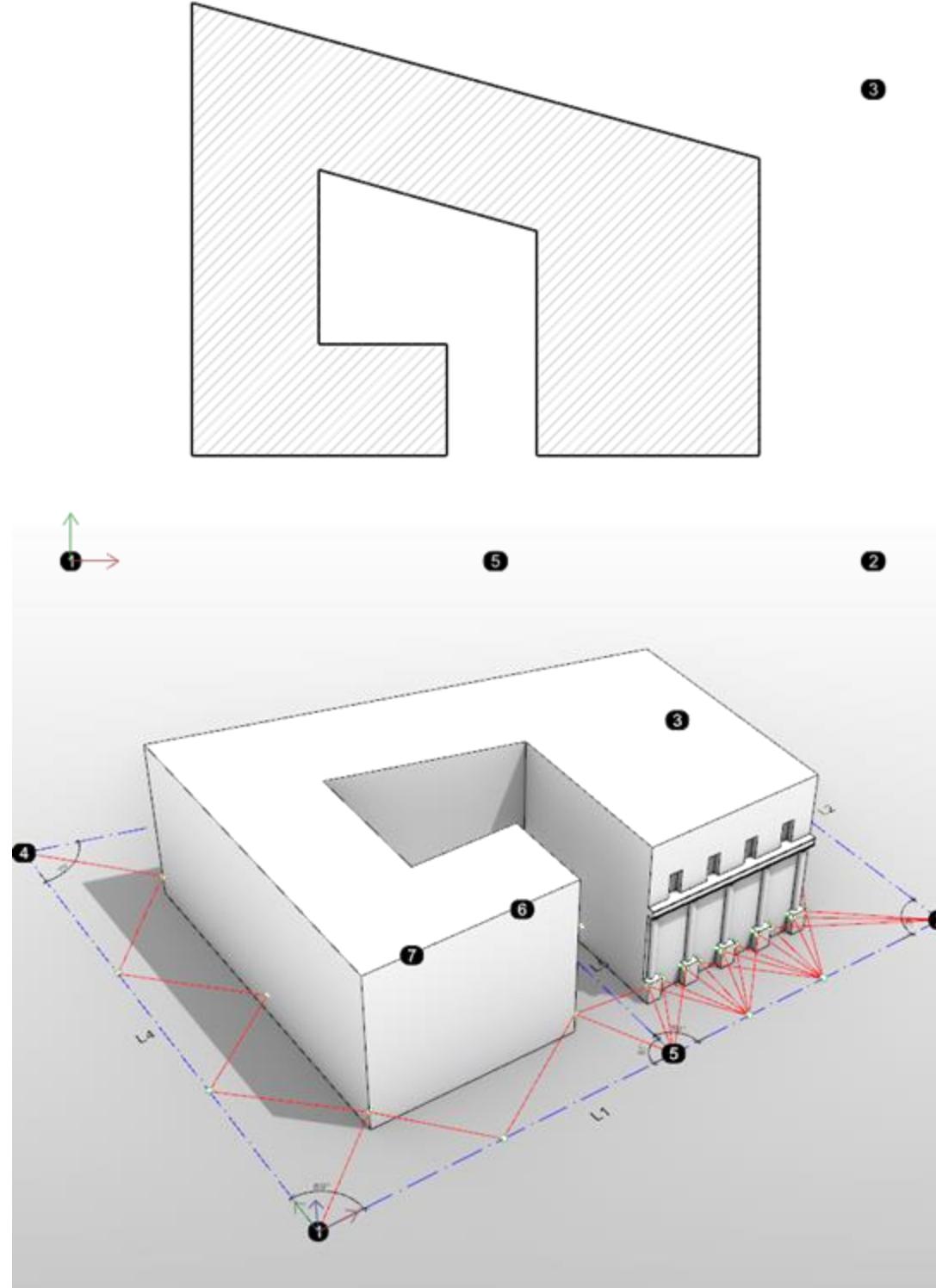
Video by Thomas Whelan and John McDonald
Department of Computer Science, NUI Maynooth

