

The laser scanner relief for the 3D reproduction of Carlo Tito by Giuseppe Sanmartino. Studies for a greater accessibility to art

1. Relief activity conducted on the statue

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Facto 3D

The three-dimensional geometries of the artifact were acquired by means of a latest generation blue light laser scanning probe, mounted on an articulated arm equipped with mechanical encoders to ensure maximum precision and accuracy of the survey. Accuracy: +/- 25 μm ; Repeatability: 25 μm , 2 σ (fig. 1).

After this first phase, after alignment and scanning noise reduction operations, a dense point cloud was built and subsequently a polygonal mesh, which represents the “digital twin” of the find. A photogrammetric survey was also carried out for the acquisition of the colorimetric data which was then added to the digital model, to obtain an extremely realistic and representative product of the work in both shapes and colors.

The metric restitution in color will improve the level of understanding of the work. In addition, thanks to future implementations it will be possible, starting from the data collected, to set up a virtual museum accessible through a web application, to design and implement protection and fruition interventions also thanks to the use of 3D printers.

2. The 3d printed reproduction of the sculpture

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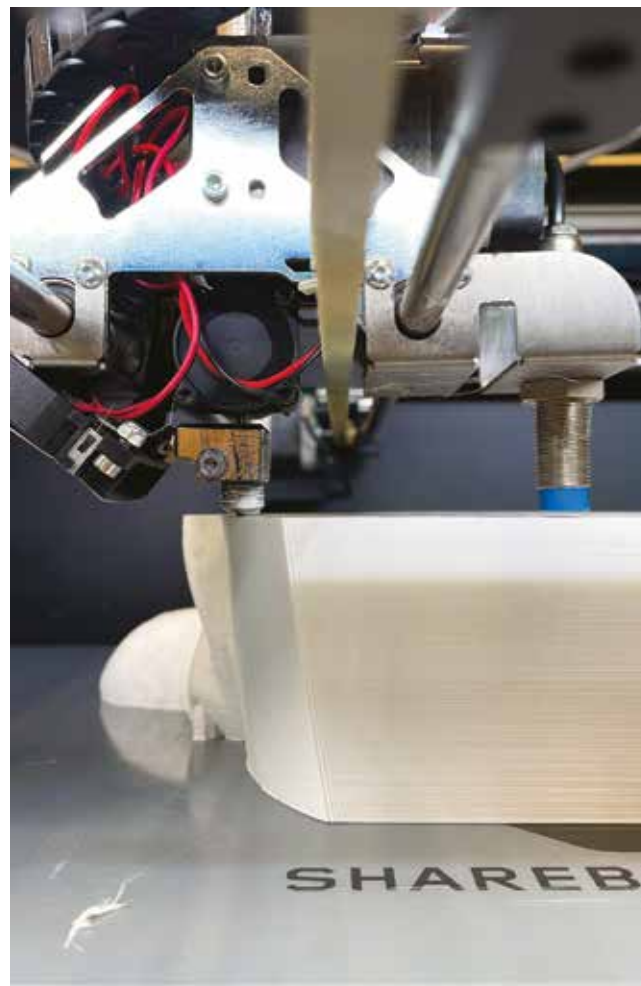
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The creative process of the sculptor Giuseppe Sanmartino, starting from a block of pink marble, progressively subtracts material in the quantities and methods that the artist deems necessary, to give the desired shape to the finished product. But sculpture, as the art of giving shape to an object, is also obtained by addition, as in the case of the clay used by the same artist also, probably, for the terracotta copy of the Royal Child Carlo Tito, for the subsequent casting in silver. The production technique, through traditional processes of removing or adding material, is in any case based on the experience and manual skills of the artist, as in this case, or of the craftsman in general. On the other hand, industrial production makes it possible to model the material with machinery and tools capable of removing or adding the quantity necessary for the project. In this case the starting point of the creative process is a drawing, which in turn can be the result of an original idea of the designer (design) or of the relief of a pre-existing object (reverse engineering).



Fig. 1
3D laser scanner
survey of Giuseppe
Sanmartino's
sculpture (Facto 3D)

Fig. 2
Printing process in
which the printer
nozzle is seen
depositing the
subsequent layers



With the advent of the fourth industrial revolution, manufacturing production was able to make use of new and disruptive processes, now additive and no longer subtractive, better known as Additive Manufacturing or 3D Printing. They allow a high degree of customization of the products and loosen many of the shape constraints associated with the use of tools in subtractive processes, to the advantage of the operator's freedom of expression, imagination and creativity and the reduction of the environmental impact of the whole process. The change of approach and the continuous development of materials offer us today the possibility of building objects with different shapes and technologies. The most widespread "3D printing" is technically defined FFF (Fused Filament Fabrication), and in its most common declination it uses plastic materials. With this technique, the product is produced by continuous deposition of a thin filament of plastic material which, by means of a suitably heated nozzle, leads to the creation of objects with a complex geometry layer by layer (fig. 2).

In FFF a copy, realistic in shape and size, of the marble sculpture depicting the sleeping child was made, quickly and at low cost (fig. 3), aimed at an alternative tactile museum itinerary. It was thus intended to expand and integrate the traditional

Fig. 3
Being able to decide on the material deposition strategy, it is possible to leave gaps inside to save material. In this case, a reticular type filling of 5% was opted for

Fig 4-5
Painting process

possibility of using the work, eliminating barriers to visual impairments and offering new possibilities for didactic experiences.

Polylactic acid (PLA) was chosen as the material. The creation of the copy of the little prince started from the 3D file obtained from an "acquisition" of the work by laser scanner, from its subsequent processing and then the final transformation into a program file for 3D printing. The filament used made it possible to create the desired shape by superimposing thin layers of material. It was decided not to add antique patinas, but to keep a "neutral" effect for distinguishability from the original, through a grouting with epoxy base and a finish with matt white paint with a warm shade (figs. 4-5) . This technique allowed to obtain a realistic final result in the shapes, with an excellent surface finish, minimizing the typical "step" effect that characterizes 3D prints.

