



METROLOGICAL EVALUATION OF 3D IMAGING SYSTEMS - GUIDELINES & BEST PRACTICES

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Short description of the STSM: Best practices and guidelines are a fundamental metrological topic, especially when a given technology matures enough that many users, not always familiar with it, decide to approach that technology and to make it mainstream. This is, for example, the case of passive 3D imaging systems. While providing access to some satisfactory results from a visual point of view, these solutions have the major disadvantage of lacking clear and unambiguous metric results. So, there is a **clear need for accuracy evaluation tools** (i.e. test-objects, methodologies and protocols) for 3D image-based modelling techniques. Furthermore, the digitization of small museum objects requires **specific best practices and guidelines** in order to provide a metrological framework by which achieve a “fit-for-purpose” 3D final reconstruction of the artefact itself. Aim of the completed STSM project is a step towards bridging the gaps by addressing the aforementioned two main open issues. Both metrological expertise and heritage conservation knowledge achieved by the VS and HO in their previous research studies have been efficiently exploited and integrated in order to:

- 1. Test the performance of an image-based 3D modelling technique** through the use of the Portable Metric Test Artefact, designed and built at UCL CEGE. The attention is focused on an open-source software solution developed by the French Mapping Agency (IGN) and provided through the suite of tools Apero/MicMac. The choice of this set of routines for bundle block adjustment and dense image matching is due to its promising potentialities that combine photogrammetric rigour, flexibility and economic advantages. With the adopted test object, different geometric criteria are evaluated, such as step, gap, angle and length characteristics.
- 2. Test the Portable Metric Test Artefact.** The latter was specifically designed for museums and heritage institutions, to support the integration of 3D imaging into the museum workflow. The STSM is thus aimed at testing the object’s performance in dealing with the evaluation of image-based techniques. The experiments suggest some improvements and practical recommendations that will lead to a future refinement of the portable metric test artefact.
- 3. Define guidelines and best practices** that will support non-experts in the 3D digitization pipeline. Since low-cost replications of the test object for museum professionals are planned for the future, the STSM experiments are tailored to the definition of a rigorous procedure to correctly perform all the phases constituting the 3D digitization pipeline, ranging from sensor selection and planning to data acquisition and processing.

The STSM project covers both objectives stated by WG II of COSCH (“*Spatial object documentation*”). Furthermore, it may also contribute to the definition of the COSCH Knowledge Repository App and its evaluation of capabilities of sensors to aid the decision making process of Cultural Heritage users.