Past and Present

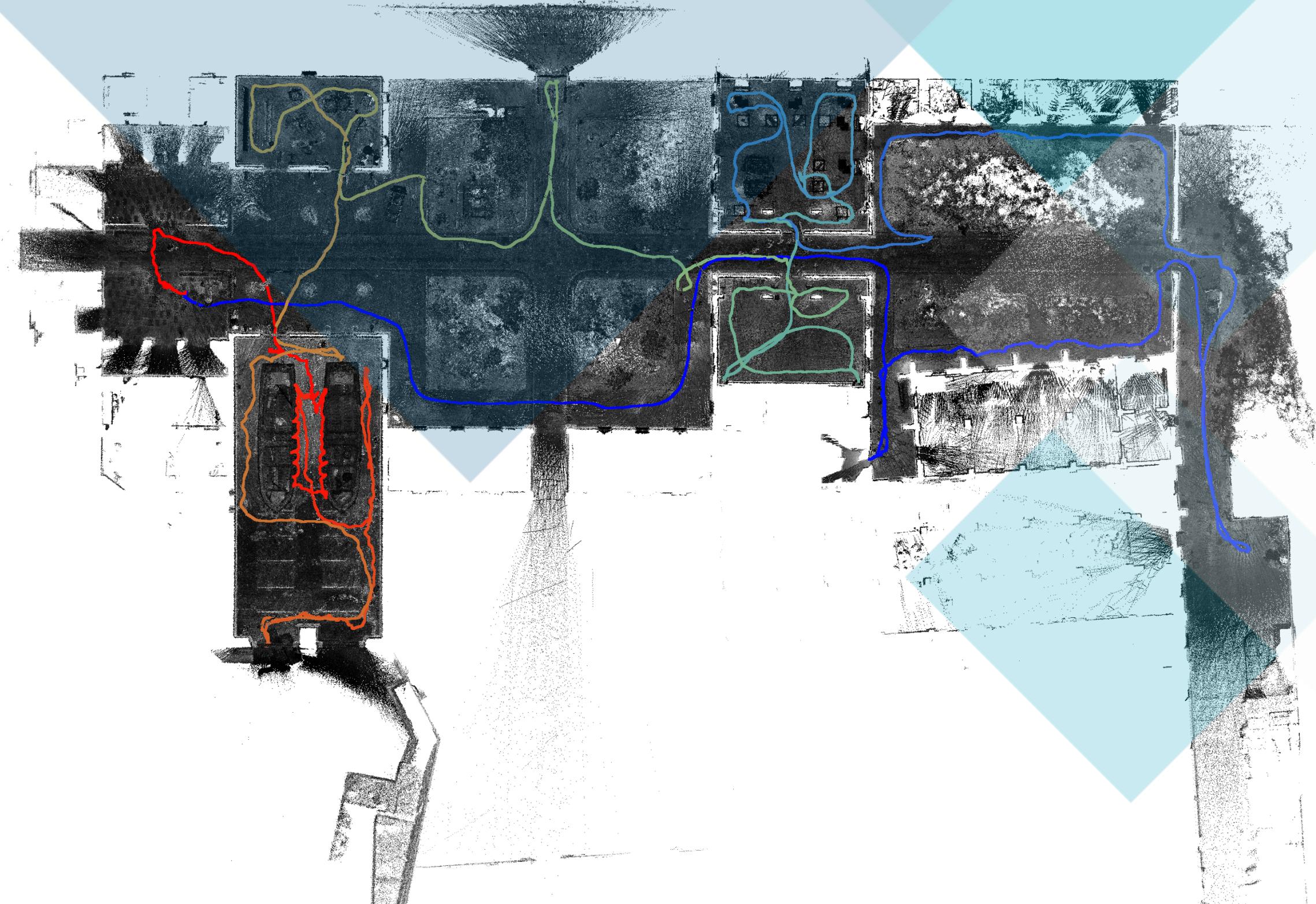
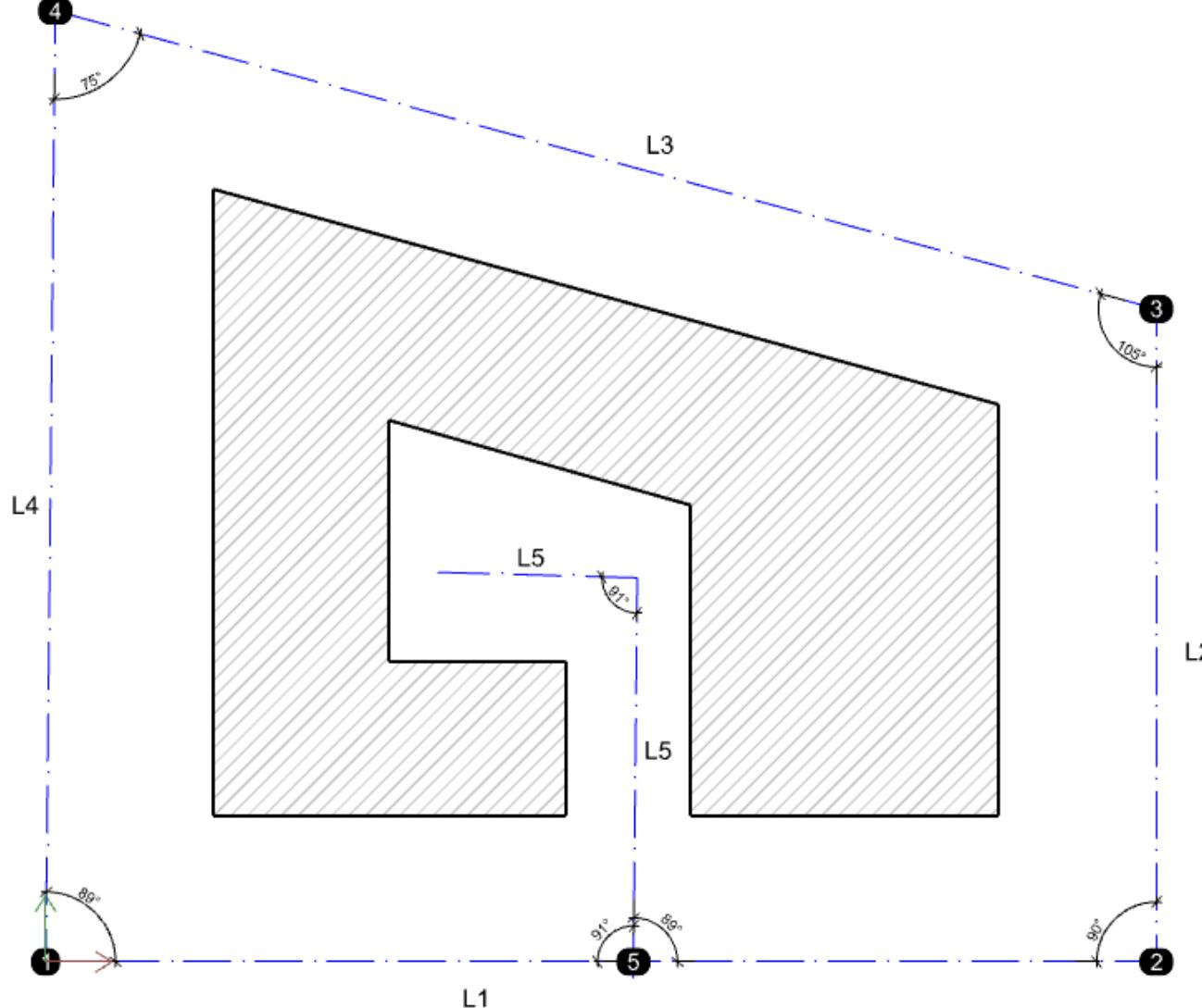
A new tool for an old method



