A MeshLab Primer

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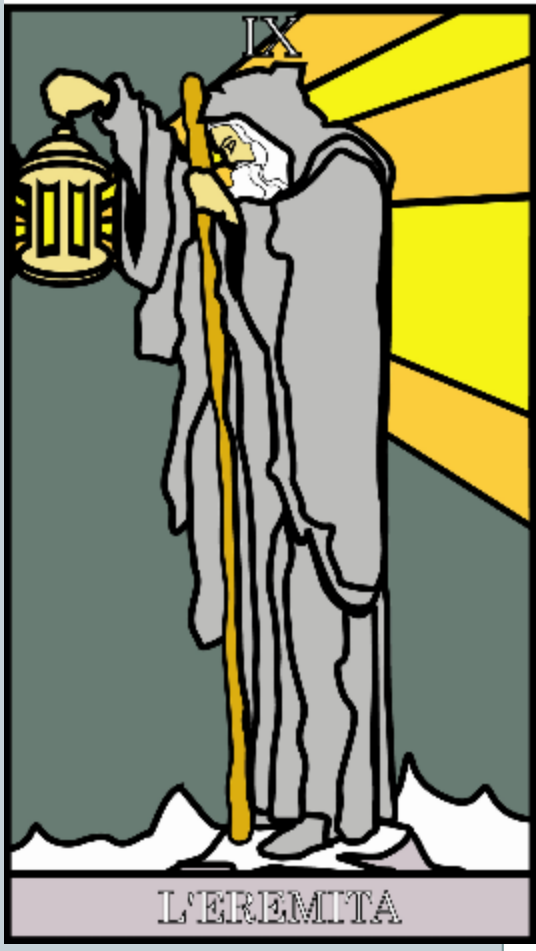
Who am I?

Marco Callieri

- Master degree & PhD in computer science

- Researcher at the Visual Computing Lab, ISTI-CNR, in Pisa
- I work on 3D data manipulation and rendering... lot of experience in 3D scanning and data processing
- Most of my activities are in the field of cultural heritage



http://vcg.isti.cnr.it/~callieri

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Beside this:

an eclectic artisan, an avid gamer, a former biker, a good cook, an incorrigible geek... and much more

Visual Computing Lab

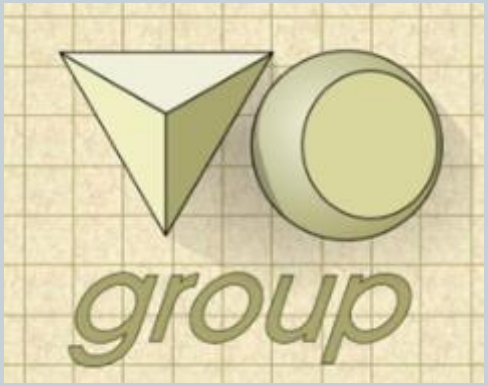
Research group working on **3D computer graphics**

part of:

Istitute of Science and Technologies of Information (**ISTI**)

part of:

Italian National Research Council (**CNR**)



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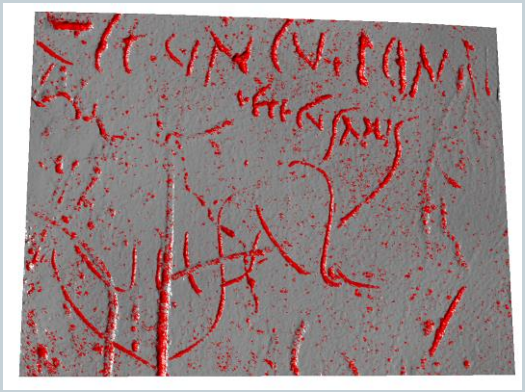
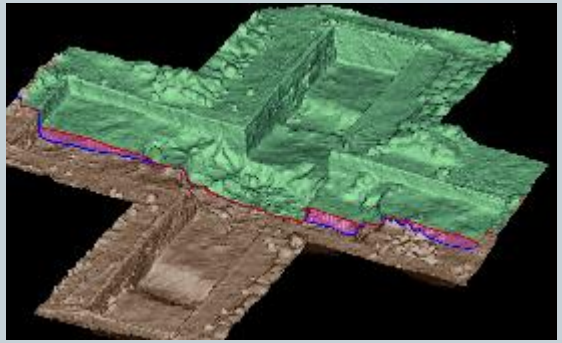
Cultural Heritage





