A MeshLab Primer

MARCO CALLIERI
VISUAL COMPUTING LAB
ISTI-CNR PISA, ITALY

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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

callieri@isti.cnr.it

Beside this:
an eclectic artisan, an avid gamer, a former biker, a good cook, an incorrigible geek... and much more
Research group working on **3D computer graphics**

part of:

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

part of:

Italian National Research Council (**CNR**) 

http://vcg.isti.cnr.it
Visual Computing Lab

Cultural Heritage
Visual Computing Lab

Realtime

3D Texture encoding
Visual Computing Lab

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 or internal use, we maintain set of tools for the community:

- **VCG Lib**: open source C++ library for 3D data structures management
- **MeshLab**: open source tool for 3D mesh processing, editing and visualization
- **3DHOP**: open source tool for 3D visualization on the web
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; officially supported by Ubuntu and other Linux distributions as packages (thanks to external help)

- **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 many 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 had more than **3,000,000** downloads, 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 new version

Last version released **MeshLab 2016**! (actually, december 2016)
We are close to a new release (I will give you a beta)

The main change has been the fully GPU-based rendering system, updated to better use accelerated video cards. Plus, a lot of bug-fixing, and some new features added.

Windows (64bit) & MacOS, plus Linux (sources or snap package, other pre-mae packages options still in progress)
Changes, right ahead

Sourceforge is becoming unreliable, the new release has been made available on GitHub.

A new website has been launched with the new release, containing links to all the available resources.
We will post more news/resources/links on the Facebook page

Updated video tutorials and HOW-TOs will be published as soon as the new version is out.
Resources
Where can I download MeshLab?
http://www.meshlab.net
https://github.com/cnr-isti-vclab/meshlab

Where can I get info about MeshLab?
meshlab.sourceforge.net/wiki/index.php/MeshLab_Documentation

www.facebook.com/MeshLab

A lot of user-uploaded tutorials and how-to... just search the web
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 ?
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
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
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
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
MeshLab can also operate as a command line tool, for batch processing:
- define a filter “chain”
- Save the script
- Invoke meshlabserver executable on your input files

Useful for batch convert, cleaning, or to setup remote processing services. Some limitations on the available filters, but still flexible.
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 *SourceForge*, tutorials on how to build it are available. Standard C++, plus some dependencies
Let us start

callieri@isti.cnr.it
www.meshlab.net
www.facebook.com/MeshLab