

# Introducción a la Fotogrametría Digital

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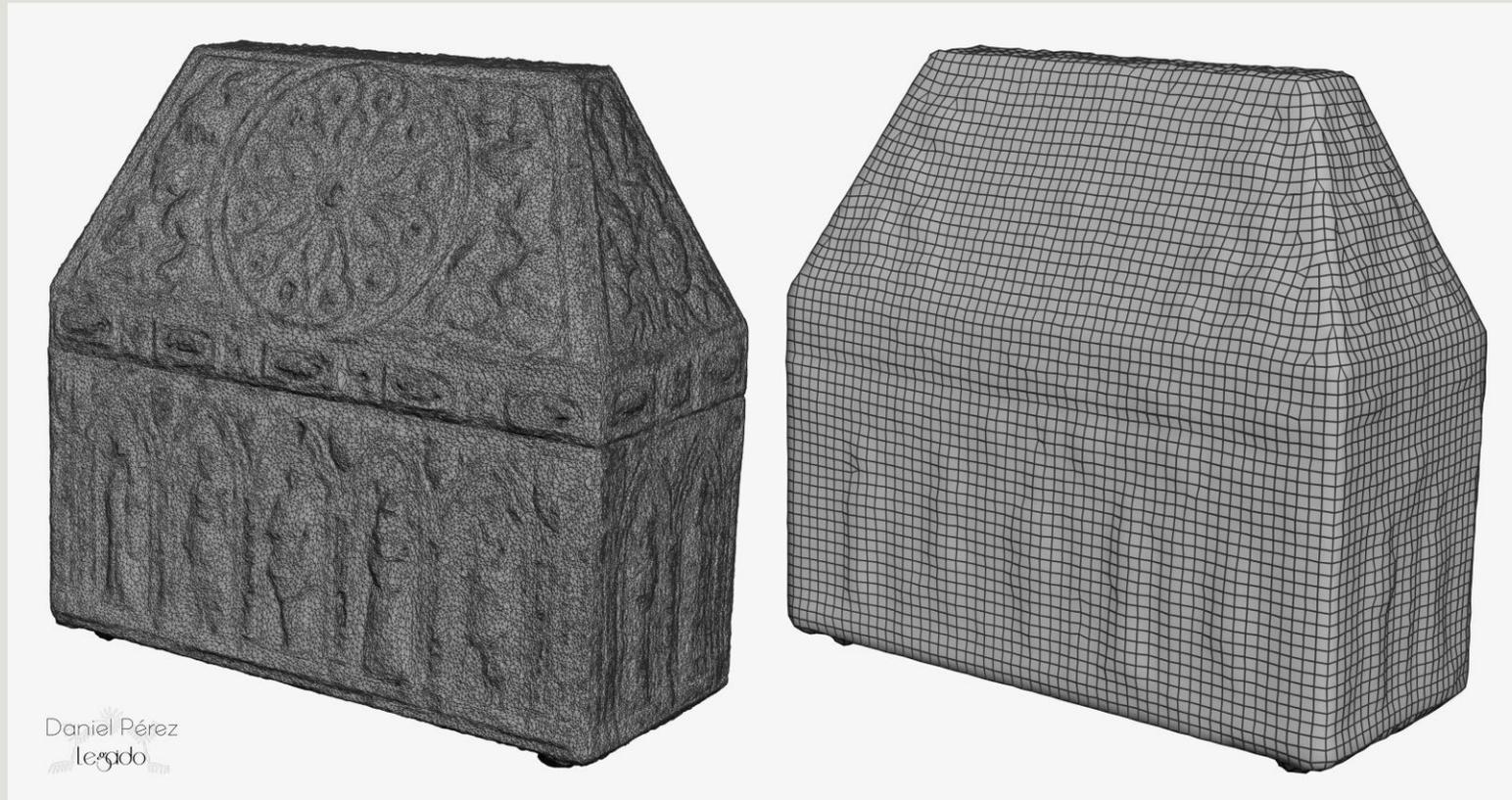
EDITANDO NUESTRO MODELO 3D



# Optimización 3D

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Modelo 3D **detallado** vs modelo 3D **optimizado**



# Optimización 3D

Modelo 3D **detallado** vs modelo 3D **optimizado**



Daniel Pérez  
legado

# MODELO EXPORTADO / MODELO DETALLADO

Formato **.obj** (+.mtl) o **.fbx**

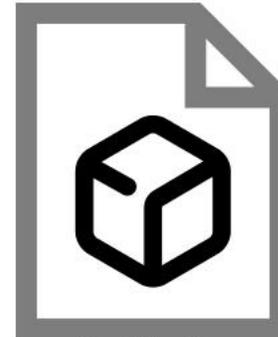
+ textura



Escudo\_Villacabuey



Escudo\_Villacabuey

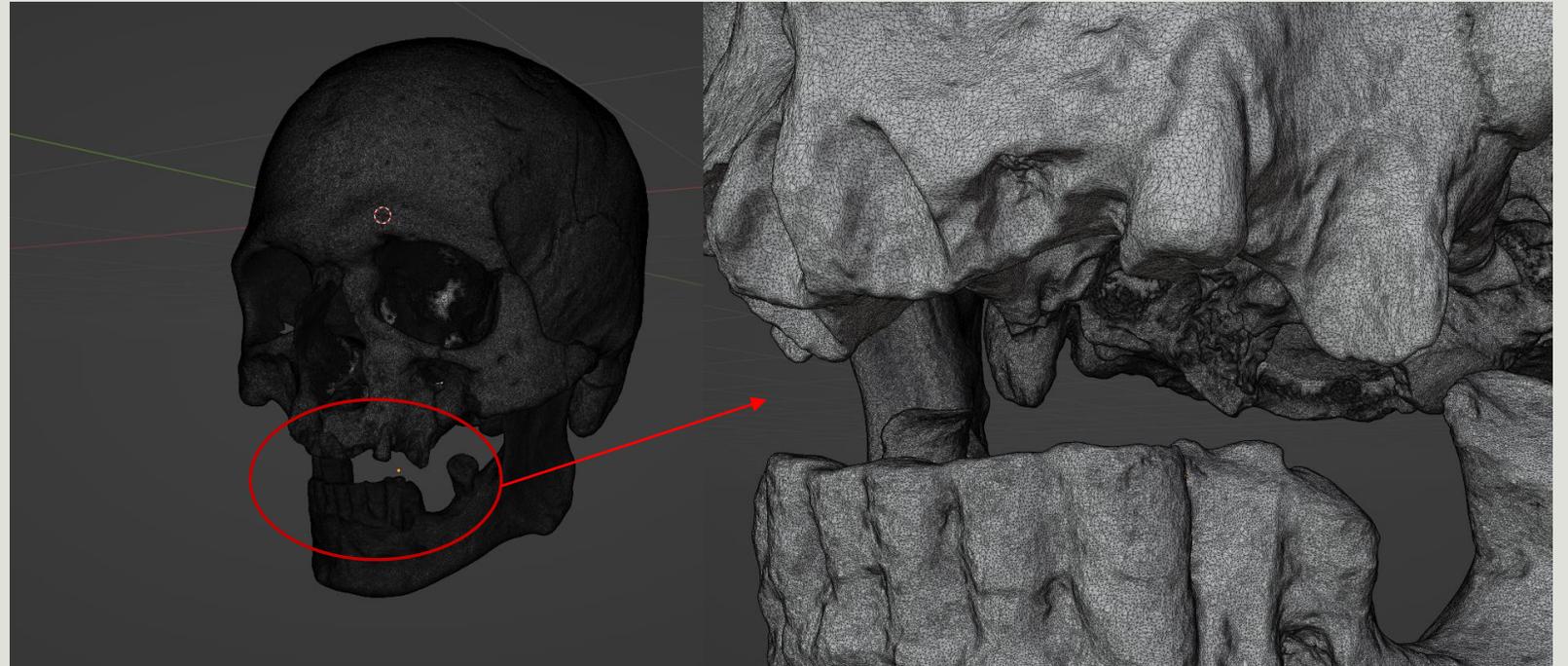


Escudo\_Villacabuey

# Optimización 3D

## Modelo 3D detallado

- Más rápido de generar
- Gran número de polígonos
- Elevado peso de archivo
- Utilidades:
  - Documentación
  - Estudio
  - Medición

