

3D da foto con software open-source: applicazioni alla didattica e al monitoraggio di scavi archeologici



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Low Cost 3D, Trento

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Image-based 3D Reconstruction

- Dense stereo matching approaches are able to obtain a 3D model starting from a set of uncalibrated images

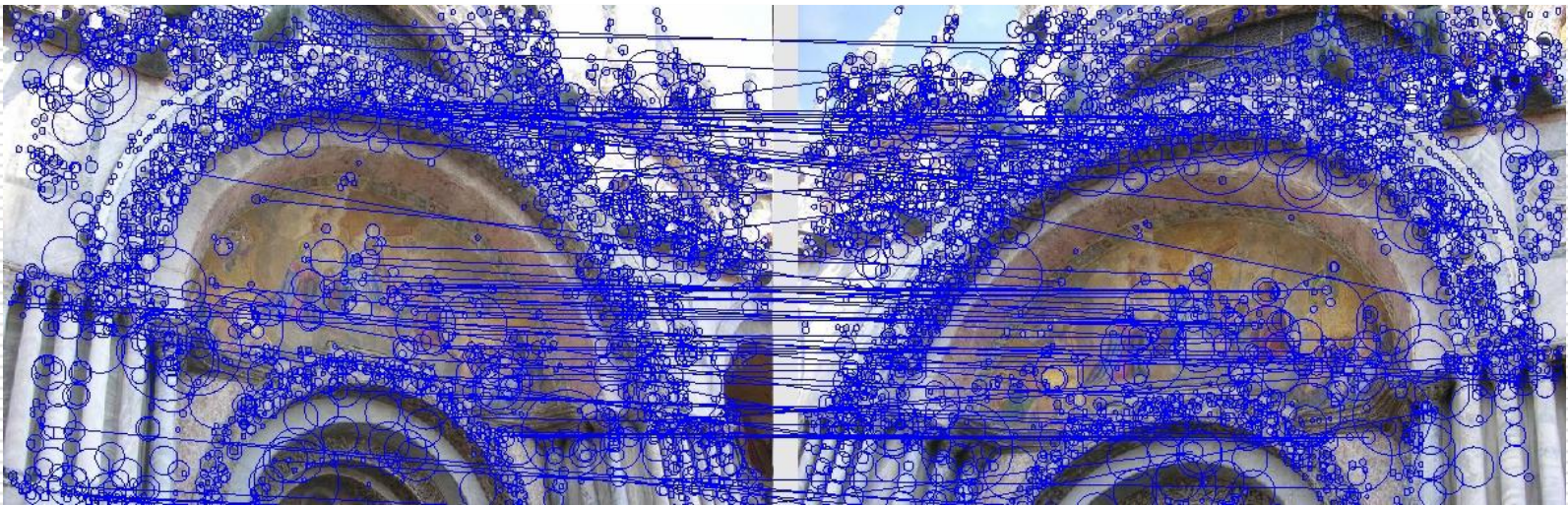


Image-based 3D Reconstruction

- Several software and services have been created and made available, most of them free:
 - Arc3D (free)
 - Photosynth Toolkit (free)
 - Visual Sfm (free)
 - Arc-Team tools (free, see later)
 - 123D (Autodesk, free... for now)
 - PhotoScan (low cost)
 - ...

 - The output of this system can be easily combined with freeware software like Blender or MeshLab
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Teaching low-cost acquisition

- “Grafica 3D per i Beni Culturali” course
 - Informatica Umanistica, Laurea Magistrale

 - Goals:
 - Have an overview of the state-of-the art acquisition techniques, with some knowledge of the technical details
 - Experiment using freeware tools
 - Be able to face a simple acquisition process and/or to judge the feasibility of an acquisition campaign
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Teaching low-cost acquisition

Acquisition techniques:

- ❑ 3D scanning (hardware issue + MeshLab)
 - ❑ User-assisted image modeling (Sketchup+?)
 - ❑ Dense stereo matching (Arc3D + Photosynth Toolkit)
 - ❑ PTM (PTM Builder)
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Teaching low-cost acquisition

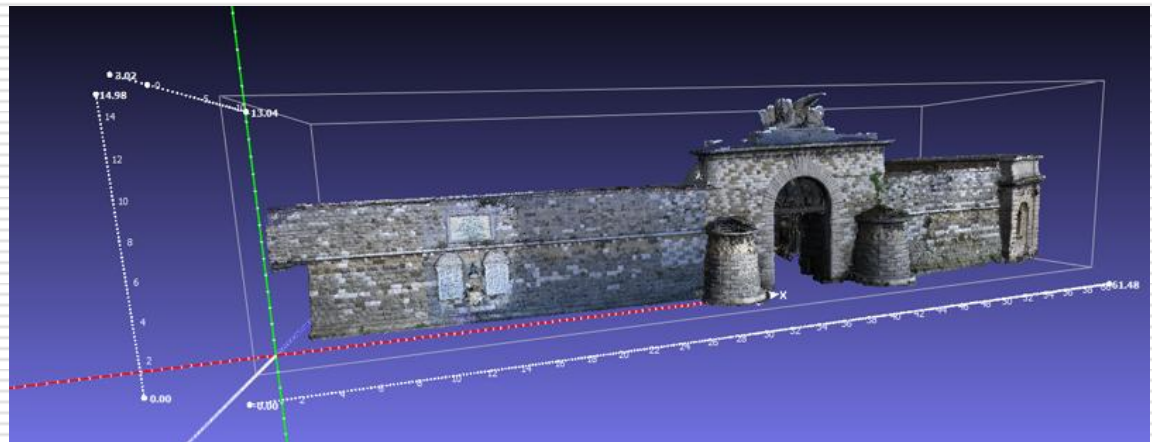
Final project:

