Out of the wall

3D documentation and restoration of an endangered Roman altar

Description

Digital 3D documentation of cultural heritage is important especially for endangered monuments, as is the case of this Roman altar reused in a palace in Venice, Italy. When it is not possible to scan the whole artefact, because it is fragmentary or not completely accessible, combining 3D scanning with 3D modeling allows the reconstruction of the original aspect of the monument.

Workflow:

- Photographic campaign: a large number of digital photographs was shot from various points of view using a smartphone camera; a subset of 100 pictures was then fed into the open source software Python Photogrammetry Toolbox (PPT) to compute a 3D model.
- PPT returned a dense point cloud representing the three-dimensional coordinates (x, y, z) of points on the surface of the object.
- Mesh: the geometric representation of the surface of the object, made of thousands of triangles having the points of the cloud as vertexes, was produced using the WRAP algorithm implemented in Geomagic (a commercial software by 3D Systems).
- A photorealistic texture was created projecting the photographic images on the mesh with the open source software MeshLab.
- The metal bar was removed from the model by selecting and deleting its triangles in the mesh, leaving a hole in its place.
- The missing right side of the funerary altar was reconstructed by duplicating, mirroring and adapting the left one. The open source software Blender was used.
- The hole left by the removed metal bar was filled and new surfaces for the back, the base and the top of the model were created (Geomagic).
- The reconstructed portions of the model did not have a properly mapped texture. The open source software GIMP was used to prepare a photorealistic texture.
- The inscription damaged by the metal bar was virtually restored. A complete A letter and the upper end of the preceding S were painted directly on the model (Blender).
- The virtual model. The final output.

Keywords

3D Model, Structure from Motion, Virtual reconstruction, Digital 3D documentation, Endangered cultural heritage, Reused inscription, Roman altar.

IMAGES

Fig. 1.1. Roman altar.

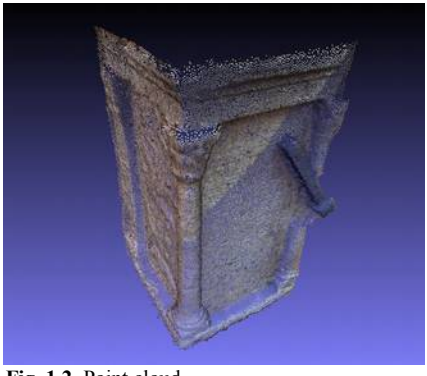

Fig. 1.2. Point cloud.

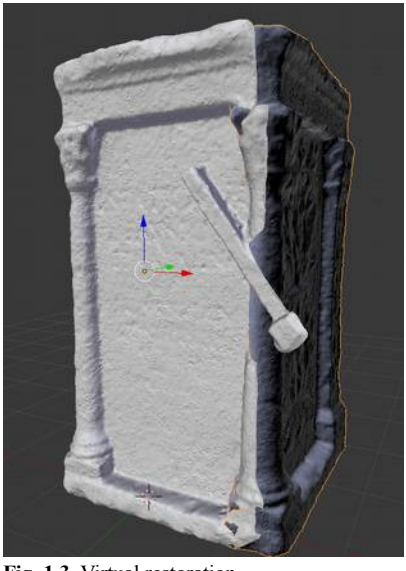

Fig. 1.3. Virtual restoration.

Fig. 1.4. Final 3D model.