Merging Virtual Reality and Digital Fabrication in Heritage applications

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Content

- Interactive Graphics, Virtual/Augmented Reality, 3D Fabrication:
  ➔ **enabling technologies** for Cultural Heritage application
- A review of some results and experiences focusing mostly on applications for **museums** (fruition)

1

Manipulating a 3D object for telling its story

3DHOP

http://3dhop.net/

3DHOP (3D Heritage Online Presenter)

- open-source platform for web-based 3D model presentation

*Why **3DHOP**?*

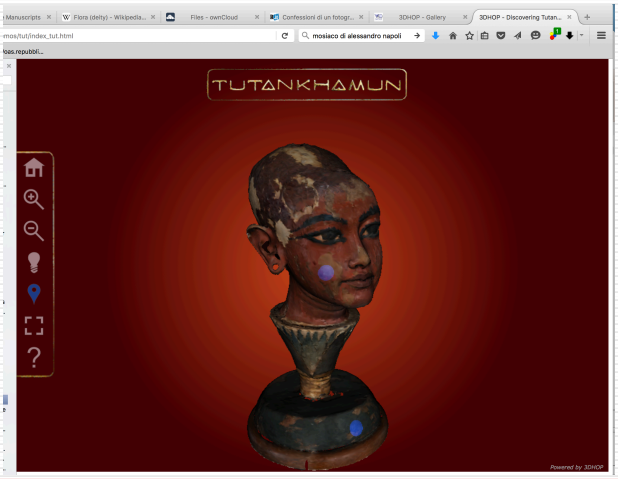
- To support the construction of **multimedia presentations** on the web OR locally

BUT

- Should be **easy to use** (no programming, just configuration of standard layouts)
- **Flexible** (CNR implements and provides **several different presentation layouts**)
- Oriented to **web designers**, NOT to CG programmers

3DHOP - Demo from the web

- http://www.3dhop.net/



Why duplicate on the web?

- Convergence of desktop and web 3D graphics allows to develop installations which could be distributed in a museum and on the web ➔ really a plus for museum managers

- Issues to consider:
  - more complicated is the interaction and display mng, more complex is to provide the same experience on the web
  - design for two stages (museum & web) is more costly

- **AR:** Interactive systems to **Augment** the reality
- Two experiences done in the framework of the **EC NoE "V-MUST"** (coordinated by CNR)

Augmented 3D graphics

Revealing Flashlight (INRIA Bordeaux)

- Goal: project content on a real artwork, to **enhance** it
- **Flashlight metaphor**
- Interaction: very straightforward, just point with your finger and the flashlight will follow your finger
- Implemented using a **Leap Motion** device

Augmented 3D graphics

Video:

Augmented 3D graphics

AR-tifact (Fraunhofer)

- Allows to augment an artifact by using any mobile system (phone/tablet)
- **Interaction**: very straightforward, rotate the portable device around your object
- Implemented using **image-matching** (to gather info on the view direction over the artwork – *tracking and registration*)

Augmented 3D graphics

Video:

2

Just 3D or also other media types?

Storytelling of **coin collections** by means of RTI
Two museums in Pisa:
Museo Palazzo Blu and **Museo Nazionale di San Matteo**

RTI for enhanced exposition

REQUEST: Presenting to the public a collection of **coins** in an innovative way

PROBLEM: Effective museum exposition is not easy

- Small, seen from a distance
- Double side (one off)
- Hidden knowledge of details and engravings

WHERE

- "San Matteo" National Museum, and "Palazzo Blu" Museum, Pisa

RTI Coins – A kiosk and on the web

Interactive kiosk

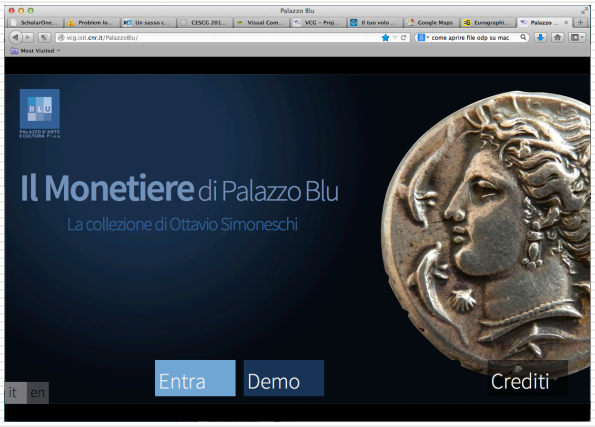
- Organization of the coins in categories and present these categories
- **Virtual inspection** of each coin:
  - RTI manipulation (HSH)
  - Presentation of the coin
  - Hotspots on selected areas to tell the story of coin's details
- Kiosk: multi-touch screen + larger display

Content of the interactive kiosk was **published immediately also on the museum web!**

