

# Rediscovery of the shape of artistic artefacts from moulds: tools and methods for 3D archivation

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## Recognition of models from plaster moulds belonging to the ancient artistic collection of Richard-Ginori Museum of Manifattura di Doccia (Florence – Italy).

The activity arises from the need to categorize and classify moulds according to sculptural structures made from them. In this perspective, the acquisition technique through 3D laser scanning, with reconstruction of the positive internal image of the moulds and subsequent reassembly of complete models, is an optimal solution for the immediate creation of a digital archive, that does not occupy space and can be organized and managed efficiently in a Database Management System. As a consequence the digital database implementation opens the field to the usability of the models on a global level, both for scientific purposes and for commercial developments.

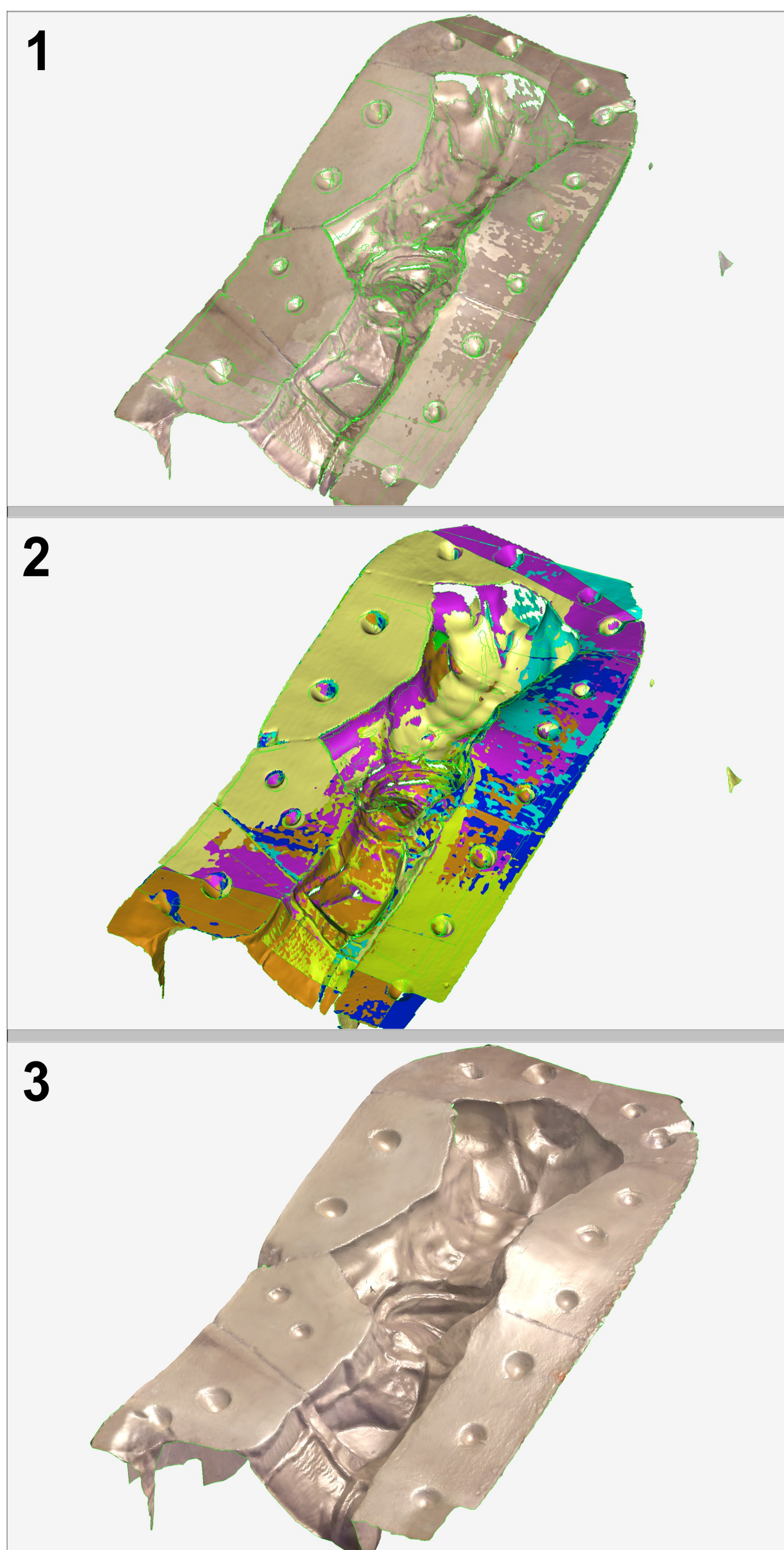
The original core of the collection was created by the founder of the Factory, marchese Carlo Ginori, since 1744 approximately [1]. The complexity of the obtainable figure is obviously a function of the number of pieces needed for its reconstruction. A digital mould archive, produced starting from a laser scanner survey, immediately seemed like a possible solution. In order to verify the method, a test was made on six piece-moulds belonging to the figure called “The Giant”.



Example of a group of piece-moulds for porcelain reproduction of “Venus de’ Medici” statue.