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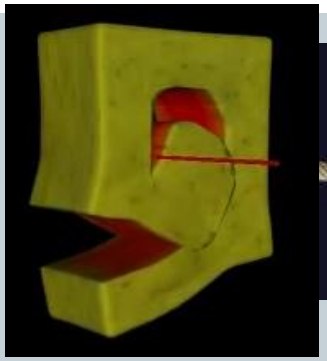
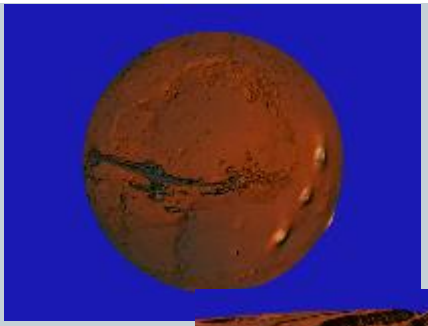
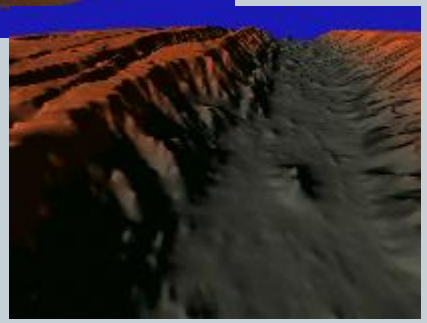
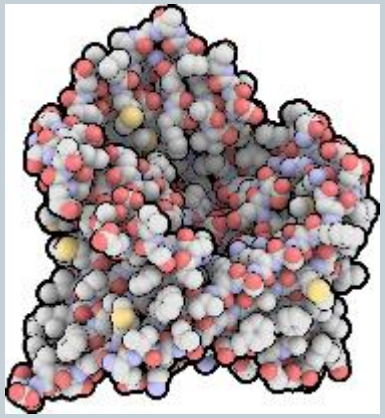
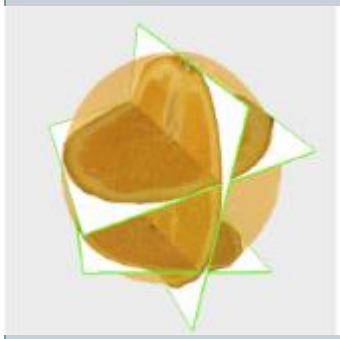
Realtime