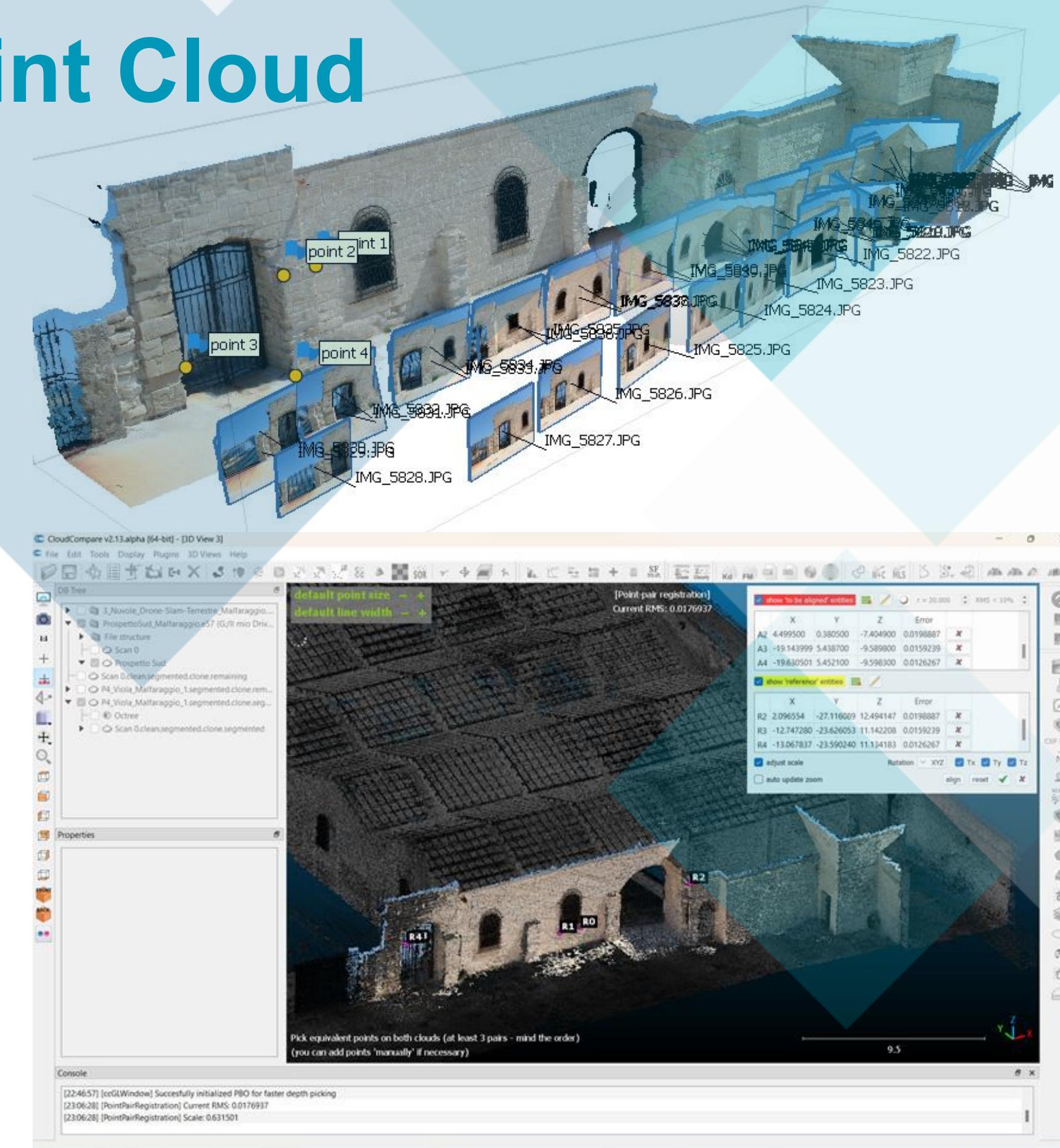
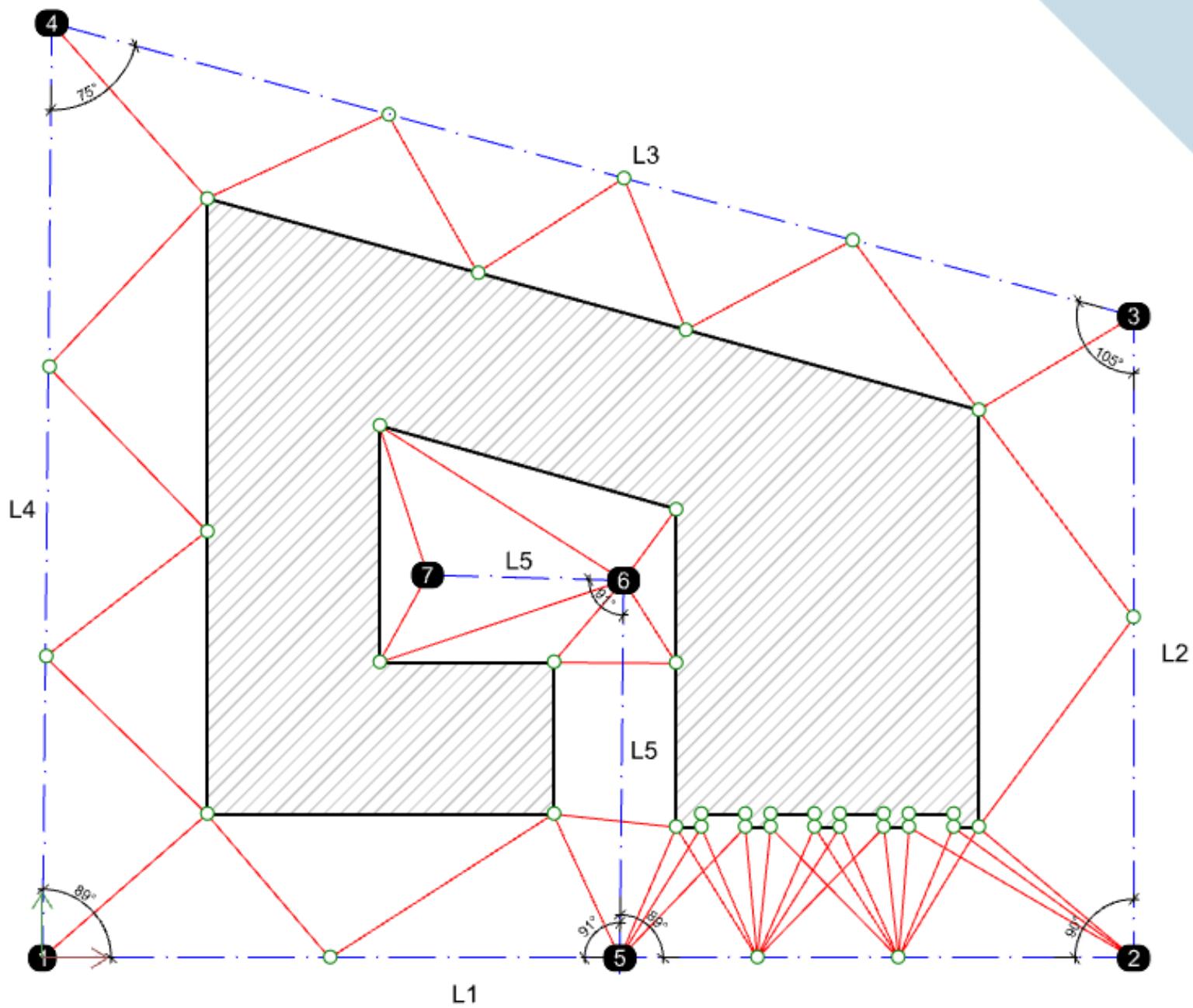
Site knowledge / Survey planning



Site knowledge / Survey planning



Choice of accuracy / Point Cloud



Choice of accuracy / Point Cloud

an example of use

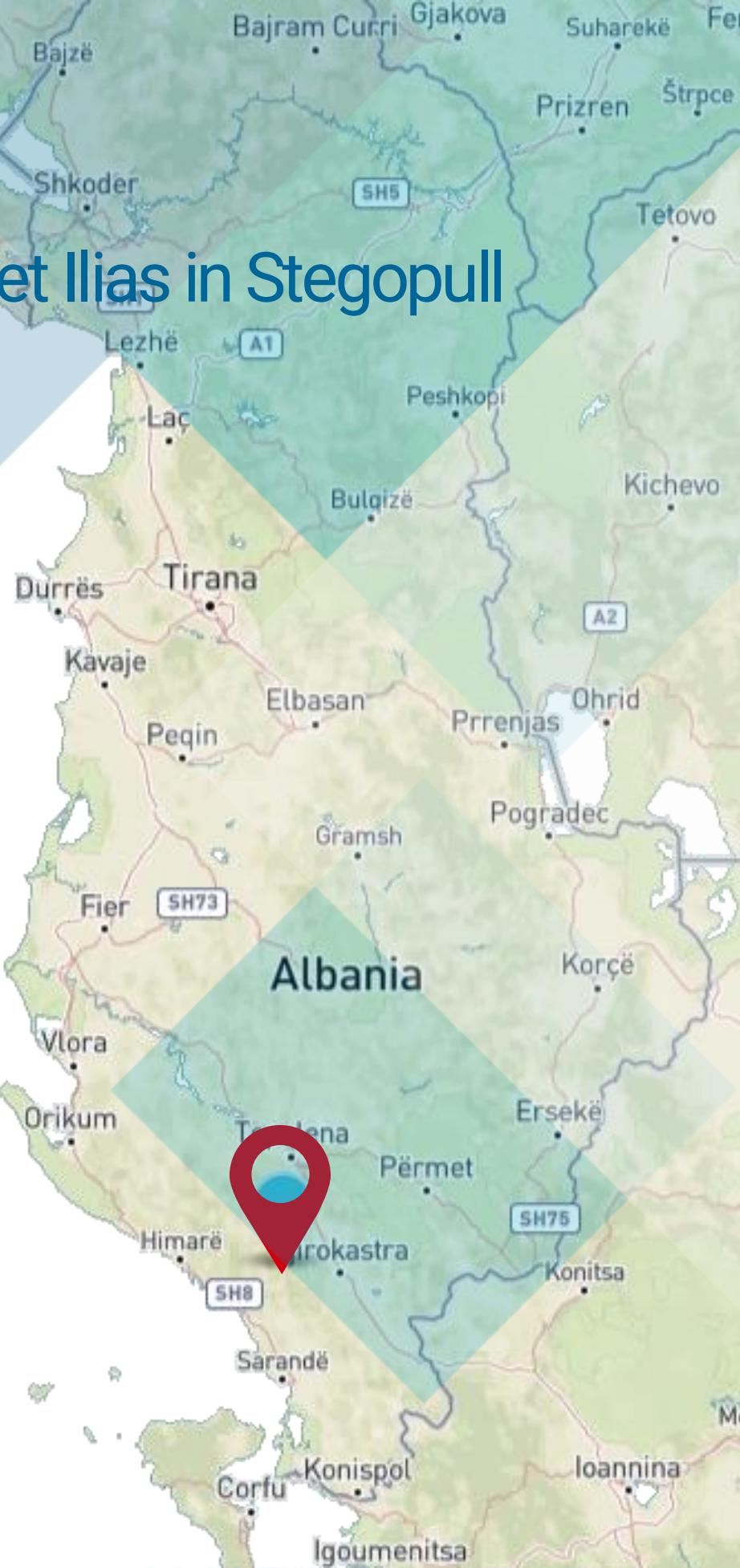
MAECI Project 2021

Multidisciplinary technologies for the study and conservation of post-Byzantine monasteries in southern Albania