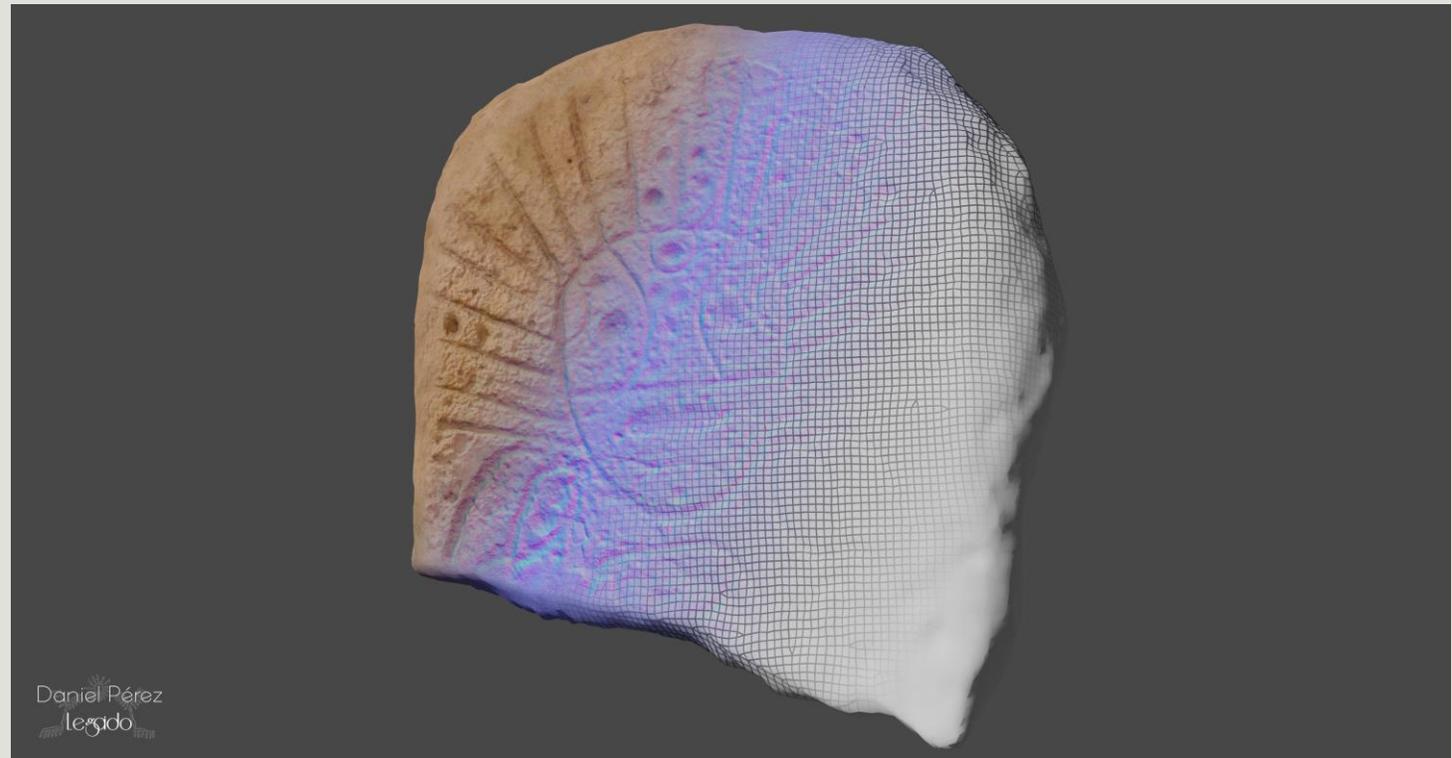


# Optimización 3D

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## Modelo 3D optimizado

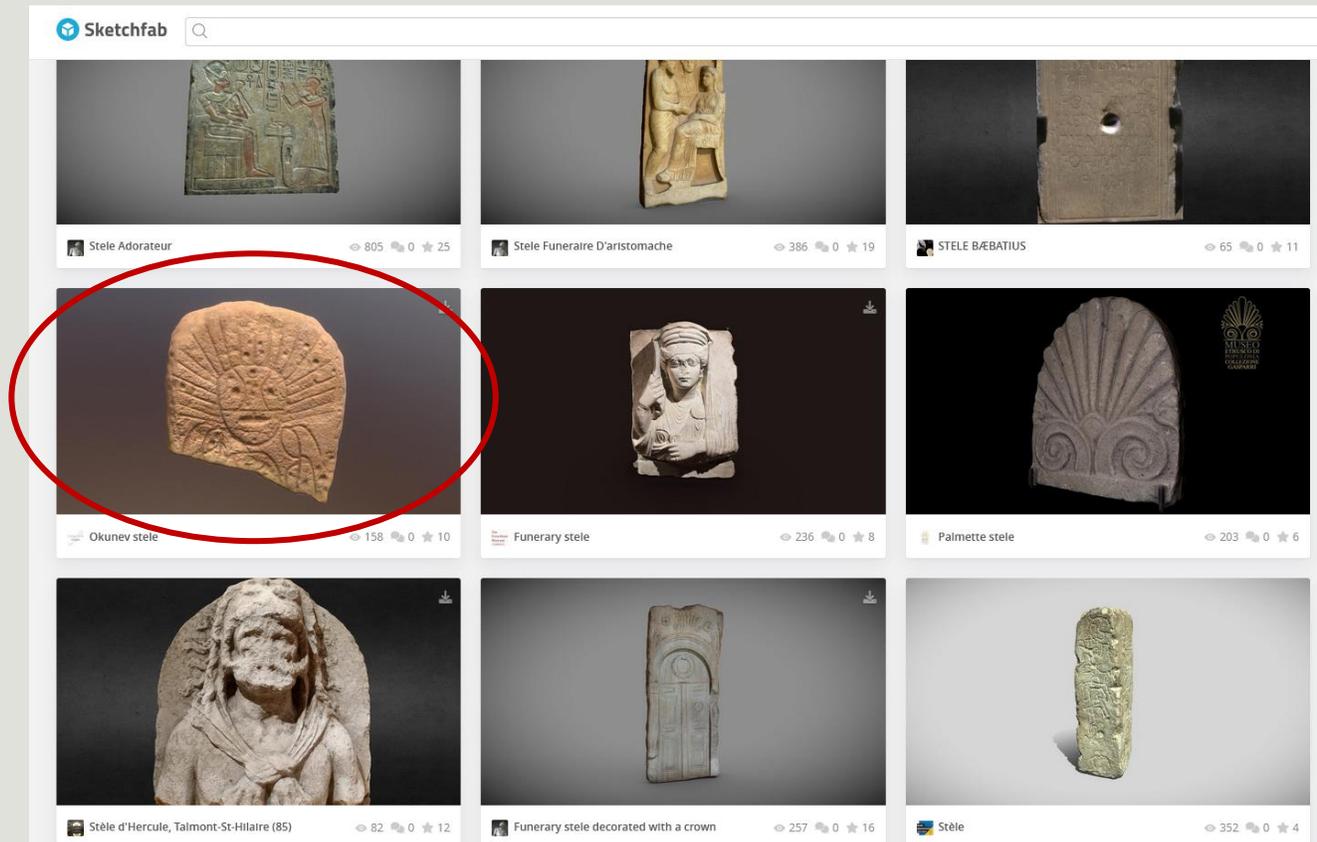
- Más tiempo de trabajo
- Bajo número de polígonos
- Bajo peso de archivo
- Utilidades:
  - Difusión
  - Visualización



# Optimización 3D

## Modelo 3D optimizado

- Más tiempo de trabajo
- Bajo número de polígonos
- Bajo peso de archivo
- Utilidades:
  - Difusión
  - Visualización



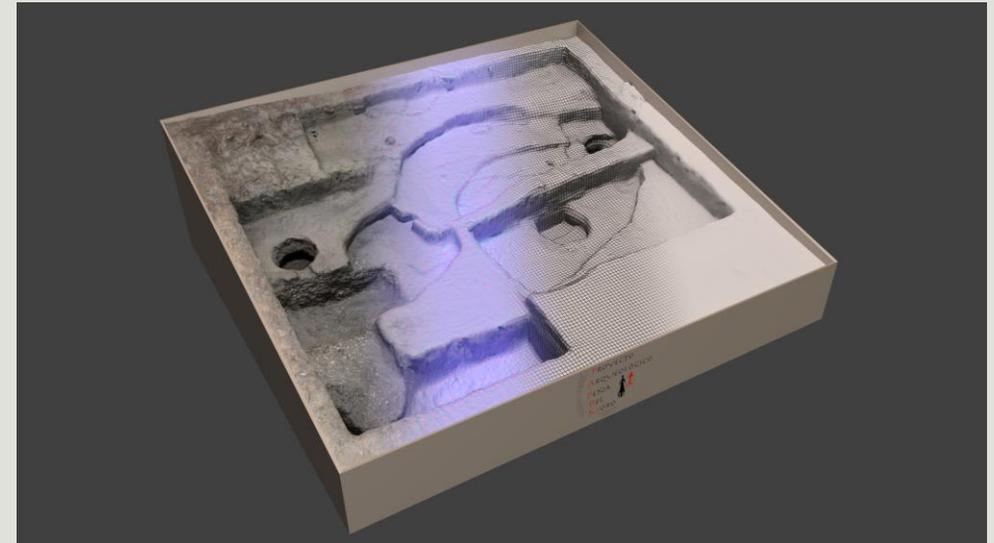
# Optimización 3D

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Modelo detallado vs modelo optimizado



