

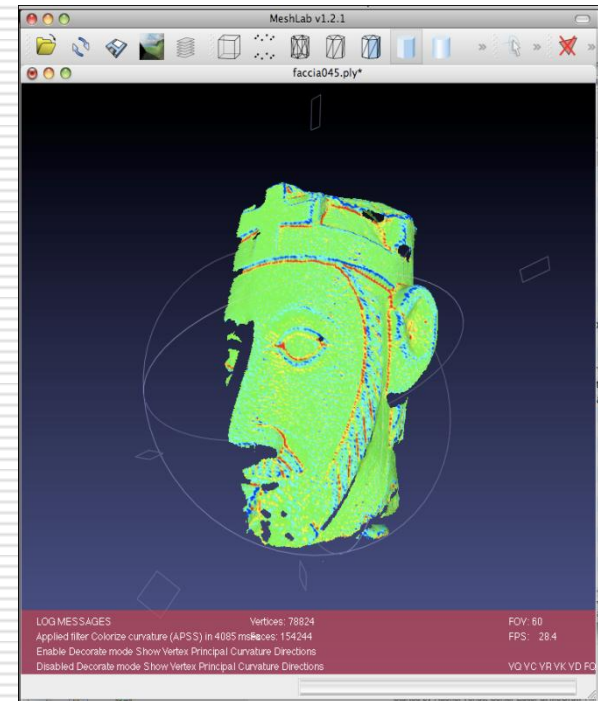
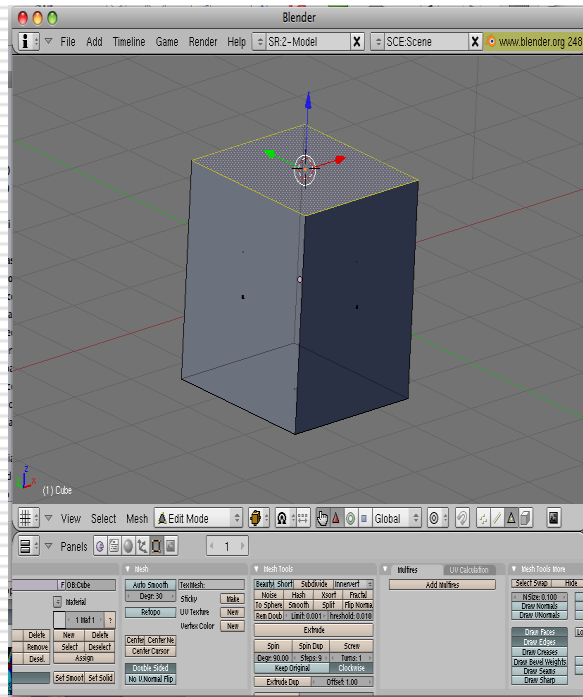


Grafica 3D per i beni culturali: MeshLab intro and basics

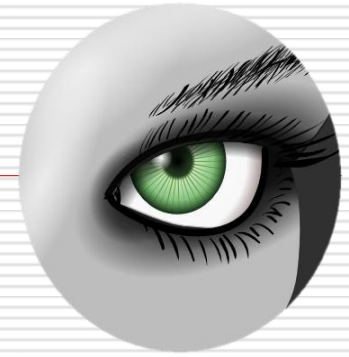
15 Marzo 2013

Editing vs Processing

- ❑ Manual modifications
- ❑ User authors the results
- ❑ Semi-automatic processing
- ❑ User supervises a process



MeshLab



- ❑ Developed at ISTI-CNR
 - ❑ 3D-COFORM Project
 - ❑ Targeted to supervised Mesh Processing
 - 3D scanning tools
 - Hundred of filters
 - With some simple editing functionalities
 - ❑ Painting
 - ❑ Selecting
-

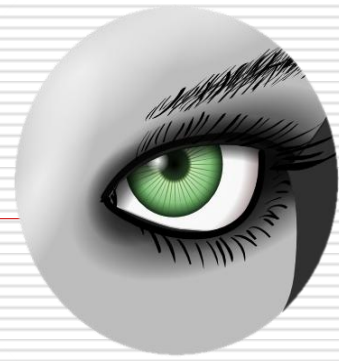
MeshLab: Where?!?

- MeshLab website
 - <http://meshlab.sourceforge.net/>
 - MeshLab SVN repository
 - <https://meshlab.svn.sourceforge.net/svnroot/meshlab/trunk/meshlab>
 - MeshLab download page
 - <http://sourceforge.net/projects/meshlab/files/>
 - MeshLab online help (devoted to programmers)
 - http://meshlab.sourceforge.net/wiki/index.php/MeshLab_Documentation
 - MeshLab blog
 - <http://meshlabstuff.blogspot.com/>
 - MeshLab forum (Help)
 - <http://sourceforge.net/projects/meshlab/forums/forum/499533>
 - MeshLab's "fathers"
 - <http://vcg.isti.cnr.it/joomla/index.php>
-

MeshLab Philosophy

- GPL license
 - Free download
 - You can read MeshLab code
 - You can freely change it
 - New developers are welcome!
 - If they don't touch my code 😊
 - Effective Plugin Architecture
 - MeshLab **is not** monolithic
 - Flexibility
 - Increase code production
 - Decrease compilation time
 - You can assemble your own MeshLab release
-

MeshLab Basics



- MeshLab's Mesh**
 - Files Manipulation & Formats**
 - TrackBall & Lighting manipulation**
 - Layers Management**
 - Selection Mode**
 - Render Mode & Shading**
 - Filters and Filter Prerequisite**
 - Snapshot**
-

MeshLab's Mesh



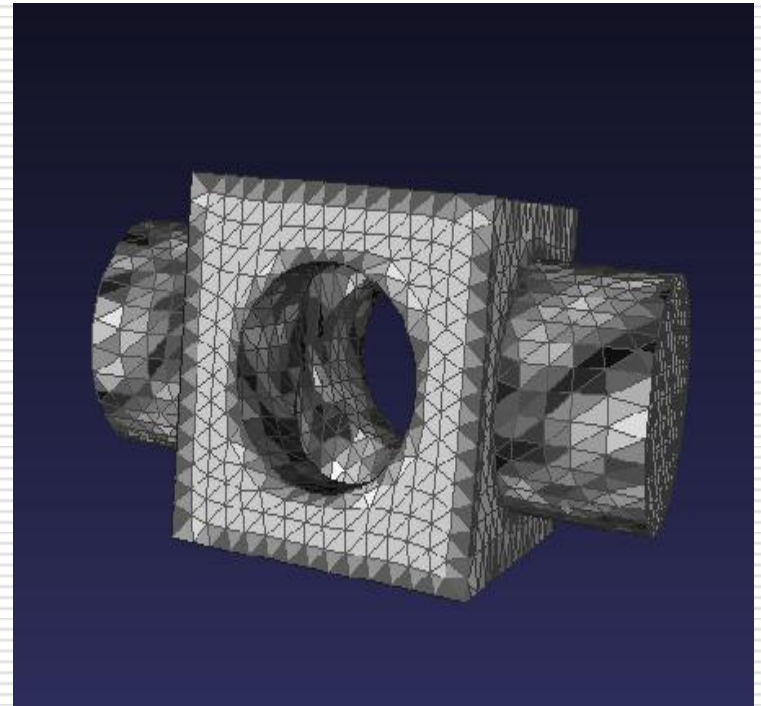
MeshLab's Vertex Attributes

- ❑ Position - 3d coords
- ❑ Normal - 3d vector
- ❑ Color - rgba color
- ❑ Texture Coordinates - 2d coords
- ❑ Quality - number
- ❑ Some other stuff (flags, radius)