Case Study

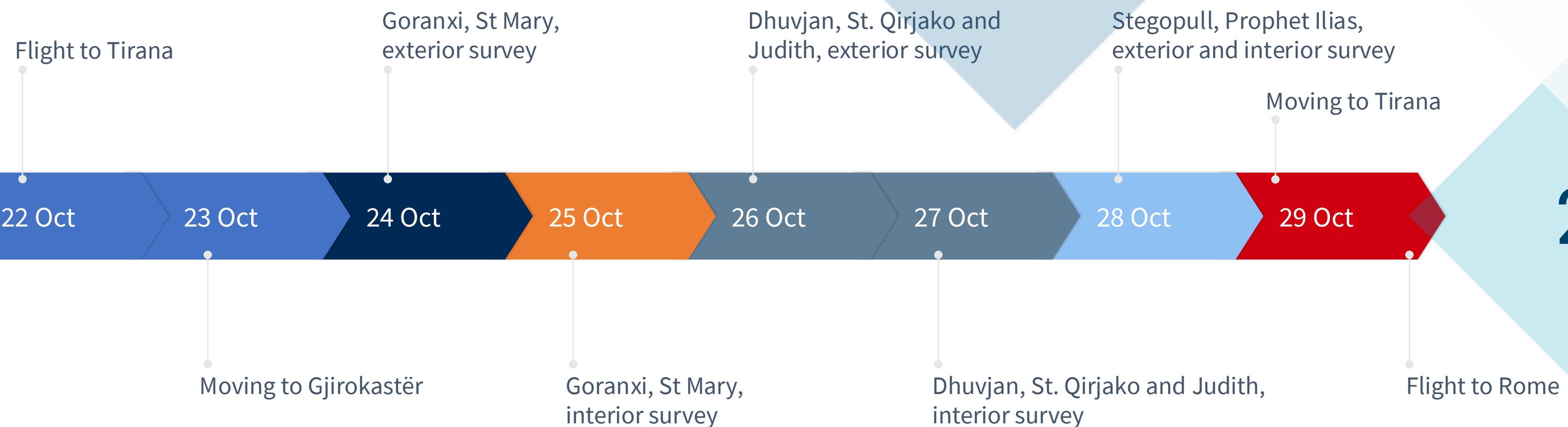
Monastery of St. Mary in Goranxi, St. Qirjako and Judith in Dhuvjan, Prophet Ilias in Stegopull





When?

