

# Using digital approaches to reveal the historical states of portable mosaic icon

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## Abstract

The portable Byzantine mosaic icon of the Virgin Pammakaristos, one of the rarest and finest surviving examples of portable mosaics, is an emblematic religious artwork of the great art of the 11<sup>th</sup>-12<sup>th</sup> centuries. A documentation framework is set up that would allow to trace the icon's states in time due to natural, anthropogenic and conservation interventions. We employ three-dimensional digital imaging methodologies to address art conservation – preservation problems. Furthermore, we define an assessment framework to evaluate their contribution towards objective diagnostic and documentation procedures. A full three-dimensional digital imaging survey was carried out as part of the icon's comprehensive preservation project. The aim of the conservation and computer graphics experts was to provide meaningful information, the basis for complete examination and documentation from structural, geometrical and topographical point of view. We undertake a three tiers acquisition protocol based on visible and non-visible spectrum acquisition methods. The visible techniques are based on both active and passive radiance capturing methods. In particular, the former includes optical three-dimensional laser scanning, while the later comprises of structure-from-motion techniques. Both methods have offered a detail geometric and colour information of the exterior surfaces and its materials. The non-visible spectrum method of dual-energy computed tomography provides encompassing and detailed presentations of the overall inner state of the icon. The inspection through three-dimensional tomographic reconstruction reveals the different components of inner structure.

Finally, we obtained a comprehensive documentation through digital reconstructions. These were guided by the art conservators' requirements' to study material and technologies and to trace the history of past conservation interventions. The integrated digitization workflow and the subsequent analysis provide valuable tools in the conservation decision-making process prior to intervention. All three analytical methods contribute to the diagnosis and provide crucial information on both the construction techniques and former conservation interventions. These studies have so far provided a comprehensive and detailed record of the current state of the icon and will be repeated after the completion of conservation works in order to acquire comparable information sets, which in turn will facilitate the transmission of quantitative and qualitative aspects of cultural heritage to the next generations.