

Sense: Art without Barriers

How Technologies can enhance art fruition

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Introduction

Sense is a project that combines digitalization, 3D printing and capacitive technology, in order to make cultural heritage more accessible to people with visual impairments. It is the result of the collaboration between ETT S.p.A. and the University of Genoa, this last owning an incredibly rich artistic heritage. Specifically, the focus of the project is on the bronze bas-reliefs by the Flemish artist Giambologna and his assistant Pietro Francavilla, preserved in the *Palazzo dell’Università di Genova*.

Historical and Artistic Backgrounds

Depicting *Christ’s Passion*, the group of seven bas-reliefs is part of a wider *corpus* of bronze sculptures that once decorated the *Grimaldi Chapel* in the destroyed Genoese church of *San Francesco di Castelletto*. Commissioned by the nobleman Luca Grimaldi to Giambologna at the end of the XVI century, this monumental group can be considered among the most important Late Renaissance bronze sculptures in Northern Italy.

The bas-reliefs constitute an extraordinary testimony of the technical ability and virtuosity achieved by the artists, who here blend the nordic taste for the rendering of the most minute details with the italian perspective lesson. This approach results in complex *spatial boxes* that start from the background, with Donatello’s *stiacciato*¹, and progress through planes of depth towards the observer, to finally reach the full relief of the figures in the foreground.

In order to allow a blind or partially sighted public to grasp the structural and stylistic complexity of the compositions, a 1:1 scale Typhlo-Didactic² model of the bas-relief with the *Deposition in the sepulchre* has been created and associated via special sensors to a synchronized audio guide (Fig.1). The model therefore allows to combine the haptic perception with an extra level of information, involving a different sensorial dimension.

¹ An extremely subtle type of flat, low relief carving that is especially associated with the 15th-century sculptors Donatello

² Teaching aids aimed at increasing the tactile exploration’s ability in visually impaired and blind people.



Fig. 1. *Sense* (© Manuela Serando).

The production of *Sense*

The production process can be subdivided into three steps:

- Digitalization
- 3D printing and finishing
- creation of contents, sensorization and testing

Digitalization

A 3D structured light portable scanner was chosen to acquire both geometry and colour data, carefully evaluating resolution and accuracy in order to achieve a high-quality level of the digital copy and to get as close as possible to the original.

The Portable Handheld mode allowed to reach elements of the composition such as undercuts and cavities that would have been impossible to capture with a fixed scanner.

3D Printing and finishing

A post-production phase consisted in the subdivision and organization of the model into sections, in order to be 3D printed. After a careful analysis of the compositional aspects and some printing tests aimed to verify the feasibility of the undercuts related to their inclinations, the FDM printing process has been chosen, with PLA filament and a Layer Height at 0.06 mm, which proved to give very good results in terms of resolution and resistance. Being a Typhlo-Didactic tool, these aspects needed indeed to be considered of primary importance (Fig. 2).

All the printed sections were then assembled and treated in order to minimize the joints, so that these would not interfere with the tactile reading. The completed model has then passed through the examination and testing of blind volunteer collaborators, who could verify the quality of the haptic property. Taking into consideration the aesthetic aspects other than the functional, a bronze coat was finally given to keep a visual consistency with the original.



Fig. 2. *Sense*, detail (© Davide Pambianchi).

Creation of contents, sensorization and testing

An accurate study of the contents has been carried out, preparatory to the sensorization process and strictly connected to the principles of haptic perception, being this last a very complex method that proceeds through gradual steps during which the blind person recreates a mental image of the analyzed object: at first very fragmented, then, to every new step, more and more complete. Such an intense cognitive effort very often negatively affects the aesthetic experience. In this scenario technologies can really contribute to rebalance the experience in favour of the emotional part.

The special sensors employed allow to link audio contents to specific POI (Points of Interest) of the object, in order to sustain the tactile reading. Moreover, the audio is activated by simply touching the responsive area, no kind of device need to be worn and the hands are completely free. Every possible barriers between the person and the object are thus eliminated, allowing autonomous and personalized exploration.

An introductory audio, conceived like a *start/pause* button, provides a first level of information, giving more general notions such as dimensional and spatial ones. Also, it points out that some characters shape up to be flatter than others, due to distance and perspective: concepts not to be given for

granted when it comes to blind people. In this phase the sensors are disabled and the user is supposed to start extensively exploring the bas-relief. Successively it is possible to start an in-depth reading, thanks to the sensors located on the bas-relief in order to follow the narration and acquire more details.

Again, an essential phase of experimentation has been carried out thanks to the involvement and collaboration of blind and partially sighted people. *Sense* has been approved by the Ligurian Regional Council of the Italian Union of the Blind and Partially Sighted (UICI).



Fig. 3. Stefano Mantero, Vice Presidente of UICI Ligurian Regional Council, testing *Sense* (© Davide Pambianchi).

Conclusions

A last consideration regards the aesthetic of tactility, which gives access to sensations and emotions that differ from the ones provided by the sight. *Sense* can thus be considered a multisensory experience suitable for everyone.

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