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INTERFACING THE PAST

COMPUTER APPLICATIONS AND QUANTITATIVE METHODS IN ARCHAEOLOGY CAA95 VOL. II

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Statistics and Classification

György Csáki
Ferenc Redő

Documentation and modelling of a Roman imperial villa in Central Italy

1 Introduction

Of the possible archaeological adaptations of computer techniques, this paper is devoted to documentation.

1.1. About the documentation

The importance of archaeological documentation cannot be overestimated. Field archaeologists are aware of the fact that their activity, in most cases, leads to the complete destruction of archaeological sites. Theoretically, the various layers of a stratified settlement are peeled off one after the other until the earliest level is reached. Finally, even the last stratum is shaved off to make sure that nothing is left underneath. It may be stated therefore that when the archaeologist's work is accomplished nothing is left and subsequent visitors can admire only the natural environment of important prehistoric sites trying to imagine the original landscape and its inhabitants. Being a Roman Period archaeologist (FR), I am specialized in a period which is characterized by a better than average preservation of archaeological features. It is not necessary to remove stone walls since nothing can be expected below them. Floor levels, however, with the exception of occasionally occurring mosaic floors of great aesthetic value, have to be systematically removed. In this rare case, one may add, non-scientific considerations are given priority: deposits under the floor are not studied for the sake of presenting a beautiful design. This type of presentation means that a moment of history is arbitrarily emphasized, although earlier and later finds must be investigated as well.

It is common archaeological experience that any surface is in the best condition at the time of recovery. That is the time when it must be documented using the broadest range of methods possible including drawing, photographing, film and video recording, verbal description as well as digital procedures. Computerized data gathering and analysis has created an opportunity for introducing new methods in this work opening perspectives that cannot even be fully appraised at this point.

1.2 About the site

Excavations at the Piano dei Santi baulk near the village of San Potito di Ovindoli in Italy have been carried out within the framework of a cooperation between the Archaeological Institute of the Hungarian Academy of Sciences, the Soprintendenza dell'Archeologia degli Abruzzi and the Comune di Ovindoli (Gabler/Redő 1986, 1988, 1991, 1994a, 1994b). This archaeological site, a villa from the Roman Imperial Period, is a fortunate case in which the most characteristic level could be pinpointed relatively easily. Most of the stratigraphy is horizontal, vertical components mean that previous features were damaged already by Roman Period construction activity. Layers within the periodization correspond to variations in the size of the habitation area.

Three elements in the documentation of this site will be presented here. Some details of this work were already presented to a professional audience in Ravello in 1993 (Csáki *et al*. 1995). Since that meeting, however, major developments have taken place both in the quantity of documented detail and the scope of methods applied.

2 Documentation of the environment

A digitalized map was prepared showing the site's broader environment. Data of the topographic contour lines in this map were used in preparing a surface model. Constructing this type of surface models often requires the introduction of artificial distortions. Eroded elevations and silted river beds sometimes changed only by centimetres; however, even such small differences may be of significance and must therefore be shown. Fortunately, such a distortion was not required in the case of San Potito since modelling the narrow valleys in the Abruzzo mountains could be carried out using contour lines indicating 10 m elevation, which resulted in a copious pattern.

Our model makes the exclusive selection of coeval topographic data both in a geographical and a historical sense, thereby showing Roman Period relationships between settlements, roads and water surfaces (Grossi 1991). Constructing the model itself will not be discussed in detail. One practical experience, however, is worth mentioning here: a high resolution model showing the excavation's immediate surroundings is equally necessary.

The model that perfectly represents the broader hilly environment shows the site itself within one level, since no

Figure 1. A digitized part of the geometric decoration of a pavement.

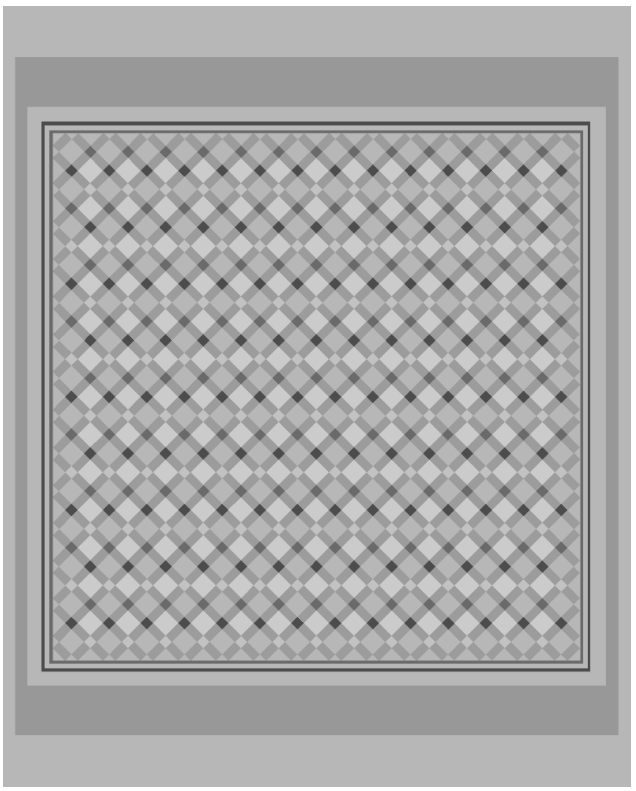

Figure 2. The fully reconstructed geometric pavement.

differences in elevation exceeded 10 m at the settlement (Csáki *et al*. 1995). At the same time we know that there were major differences in the levels of various features within the villa as is evidenced by the presence of stairs between the inner courtyards. Our measurements are indicative of more than three metres of vertical difference between the lowest and highest points of the Roman Period floor levels. The orientation of the villa's drainage system was also carefully laid out. It is for this reason that a stepwise surface model is required that will bridge contradictions in the data and will make the satisfactory documentation of excavation results possible.