### Acquisition

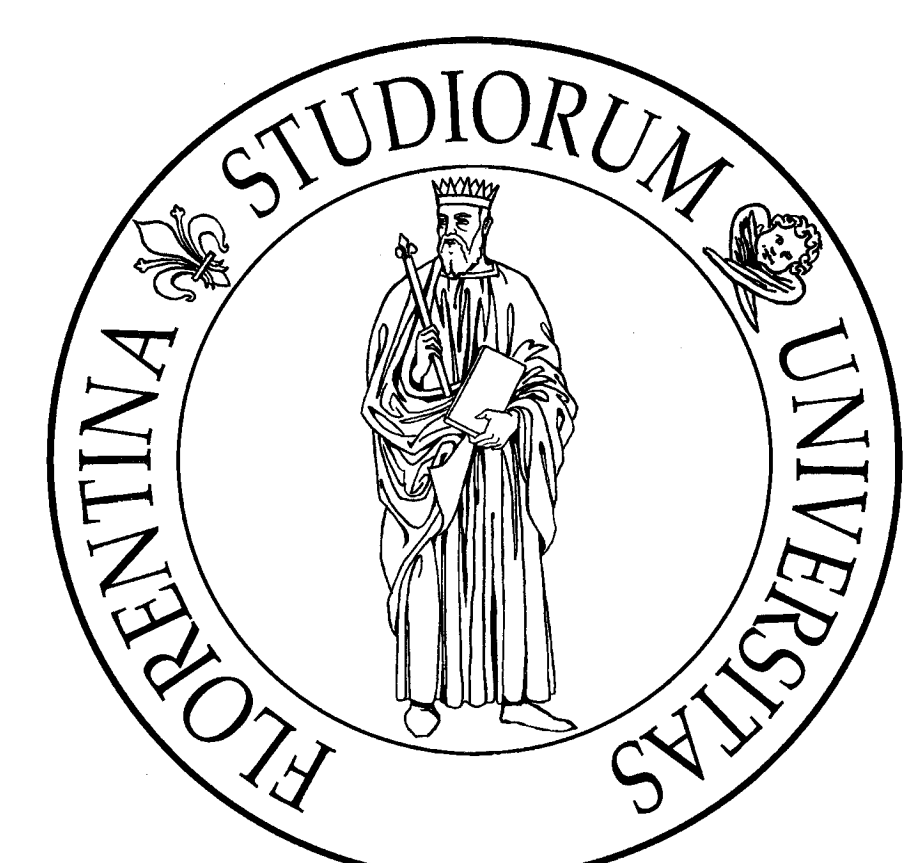
Scan operations, carried out using laser stripe technology (useful for the survey of small objects characterized by a high level of detail, as artistic artefacts)[2][3][4], have produced four different colored range map sets (one for each piece-mould). The main shape features and details of each piece-mould were documented using a sample grid never less than 0.25 mm. For each set we took the range map registration in order to obtain a complete 3D digital model of each piece-mould.



A: initial alignment based on homologous points directly identified on surface. B: ine registration based on I.C.P. (interactive closest point) algorithm. C: Complete 3D digital model of one piece-mould.

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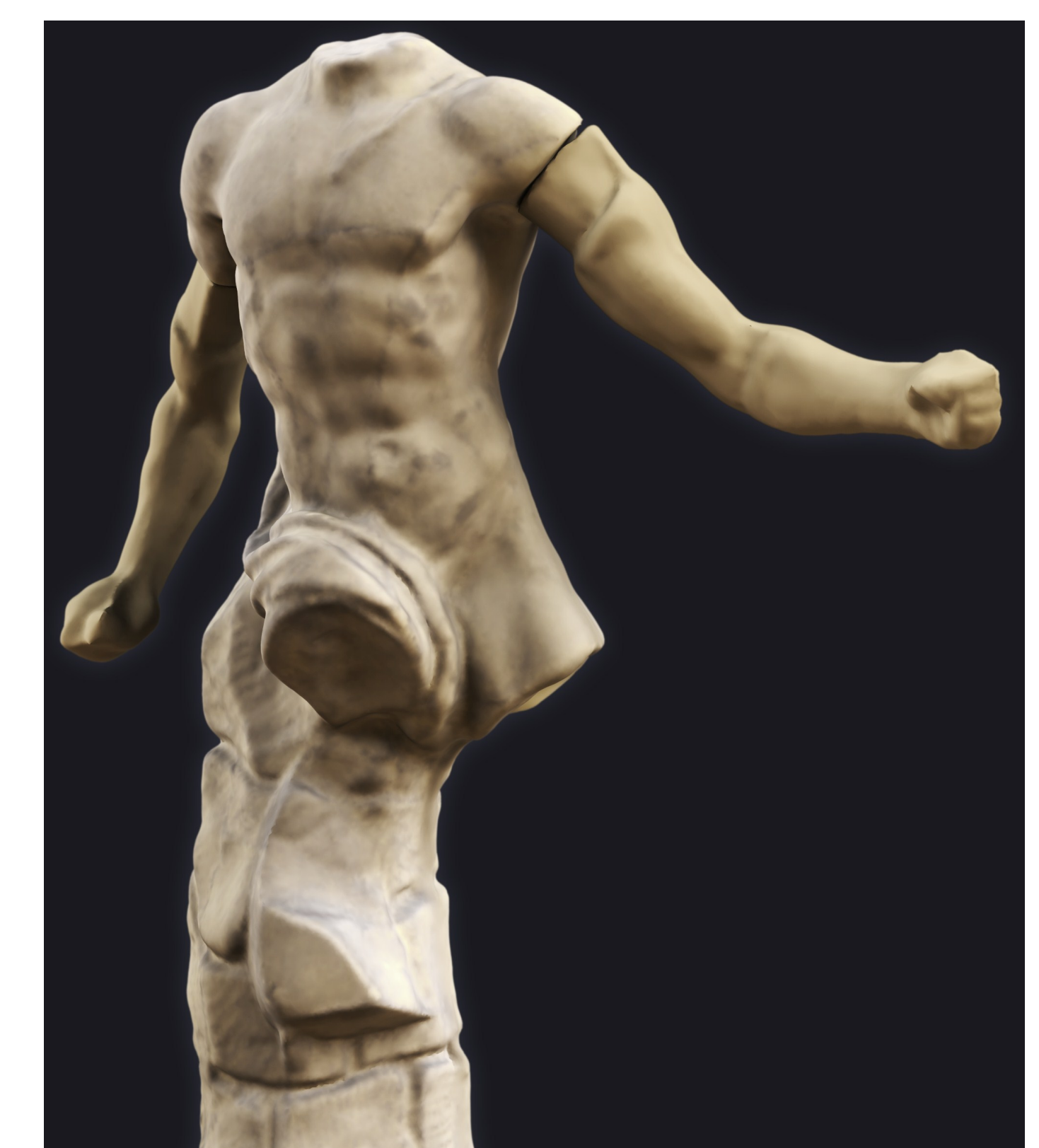
### Reconstruction