Archivo .obj + textura: 293 mb

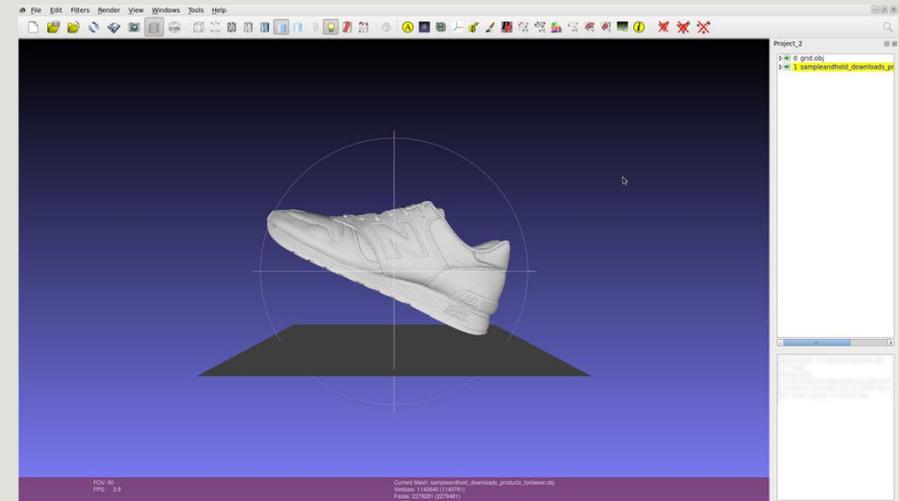


Archivo .obj + mapas de textura: 45 mb

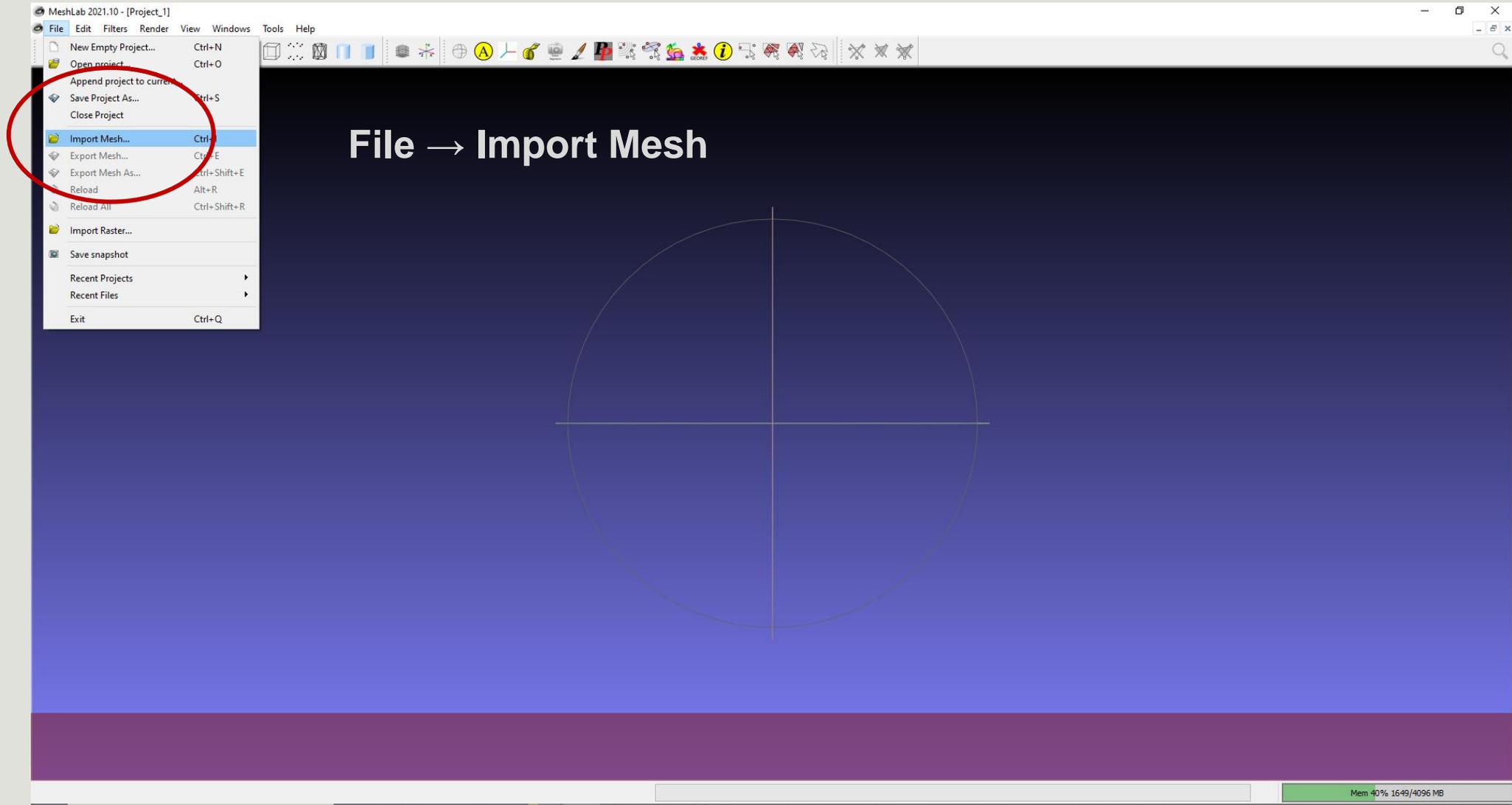
# Softwares de edición 3D

## Meshlab: ¿Qué podemos hacer con él?

- Edición y procesado de modelos 3D
- Alineamiento de nubes de puntos
- Visualización y presentación de modelos 3D
- Reconstrucción de geometrías a partir de nubes de puntos
- Escalado y orientación de modelos 3D
- Simplificado y refinado de geometrías
- Herramientas de medida



# Meshlab: Decimado



¡Cuidado con los nombres de los modelos!

# Meshlab: Decimado

The screenshot displays the MeshLab 2021.10 interface. The 'Filters' menu is open, showing a list of operations. The 'Remeshing, Simplification and Reconstruction' category is highlighted. A list of specific filters is shown, including 'Simplification: Quadric Edge Collapse Decimation (with texture)'. A yellow box highlights this filter, with arrows pointing to the text 'Remeshing, Simplification and Reconstruction' and 'Simplification: Quadric Edge Collapse Decimation (With Texture)'. The interface also shows a 3D view of a mesh, a project list on the right, and a console window at the bottom right.

**Filters**

**Remeshing, Simplification and Reconstruction**

**Simplification: Quadric Edge Collapse Decimation (With Texture)**

**Filters**

- Alpha Complex/Shape
- Build a Polyline from Selected Edges
- Close Holes
- Convex Hull
- Create Solid Wireframe
- Curvature flipping optimization
- Cut mesh along crease edges
- Generate Scalar Harmonic Field
- Global Align Meshes
- ICP Between Meshes
- Iso Parametrization Build Atlased Mesh
- Iso Parametrization Remeshing
- Iso Parametrization transfer between meshes
- Iso Parametrization: Main
- Marching Cubes (APSS)
- Marching Cubes (RIMLS)
- Merge Close Vertices
- Mesh Boolean: Difference
- Mesh Boolean: Intersection
- Mesh Boolean: Symmetric Difference (XOR)
- Mesh Boolean: Union
- Planar flipping optimization
- Points Cloud Movement
- Refine User-Defined
- Remeshing: Isotropic Explicit Remeshing
- Remove Duplicate Faces
- Remove Duplicate Vertices
- Remove Isolated Folded Faces by Edge Flip
- Remove Isolated pieces (wrt Diameter)
- Remove Isolated pieces (wrt Face Num.)
- Remove T-Vertices
- Remove Unreferenced Vertices
- Remove Vertices wrt Quality
- Remove Zero Area Faces
- Repair non Manifold Edges
- Repair non Manifold Vertices by splitting
- Select Crease Edges
- Simplification: Clustering Decimation
- Simplification: Edge Collapse for Marching Cube m
- Simplification: Quadric Edge Collapse Decimation (FilterMeshing)
- Simplification: Quadric Edge Collapse Decimation (with texture)
- Snap Mismatched Borders
- Subdivision Surfaces: Butterfly Subdivision
- Subdivision Surfaces: Catmull-Clark
- Subdivision Surfaces: LS3 Loop
- Subdivision Surfaces: Loop
- Subdivision Surfaces: Midpoint

Surface Reconstruction: Screened Poisson

Surface Reconstruction: VCG

Tri to Quad by 4-8 Subdivision

Tri to Quad by smart triangle pairing

Turn into Quad-Dominant mesh

Turn into a Pure-Triangular mesh

Uniform Mesh Resampling

Vertex Attribute Seam

Voronoi Filtering

FOV: 60  
FPS: 92.6  
BO\_RENDERING

Project\_1

Escudo\_Villac...