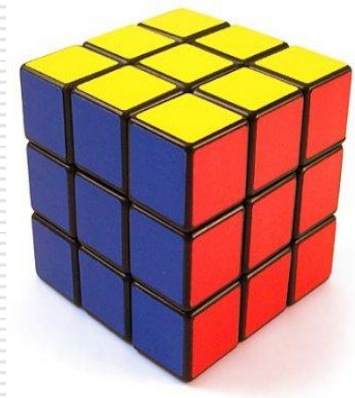
MeshLab's Face Attributes

- Color – rgba color
- Normal – 3d vector
- Quality – number
- Vertices' indices – 3 indices



Wedge

- More than edges in MeshLab we focus in attributes for wedge
- What is wedge?!?
 - A single vertex is part of more than one face
 - A vertex's attribute value could be different depending on the face

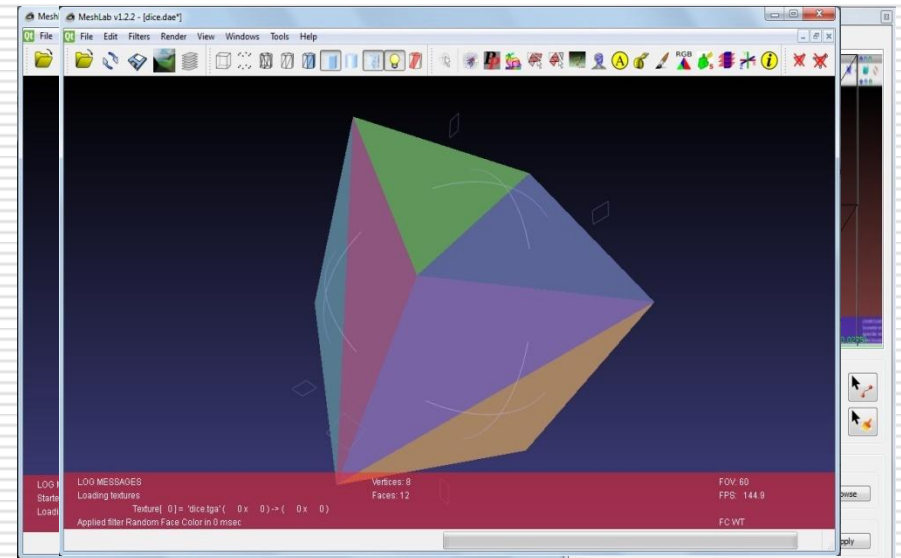


MeshLab's Wedge

□ Texture Coords – 2d coords

□ Color – rgba color

□ Normal – 3d vector



Files Manipulation & Formats



Supported File Formats

- Many Input/Output formats supported
 - **Import:**
 - PLY, STL, OFF, OBJ, 3DS, COLLADA, PTX, V3D, PTS, APTS, XYZ, GTS, PDB, TRI, ASC, X3D, X3DV, WRL, ALN...
 - **Export:**
 - PLY, STL, OFF, OBJ, 3DS, COLLADA, VRML, DXF, U3D, GTS, IDTF, X3D...
 - Raster models! JPG, PNG, XPM
 - Directly open and process the models reconstructed by the Epoch 3D Web Service (V3D) and Photosynth!
 - New MeshLab project file!!!!!!!
-

TrackBall & Lighting manipulation

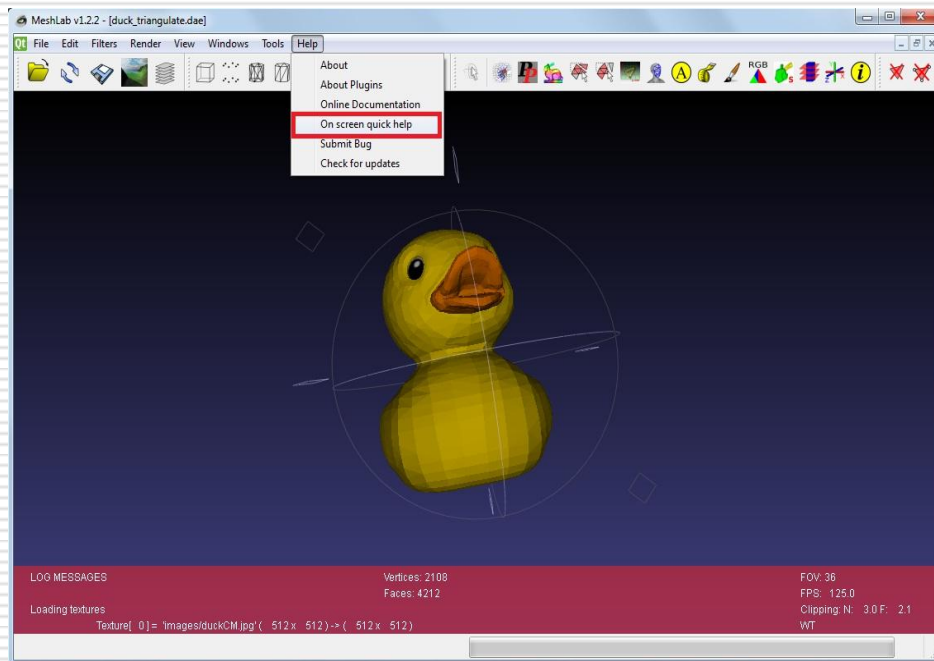


First of all...