The polygonal surface [5] [6] of each piece-mould describes, in its convex side, the shape of the artefact; in this way it is possible to recognize immediately the artefact starting from its piece-mould survey. The piece-mould’s contact surfaces are characterized by the presence of joints which are useful to identify the right correspondence between the different part of the mould. The accurate survey of these contact surfaces has allowed to detect joints and, once placed some tie points into each one, they were used to constrain the alignment between semi-moulds. In the case of “Giant” these operations have resulted in the complete model of the bust and the arms.

According to the contact surfaces and the shape features of the pieces a solution has been formulated about the right position of the arms in the bust. The scholars have the possibility to verify immediately their reconstruction hypothesis just handling these three digital models, which could be used to visualize solutions in order to share the knowledge with other scholars.



Rendering of the Giant's bust. The image show the level of detail acquired during the survey.



Rendering of the Giant's bust. One of the reconstruction hypothesis.

### Storage

A dedicated server is needed for archiving different types of 3D images: those obtained by scanning moulds and others by reconstructing casts and comprehensive models. Moulds, while handled for the scan, are labelled with an automatic readable identification code, which make it possible to identify piece-moulds of the same model. A QR classification data must be entered into a server database. The information about the model can then be extended with XML classification files recording specific features or with other fields deemed useful for research and consultation in the database. In order to carry out the consultation of the pieces we have to design an ad hoc application that makes it possible to perform specific research queries in the database, presents the resulting information and invokes a program for 3D image viewing and navigating according to their storage format.

### Perspectives

The presented system, could allow to solve all the problems related to the recovery of historical and artistic heritage represented by the Richard-Ginori collection:

- realization of new moulds database from 3D digital models;
- conservation of the artistic heritage of plaster moulds;
- reconstructions of the same model in different poses;
- association of descriptive digital cards.

Interesting developments for database extension are also possible, in addition to basic information determining the mould’s identity card, many special features, which allow a more sophisticated typological classification, can be associated to individual moulds and especially to models in their entirety. For example in the case of a human or mythological form, we can refer to the pose, the represented objects, clothes or more abstract characteristics such as attitude or expression.

### REFERENCES

- [1] D. Zikos, “On the nature of the moulds purchased and commissioned by Carlo Ginori”, Quaderni - Amici di Doccia, Polistampa, number IV, 2010, pp. 32-39.
- [2] M. Levoy (Computer Science Department Stanford University) “Digitizing the Forma Urbis Romae” Proceedings of SIGGRAPH 2000, Computer Graphics, Annual Conference Series.
- [3] Marc Levoy “The Digital Michelangelo project: creating a 3D archive of his sculpture using laser scanning” Proceedings of Electronic Imaging and the Visual Arts (EVA) '99, Florence, March 26, 1999.
- [4] G. Guidi, M. Russo, J. A. Beraldin “Acquisizione 3D e modellazione poligonale” McGraw-Hill, Milano, 2010.
- [5] D. Foley; A. van Dam; S. K. Feiner; J. F. Hughes. “Computer Graphics. Principles and Practice”, Addison-Wesley, 1995.
- [6] A. G. Requicha, “GEOMETRIC MODELING: A First Course text for the geometric modelling courses taught at USC” (University of Southern California) Copyright © 1995-1999.