Planning of survey activities



Survey Tools



KAARTA Stencil 2

Connections between
survey techniques



Canon EOS 750D

Detailed exterior elevations
and interior spaces



DJI Mavic Mini

Roofs and terrain topography



GNSS HYPE V

TOPCON

Global orientation of the
different survey

DJI Mavic Mini



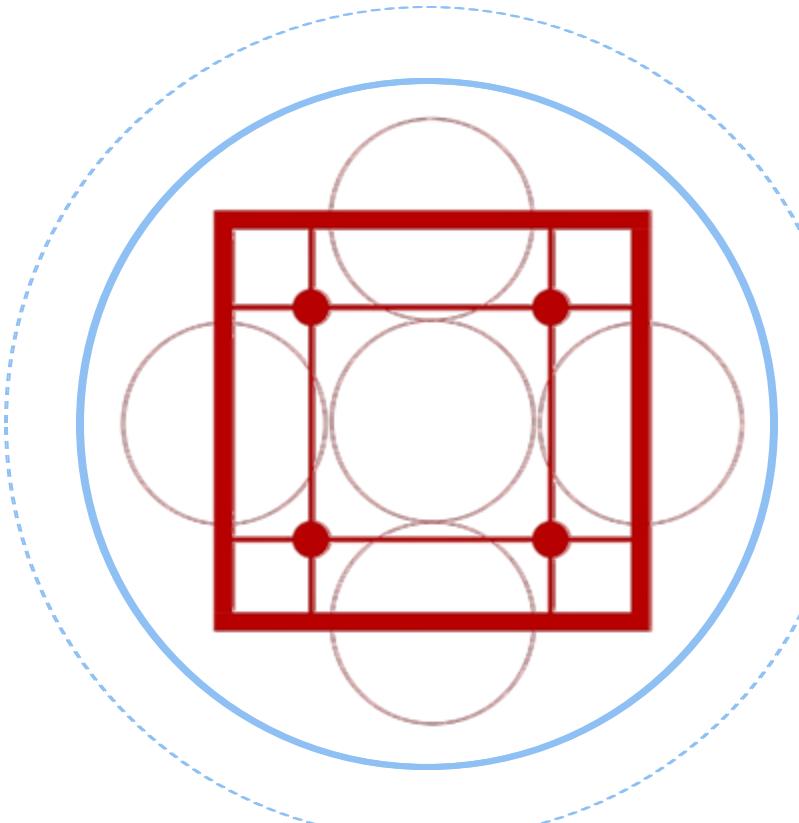
GNSS HYPe V
TOPCON

Canon EOS 750D

second

KAARTA Stencil 2

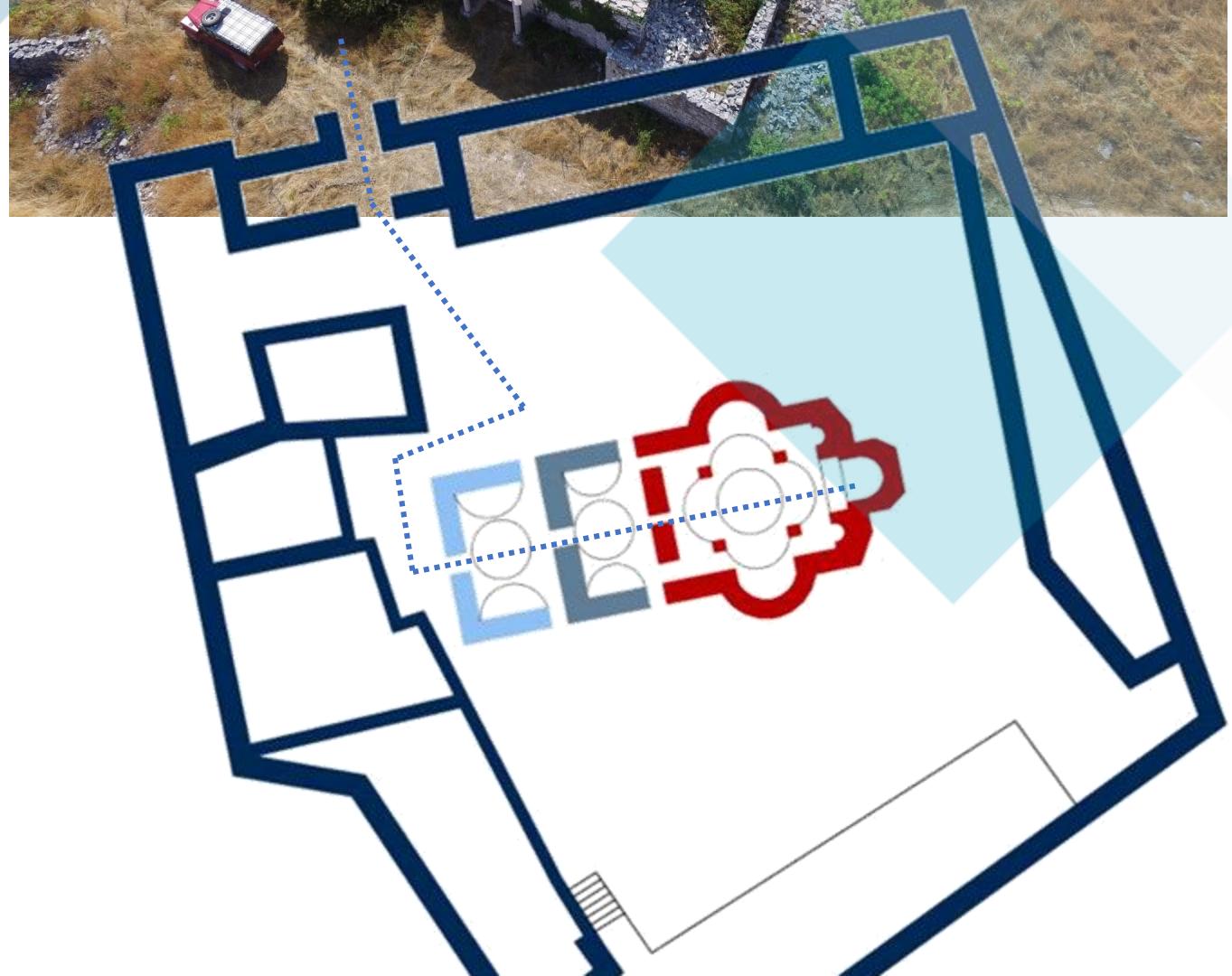
Monastery of St. Mary in Goranxi (1600)



