Geometrical comparison of 3D data of silver coins

1. Abstract

The four silver Roman *denarii* used in the case study raise interesting questions concerning their provenance, authenticity, design and iconography, purpose of issue and historic usage. They also pose a considerable recording challenge due to their small size, particular material and surface properties, some of which may not be original, but a result of extensive cleaning.

Many relevant aspects for the analysis of historic coins have been traditionally described in rather ambiguous terms, without taking into account the advantages of quantitative measurements of, namely, shape/form and macro/micro topographic features. The coins have been specifically chosen in order to establish whether the selected recording methods can support the comparison of features and properties.

In a wide perspective, this STSM aims at contributing to a better knowledge about the surface characteristics of historic coins, by using digital metrological methods, techniques and procedures for a comparative geometrical analysis and evaluation of the 3D data (for each single object/technique and between objects/techniques). These data have been acquired by different 3D systems (structured light, laser, SfM, µ-CT), from several european institutions. In a more confined sense, the aim is at contributing to the publication of a guide to good documentation practice, including relevant digital preservation guidelines.

The data was analysed using 3 different software (commercial and freeware). A standard procedure was applied to ensure coherency of the comparisons. Preliminary results raised more questions and discussions – including methodological concerns – than gave answers or conclusions. As expected, different systems, resolutions, software, parameters, filters, etc., lead to some differences in the overall and/or in the fine morphology of the coins, which may reveal, distort or conceal topographical details of the surface. Then, we may ask how accurate is the captured data in respect to the original object? And how will this level of accuracy affect the analysis, classification, and interpretation of the cultural heritage (CH) object? These issues are of great importance when analysing and interpreting, e.g., variations in the hammering process, die, mint signs, shape, scratches, wear pattern of the used stamp, or cut and punch-marks. Or even when trying to detect changes on the coin's surface after a loan or other condition monitoring, among others. At the end, depending on the numismatics' questions behind and scale of analysis, the accuracy, resolution and precision of the measurements should be high enough to fulfil numismatist's needs for an improved scientific documentation and study of coins.

Although a 3D digital model does not provide a complete picture of the object, it should be understood as a highly powerful tool – potentially, with valid data – for CH research, and complementary to other measurement techniques and fields of knowledge. This is the multidisciplinary nature of CH objects.

This research topic is addressing the aims of: WG2 "Spatial object documentation", topic 6 "Comparative analysis of measurements realized for one single object"; Case study "Study of Roman silver coins using spectroscopic and 3D imaging approaches"; Think tank on vocabularies; and COSCH KR App.