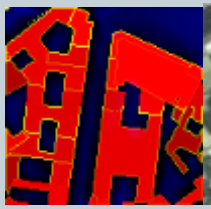


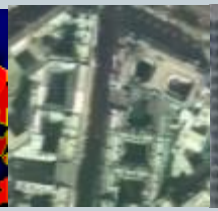












3D

Texture encoding

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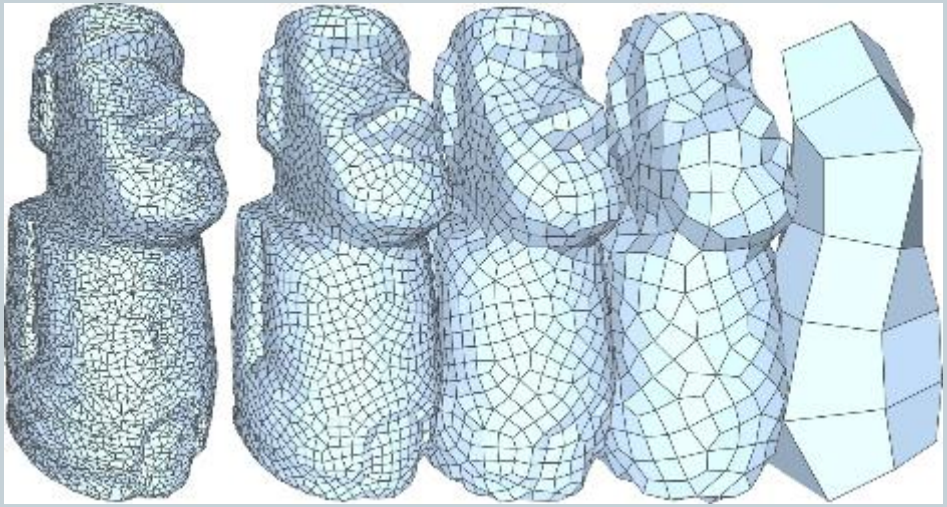
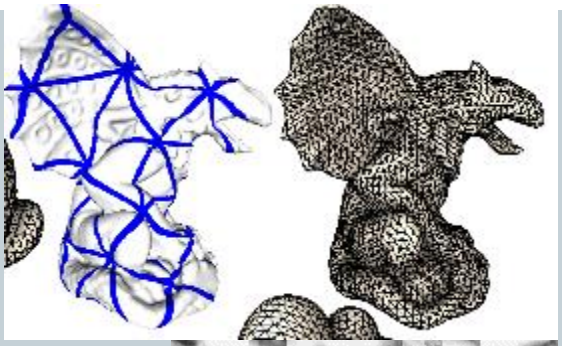
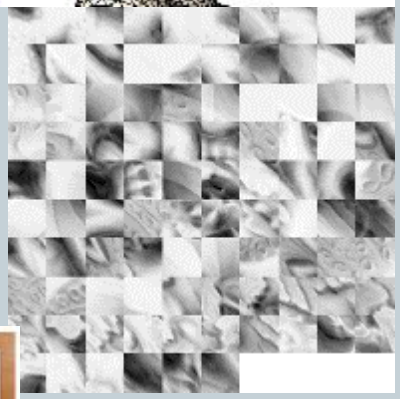
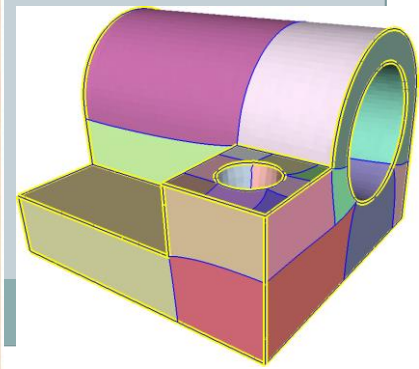
Geometry Processing









Our Lab

We work in different practical projects (especially in CH), but we are computer scientists... So, beside methodologies, we work on software tools...

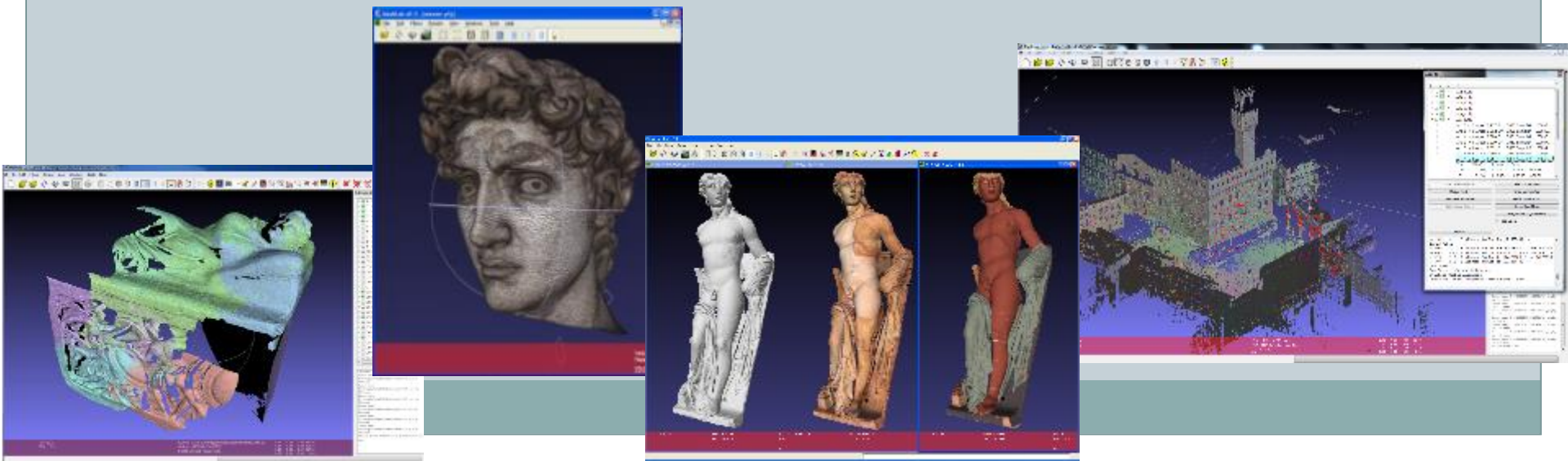
Beside custom tools for one-shot o internal use, we maintain set of tools for the community:

