OLERDOLA'S CAVE, CATALONIA, PAST AND PRESENT: A VIRTUAL REALITY RECONSTRUCTION FROM TERRESTRIAL LASER SCANNER AND GIS DATA

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The goal of the project:

- To perform a digital reproduction of the cave and of its surroundings
- To use a fast and accurate technology
- To create an interactive 3d environment
- To support the archaeologist virtual restitution of different hypothesis of the ancient buildings.

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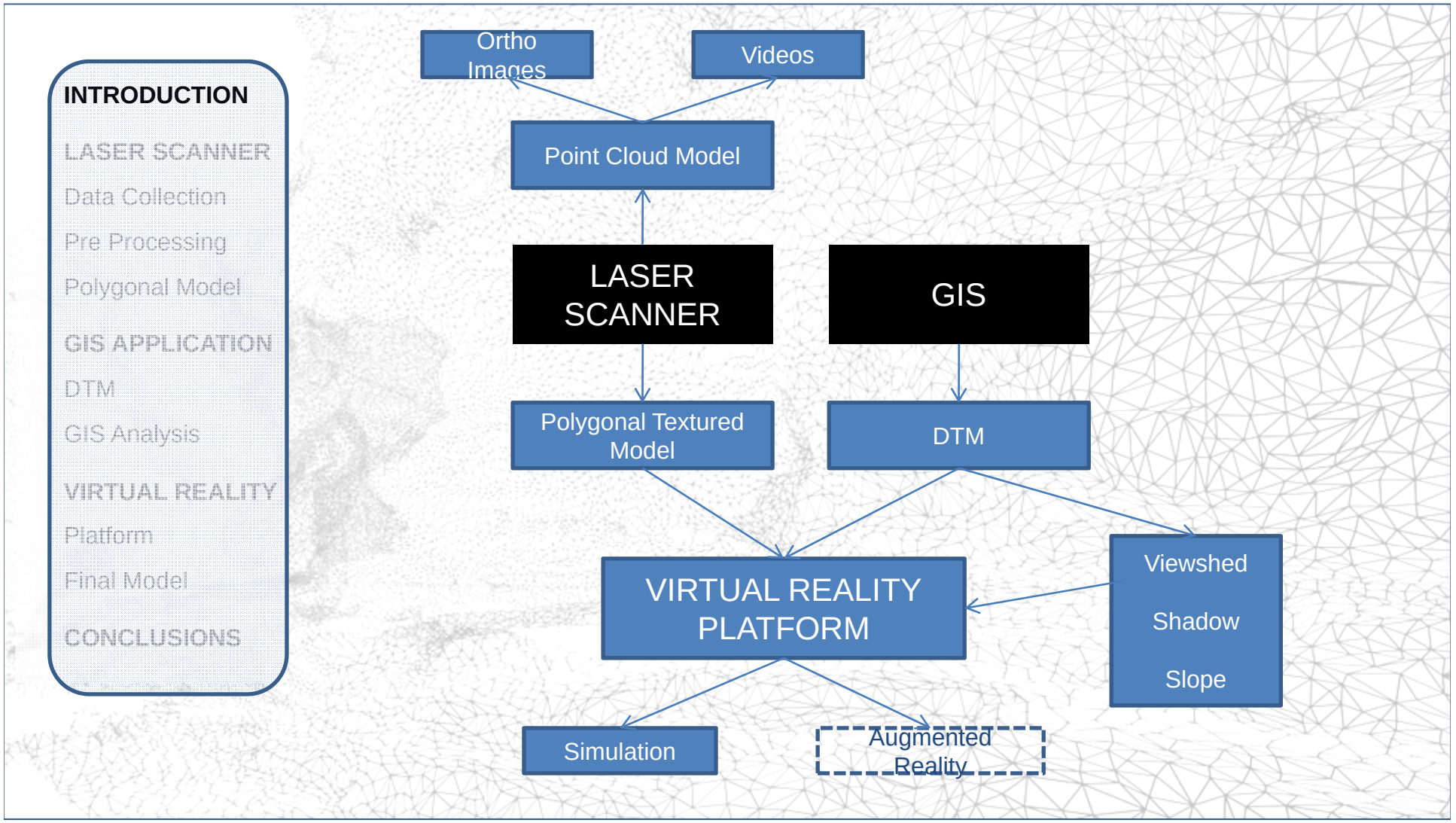
2. PROJECT WORKFLOW



