



NETVAL Workshop on:  
Creating value from Research – The evolving role of knowledge transfer

# Visual and interactive technologies for Cultural Heritage

Roberto Scopigno  
CNR-ISTI, Pisa, Italy



# ITALIAN NATIONAL RESEARCH COUNCIL

**ROBERTO SCOPIGNO**

**ISTI INSTITUTE**

# ***Who I am...***

- Led a research lab (**Visual Computing Lab**) at **ISTI**, CS institute of the Italian National Research Council (**CNR**), now Director of ISTI
- Located in **Pisa**, Tuscany, Italy
- Active on **3D graphics** and other **visual media** (we are computer scientists)
- Main domain of application: **Cultural Heritage**
- Many EU projects and collaborations active with museums, universities and restoration institutions

# The first phase: Digitization

- Digital Cultural Heritage:
  - Action 1: produce **high-quality** digital models of artworks of interest
  - From a small jewel to a statue... a building... an entire city → **Huge scale issues & data complexity**
  - Many consolidated technologies for digitization:
    - Digital photography
    - **3D scanning**
    - Hand-modelling (entertainment tech)



# 3D Scanning

A very recent digitization:

- **Busto di Francesco I d'Este, by Gian Lorenzo Bernini, Galleria Estense, Modena**

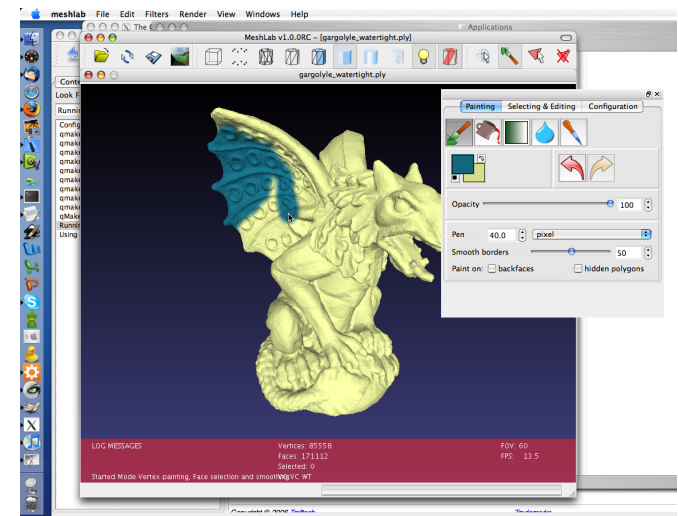
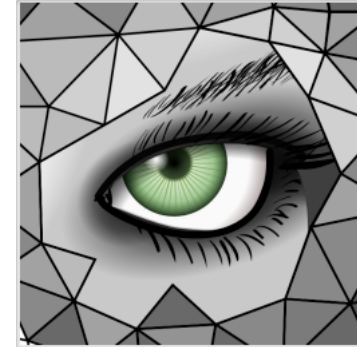


R. Scopigno, Netval, Roma 2019

# SW tools for 3D data - MeshLab

- A success story:
  - OpenSource tool (GPL) supporting mesh processing and viz of triangle meshes
  - Started as an academic project
  - Evolved to a complete and sophisticated system (**103K** lines of code, **26** py estimated)
  - Downloaded yearly by **>350.000** users, worldwide distribution
  - De facto **main open platform** for mesh editing of **sampled 3D data**

<http://meshlab.sourceforge.net/>



# The potential impact of 3D content

- **3D** representations are **easy to produce** (active 3D scanning, photogrammetry / 3D from images, hand modelling)
- **3D**: nice and entertaining media, important component for *storytelling*
- Other **Visual Media** (360 img or videos, RTI images) could also contribute to the production of visual/interactive content
- ***The (Visual) Media is NOT the message*** →  
the *story* is the message, visual media are just *instruments* for reaching and engaging the public OR to organize & access data