- **MeshLab:** open source tool for 3D mesh processing, editing and visualization
- **3DHOP:** open source tool for 3D visualization on the web
- **Relight**: software for creating and visualizing RTI

MeshLab

MeshLab is an Open Source mesh processing tool, oriented to the management of dense triangular meshes and 3D data coming from 3D scanning devices…

Started as final project for a university course in 2005, it evolved into a powerful and advanced tool for mesh visualization and editing.



MeshLab Facts

- **Open Source**: all code distributed with GPL licence, the main repository is on GitHub
- **Multiplatform**: installers available for Win64, and MacOS; on Linux platform with AppImages
- **Plugin based**: modular structure for easier addition of new features, lots of state-of-the art algorithms, often implemented by the authors themselves

MeshLab Facts

- Hundreds of universities and research centres around the world are using MeshLab.
- MeshLab is used in may fields: Computer graphics labs, CH operators, biological/medical/physics research centres, government offices, forensic analysis, military, manufacturing industry and more...
- Many independent 3D scanner, printers and specialized 3D hardware producers suggest MeshLab as viewer/processing tool

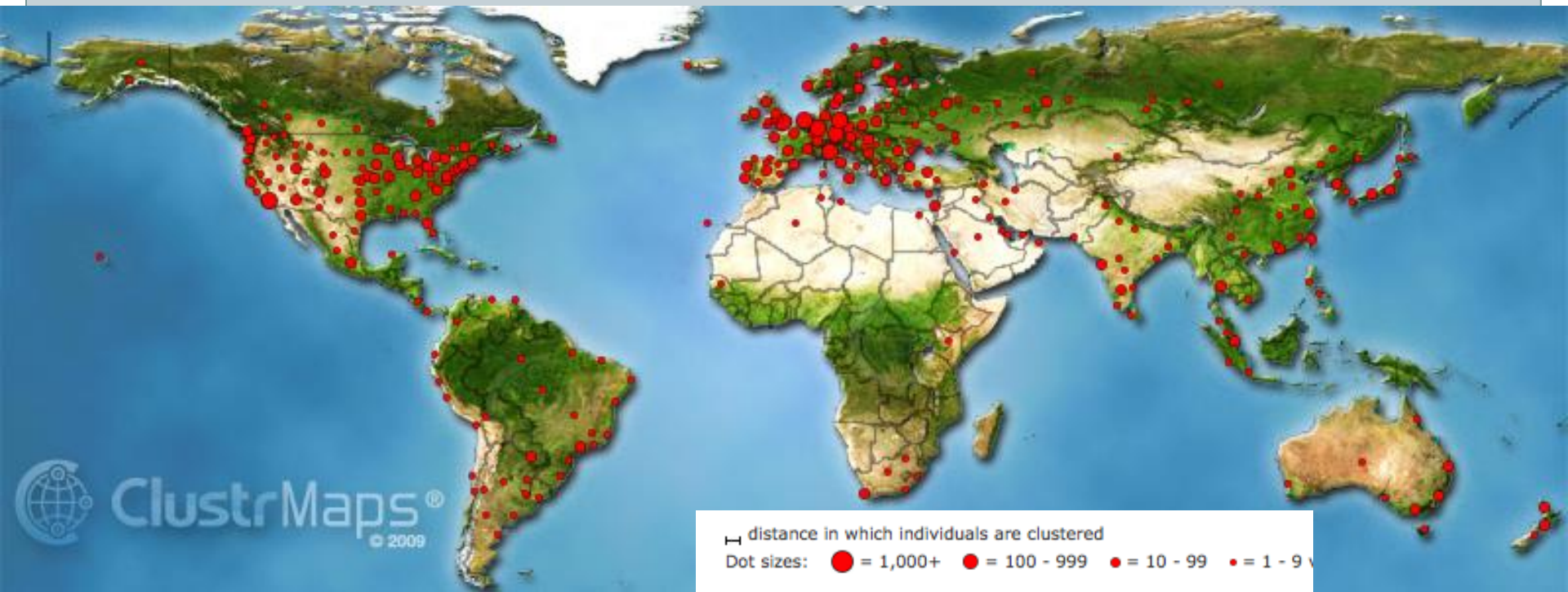
Last but not least: **we are using it for real things!**