3. TERRESTRIAL LASER SCANNER

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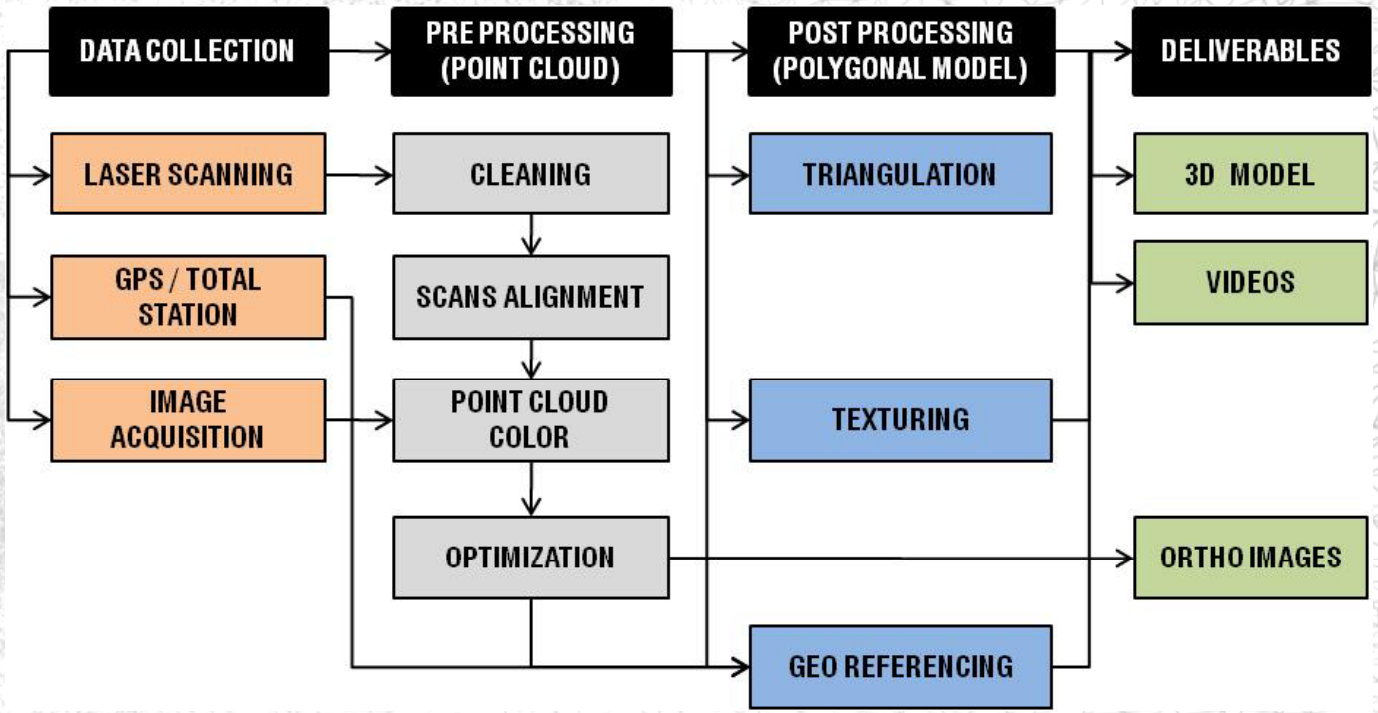

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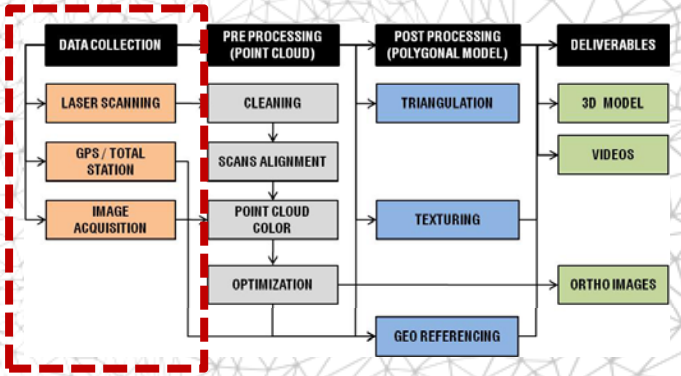
Data collection:

