

Using digital photogrammetry to obtain 3D models in prehistoric enclosures: Perdigões a case of study.

INTRODUCTION

The archaeological complex of Perdigões (Reguengos de Monsaraz, Portugal) is a prehistoric site near the Guadiana river, comprising at least 12 ditched enclosures, several hundred pits, an area with megalithic tombs and a set of standing stones (*cromeleque*). It is located in one of the richest archaeological landscapes of Iberia, with notable examples of Prehistoric monumental architecture such as menhirs and portal tombs (*antas*). A team from the University of Malaga (Spain) has been carrying out fieldwork in collaboration with the Portuguese entity ERA Arqueologia at the site since 2008.. The first and second campaigns was centered on ditch 1 that was excavated by ERA Archaeology in 1997 but don't complete the archaeological sequence. The 2011 and 2012 campaigns was related making an extension excavation showing, as result, all gate 1 structures. Also geophysical study was done (2009) and microtopographical model (2011) both of whole site. In addition in 2013 campaign we excavated 4 structures: "imbrex", "crosspiece", ditch 1 y ditch 1 closure structure. As a result of the campaigns we discover all structures related to gate 1 and located several artifacts including 2 little idols and 1 decorated tear.

In this paper we describe how we used digital photogrammetry in Perdigões. Digital photogrammetry is a cheap computerized method to obtain 3D models from photos using image pattern recognitions This technique helps in whole process of excavation providing methods to digitalize de excavation process, provide 3D models of the stratigraphical units and to digitalize singular findings. In addition this technique will help us to the site diffusion. We will introduce how this technique has been used in the Perdigões site with 3 case of study.

MATERIALS AND METHODS

In brief, we show two main topics: photogrammetry basics and workflow and the use in perdigoes for including to the study of prehistoric enclosures. The main uses can be summarized in three areas:

- Obtaining DTM (digital terrain models): of excavation large areas like Perdigoes' gate 1 (about 1000m²). In
- Obtaining 3D models of different "cortes" made on the site: in this case we get foso 1 model.
- Obtaining models of singular findings. This is a difficult task because findings size. In this issue we present an idol from the site.

For all these issues we present basic workflow and recommendations for each one type of model. Also the use for the study and diffusion of prehistoric enclosures. In every section we show the technical data like software, computers, photos, polygons, mesh and texture to obtain good models.

Moreover we discuss about other solutions for cultural heritage digitalization like LIDAR and total station scanners with LASER. Thus, we show a comparative about these techniques evaluating pros and cons.

RESULTS

We can summarize the principal findings in three ways. First we introduced the photogrammetry as a method enclosures sites providing digital models that can be used for the study and excavation recording. So we obtained a model of a whole plant of gate 1 that it would have been difficult and expensive using other methods like LIDAR. This excavation recording has been used to obtain paleo-reconstructions of the site. Secondly, this methods has also been used to obtain partial 3D models of the excavations process. That 3D models are recorded and can be used for the site study and for the site diffusion.

CONCLUSIONS

Digital photogrammetry helps us to digitalize the excavation process and singular findings. This tools has been used for obtaining realistic models that can be used from the excavation process recording to the diffusion of singular findings. We use this technique in several ways in Perdigões. First to obtain a model of the excavation plant that sizes an area of 1000m². This help us to obtain a synthetic photo and a digital terrain model of a great zone. Second we used it to obtain 3D models of stratigraphy for improve the information recorded in the excavation process. Finally, we can used it to obtain 3D models of singular findings. Consequently, including this technique we improve the archaeological recording and thus can improve the diffusion of this archaeological sites including its findings.