Escudo\_Villacalabuey.obj

Shading: Vert Face None

Color: Vert Face Mesh User-Def

Back-Face: Single Double Fancy Cull

Texture Coord: On Off

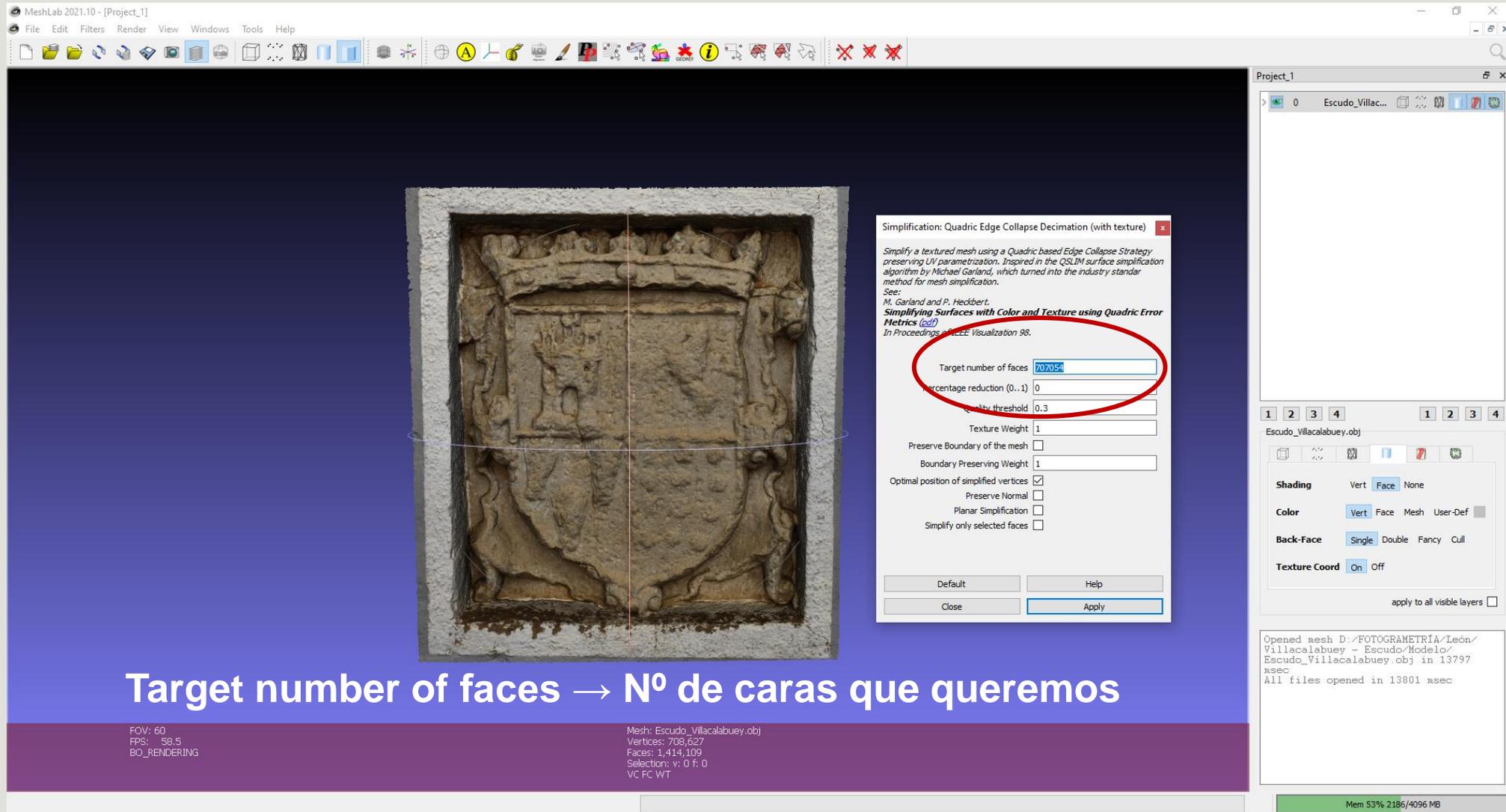
apply to all visible layers

Opened mesh D:\FOTOGRAFIA\León/Villacalabuey - Escudo/Modelo/Escudo\_Villacalabuey.obj in 13797 msec  
All files opened in 13801 msec

Mem 52% 2170/4096 MB

¡Cuidado con los nombres de los modelos!

# Meshlab: Decimado



MeshLab 2021.10 - [Project\_1]

File Edit Filters Render View Windows Tools Help

Project\_1

Escudo\_Villac...

Escudo\_Villacalabuey.obj

Shading Vert Face None

Color Vert Face Mesh User-Def

Back-Face Single Double Fancy Cull

Texture Coord On Off

apply to all visible layers

Opened mesh D:/FOTOGRAMETRIA/León/Villacalabuey - Escudo/Modelo/Escudo\_Villacalabuey.obj in 13797 msec  
All files opened in 13801 msec

Mem 53% 2186/4096 MB

Simplification: Quadric Edge Collapse Decimation (with texture)

Simplify a textured mesh using a Quadric based Edge Collapse Strategy preserving UV parametrization. Inspired in the QSLM surface simplification algorithm by Michael Garland, which turned into the industry standard method for mesh simplification.

See:  
M. Garland and P. Heckbert,  
**Simplifying Surfaces with Color and Texture using Quadric Error Metrics** (pdf)  
In Proceedings of IEEE Visualization 98.

Target number of faces: 707054

Percentage reduction (0..1): 0

Quality threshold: 0.3

Texture Weight: 1

Preserve Boundary of the mesh:

Boundary Preserving Weight: 1

Optimal position of simplified vertices:

Preserve Normal:

Planar Simplification:

Simplify only selected faces:

Default Help

Close Apply

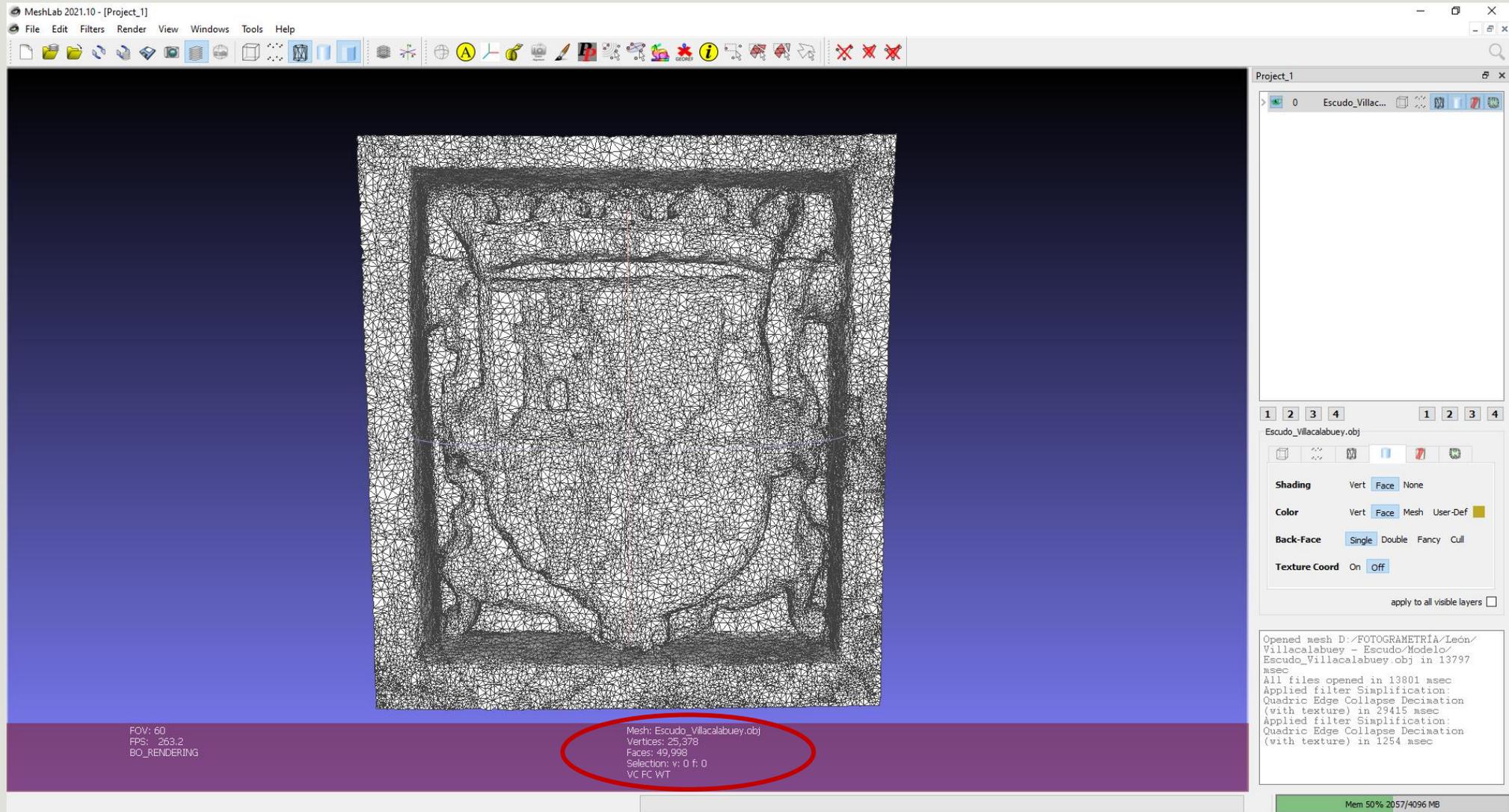
FOV: 60  
FPS: 58.5  
BO\_RENDERING

Mesh: Escudo\_Villacalabuey.obj  
Vertices: 708,627  
Faces: 1,414,109  
Selection: v: 0 f: 0  
VC FC WT

Target number of faces → N° de caras que queremos

¡Cuidado con los nombres de los modelos!

# Meshlab: Decimado



¡Cuidado con los nombres de los modelos!

# Meshlab: Decimado

**File → Export Mesh As...**

FOV: 60  
FPS: 47.2  
BO\_RENDERING

Mesh: Escudo\_Villacabuey.obj  
Vertices: 25,378  
Faces: 49,998  
Selection: v: 0 f: 0  
VC FC WT

Escudo\_Villacabuey.obj

Shading: Vert Face None  
Color: Vert Face Mesh User-Def  
Back-Face: Single Double Fancy Cull  
Texture Coord: On Off

Opened mesh D:/FOTOGRAMETRIA/León/Villacabuey - Escudo/Modelo/Escudo\_Villacabuey.obj in 13797 msec  
All files opened in 13801 msec  
Applied filter Simplification: Quadric Edge Collapse Decimation (with texture) in 29415 msec  
Applied filter Simplification: Quadric Edge Collapse Decimation (with texture) in 1254 msec

Mem 49% 2033/4096 MB

¡Cuidado con los nombres de los modelos!

# Meshlab: Decimado

The screenshot shows the MeshLab 2021.10 interface. A 'Save' dialog box is open for the file 'Escudo\_Villacalabuey.obj'. The file type is set to 'Stanford Polygon File Format (\*.ply)'. The 'Alias Wavefront Object (\*.obj)' option is highlighted with a red circle. The main 3D view shows a wireframe mesh of a shield. The right sidebar contains the 'Project\_1' panel, a toolbar, and a 'Shading' panel with options for 'Vert', 'Face', and 'None'. A console window at the bottom right displays the following text:

```
Opened mesh D:/FOTOGRAMETRIA/León/Villacalabuey - Escudo/Modelo/  
Escudo_Villacalabuey.obj in 13797  
msec  
All files opened in 13801 msec  
Applied filter Simplification:  
Quadric Edge Collapse Decimation  
(with texture) in 29415 msec  
Applied filter Simplification:  
Quadric Edge Collapse Decimation  
(with texture) in 1254 msec
```

At the bottom of the interface, there is a status bar showing 'Mem 49% 2044/4096 MB'.

Formato .obj

FOV: 60  
FPS: 243.9  
BO\_RENDERING

Mesh: Escudo\_Villacalabuey.obj  
Vertices: 25,378  
Faces: 49,998  
Selection: v: 0 f: 0  
VC FC WT

¡Cuidado con los nombres de los modelos!