□ Help->On screen quick help

□ Videotutorial:

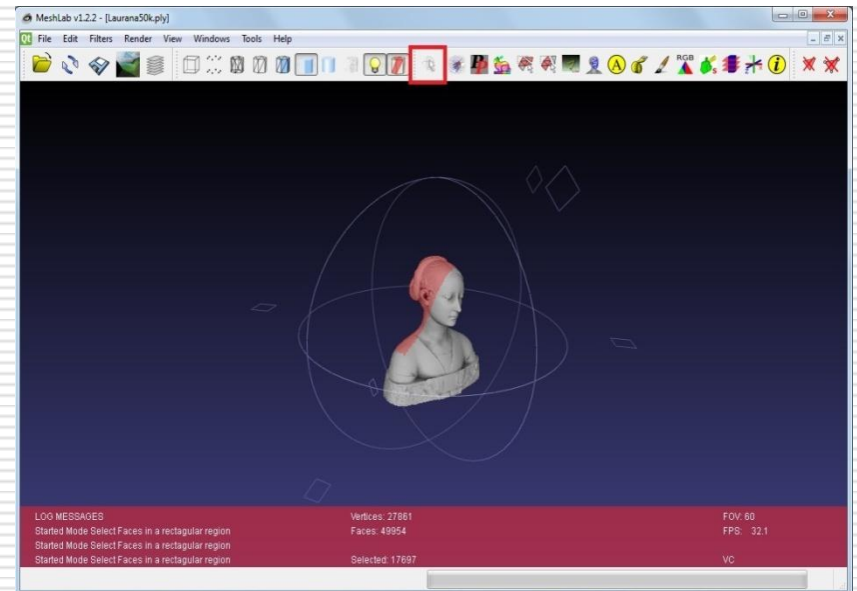
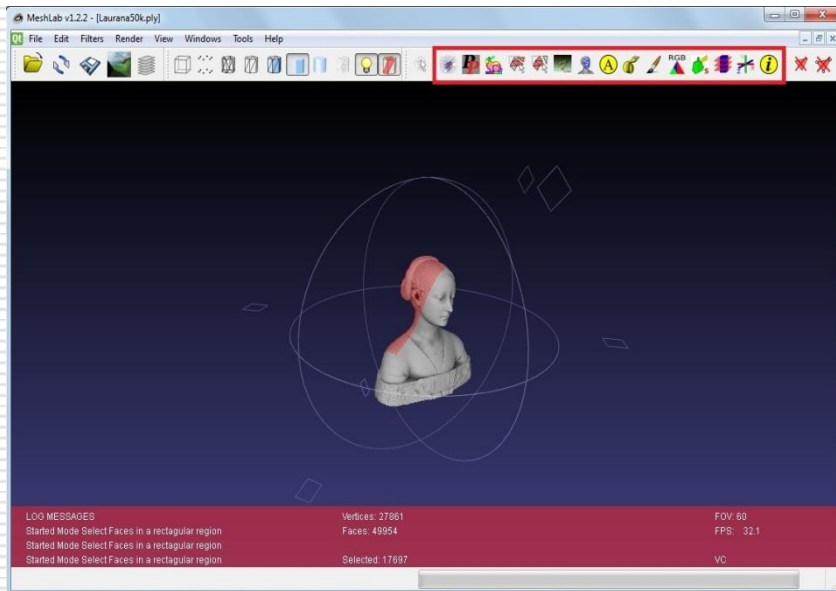
<http://www.youtube.com/watch?v=Sl0vJfmj5LQ&list=PL8B1E816EAE236B4D&index=1>



MeshLab Quick Help	
Drag:	Rotate
Ctrl-Drag:	Pan
Shift-Drag:	Zoom
Alt-Drag:	Z-Panning
Ctrl-Shift-Drag:	Rotate light
Wheel:	Zoom
Shift-Wheel:	Change perspective
Ctrl-Wheel:	Move far clipping plane
Ctrl-Shift-Wheel:	Move near clipping plane
Double Click:	Center on mouse
F1:	Toggle this help
Alt+enter:	Enter/Exit fullscreen mode

Trackball Mode

- ❑ Trackball mode is the starting interaction mode
- ❑ Clicking on an icon of edit toolbar switch to edit mode
- ❑ to turn back to Trackball mode
 - Click again on the same icon
 - Click on Trackball mode icon



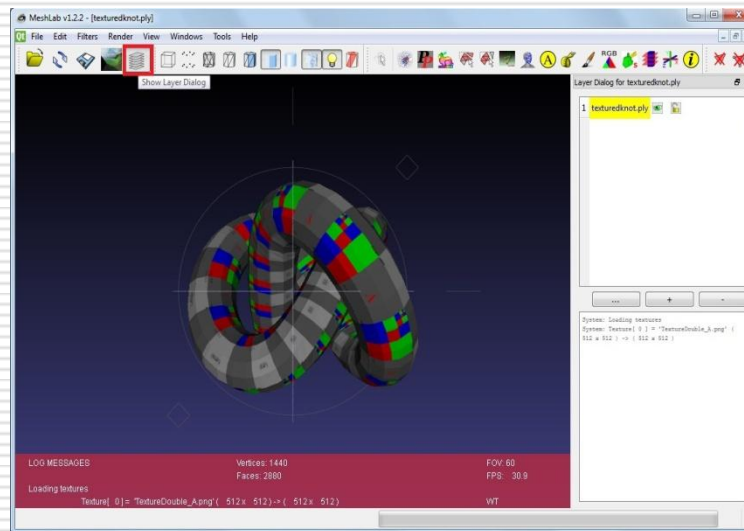
Layers Management



Layer

- Layer Dialog icon in toolbar
- Videotutorial:

