



FACTVM
FOUNDATION

FOR DIGITAL TECHNOLOGY
IN CONSERVATION



3D Cameras

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We, along with many others, are looking to find ways to save and preserve heritage objects and sites that are in such danger - especially in the Middle East - using digital technology. Sadly there is a little misunderstanding about that technology and what phrases like 3D imaging and resolution actually mean and how these techniques can help. So, this Opinion is a quick review - the website links will take you to more - as the Foundation's focus is based on the accurate recording in three dimensions and we want to remove any misunderstanding of what this means and entails.

It has been possible to record stereoscopic images on what are called '3D cameras' since the 19th century, but these don't actually record three-dimensional data - they record an illusion of 3D on a flat plain that can be viewed with special glasses or as lenticular prints. Photogrammetry, multiple images taken with a decent SLR camera and a constant light source, can record 3D data when the recorded data is processed with the right software. This can be a relatively cheap and efficient method when access to sites is difficult and heavy or sensitive equipment cannot be used. What is essential, though, is the processing of the recorded raw data as it is not yet a 3D image - it is a very noisy set of data.

3D Scanning has, in recent years, become part of a coherent and non-contact approach. A number of different methods exist for both scanning and photogrammetry, each with their own advantages and limitations - see details here. The challenge is to identify the right system for the right application: no one system can do everything.

Photogrammetry can be used on a very large scale (site) - or it can be used close range and with enough resolution to document the surface of a carving - the result being visible at a greater resolution than normally visible by the human eye. This data can be very useful for epigraphic study or condition monitoring that cannot be achieved in normal photographs.

Photogrammetry has the added advantage that colour and 3D are recorded at the same time. Processing data is time-consuming and requires powerful computers, software and skill - every hour spent recording in the field requires one days processing. Facsimiles result from our ability to rematerialise data as three-dimensional objects - it is demanding new skills and a different understanding of recording technologies and their application. The most widely reported example of this approach (Lascaux and Chauvet are important and have been successful but they are not facsimiles - they are hand painted copies) is the Foundation's facsimile of the burial Chamber of Tutankhamun - a Foundation project. As a public attraction, the facsimile is helping visitors understand the damage they cause and the complexity of allowing sites to be visited while ensuring their long-term preservation. Such initiatives are leading to a re-negotiation of the relationship between the original and the authentic.

Exact facsimiles are being made possible through advances in 3D recording, composite photography, an assortment of multi-spectral imaging techniques, image processing and output technologies - not all of which are necessarily available or useable in conflict sites such as the Middle East.

Resolution is another important but largely misunderstood factor. The way we use the term 'resolution' refers to the level of detail a 3D file contains. We evaluate the resolution not just by a theoretical description of the sensor of the scanner, but also by the correspondence between the scanned data and the original surface.

If we and other organisations can work together on a planned approach then the capture of colour and 3D information can be achieved using the necessarily wide range of equipment required by different circumstances. An important part of this approach should be the transfer of skills and equipment to paid local operators with local knowledge and a desire to be part of a major initiative. Data can be downloaded to centralised hubs for organisation and storage until the time-consuming, systematic work of processing can begin which process requires expensive computers or server farms. As a collective activity, this will grow rapidly into a vast archive of data and an open source model. The technology is there – it is now time for the politicians to hand over to the technicians and to set demanding targets. With the right support and equipment, the growing team of people doing the recording can really make a difference. It is through the understanding of the past that we shape the future.