MeshLab Facts

MeshLab had more than **3.000.000** downloads (2016), with 30-40K downloads per month.

We have a raising trend, with thousands of regular power users…

(people with more than 1k mesh processed).



MeshLab Philosophy

MeshLab provides a series of self-contained, independent operations, often offering different alternative methods for the same task.

This lets the user choose the best tool for the job…

Just like a **Swiss-Army Knife**…

Unfortunately, this means that, sometimes, you will need to try a lot of blades, until you find the correct one ☺

An ongoing effort

The current version

Automatic releases every month

- macOS installer
- Win64 installer or «live» folder
- Linux appimage

Meshlab.net

https://github.com/cnr-isti-vclab/meshlab/releases/

The current version

When you try to install it, you will receive lots of warnings, because the executable is not yet «signed»

You always have to ask for more info, then accept…

Resources

MeshLab Resources

Where can I download MeshLab?

http://www.meshlab.net

https://github.com/cnr-isti-vclab/meshlab

www.facebook.com/MeshLab

A lot of user-uploaded tutorials and how-to… just search the web. BE CAREFUL WITH THE VERSION!

Mr P. MeshLab Tutorials

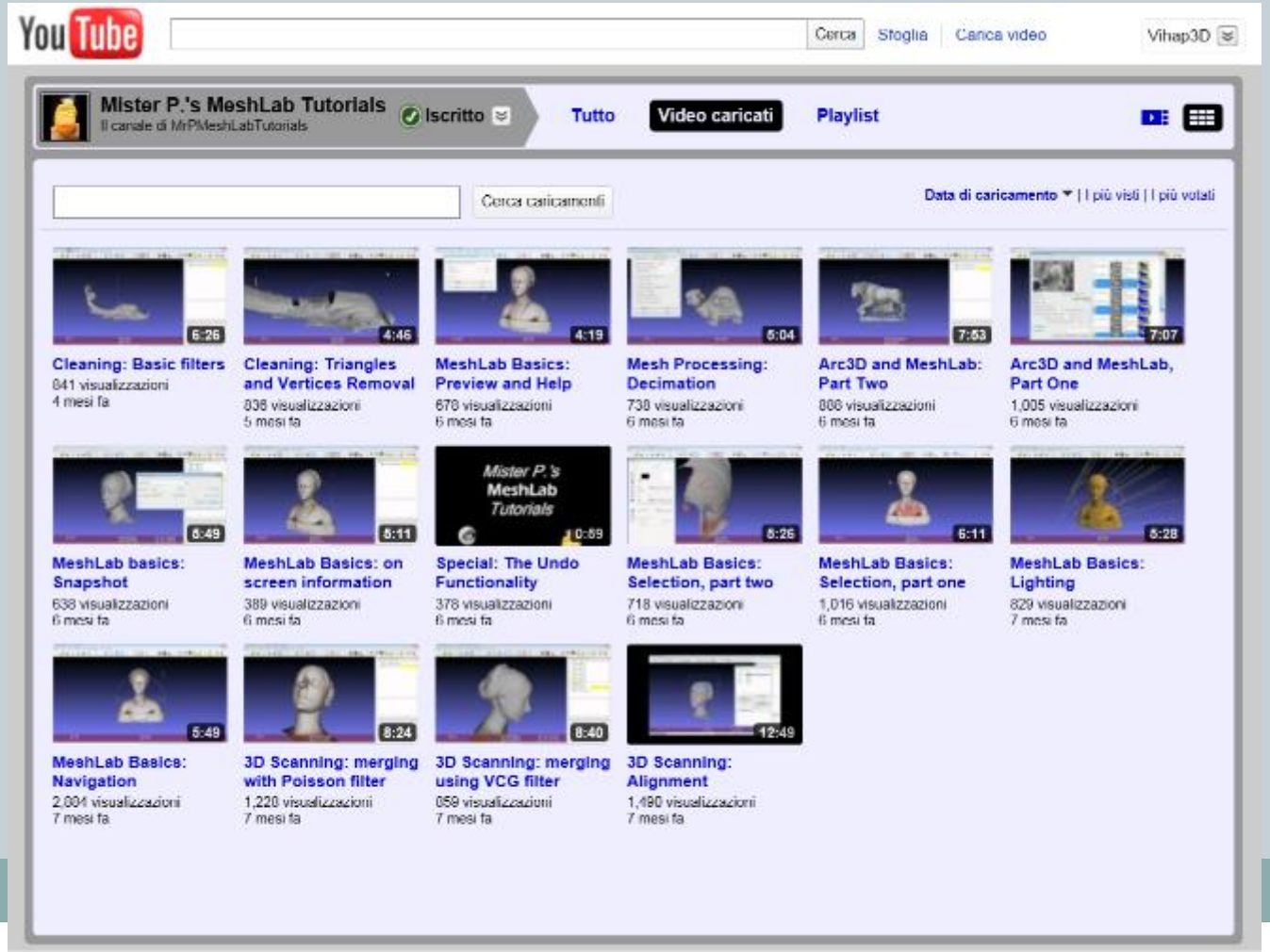
Mr P. is a silent but invaluable companion in our travels... He is also an expert MeshLab user...

On YouTube, there is a channel with various video tutorials on MeshLab usage....

The tutorials cover the basics and most of the most useful features of the tool; new tutorials are uploaded (almost) regularly

Mr P. MeshLab Tutorials

www.youtube.com/user/MrPMeshLabTutorials



HOW ?

From ground up…

MeshLab is not the friendliest tool you will find around… So, in order to learn how to use it, better start from the basis

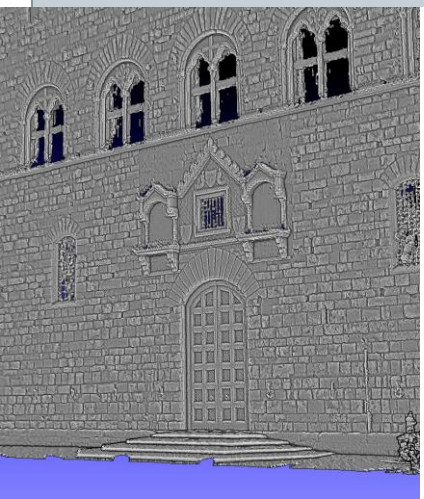
MeshLab can be useful even just as a **free viewer/converter** for yourself, you partners, your clients…