http://www.youtube.com/watch?v=-US_EJzL8Ts&list=PL8B1E816EAE236B4D&index=9

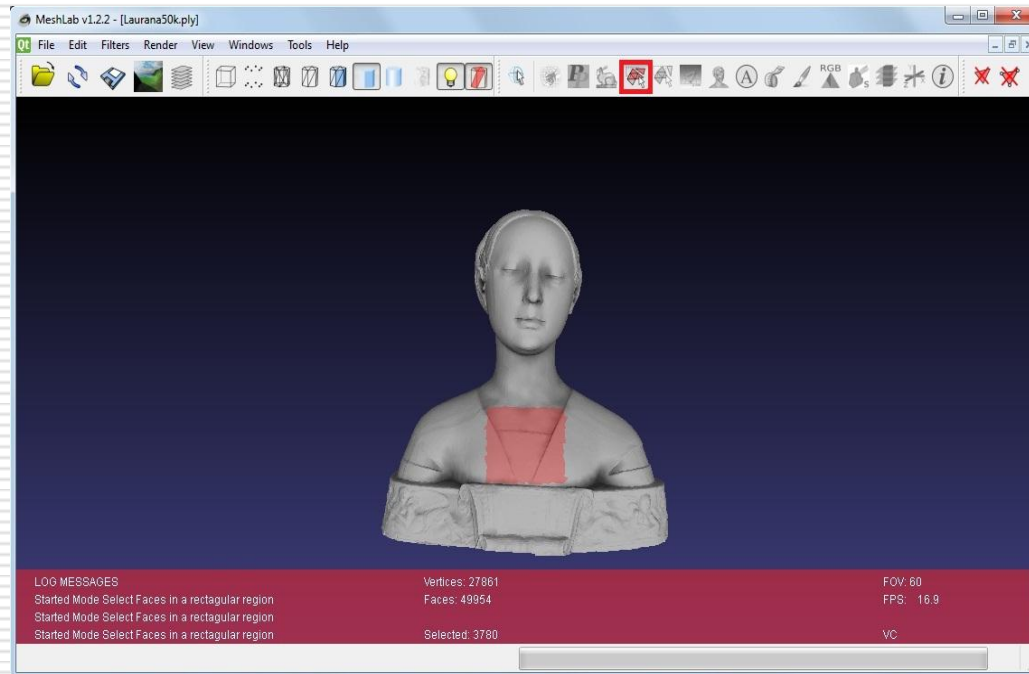


Selection Mode



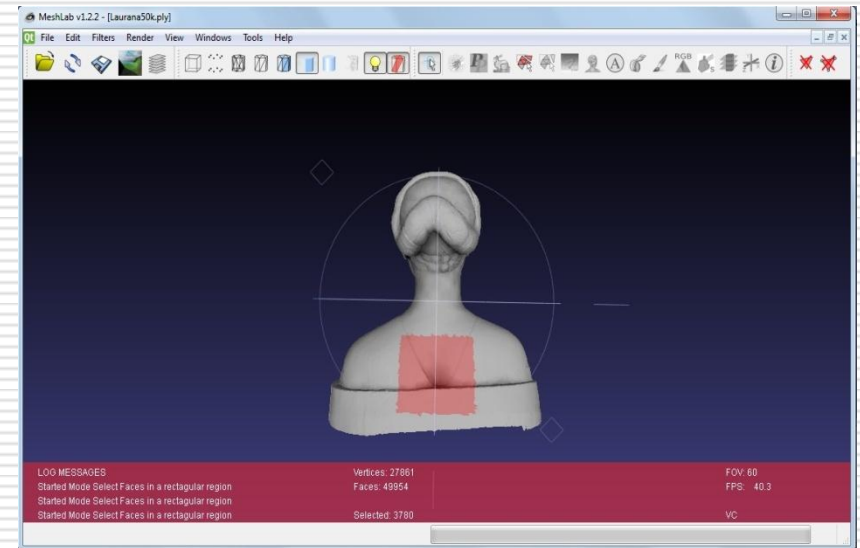
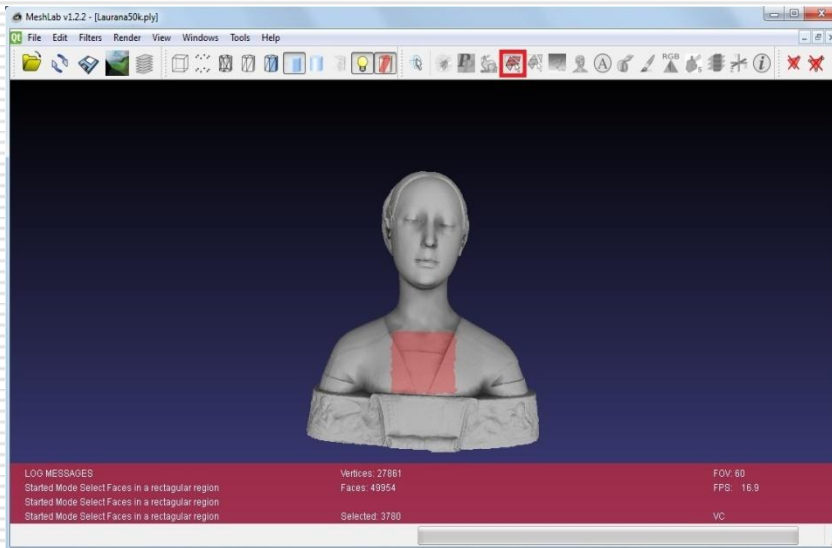
Selection (1)

- Selection is a key operation
 - remove useless/"wrong" geometry



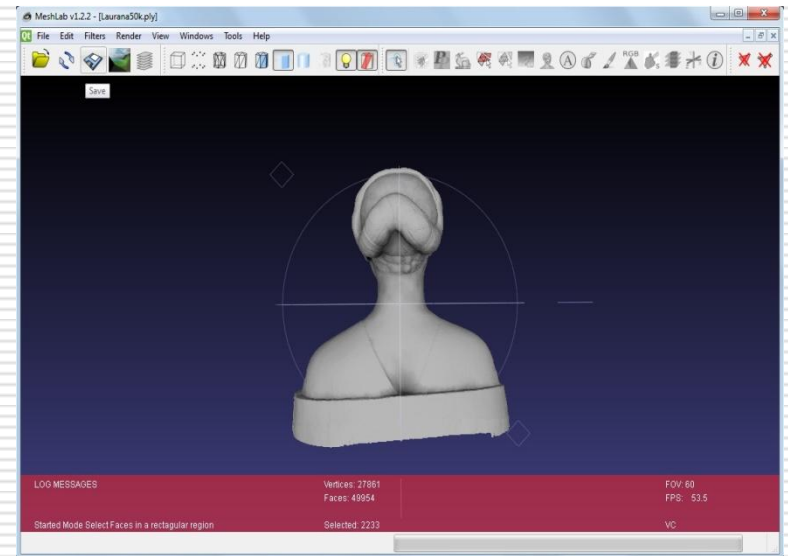
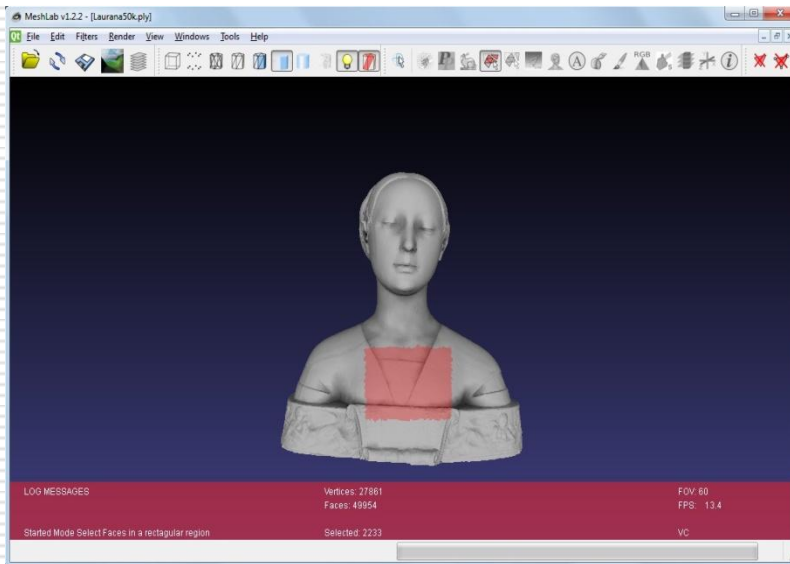
Selection (2)

- ❑ In MeshLab many kind of selection!
- ❑ The base one is double sides selection
 - Selecting a front area means selecting also back one!