- RIEGL LMS Z420i and Nikon D100
- One field day
- 28 scan positions (@10m, 0.1º FOV 80x180º)
- 1,5 million points per scan
- 70 calibrated images
- No registration targets



2 scanpositions

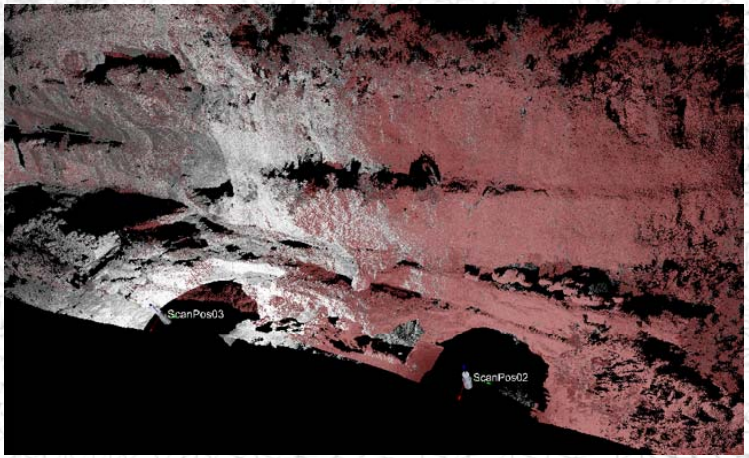


Image acquisition

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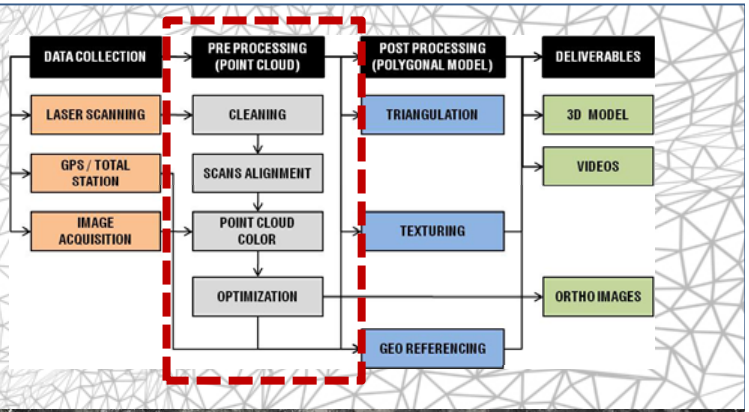
Point Cloud Processing:

- 3 Day elaboration:
  - Cleaning unwanted data
  - Aligning scan position
  - Fixing colour of the images
  - Optimizing the resolution
- Raw point cloud model
  - 46,3 millions points 790Mb
- Optimized point cloud model
  - 22,6 millions points 198Mb
- Plan, section and facade ortho images
  - 100pixel/cm resolution
- HD videos