- ❑ Choose one (or more) objects
 - ❑ Acquire them using one of the presented techniques
 - ❑ Build a small website and present results
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Teaching low-cost acquisition

Example project 1: Daniele

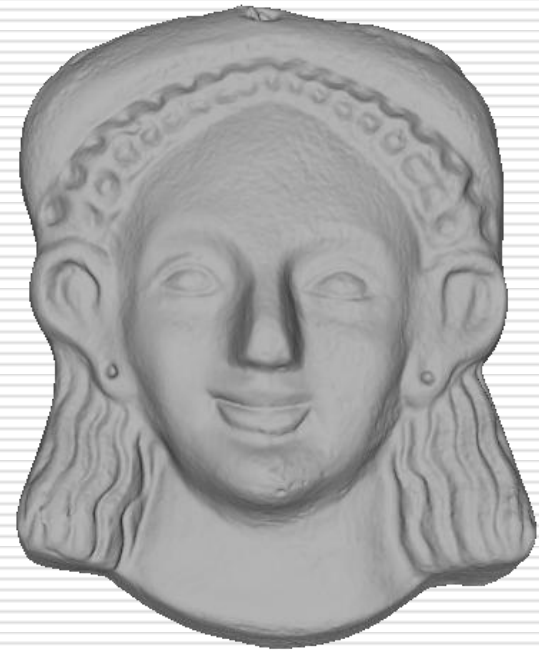
- ❑ One big object, several acquisitions
- ❑ Integration of different data and levels of detail
- ❑ Used: Photosynth Toolkit + MeshLab



Teaching low-cost acquisition

Example project 2: Francesco

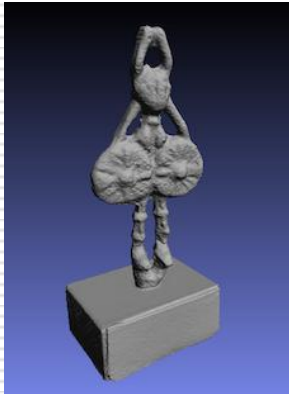
- ❑ Three small objects, difficult materials
- ❑ Ad-hoc acquisition setup
- ❑ Used: Arc3D + MeshLab



Teaching low-cost acquisition

Example project 3: Camilla

- ❑ PTMs of small objects
- ❑ Comparison with 3D scanning
- ❑ Used: Nikon 70D + PTMBuilder



Teaching low-cost acquisition

Conclusions

- ❑ It's possible to teach these techniques in 3 months
- ❑ Freeware solutions are robust enough
- ❑ Students are smart!
- ❑ Limitations: hardware, integration with 3D modeling

Website: <http://vcg.isti.cnr.it/~dellepiane/Corso.html>

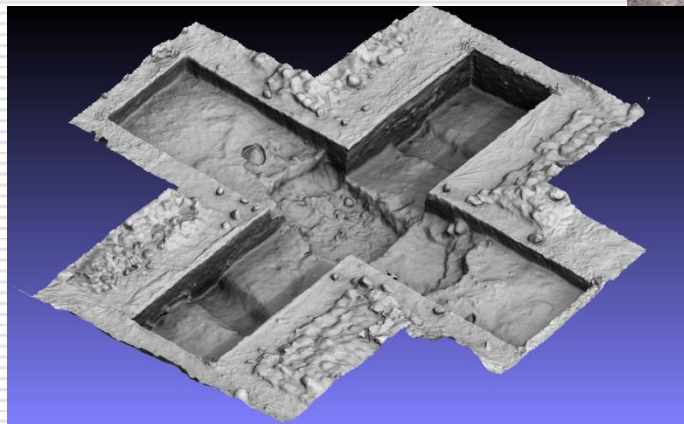
Monitoring Excavations

- Collaboration with University of Lund, Sweden (Nicolò Dell'Unto)
 - Monitoring of an excavation using Dense Stereo Matching techniques
 - Creation of a 3D documentation of the evolution
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Monitoring Excavations

□ Pipeline

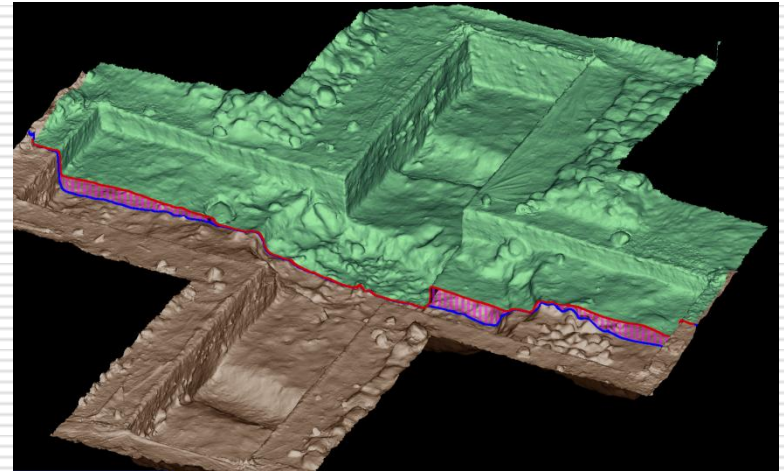
- Acquisition (by an trained archeologist)
- Data processing (Arc3D, Photosynth Toolkit, PhotoScan)
- Scaling and alignment (using markers)
- Visualization



Monitoring Excavations

□ Results

- Layers visualization
- Decorations and filters
- Photocloud!



Monitoring Excavations

□ Conclusions

- It's possible!
- Accuracy ok (needs testing)
- Integration with freeware systems (i.e. MeshLab)

□ Future perspectives

- 3D integrated in documentation activity
 - Annotation on 3D!
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Conclusions

- 3D for everyone? No, il dibattito nooo!!!

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