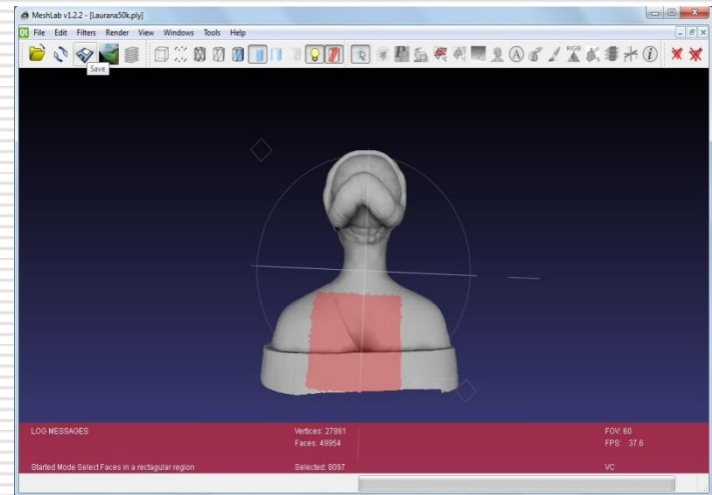
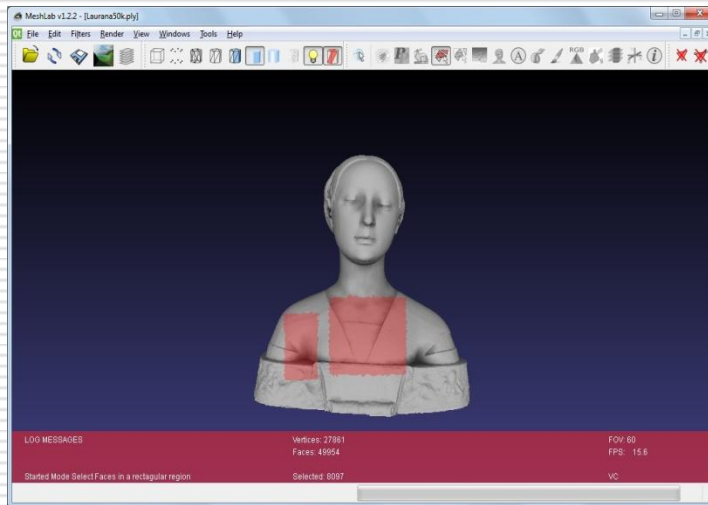
Selection (3)

- Select only front area
 - Switch on Selection Mode
 - Alt + drag (eye icon)



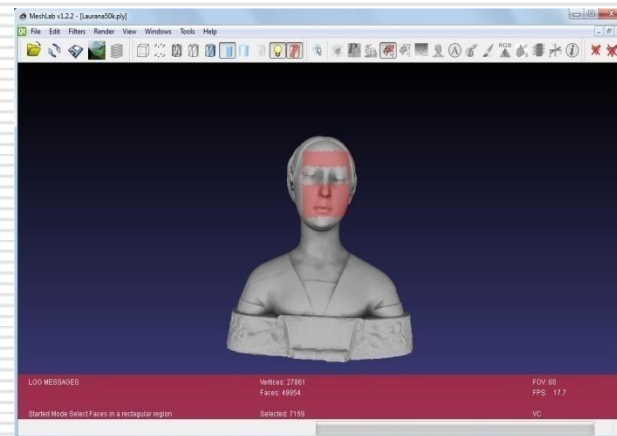
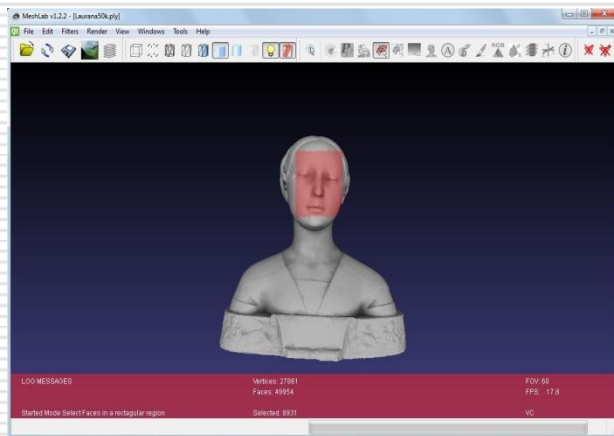
Selection (4)

- Add a new selected area to a previous one
 - Switch on Selection Mode
 - Ctrl + drag (“+” icon)
 - Could be used in conjunction with “only front selection” (eye and “+” icon)



Selection (5)

- Remove a sub area from a selection
 - Switch on Selection Mode
 - Select an area
 - Shift + drag ("-" icon)
 - Could be used in conjunction with "only front selection" (eye and "+" icon)
- Videotutorial:
<http://www.youtube.com/watch?v=xj3MN7K6kpA&list=PL8B1E816EAE236B4D&index=5>

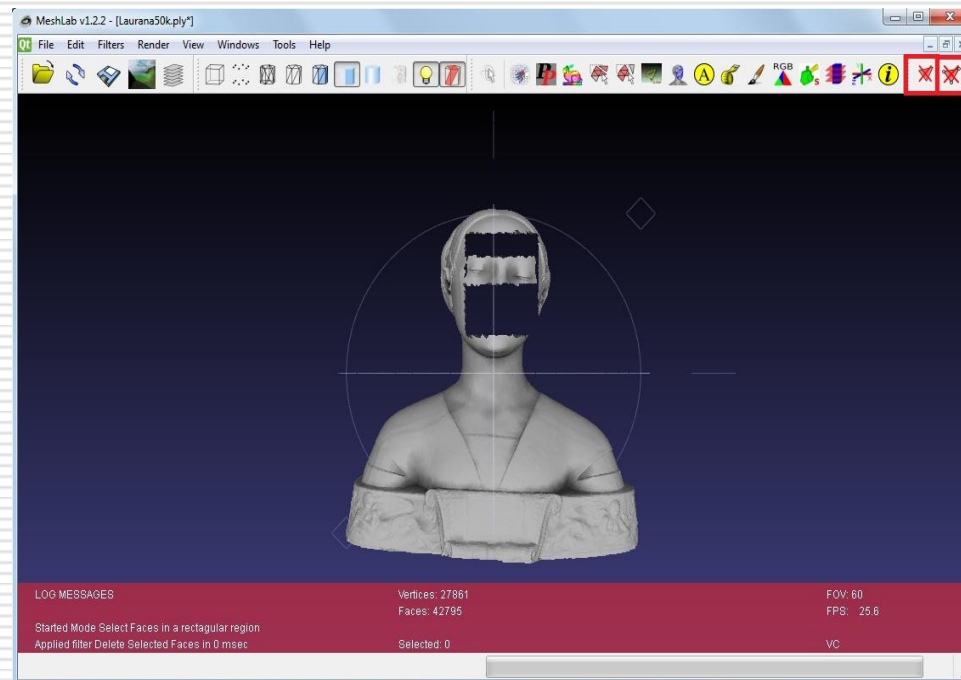


Selection (6)

- ...and many others
 - Small pieces
 - Quality
 - Erosion
 - Expansion
 - Connected Component
 - We will discover them during the course...
-