Facade Image 100pix/cm by Pointools

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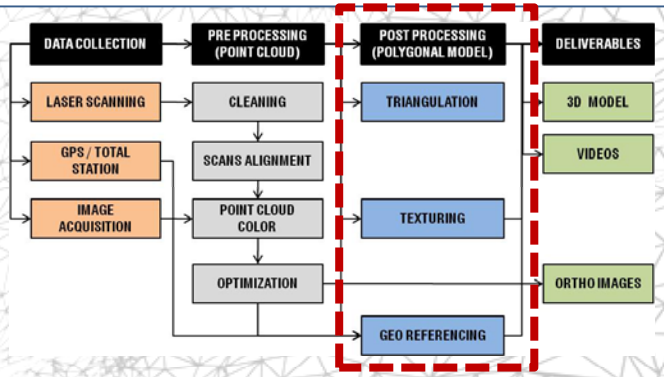
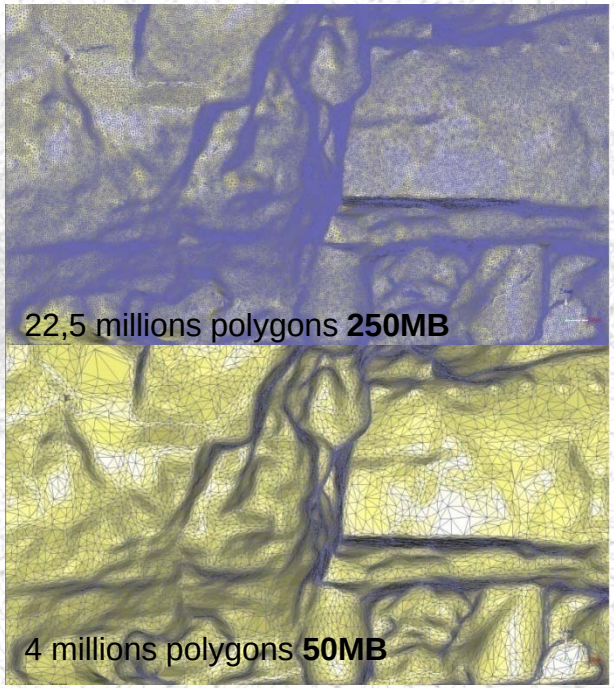
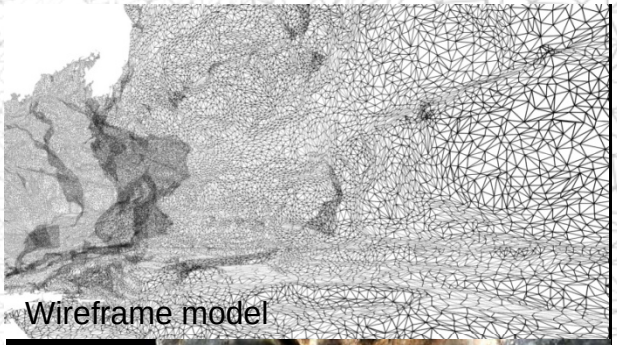
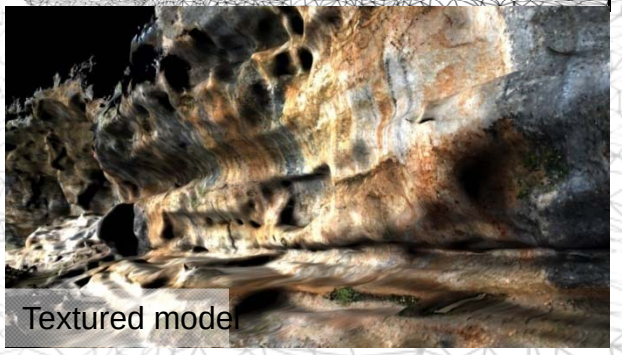
Post Processing (Polygonal Model)

- Triangulation of the optimized point cloud
- RAW Model: 45 millions polygons, 250Mb
- Decimation
- Model: 4 millions polygons, 50Mb
- Texture Application
- 140 images (3008x2000pixel)






Wireframe model


Textured model

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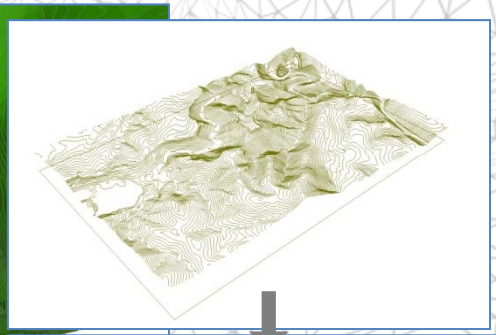

