The life cycle of 3D digital data in an archaeological research: case study in Greek archaeology with the lesbic kyma

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Abstract

The use of 3D in our research is not only a simple illustration of an archaeological fact. Digital reconstruction participates fully in the dissemination of information as a complementary resources of traditional architectural statements. We built databases which gathers all the available elements on each molding, whose modeling is the transposition into volume. These catalogs have been developed so that it can be considered as a reusable tool for scientific research.

In the context of open science, a particular effort has to be done for digital data to remain accessible and reusable. Access to the digital information is a fundamental vector for enhancing the value of our respective work. It also promotes not only the dissemination of information, but also potential and new working relationships between researchers. Consequently, it is essential to guarantee access to the digital data in our corpus, as well as its reuse within the scientific community. This application facilitates concretely in strategies on registered file formats, a real opening of research data (access to metadata), the chosen volumetry favoring an easier opening 3D model, etc. Taking all these parameters into account requires a global reflection which is grafted in parallel with our scientific approach. To confront these challenges, we will take care to examine the available solutions, as well as to show the new perspectives offered by the national 3D data conservatory assigned for the sustainability of our digital research work.

To illustrate our approach, we take as example the Lesbian kyma pattern. It is one of the most important and persistent decorative motifs in Greek architecture. This one has a rich morphological development from the Greek archaic through Roman imperial periods, with both regional and chronological formations. The aim of this case study is to show how we can combine the digital tools with a traditional archaeological research in order to improve our scientific results.

This improvement doesn't only concern the archaeological data, but also our capacity to enhance the accessibility and reuse of digital data. It is thus a great opportunity to reveal the life cycle of the digital data from the beginning of their creation until their conservation and archiving.

In our research, the use of digital techniques is applied like a tool that allows us to study

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this specific decorative element of Greek Architecture more efficiently. The exhaustive and systematic study of these architectural decorations over more than 8 centuries and over a very large geographical area has enabled us to build up a corpus of nearly 400 moldings with nearly 200 3D models and 60 photogrammetric models. As consequence as, these digital data requested a long integration work upstream of our research, so that they would not only have a simple illustrative value. On the contrary, these elements should encourage the emergence of new scientific results.

By making use of photogrammetry in dense correlation, we explore stylistic connections through this seminal molding. This digital tool allows us to measure and evaluate plastic connections between several moldings by comparing their profile, pattern, and morphology in three dimensions and on a consistent scale. This 3D technique enables us to expand and render more precisely our stylistic analyses in defining architectural centers of excellence. In addition, we can use 3D modeling to create a catalog as well.

In order to illustrate these points, we will present in detail the methodology, as well as the techniques used in modeling of these architectural decorations. Our objective was to build a credible digital datum by taking into account of the archaeological facts, so that we don't betray the original. And therefore, we will be particularly interested in explaining our scientific approach to ensure the accuracy and scientific rigor of the 3D representations of our corpus. If the use of the photogrammetry by dense correlation is not an innovative element, since currently it is perfectly integrated in many historical research, and it is nevertheless important to explain the acquisition protocols, as well as the digital data processing.
Thus, this case study, concentrated on a typical decoration of Greek architecture, is aimed to launch out into the processes, as well as the good practices that allow the valorization of the digital data produced by scientific research, until its backup and its reuse. Through our work that has contributed to the reconstruction of this corpus, we would like to share our conception on the use of digital tools in the humanities and social sciences research. Moreover, in the same perspective, our experience feedback, as well as the practices developed in the construction and enhancement of digital data are likely to meet the expectations of other projects conducted in the fields of digital humanities.