# The role of **interaction**

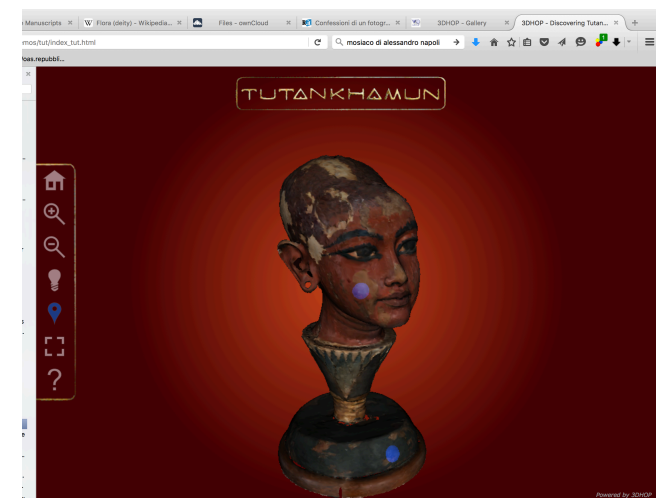
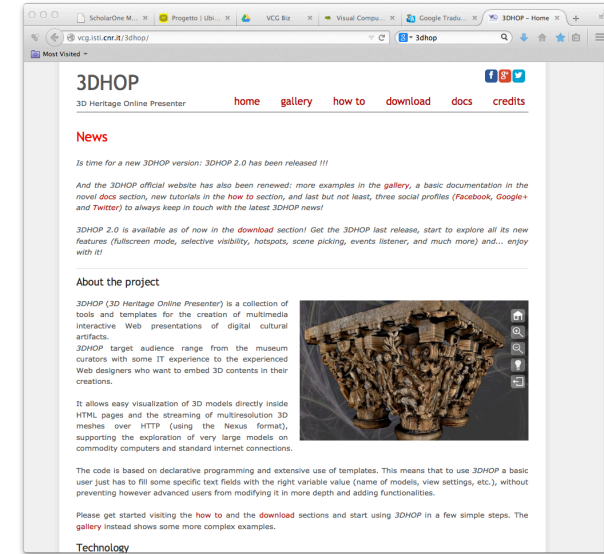
- Visual media have been largely used in museums
- **Passive** (computer animation, video) vs. **Interactive media**
  - **Pro:** increased participation of visitors (active interplay)
  - **Cons:** more complex to implement, deploy and maintain (especially if interaction is with sophisticated devices/approaches)

# Telling stories on **multiple channels**

- **Focus:** should not be restricted to the **single** museum kiosk/installation
  - All content should be available on different channels (kiosk, web, mobile,...)
  - Fruition is *before, during and after* the physical museum visit
  - Use platforms able to **design content for multiple channels**

# Visual Media on Web with 3DHOP !

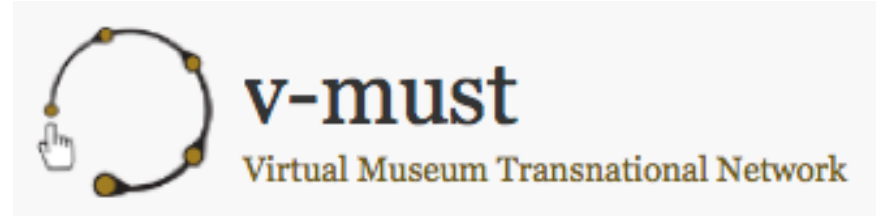
- **3DHOP**: a CNR open-source platform for publishing and visualizing visual data on the **web** (or locally)
- Flexible and modular structure
- Lot of info on how to configure / modify / extend
- Manages **high-resolution** models (multi-resolution, compression) – Visualise & interact in real time
- See at: <http://3dhop.net/>
- Automatic web publishing: VisualMedia Service <https://ariadne1.isti.cnr.it/>



# Telling a story with new technologies

- Initial video :
  - Visualize the **difficult to see**
    - ➔ **Coins collection** – Palazzo Blu, Pisa [2D-RTI]
    - ➔ **A large vault** – Villa Farnesina, Roma [360 image]
    - ➔ **A complex painted surface** – Pollock at Guggenheim [3D]
  - **Documenting** a complex restoration in 3D [3D&data]
- Employ **Virtual Reality**
  - ➔ **Navigate in 3D spaces**- EC V-MUST, CNR-ITABC, Rome [virtual 3D]
- Employ **Immersive** technologies [3D / 2D]
  - ➔ Head Mounted Displays (Oculus etc.)