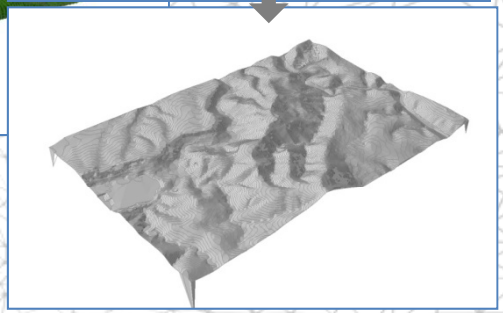

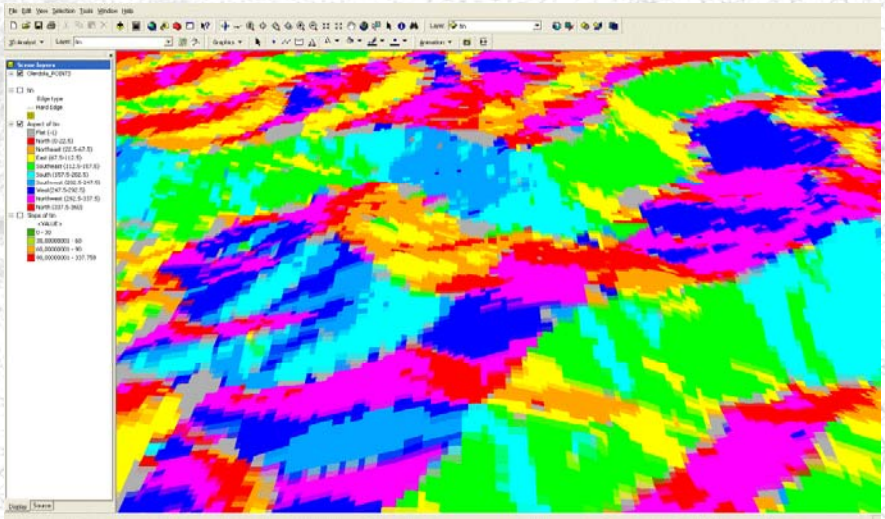

Gis Aplication

- ICC Web:
  - DXF Curves 1:5000
  - MrSID Ortho Image 1:5000
- Arc Scene TIN analysis:
  - Viewshed
  - Slope
  - Shadow

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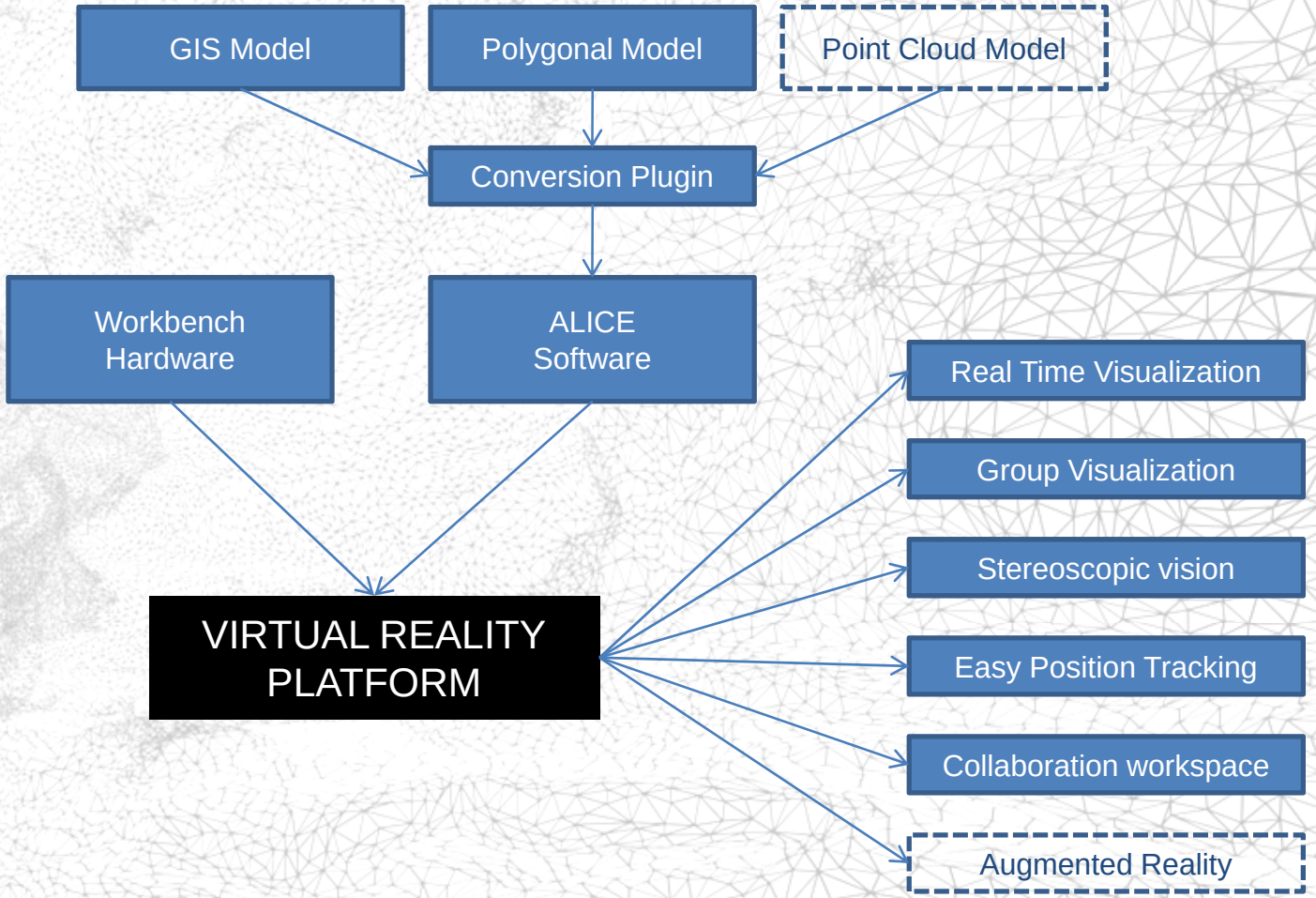

