SIGGRAPH2009 NEW ORLEANS

Computation & Cultural Heritage: Fundamentals and Applications

Pitfalls and deficiencies in the use of 3D acquisition techniques

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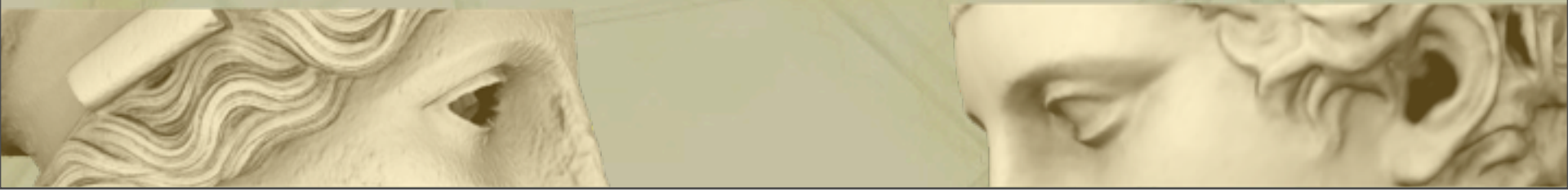


Cultural Heritage world

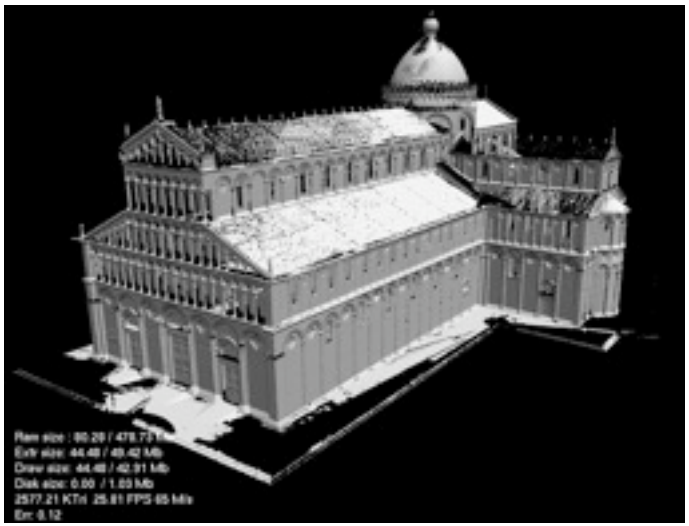
- A whole different world
  - Rich, vibrant, full of history, traditions, and culture and definitely with a strong appeal
  - Fascinating, even if not economically rich

So, what could go wrong?

- Different Worlds -> different language
  - CH institutions speak a different language
  - Easy to create wrong expectation/misunderstanding etc.
  - Both sides has their own responsibilities

Misuse and Pitfalls of *Non Technicians*

- **Wrong Expectations**:
  - Modeled vs acquired misunderstanding



Misuse and Pitfalls of *Non Technicians*

- Wrong Expectations
- **Knowledge of the limits of the technologies**
  - 3D vs panorama
  - Size vs error requirements
  - Completeness vs authenticity

Misuse and Pitfalls of *Non Technicians*

- Wrong Expectations
- Knowledge of the limits of the technologies
- **Evaluation of results**
  - How good, respectful, accurate, usable is the returned model?

Misuse and Pitfalls of Non Technicians

- Wrong Expectations:
- Knowledge of the limits of the technolo
- Evaluation of results
- Exploitation of results
  - Use the data!
    - Presenting
    - Documenting
    - Analysis
    - Support to restoration
  - Spread the data

Misuse and Pitfalls of the *Technicians*

- **Wrong choice and use of the hardware**
  - Many different technologies, just a few example
  - Laser or structured light, Triangulation
  - Laser, Time of flight
  - Photogrammetric techniques

Misuse and Pitfalls of Technicians

- Wrong choice of HW
- **Wrong way of processing**
  - There is a huge arsenal of mesh processing algorithms that can help you to make your data to look better.
  - Not everything is safe from a CH documentation point of view.

