

The arrival of digital technology in archaeology, as in so many other disciplines, has had a profound effect on the methods and tools that are part of everyday use, and more widely on overall working practices. Nonetheless, these changes have sometimes given rise to failings that only experience and practice have revealed and only experience and practice have managed to gradually correct. One of the most obvious concerns photography. Indeed, while digital photography may have ended any restrictions imposed by the cost of traditional film, it has also led to a rather reckless overindulgence in the number of pictures taken, resulting in massive amounts of all-to-often useless documentation. However, the development of digital photography, in conjunction with the increased capacity of laptop computers, has popularised the use of photogrammetry. This latter technique allows one to calculate 3D measurements from 2D data, and, within the field of archaeology, has gradually replaced some or all of the traditional methods of on-site drafting (by hand, on graph paper) and surveying. Photos of archaeological vestiges have become media to be used in technical and scientific surveys. Of course, good practice of this procedure implies command of a body of knowledge and techniques during the phases of data acquisition and processing, which too many users might be tempted to ignore given that software interfaces have simplified usage. This impression, and it is only that, has led some to characterise its use as being a matter of flicking a switch, whereas in reality it is an extremely scientific procedure.

While the applications of photogrammetry are many and varied, the way in which it is used in archaeology is nowadays quite standardised in the great majority of cases. In general, it replaces traditional surveying of archaeological vestiges in plan, section and elevation, with the creation of orthoimages, orthomosaics, and digital surface models.

This short book, intended as a guide for the archaeological community, was born of a number of observations, including, among others: the great variety in on-site implementation of these techniques (from survey expectations to the choice of equipment); the self-taught nature of very

many archaeologists; the almost systematic use of software that favours ease of use over reproducibility of results; and the noticeable variability in the way published photogrammetry data is qualified (quality, precision etc.) Consequently, the first aim of this guide is to provide access to these tools for all in the daily exercise of his or her discipline, by using the same equipment and the use of a free, open-source software developed by the leading French photogrammetry research units. The second aim is to present a comprehensive and focused procedure for creating an orthomosaic from a set of digital photographs. Indeed, photogrammetry can also produce point clouds depicting a three-dimensional scene, but this aspect of the technique and its usage will only be touched upon in this publication.

It is important to mention that the substance of this guide comes from eight years of experimentation and of methodological development during which we tested many software programmes and much dedicated equipment, from the most expensive to the free solution finally opted for, while also examining the most commonly used systems within the discipline. A large part of this methodological development took place as part of projects run by the 6249 Chronoenvironnement archaeological research unit, particularly those conducted on the site of Bibracte in France. Much was also gained from the doctoral thesis presented by Q. Verriez (Université de Bourgogne/UMR 6298 ArTeHiS) and financed via an agreement (CIFRE) between PCC Bibracte and the Association Nationale de la Recherche et de la Technologie (ANRT). Without this financing, the work would never have seen the light of day.

We shall present a comprehensive photogrammetry protocol based upon tried and tested examples drawn directly from archaeological contexts and respecting the recent recommendations issued by the Consortium “3D for Humanities”. The intention is to provide archaeologists with the essential information for producing orthomosaics that are relevant and can be meaningfully evaluated by the scientific community.

First of all, we shall review a certain amount of theory for readers who are not specialists in photography, optics and digital imaging. Thereafter, we shall examine the necessary tools and the settings that must be respected in order to conduct a data-gathering campaign on an archaeological site. The core of the book is dedicated to the processing phase and presents a comprehensive protocol developed for MicMac, an open-source software designed for an academic audience that is focused on results that are transparent and reproducible. The final section tackles the necessary steps for the backup and distribution of this type of data.