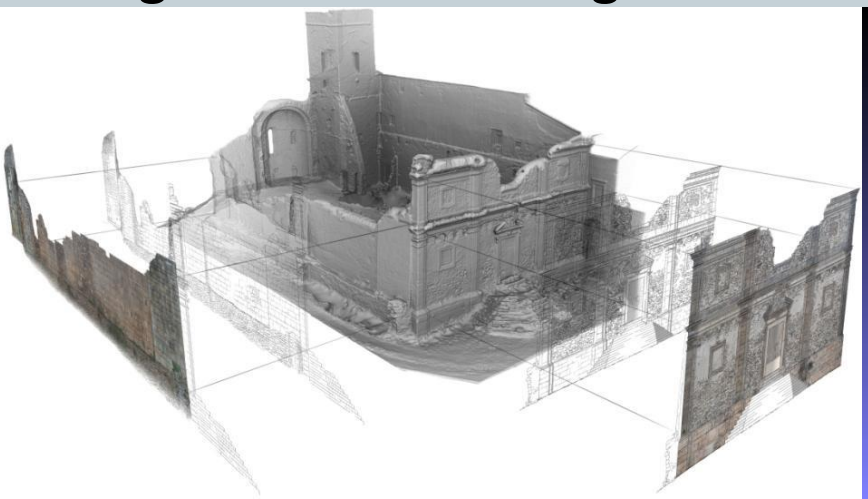
- Many input/output formats
- Free, multiplatform
- Efficient rendering, simple model navigation

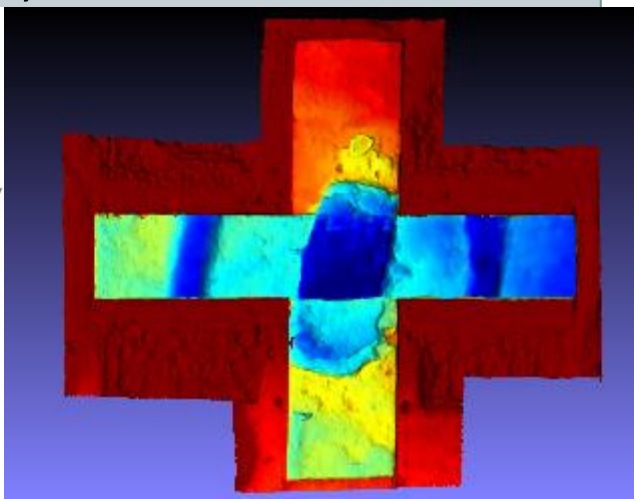
One step further

Advanced visualization: study and document your model

- **View control**: predefined views, save viewpoints
- **Measuring**: size, distances, colour mapping of info
- **Decorators**: add elements showing measures, axis and other info
- **Rendering**: controlling light, rendering modes, shaders
- **Screenshots**: high resolution image creation, referenced







Not just visualization

MeshLab is also an editing tool; you may start by using some of the general-purpose editing operations:

- **Simplification**: reduce geometric complexity of triangulated mesh and pointclouds
- **Basic editing**: automatic and manual selection of parts, to delete them or split the object
- **Automatic filtering**: remove topological errors, parametric modification of geometry, smoothing,
- **Transformations**: rotates, translate, scale, center, re-orient

More complex stuff

Then, move on to more complex processes, involving manual input and chain of operations:

- **Scanning Pipeline**: going from raw 3D data to a usable model
- **Colour mapping**: map colour from photos, generate and edit texture or per-vertex encoding
- **3D Model optimization**: strongly modify the geometry of your meshes or pointclouds

PyMeshLab

New feature: it works, but still under development!

MeshLab functionalities can be called from within a Python environment.

This is useful for scripting and batchig.

The winding road

You do need a specific feature?

Write your own plugin ☺

MeshLab is open source, and it is possible to compile it with free tools. MeshLab source is on *GitHub*, tutorials on how to build it are available. Standard C++, plus some dependencies

Let us start

THANKS FOR YOUR ATTENTION…

callieri@isti.cnr.it

www.meshlab.net

www.facebook.com/MeshLab