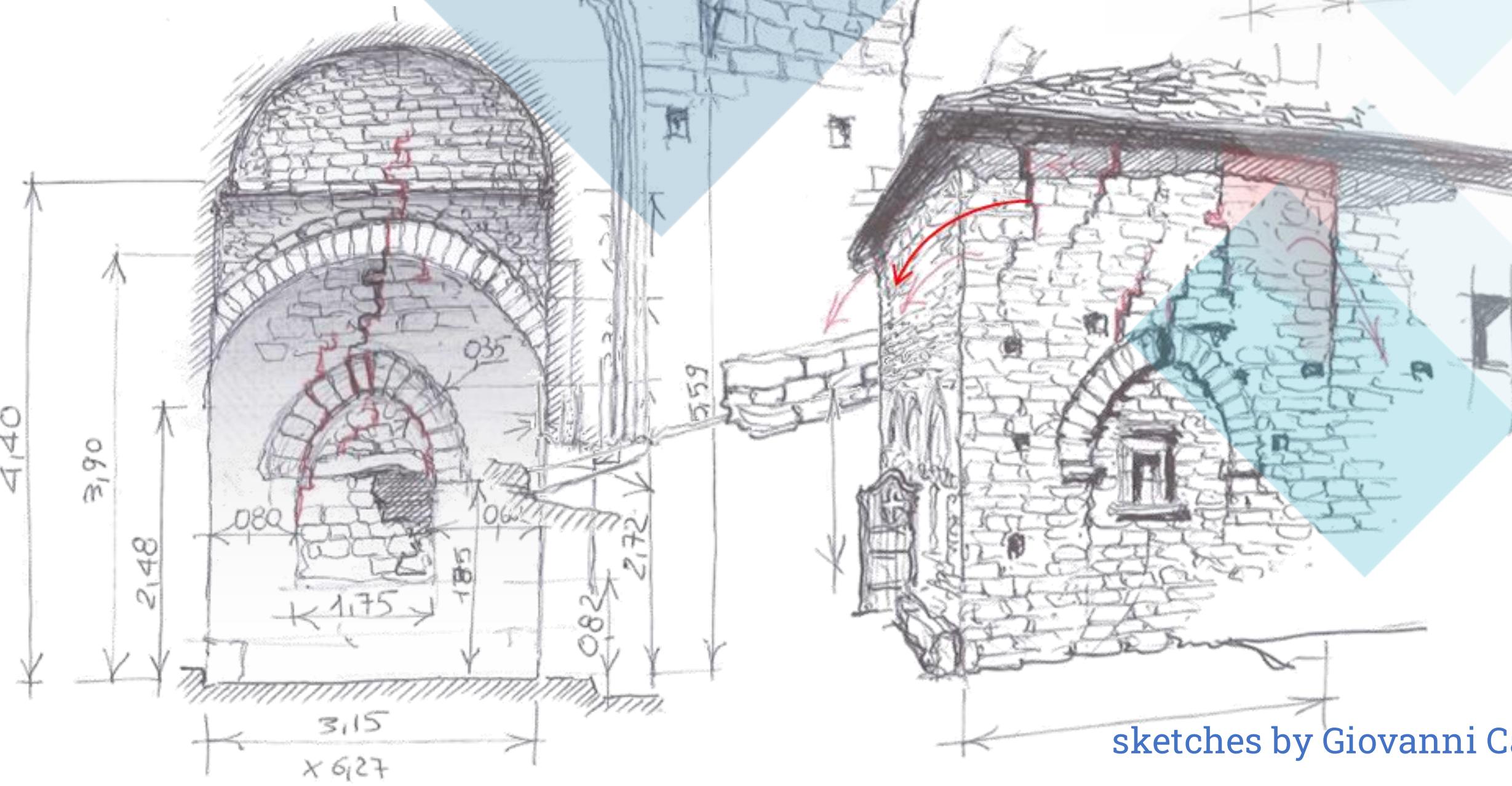
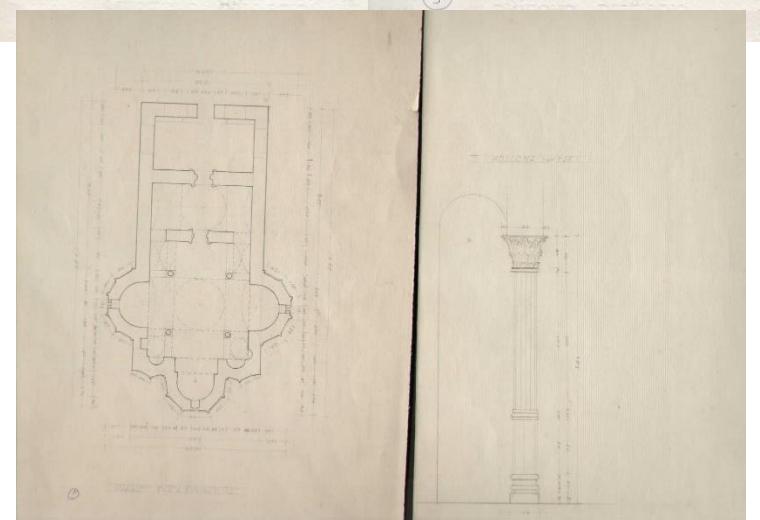
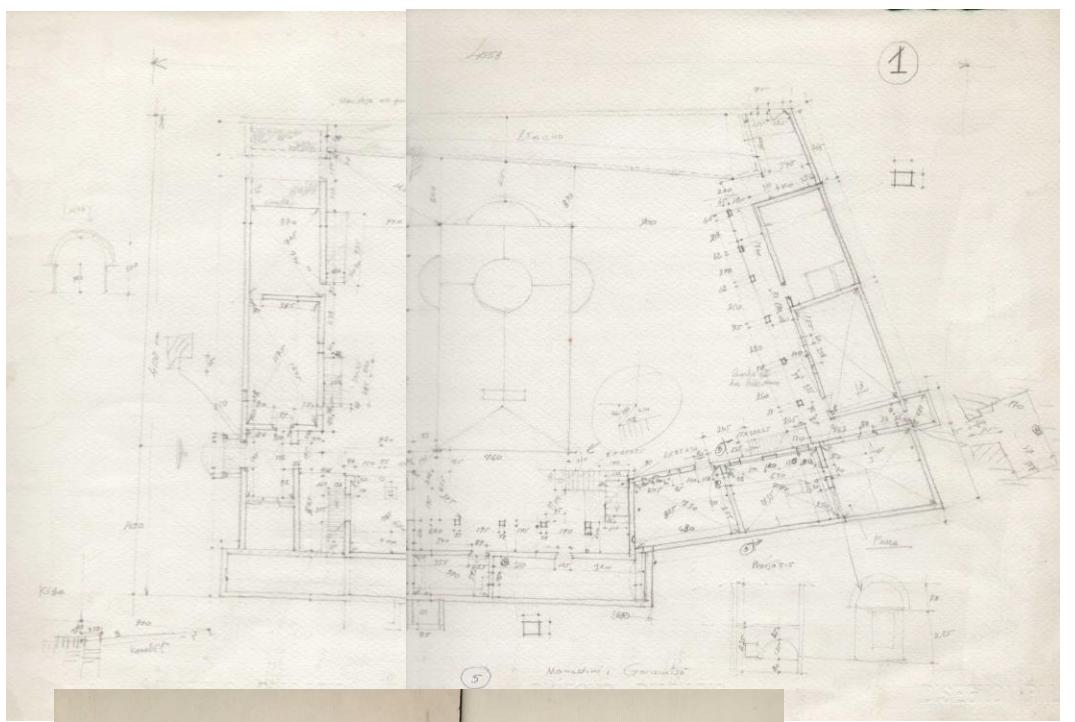
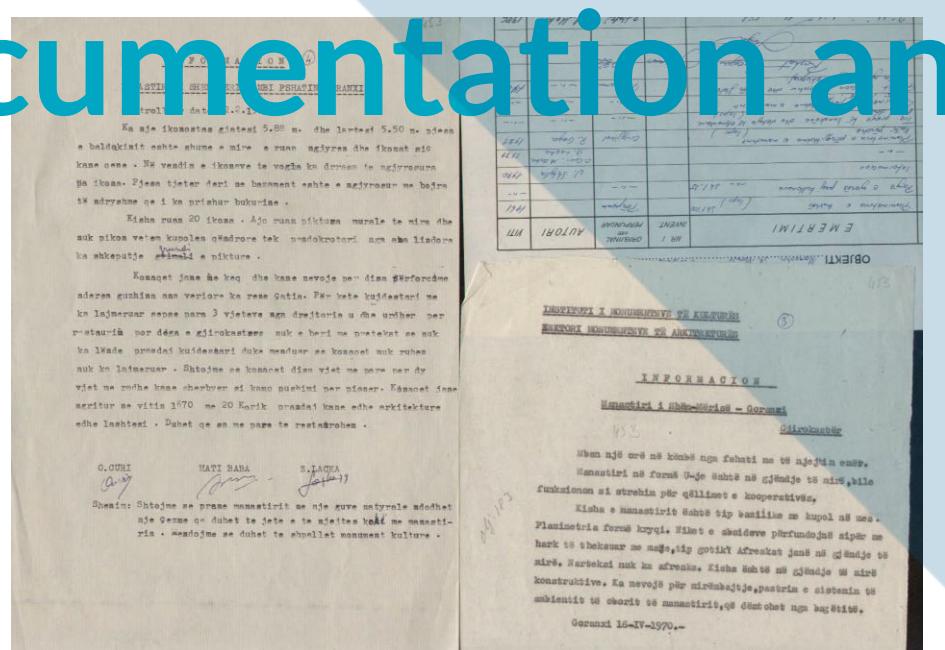
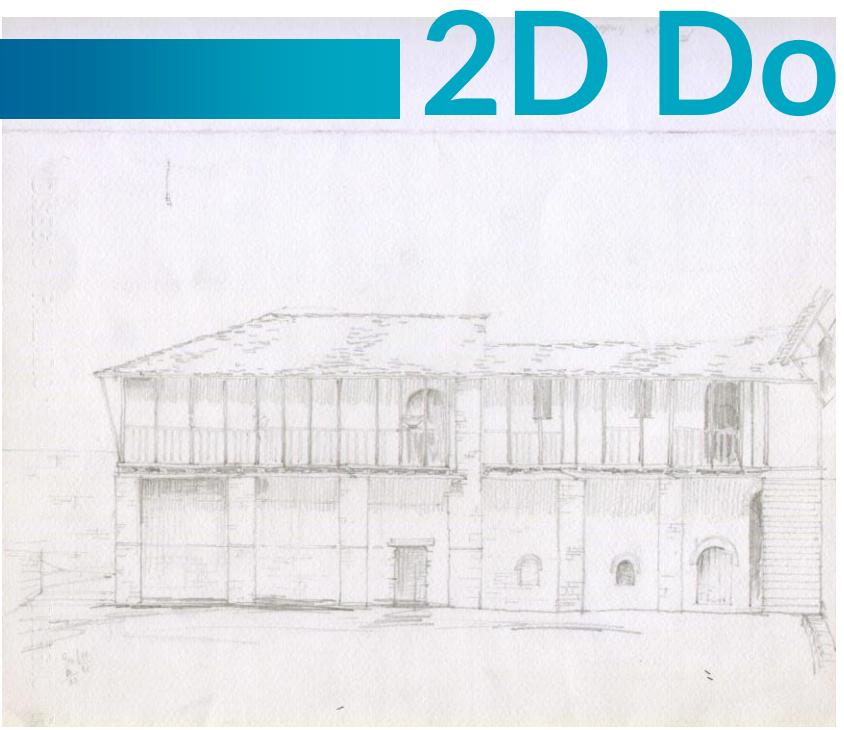
40°00'26.1"N 20°10'06.1"E