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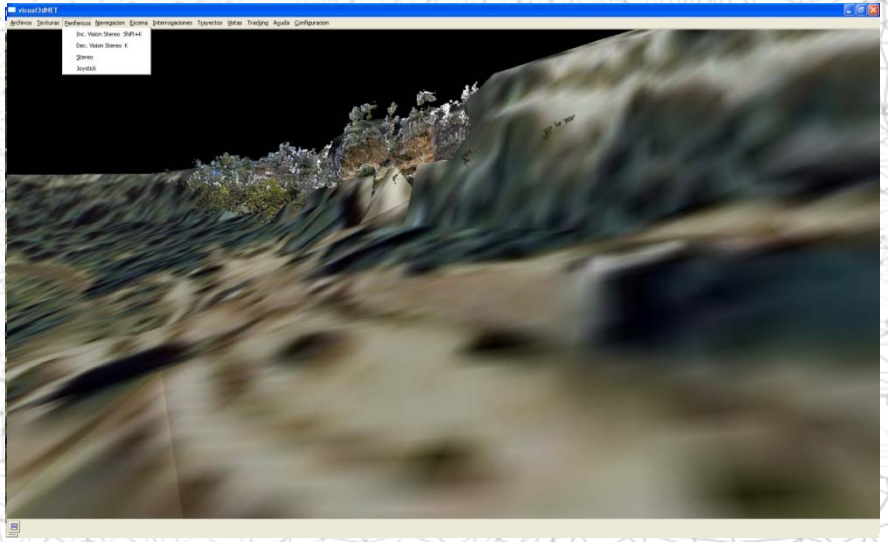
Alice Software:

- High-quality visualization thanks to the use of different algorithms and other high-end technologies.
- High range of navigation options accessible trough classic interactive hardware or using different tracking devices.
- Stereoscopic vision from different virtual reality hardware: 3d glasses, head mounted displays, CAVE, PowerWall and Workbench.
- Space referenced sound
- Collaboration workspace
- Plugin for importing VRML97 (WRL), AutoCAD (DXF), y 3DStudio MAX 4.0(MAX) files



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The Workbench:

- Can be be moved to any particular location
- Can be shown to a group of people instead of being single user
- Position in virtual environment can be easily located for tracking purposes