Delete Faces and/or Vertices

-  Remove only faces (but not unref vertices)
-  Remove faces and vertices

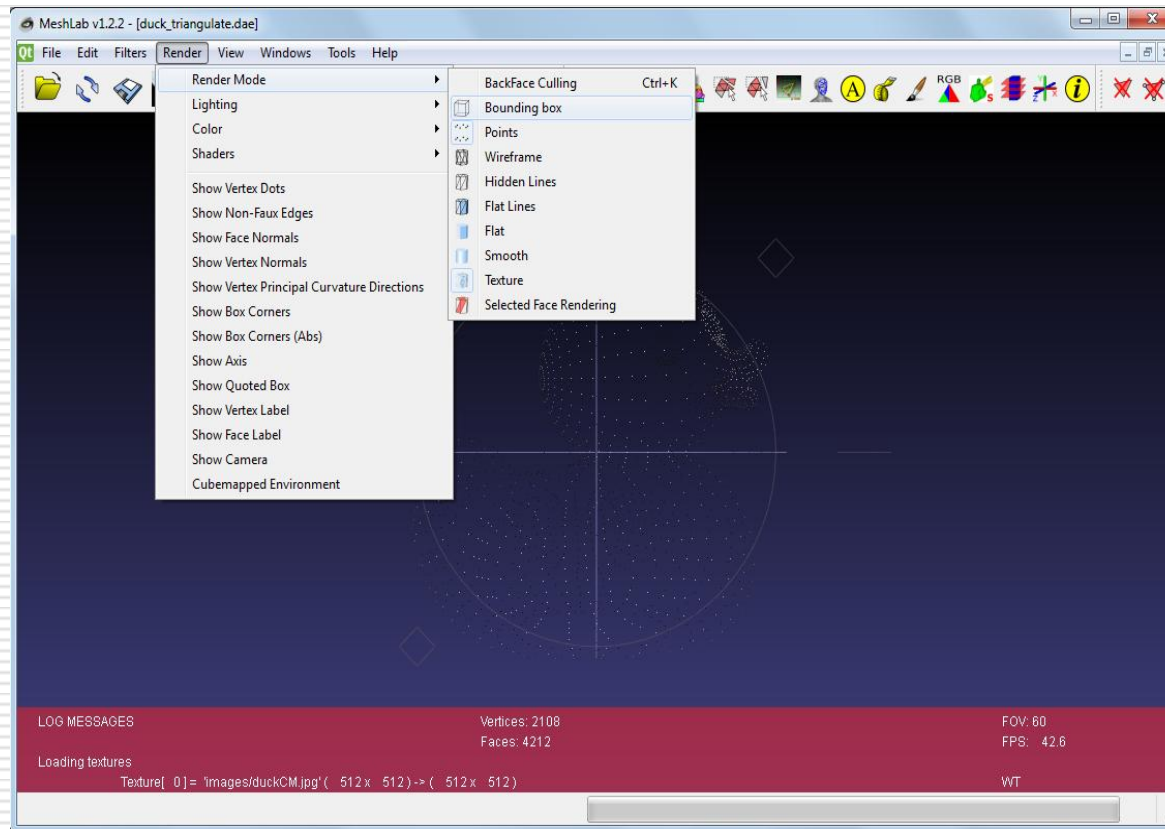


Render Mode & Shading

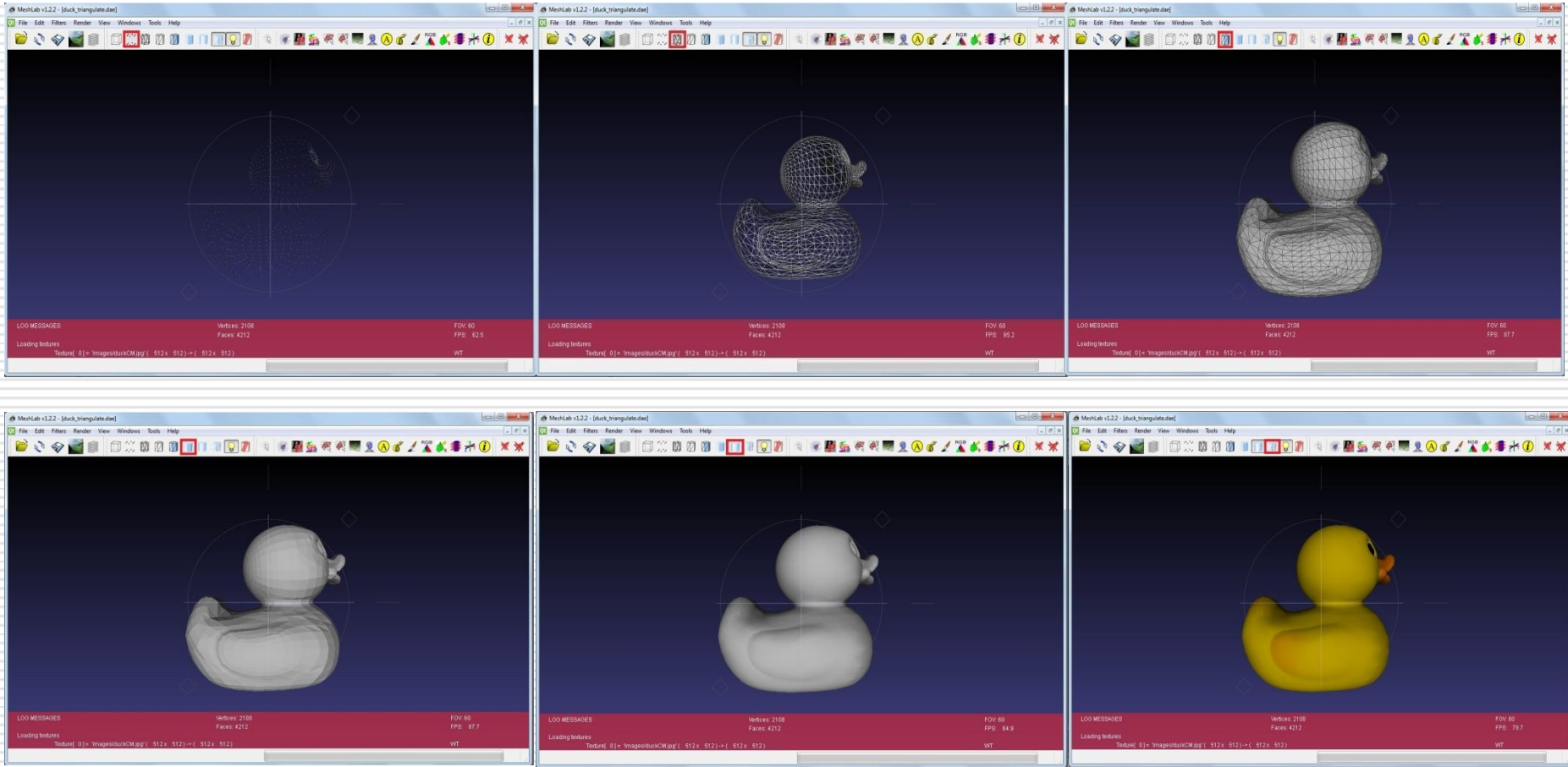


Render Mode

□ Render->Render Mode

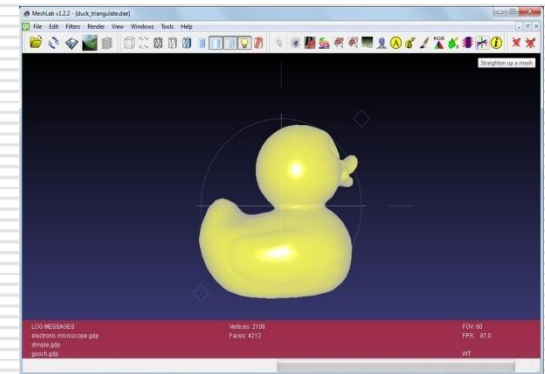
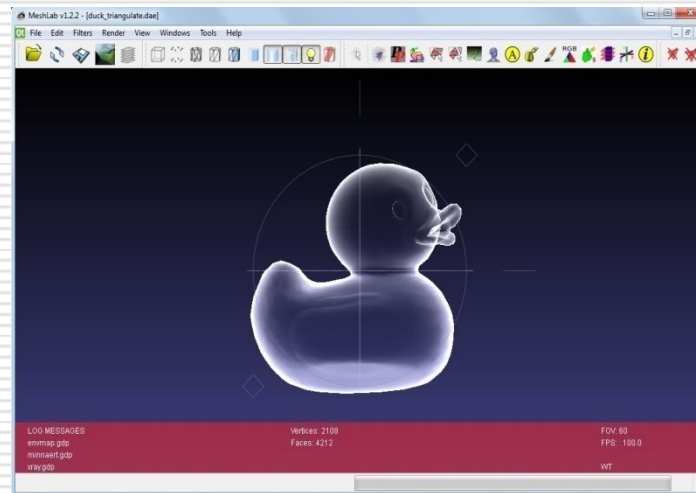
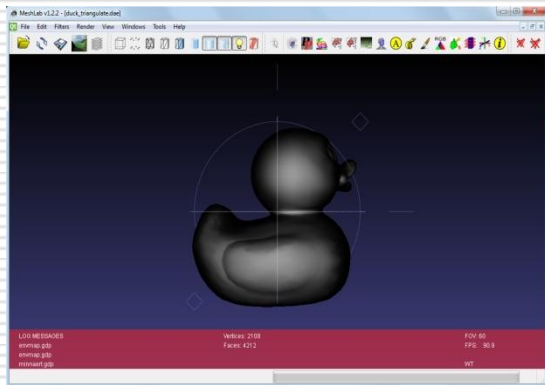