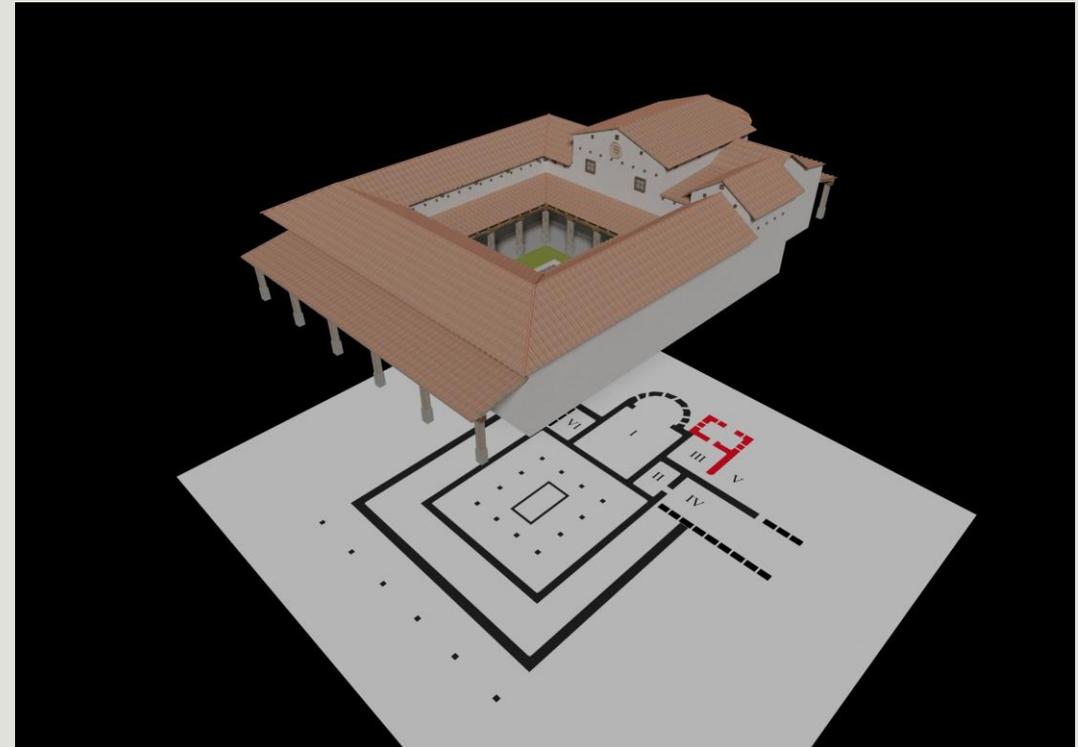
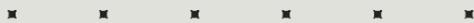
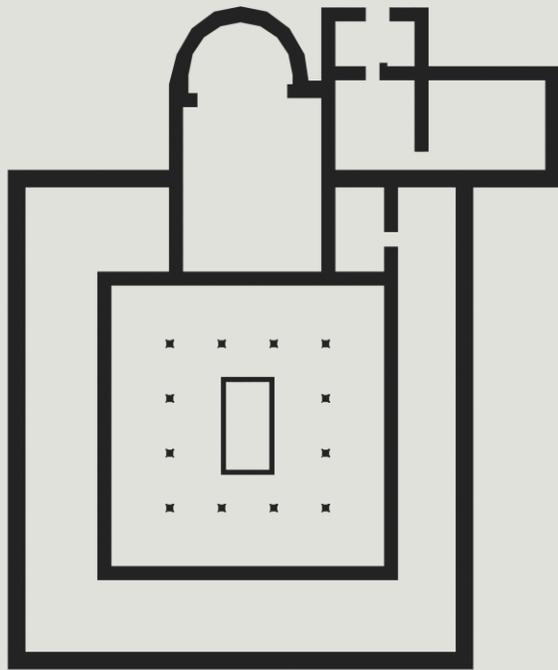
# Softwares de edición 3D

## Blender: ¿Qué podemos hacer con él?

- Edición y procesado de modelos 3D
- **Alineamiento de nubes de puntos**
- Visualización y presentación de modelos 3D
- **Reconstrucción de geometrías a partir de nubes de puntos**
- Escalado y orientación de modelos 3D
- Simplificado y refinado de geometrías
- Herramientas de medida



# Softwares de edición 3D



Reconstrucción virtual de la villa romana de Matabuey (Nava de la Asunción, Segovia)

# Softwares de edición 3D

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*Reconstrucción virtual de la villa romana de Matabuey (Nava de la Asunción, Segovia)*

# Blender

Barra de herramientas superior

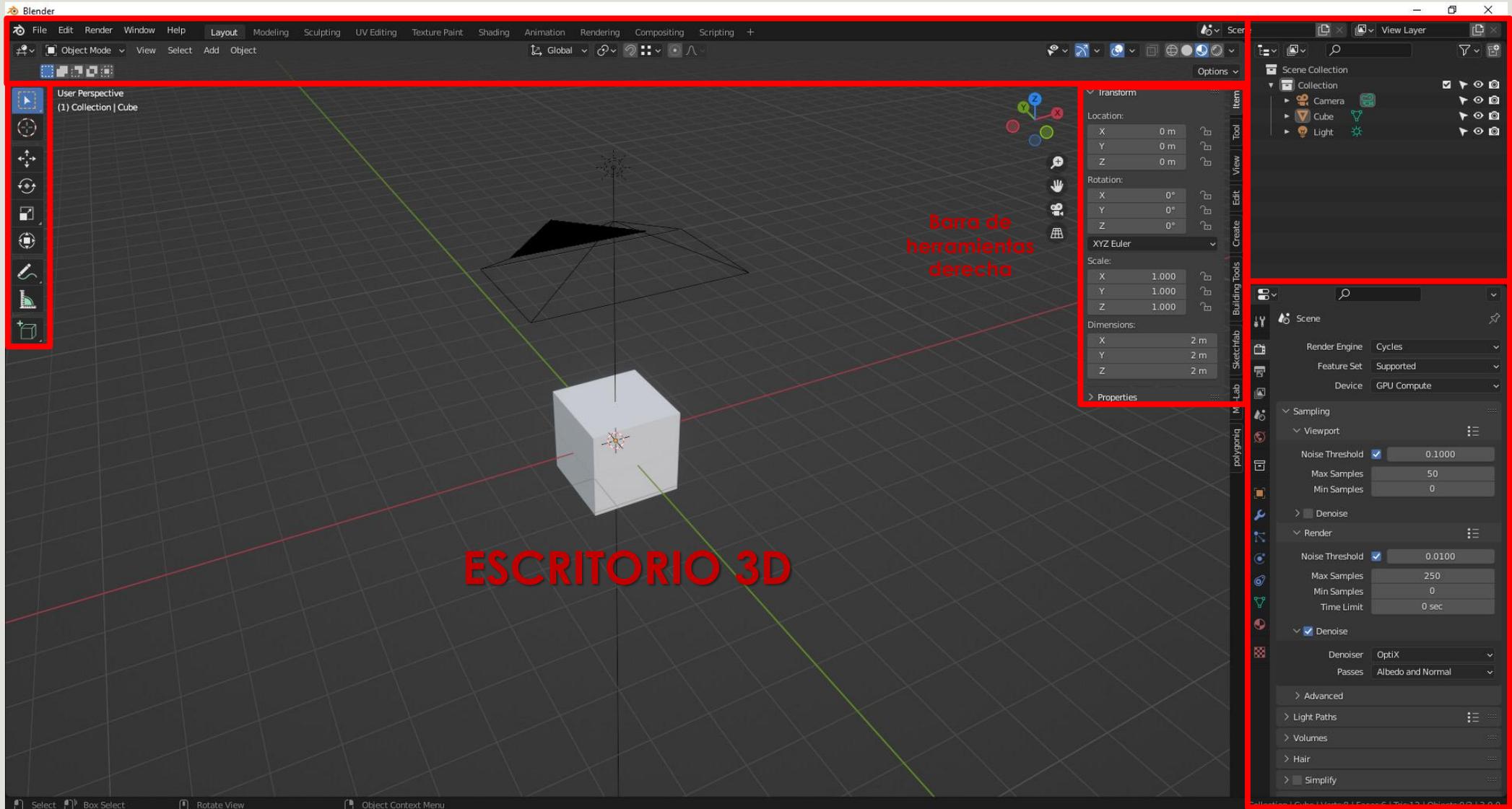
Barra de herramientas izquierda

Barra de herramientas derecha

Objetos de la escena

Herramientas de modificación, renderizado, etc.