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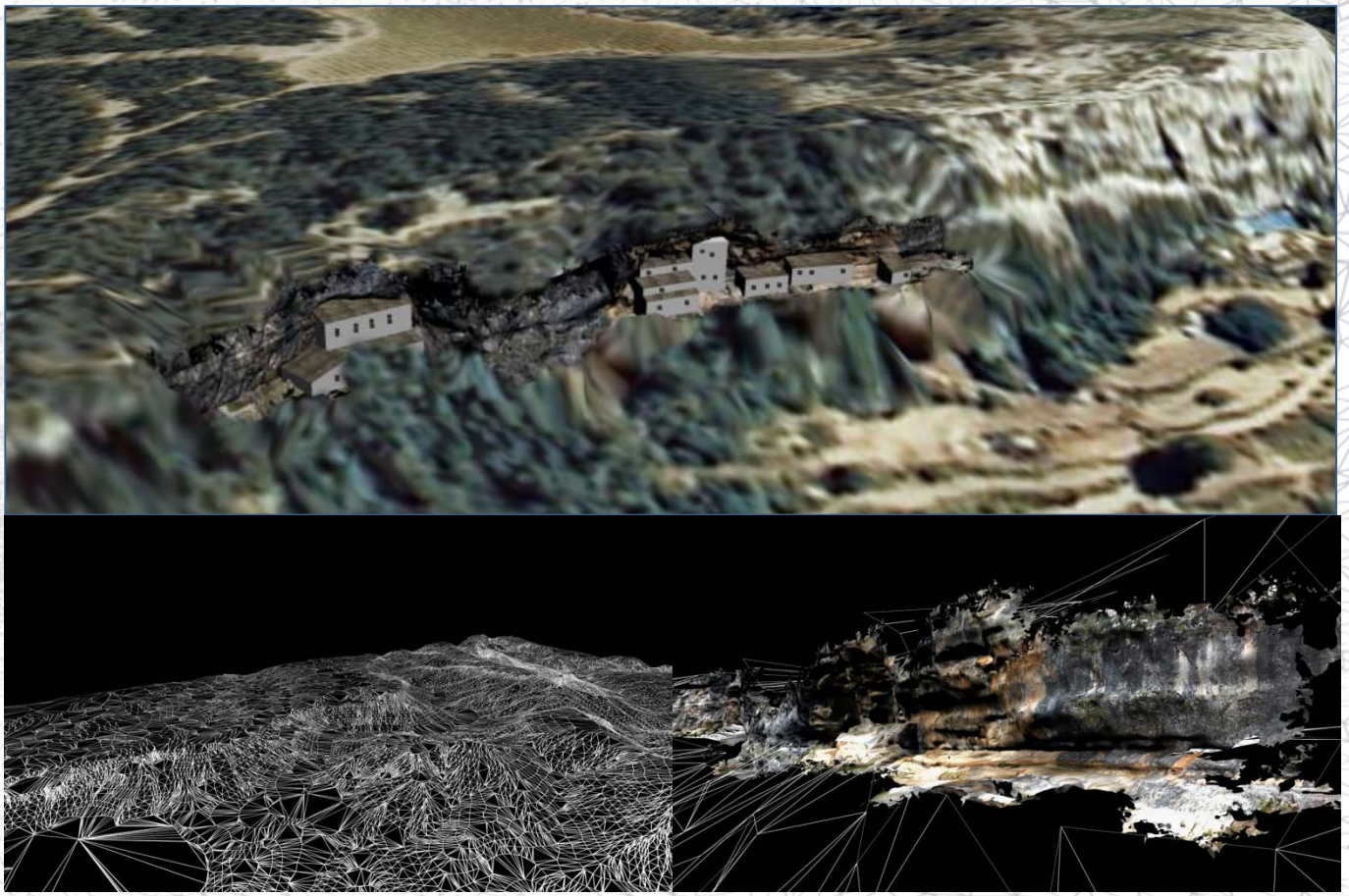

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	ADVANTAGES	PROBLEMS AND POSSIBLE SOLUTIONS
LASER SCANNER	• Is a valid alternative where traditional survey techniques doesn´t give enough information for complex 3d models environments • Data collection is fast and accurate.	The triangulation of a point cloud is not a standard process, is still significantly time consuming. Moreover, accuracy lost in this process cannot be exactly controlled. The development of tools able to introduce a dense colored high resolution point cloud in the Virtual Reality platform could permit to reduce the post processing time and to maintain all laser measurement.
GIS	• Enriches the 3d virtual environment, allowing different standard analysis to work interactively with the virtual model. • There are many free available databases online, which can be used to adequately represent the context.	More possibilities of exploiting GIS data in Virtual environments need further studies to be tested at different level of detail and scales
VIRTUAL REALITY	• Allows laser scanner and GIS data real-time visualization. • Permits a first-class interaction between different users and complex data by easy position tracking.	Flexibility of data integration must be improved and high resolution visualization can be implemented. A more portable and easy to use device is needed. This work in progress project opens new future scenarios, in which a more portable and easy to use device can be applied and an augmented reality application can be developed.