Basic Rendering Mode



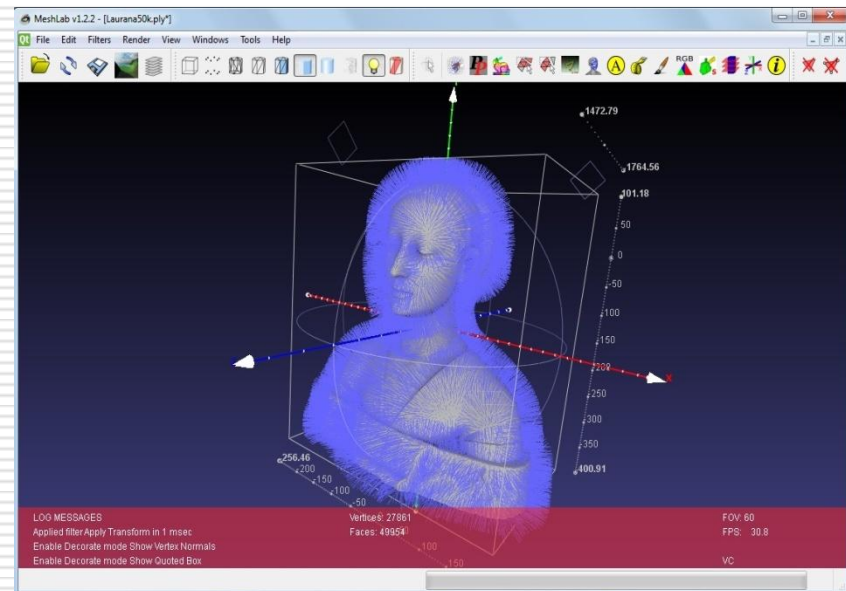
Shading Mode

- ❑ Shading Model == a computational model to simulate how light interact with a 3d Object
- ❑ Render->Shader



Decorate Mode

- Render submenu
- Adding visual info of the Mesh
 - Per face/vertex normals
 - Mesh's Bounding box (quoted)
 - Principal axis