ESCRITORIO 3D



# Blender

**Modos de visualización (de izda. a dcha.):**

- Vista wireframe (aristas y polígonos)
- Vista sólida (malla geométrica)
- Vista material (vista con textura y/o color)
- Vista renderizada (con iluminación)

Collection | Cube | Verts:8 | Faces:6 | Tris:12 | Objects:0/3 | 3.0.0

# Blender

## Controles básicos

Click izda. → Seleccionar

Click dcha. → Menú de opciones

Rueda ratón → Zoom

Click rueda ratón → Movimiento orbital

Shift + click rueda ratón → Travelling

G → Mover objeto

R → Rotar objeto

S → Escalar objeto

A → Seleccionar todo

Ctrl. + Z → Deshacer

Ctrl. + Shift + Z → Rehacer

Tab. → Modo Objeto / Modo Edición

## Controles vistas

Num. 5: Cambio perspectiva/ortogonal

Num. 1: Frente

Shift + Num. 1: Detrás

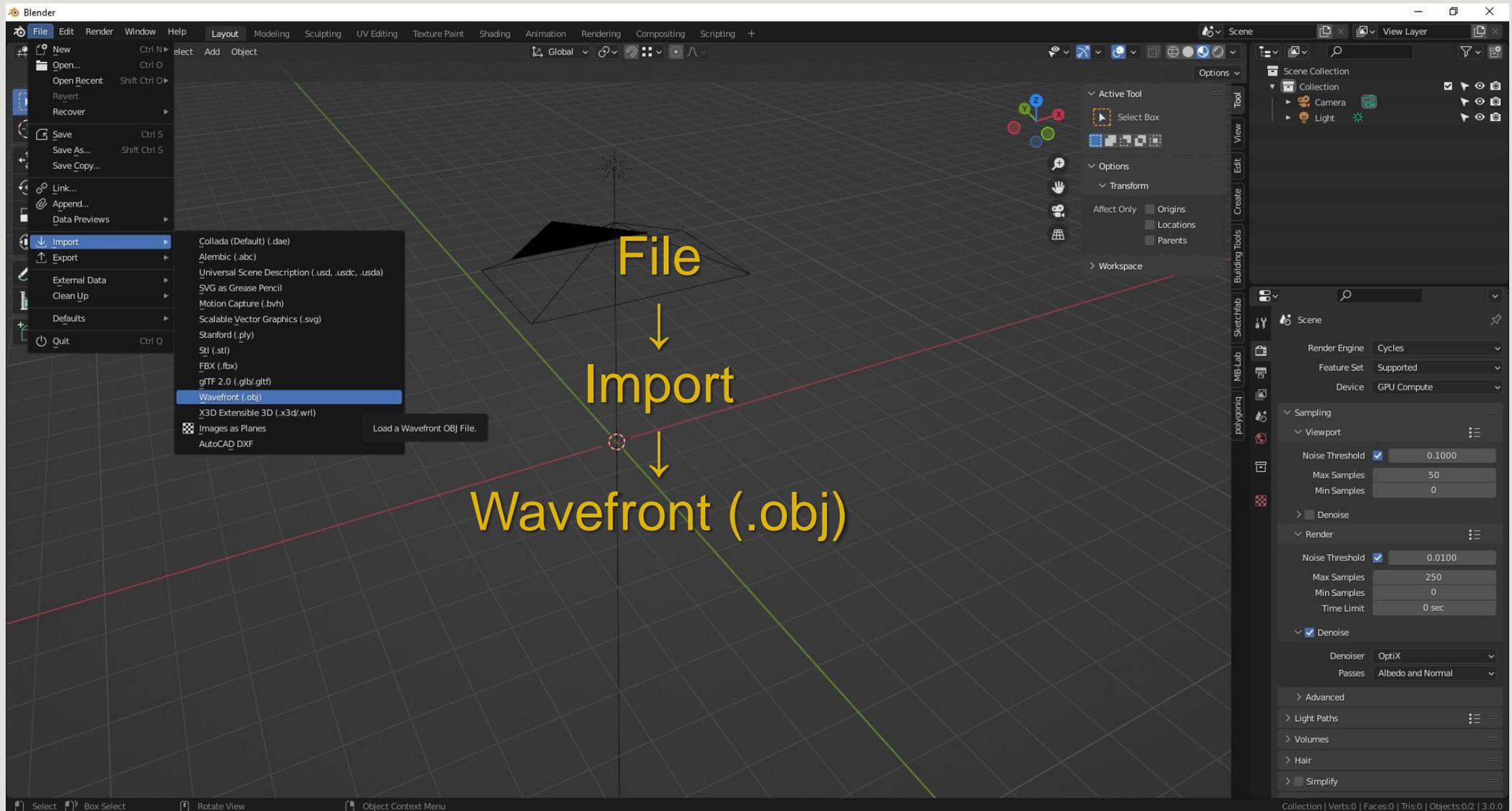
Num. 3: Izquierda

Shift + Num. 3: Derecha

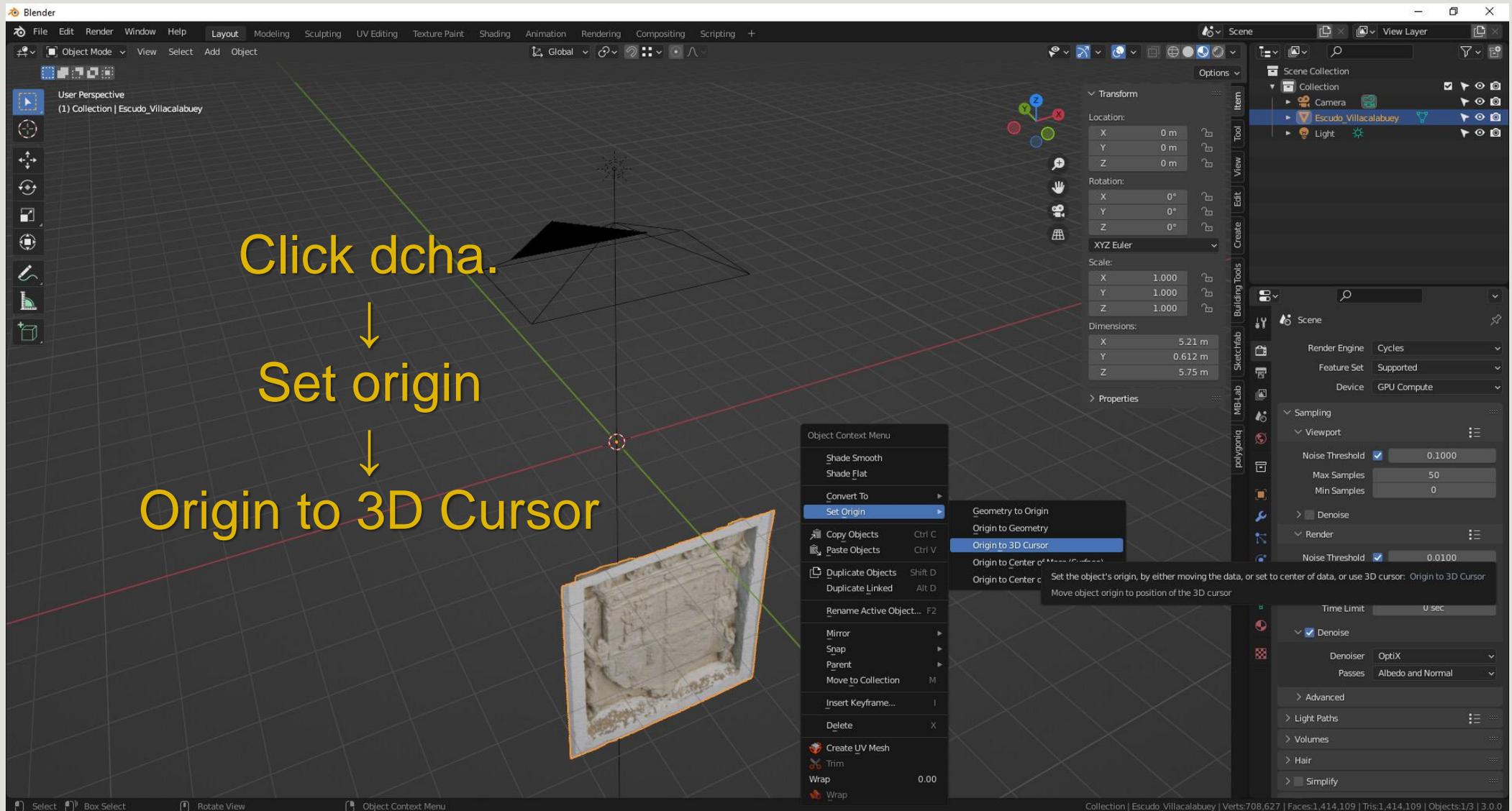
Num. 7: Arriba

Shift + Num. 7: Abajo

# Blender: Importar modelo



# Blender: Centrar modelo



# Blender: Centrar modelo

Click dcha.

Set origin

Geometry to Origin

Object Context Menu

- Shade Smooth
- Shade Flat
- Convert To
- Set Origin
- Copy Objects Ctrl C
- Paste Objects Ctrl V
- Duplicate Objects Shift D
- Duplicate Linked Alt D
- Rename Active Object... F2
- Mirror
- Snap
- Parent
- Move to Collection M
- Insert Keyframe... I
- Delete X
- Create UV Mesh
- Trim
- Wrap 0.00
- Wrap

Transform

Location:

X	0 m
Y	0 m
Z	0 m

Rotation:

X	0°
Y	0°
Z	0°

XYZ Euler

Scale:

X	1.000
Y	1.000
Z	1.000

Dimensions:

X	5.21 m
Y	0.612 m
Z	5.75 m

Properties

Render Engine: Cycles

Feature Set: Supported

Device: GPU Compute

Sampling

Viewport

Noise Threshold  0.1000

Max Samples 50

Min Samples 0

Denoise

Max Samples 250

Min Samples 0

Time Limit 0 sec

Denoise

Denoiser: OptiX

Passes: Albedo and Normal

Advanced

Light Paths

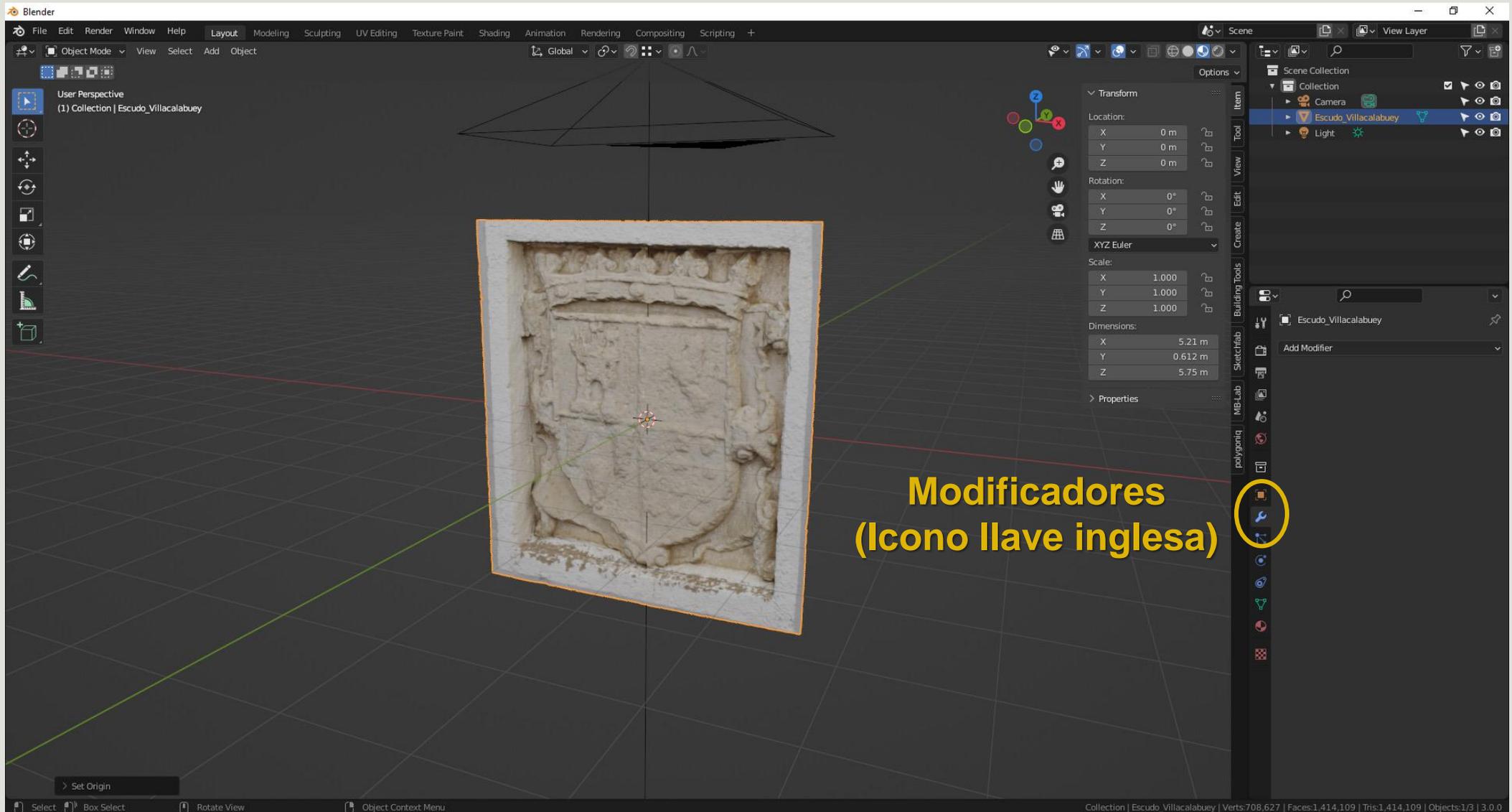
Volumes

Hair

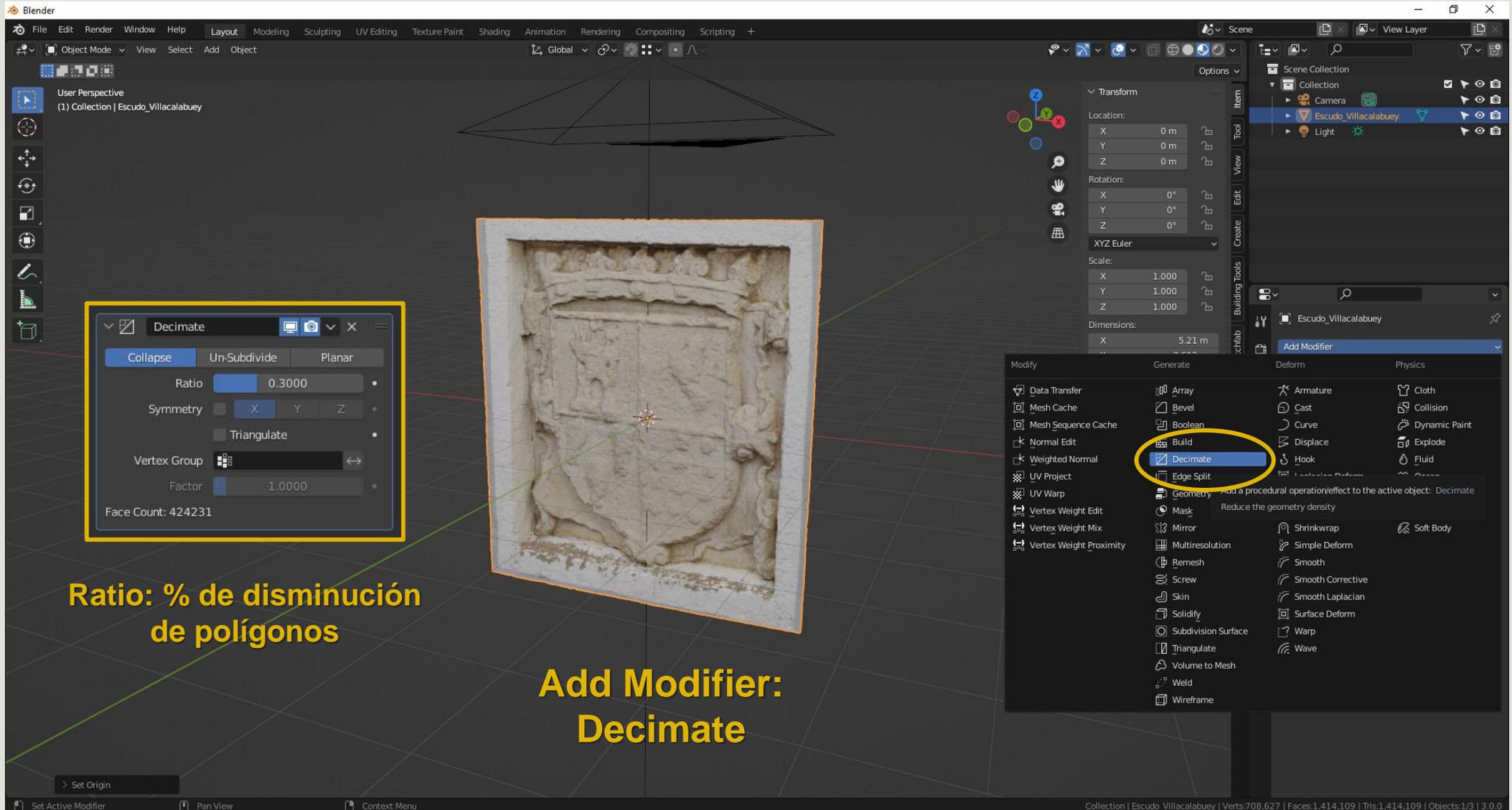
Simplify

Collection | Escudo\_Villacalabuey | Verts:708,627 | Faces:1,414,109 | Tris:1,414,109 | Objects:1/3 | 3.0.0