DMS System

- Monastery
- Church
- Narthex
- Eso-Narthex

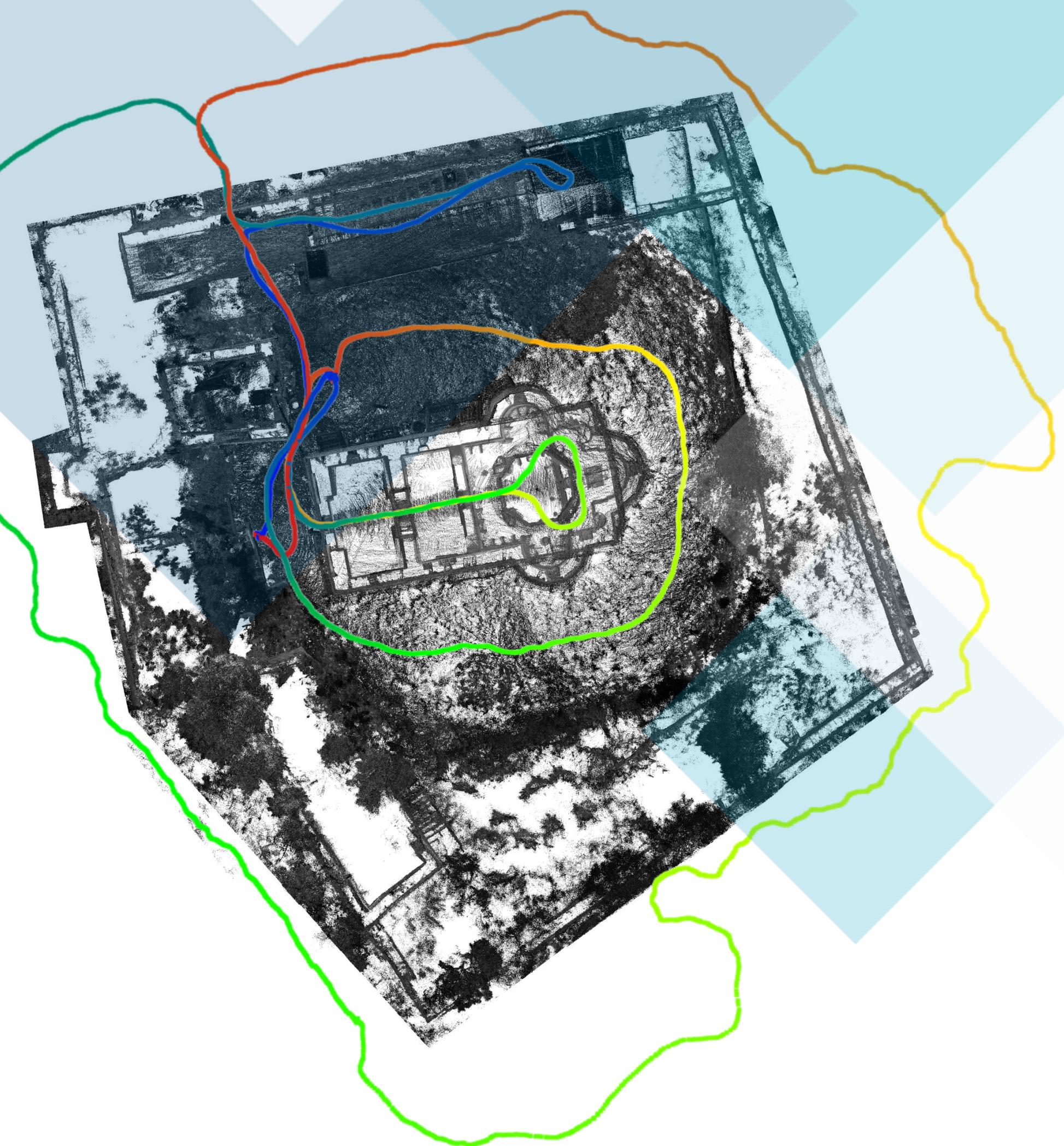


2D Documentation and on site observation



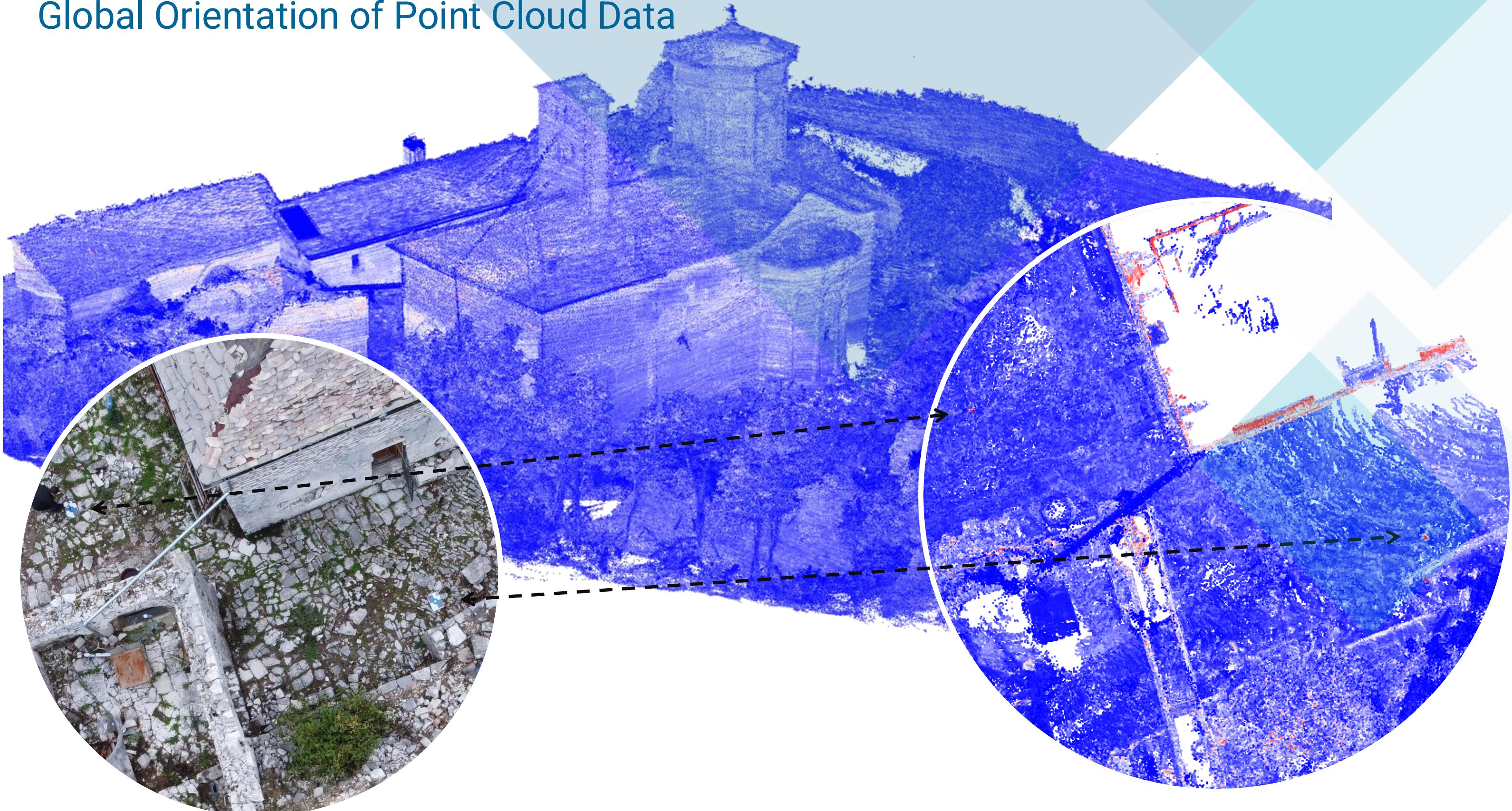
sketches by Giovanni Cangi

3D Survey



Registration

Global Orientation of Point Cloud Data





CloudCompare v2.9.beta [64-bit] - [3D View 1]