Misuse and Pitfalls of Technicians

- Wrong choice of HW
- Wrong way of processing
- **Wrong way of presenting**
  - Nice movies vs true data
    - Both of them is not impossible

Misuse and Pitfalls of Technicians

- Wrong choice of HW
- Wrong way of processing
- Wrong way of presenting
- **Wrong way of preserving**
  - Long term preservation of data
    - Formats, applications?
    - Standards

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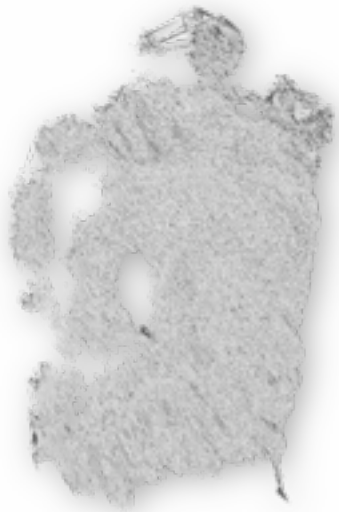
Technicians' duties
3D processing in CH

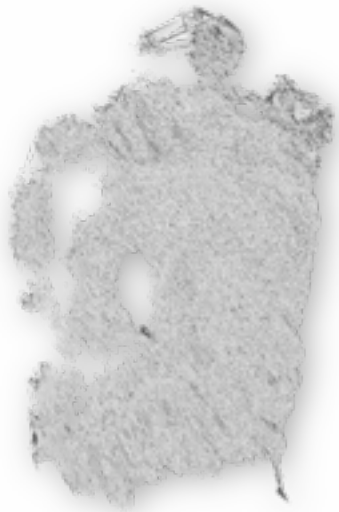
- An example and some considerations
- There is a huge arsenal of mesh processing algorithms that can help you to make your data to look better.
- Not everything is safe from a CH documentation point of view.

Technicians' duties
Coping with fake/dummy data



Technicians' duties
Coping with fake/dummy data

- When processing 3D scanned data is easy to create new data



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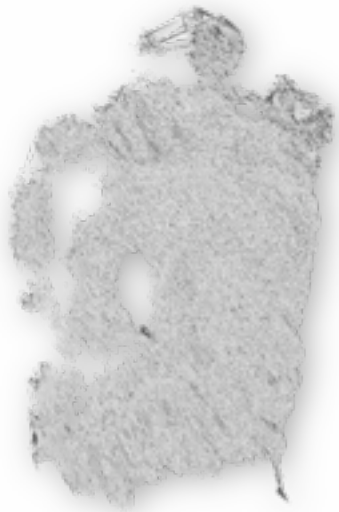
Coping with fake/dummy data

- When processing 3D scanned data is easy to create new data
- Noise reduction/surface fitting techniques nicely fill and interpolate.
  - Too nicely sometimes.



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- For this case it was easy to understand what is good.
  - Hausdorff distance between original data and surface.
  - Discard anything farther than half of the scanning acquisition error

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Technicians' duties
Provenance Issues

- Pipeline processing can be long and complex:
  - What data has produced what?
  - What is the confidence of the final data?
  - How far is the final mesh different from the "original" data?
  - Have we added anything "new"?
- Retaining provenance data
  - the origin, or the source, or the history of the ownership or location of an object.

Technicians' duties
Provenance issues

- What images contributed to build this model (or this texel?)

Technicians' duties
Recording and preserving Data

- Long Term Preservation
- CH data should live for a loooong time.
  - Open format
    - Avoid closed formats!
  - Open tools for processing
    - Even the processing should be done (if possible) with open tools
      - Easier to achieve long term repeatability of the process
      - (if someone has documented it)

Technicians' faults

- Reasons:
  most errors caused by non deep knowledge of the specific CH field
  - Gross ignorance
    - You miss to exploit all the potentialities due to the fact that you ignore something
    - What is the important stuff of this object
  - Lack of respect
    - Original data should be sacred
      - (Whatever it means!)

Conclusions

- Lot of fruitful interactions between 3D and CH
- Be respectful
  - pay attention to data origin, history, and evolution
- Be open and verbose
  - In data, use open formats and tools

- Final Note: Most of the shown mesh processing tasks were accomplished using MeshLab an open source, portable, mesh processing system:

  http://www.meshlab.org