Filters and Filters' Prerequisite

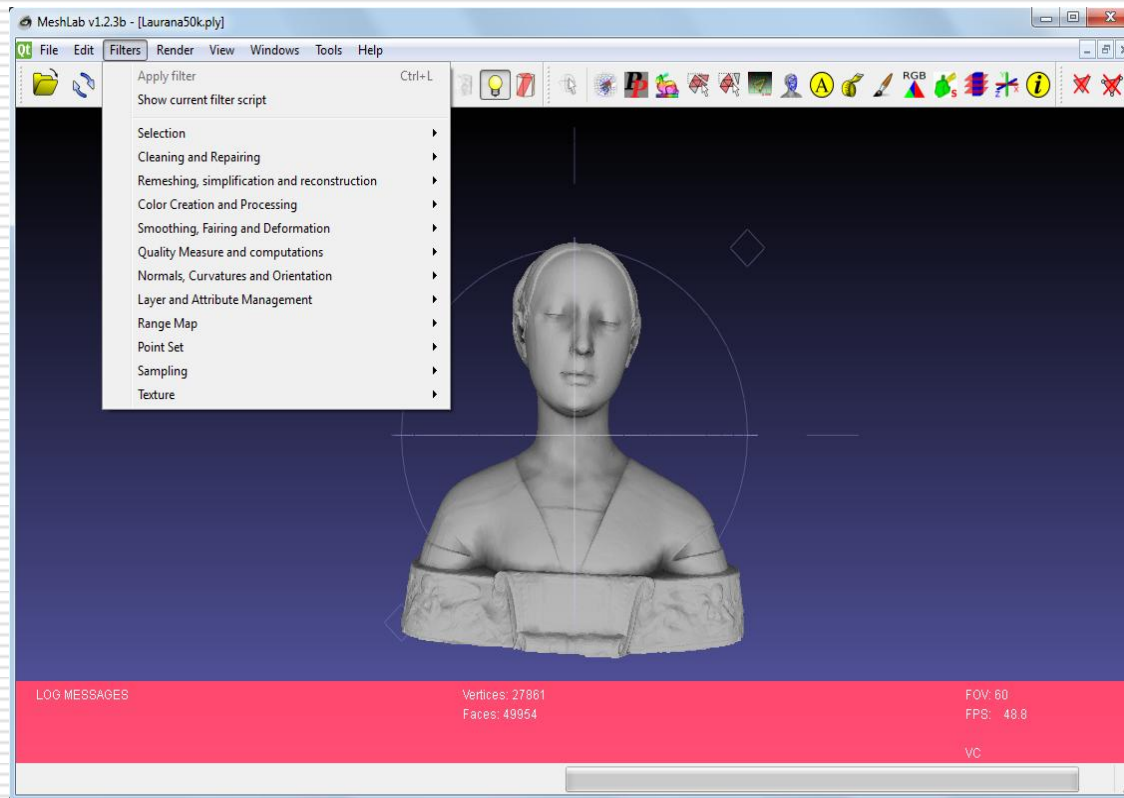


Filters

- What is a Filter?!?
 - Automatic algorithm that can be applied to a mesh
 - In MeshLab a filter changes the state of a mesh
 - Vertex position
 - Color
 - Quality
 - Normal
 - Triangulation
 - etc
 - > 100 different filters in MeshLab
-

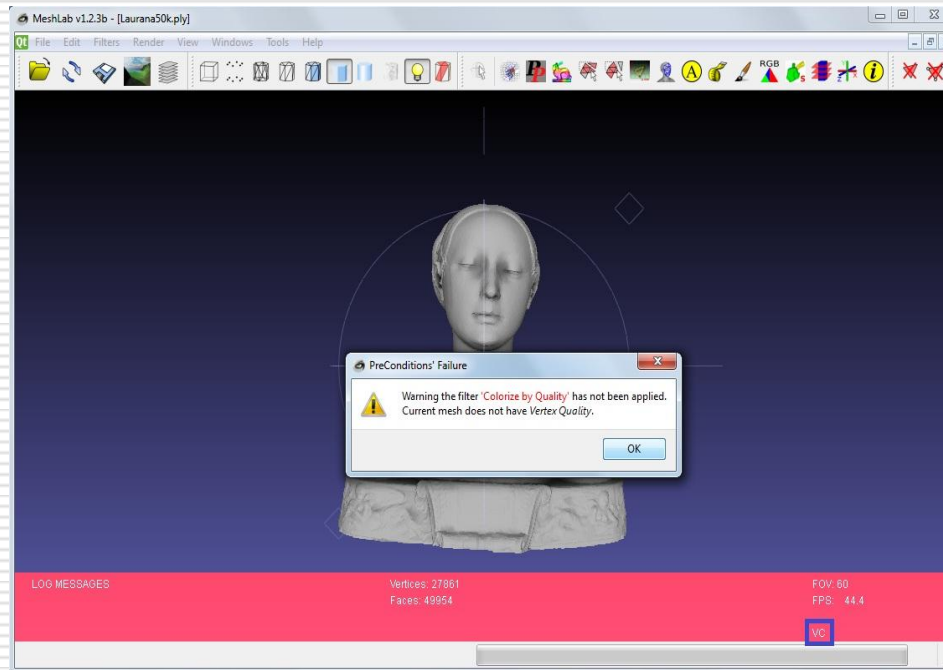
MeshLab's Filters

□ Filters Menu



Filter Prerequisites

- Some filters need that some mesh's attributes have been defined
 - colorize a mesh by quality implies VQ presence



SnapShots

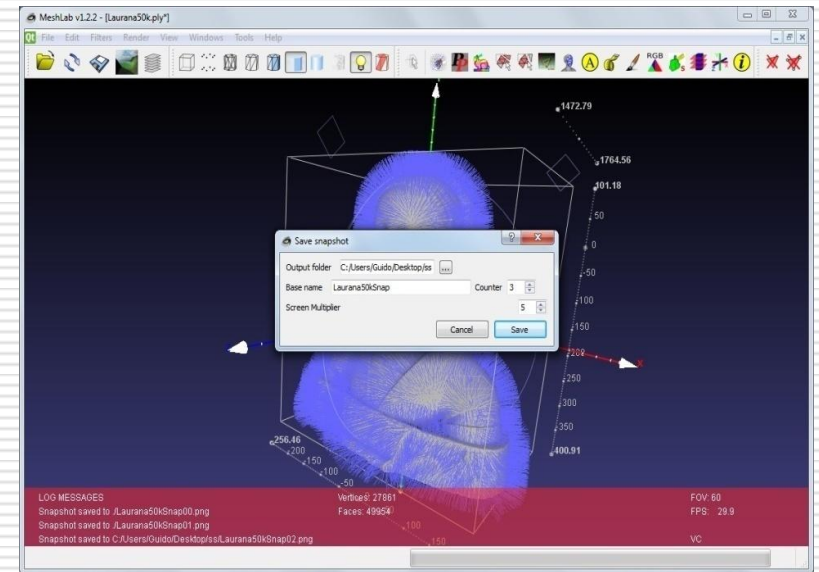
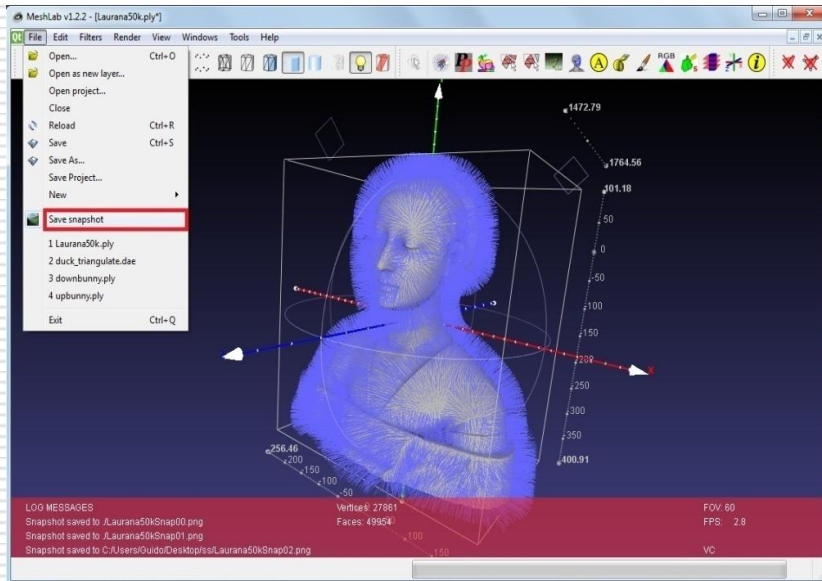


SnapShots

- ❑ MeshLab exports his rendering context in high resolution
 - Could be useful for documentation
- ❑ Png image format

Videotutorial:

<http://www.youtube.com/watch?v=wlOIfue-ilU&list=PL8B1E816EAE236B4D&index=7>



Next in line...

Next lesson:

- 3D Scanning in MeshLab

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