Coin Kiosk - Demo

http://vcg.isti.cnr.it/PalazzoBlu/

http://vcg.isti.cnr.it/SanMatteo/



RTI on the WEB - WebRTIViewer

Viewer built over **HTML5** (javascript), WebGL, SpiderGL

- Implements a **multiresolution streamable** data format
  - High resolution RTI images (PTM and HSH)
  - High resolution images (JPG, PNG and TIFF)
- Asynchronous data loading

http://vcg.isti.cnr.it/rti/webviewer.php

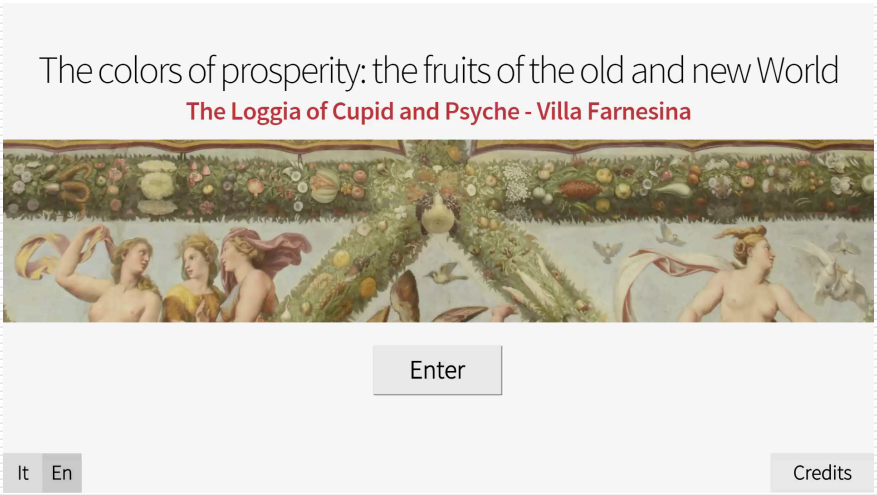
Presenting a large fresco on a vault

3D or panoramic image?

The case of the fresco of "Amore e Psyche" (Raffaello e Giovanni da Udine), Villa Farnesina, Roma

http://vcg.isti.cnr.it/farnesina/

Amore e Psyche, Villa farnesina



3

How can we use results from 3D printing / fabrication in museums?

3D Fabrication & Museums

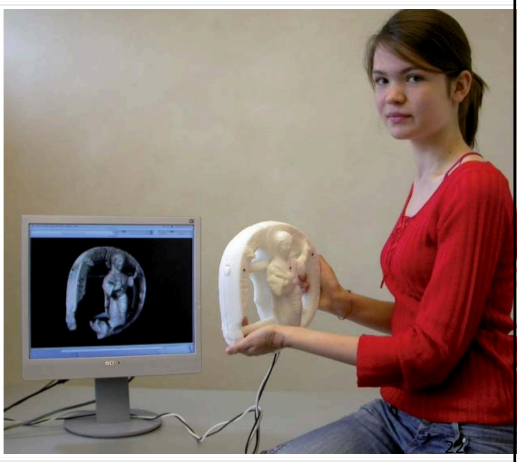
- Current technology allows to produce replicas from digital 3D models
- Replace the standard **calco/moulding** approach with digital **3D print tech** to produce replicas
- Use replicas in museums
- ***From static to active replicas…***

3D Fabrication & Museums

➔ 3D printed replicas with **added sensors**

VisualDimension (Belgium)

- small physical buttons immersed in the 3D replica to activate video content



3D Fabrication & Museums

➔ 3D printed replicas with added sensors

- **TOOTEKO**
  - Near Field Communication (NFC) emitters immersed in the 3D replica
  - User wears a NFC ring to locate those hot spots
  - **Audio content** is automatically activated
  - User receives it via an App on a smart device

3D Fabrication & Museums

EC H2020 "EMOTIVE" (2016-2019)

- New storytelling tech for museums
- **CNR** task:
  - Augmented reality approaches by mixing 3D fabrication and high fidelity rendering
  - **Manipulating** a real artefact is a very intuitive approach for personal analysis
  - Provide a copy (plastic/gypsum) for direct manipulation
  - Augment visual quality by rendering in real time via a **HMD** (e.g. Hololens)

3D Fabrication & Museums

Conclusions

- Technology ready and stable for presenting and visualizing high-fidelity RTI or 3D data on the web & in museums
- **Convergence of kiosk-based and web resources** ➔ cheaper development and increased dissemination
- Plenty of potential uses in museums, research, documentation, restoration, didactic
- **Open data**: crucial common goal, still hard to reach, many professionals have a strong sense of property over their data, many issues in sharing data…

Questions?

- ***Contact:***
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Remind to submit to:

ACM Journ. on Computing and Cultural Heritage (JOCCH)