# EC «V-MUST»



- EC Network of Excellence project (2011-2015)
- Led by CNR (Sofia Pescarin, CNR-ITABC + ISTI)
- Strong leading role in further *development*, *assessment* and *dissemination* of interactive visual technologies applied to Cultural Heritage & Museums



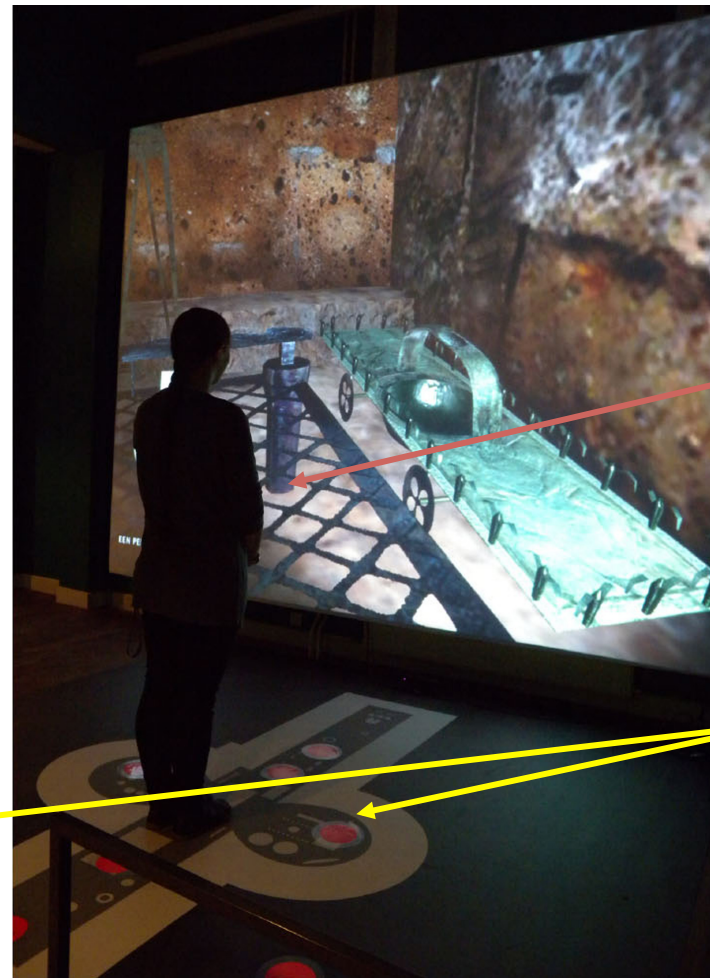
# Virtual Navigation

- **Gesture-based** navigation & interaction (CNR-ITABC 2013+)
  - Used in several projects: Etruscanning, Tiber Valley, V-MUST KeyToRome, ...
  - Small set of gestures to drive selection & navigation
  - User posture gathered with Kinect



# Virtual Navigation

- **Gesture-based interaction** (CNR-ITABC 2013+)



gestures

Select:  
mode  
content  
location

# Interaction via gestures

- Gestures: we still miss a *consolidated & common* gesture language
- Users have to learn how to drive the system
- Often, an operator instructs briefly the user (costly!)
- Technology required: medium complexity (low cost, but a bit complex assembly)



# Immersive - Head Mounted Displays

- **Immersive** navigation:
  - Immersive via HMD or large screens
  - Interaction: gesture-based



ITABC-CNR



ISTI-CNR

# Immersive - Head Mounted Displays



# Conclusions

- Excellent opportunities nowadays for telling the story of our Culture in a compelling and entertaining manner
- Speaks to every generation
- Implementation cost and complexity is reducing
- Should be designed by multidisciplinary staff (not just CS) and well integrated with the museum communication policy
- Should be **multi-channel** (not only available in a single museum or on a specific platform) and **preserved in time**

# Questions?

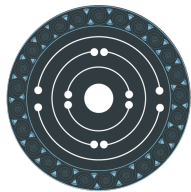
## **Contact:**

***Visual Computing Lab  
of ISTI - CNR***

<http://vcg.isti.cnr.it>

[r.scopigno@isti.cnr.it](mailto:r.scopigno@isti.cnr.it)

[paolo.cignoni@isti.cnr.it](mailto:paolo.cignoni@isti.cnr.it)



**PARthenos**

Pooling Activities, Resources and Tools  
for Heritage E-research Networking,  
Optimization and Synergies



Horizon 2020  
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for Research & Innovation



**EMOTIVE**

Storytelling for cultural heritage