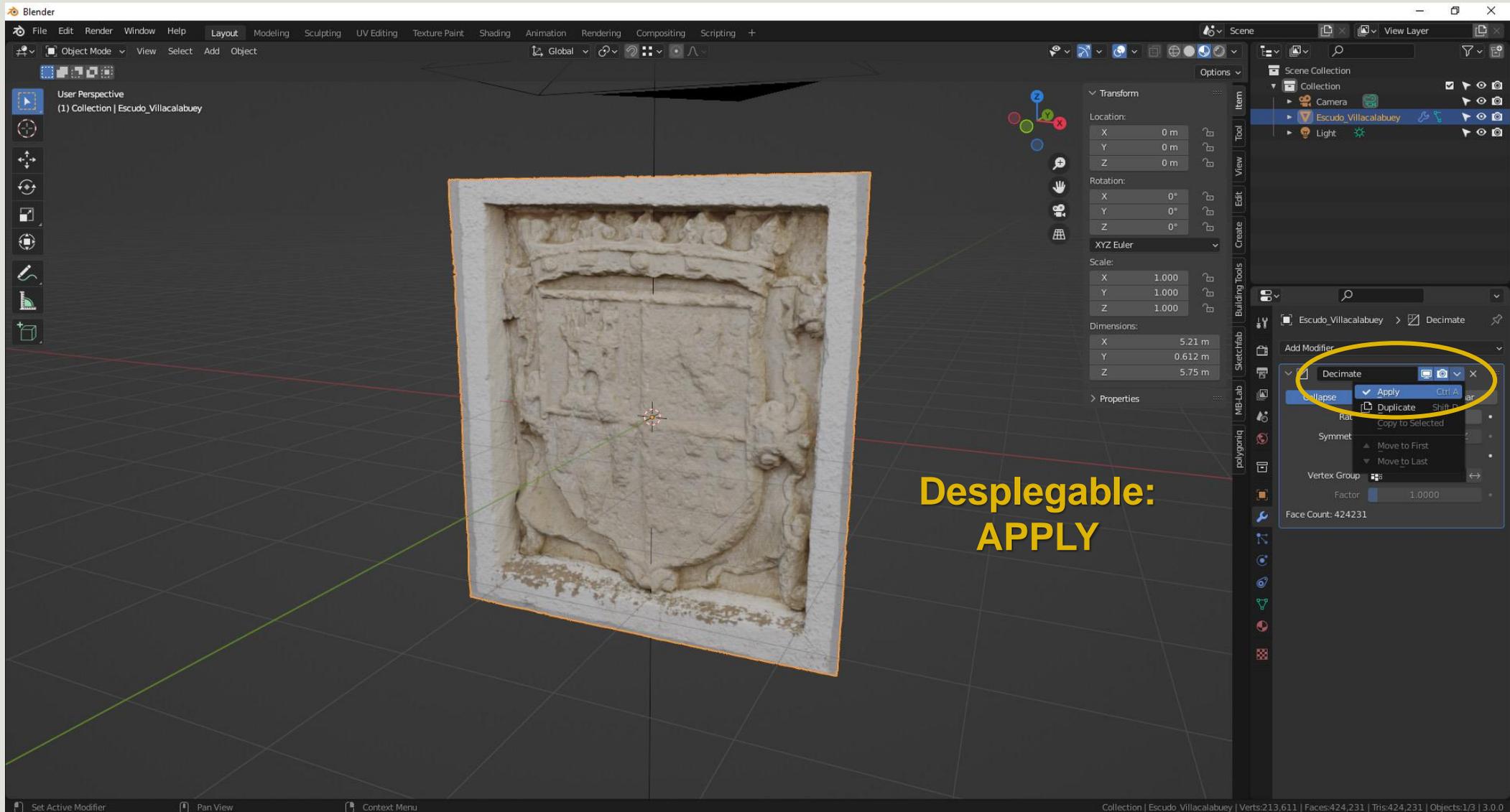
# Blender: Decimado



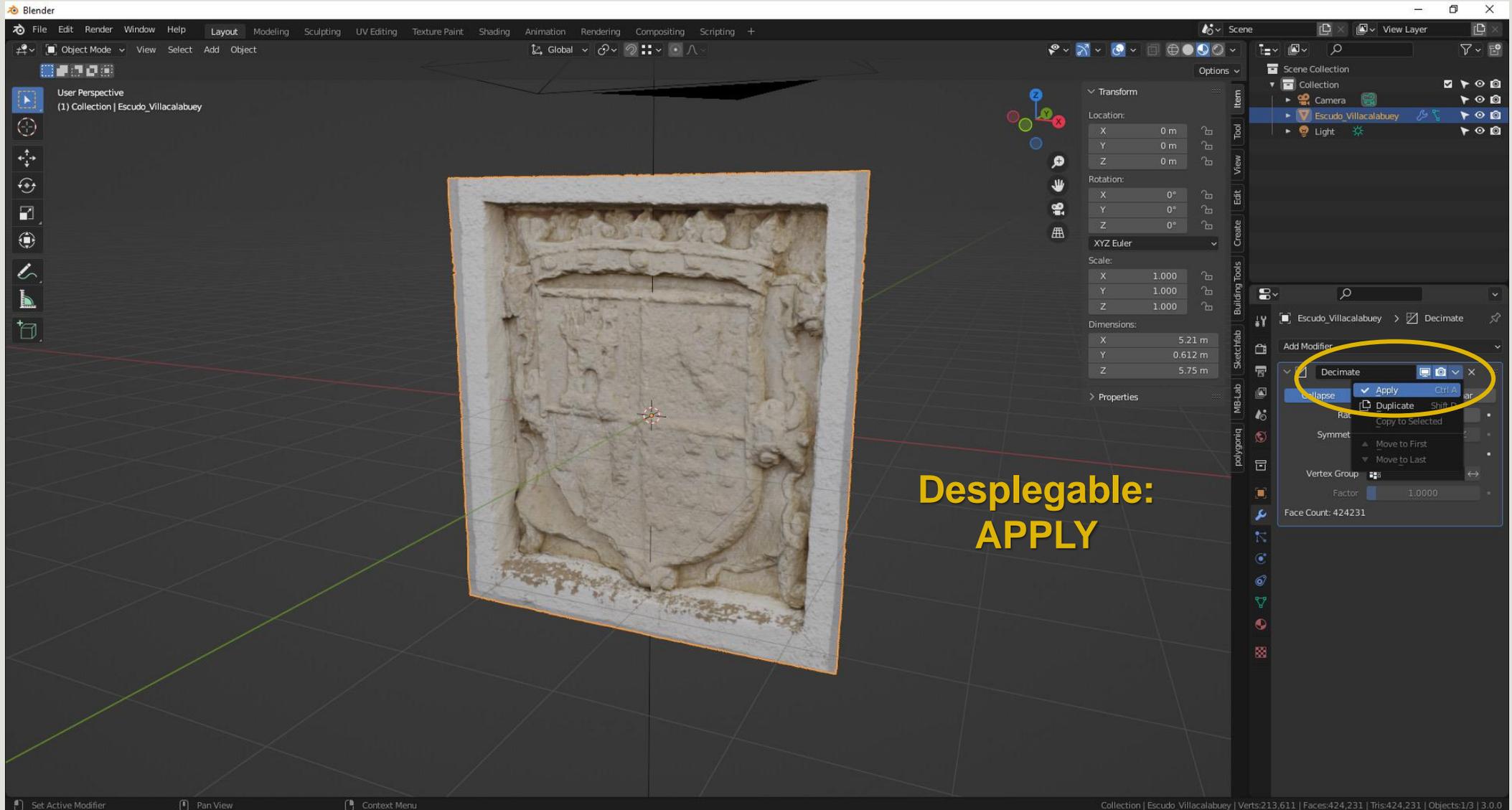
# Blender: Decimado



# Blender: Decimado



# Blender: Decimado



# Blender: Decimado



Modelo sin decimar



Modelo decimado

# Blender: Decimado

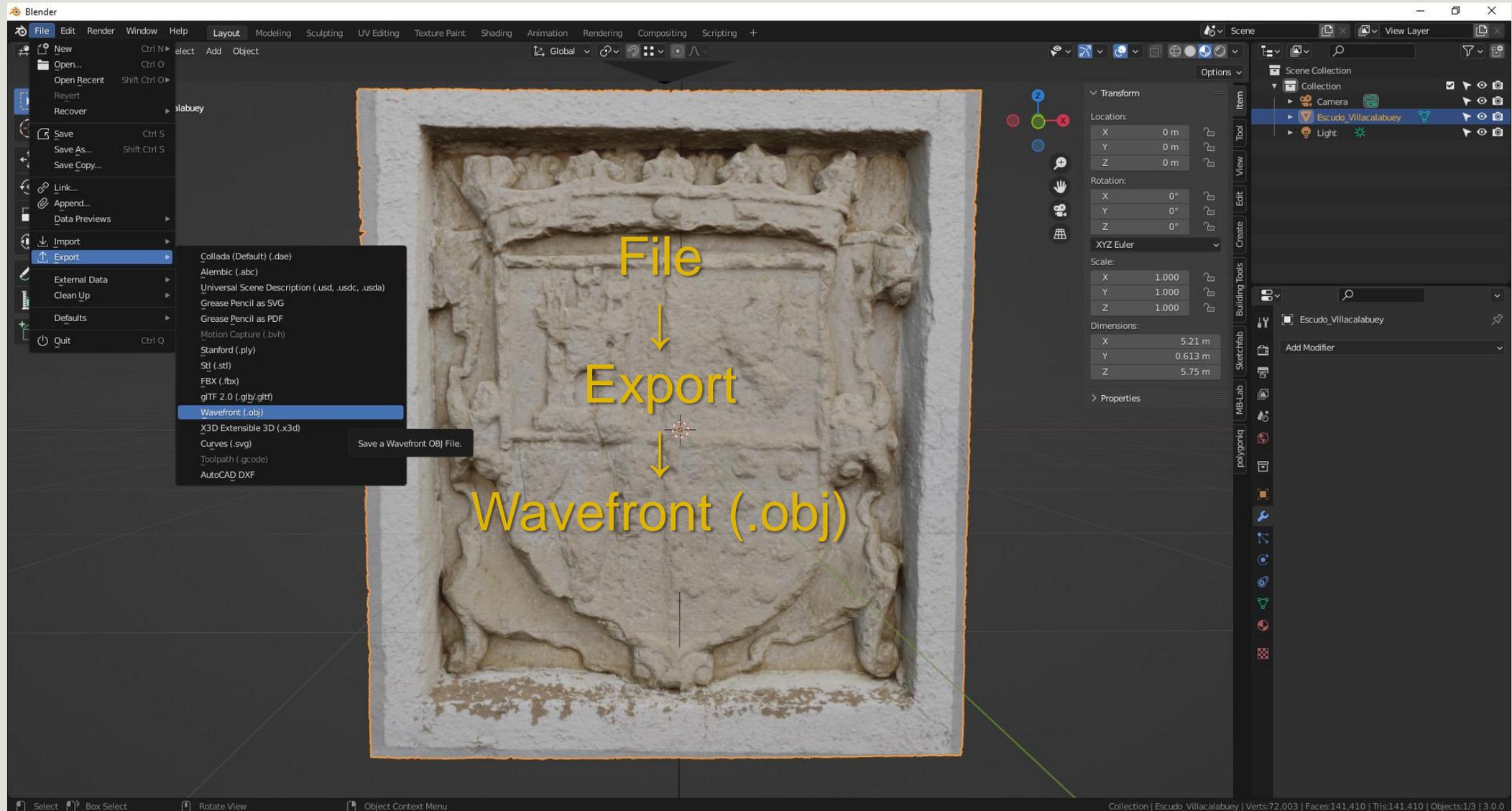


Modelo sin decimar



Modelo decimado

# Blender: Exportar modelo



# Blender: Exportar modelo

The image shows the Blender 2.80 interface with the 'Export > OBJ' dialog box open. The dialog box has the following settings:

- Operator Presets: + -
- Include:  Selection Only
- Objects as:  Obj Objects,  OBJ Groups,  Material Groups
- Animation:  Animation
- Transform: Scale: 1.00, Path Mode: Auto, Forward: -Z Forward, Up: Y Up
- Geometry: > Geometry

A yellow text overlay in the center of the dialog box reads: **¡OJO!**  
Selection only para objetos individuales

The background shows a 3D model of a dental arch in Object Mode. The 'Blender File View' window is open, showing the file system. The 'Export OBJ' button is highlighted in blue.