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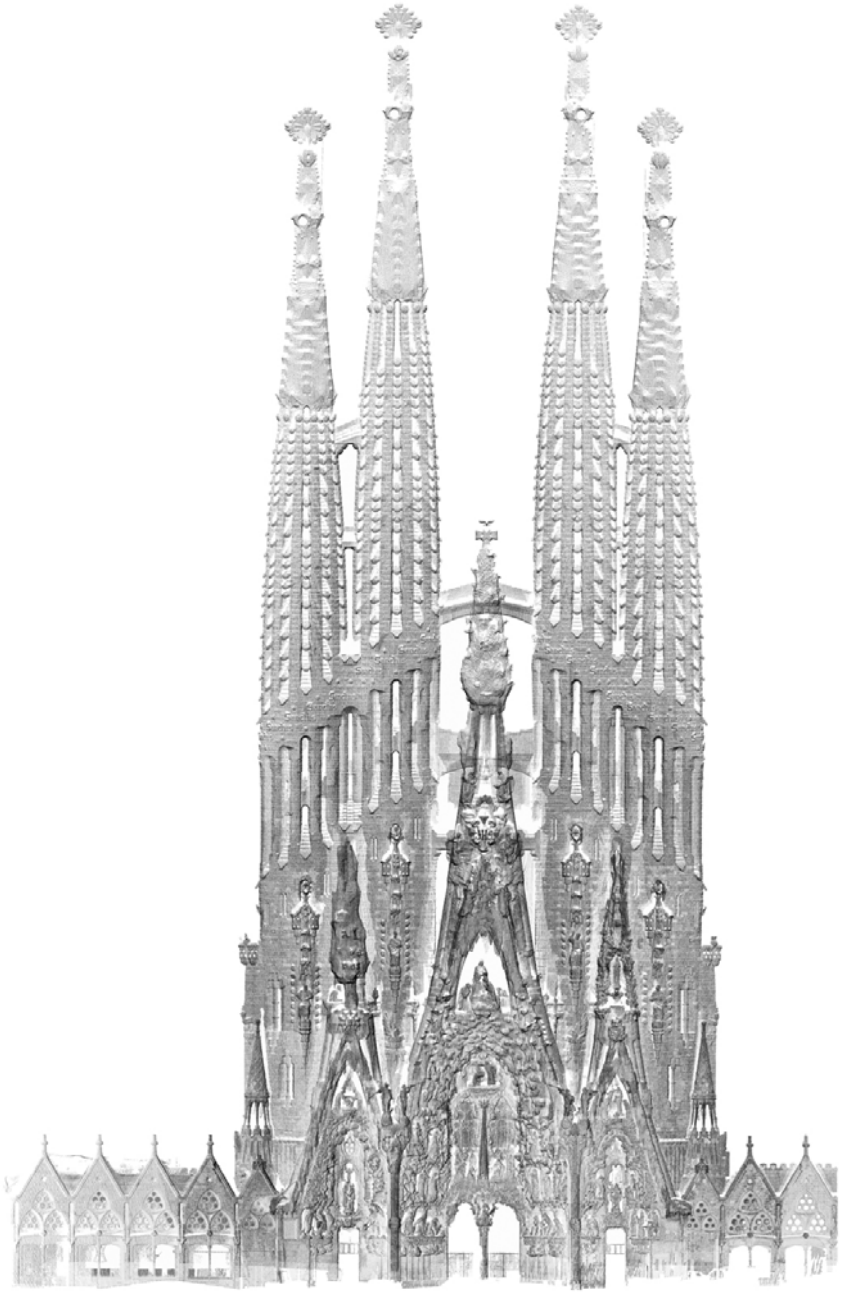

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