File Edit Tools Display Plugins 3D Views Help

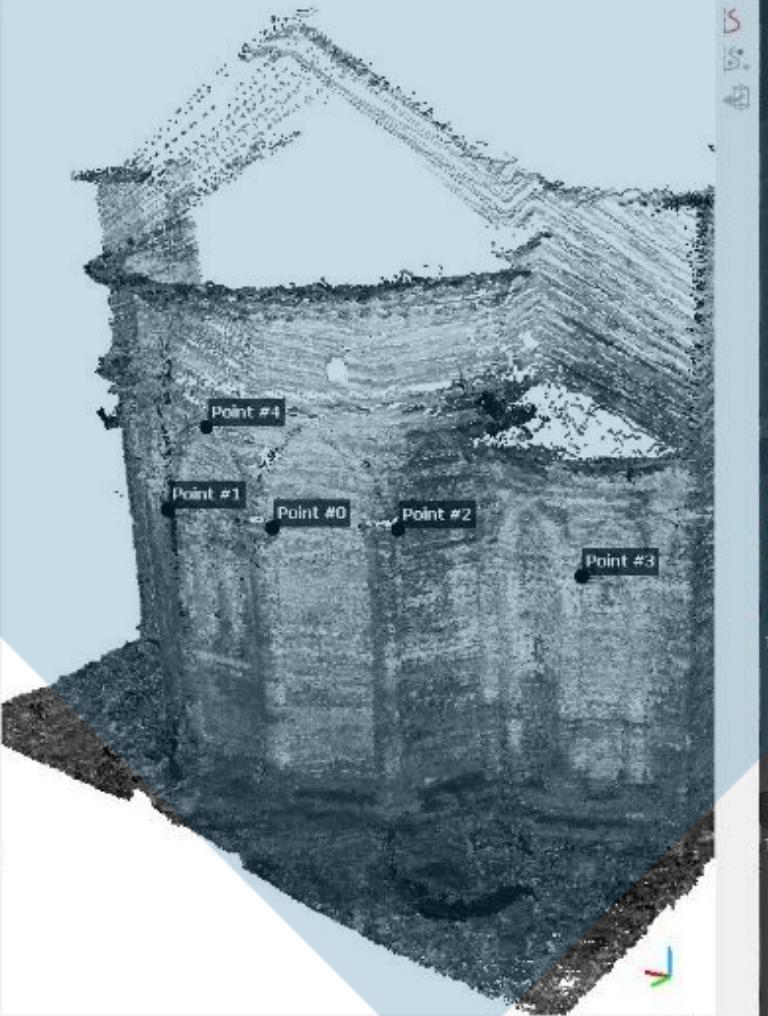
DB Tree

- sdMary.al_3.bm (E:/SPC-CNR/MAECI/N...)
- Karts
- pointcloud_2021-10-24-15-19-14...
- Front
- Dx
- Sx
- Back
- Picked points list
 - 2D label: Point #0
 - 2D label: Point #1
 - 2D label: Point #2
 - 2D label: Point #3
 - 2D label: Point #4
- Slice
- Fotogrammetria
- Phantom
- CoperturaCresca.ply (E:/SPC-CNR/M...

Properties

Console

```
[10:58:44] New point size: 5  
[10:58:45] New point size: 4  
[10:58:45] New point size: 3  
[10:58:47] New point size: 2
```



StMary_prosPost.psx — Agisoft Metashape Professional

File Edit View Workflow Model Photo Ortho Tools Help

Reference

Model

Perspective 3D

Cameras X (m) Y (m) Z (m)

- IMG_8...

Markers X (m) Y (m) Z (m)

	X (m)	Y (m)	Z (m)
✓ point 1	8.207200	15.060166	2.506216
✓ point 2	9.417965	15.138896	2.510542
✓ point 3	7.205099	14.545624	2.507902
✓ point 4	5.855898	13.680985	2.087912
✓ point 5	8.967577	14.998187	3.332744

Total Error

Control points

Check points

Scale Bars Distance (m) Accuracy (m) Error (m)

Total Error

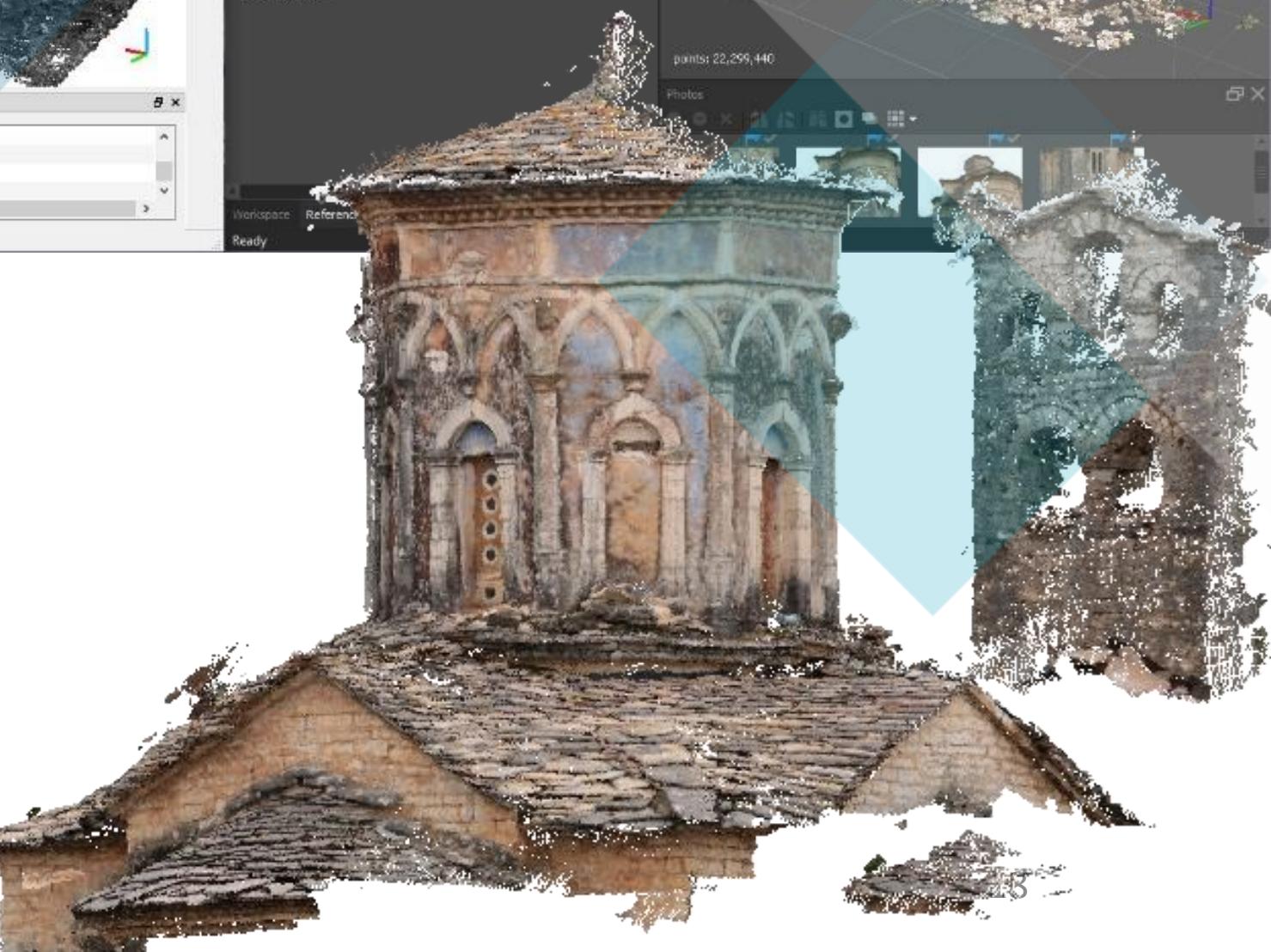
Control scale ...

Check scale b...

Photos

points: 22,295,440

Workspace Reference Ready



Close Range Photogrammetry





Thanks for your attention!

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