3 Documentation of mosaic pavements

The size and luxurious character of the villa under discussion here was well above even the Italian average. On the basis of data available to date, one may say that the residential section, made up by rooms around an approximately 50 by 70 m inner courtyard, was built with care and reflects wealth. It was equipped with glass windows and decorated with wall paintings as well as mosaic floors.

The documentation of mosaic floors was an interesting task. Theoretically, data could be recorded in two different ways. Photographs and drawings of the floor could be either scanned, or digitalized drawings could be used.

3.1 Different methods of documentation

My experience is that computerized data recording does not save the tedious work of making precise drawings. The poor state of mosaic floors in the field circumstances of recovery usually does not make 'objective', that is non-commented, documentation possible. Fragmented surfaces cannot be cleaned to the degree that is required for the taking of informative photographs. Field drawings, on the other hand, also have their limitations set by scaling, the thickness of pencil points and our eyesight. These may be modified by the beneficial influence of additional information gathered on the object. It is not an accident therefore that this type of hand-drawn field documentation also contains quantities of written, that is, non-visual information. It is at this point that the tremendous advantage offered by digitalization can be exploited. This computerized technique makes the recording of features in natural size possible. The amount of

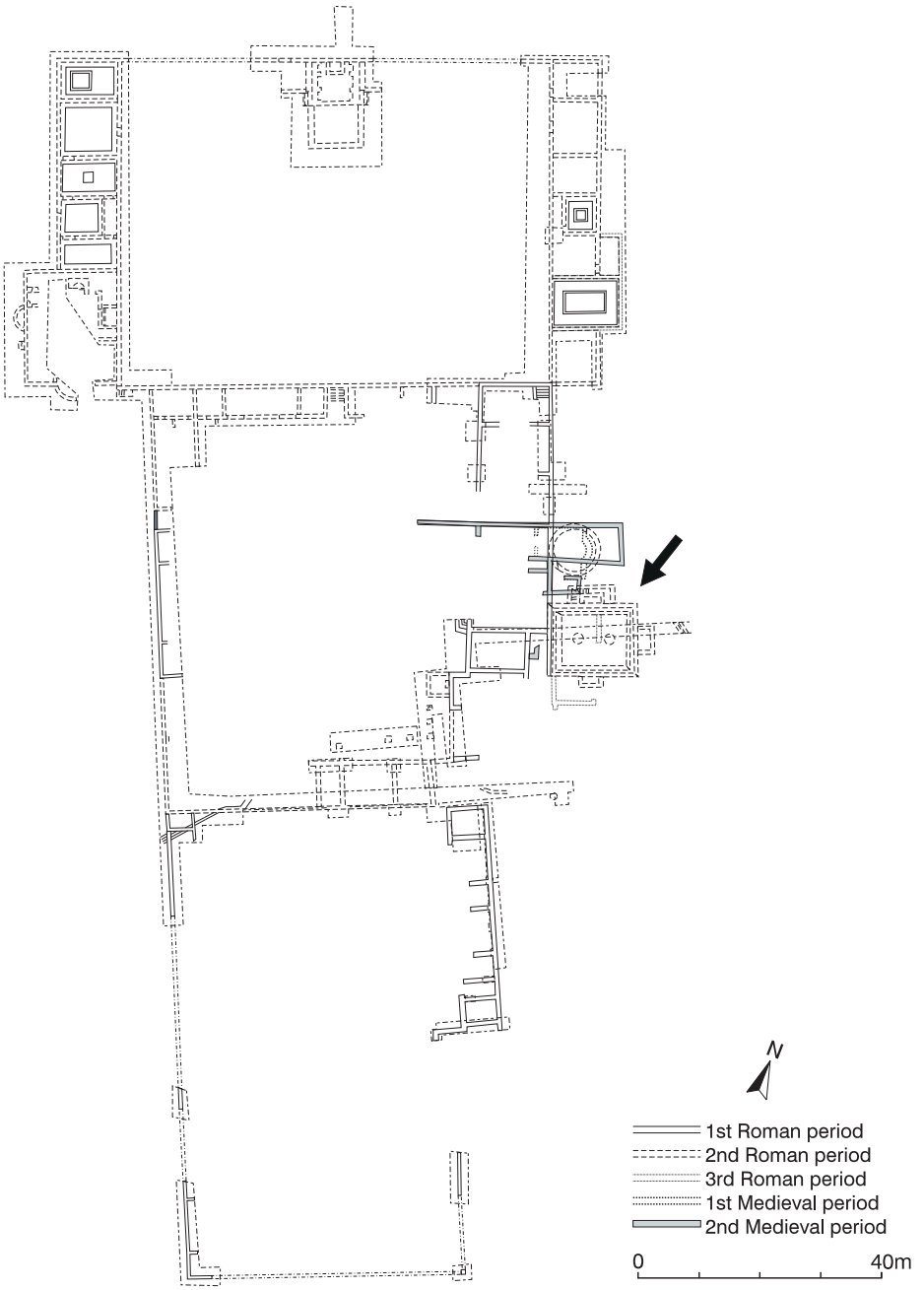

Figure 3. Ground plan of the villa, with the double walled construction.

detail and precision in such records, however, is far beyond physical visibility, falling within the realm of knowledge. Consequently, the possibly most complete data set may be compiled (fig. 1).

Naturally, not every detail in such a data set is utilized simultaneously and constantly. On the other hand we have a data base at our disposal that is as complete as possible and can be exploited to the degree required.

3.2 Reconstruction and publication

Of the examples discussed here, the completion of mosaic floor surfaces may be considered the most exciting. The

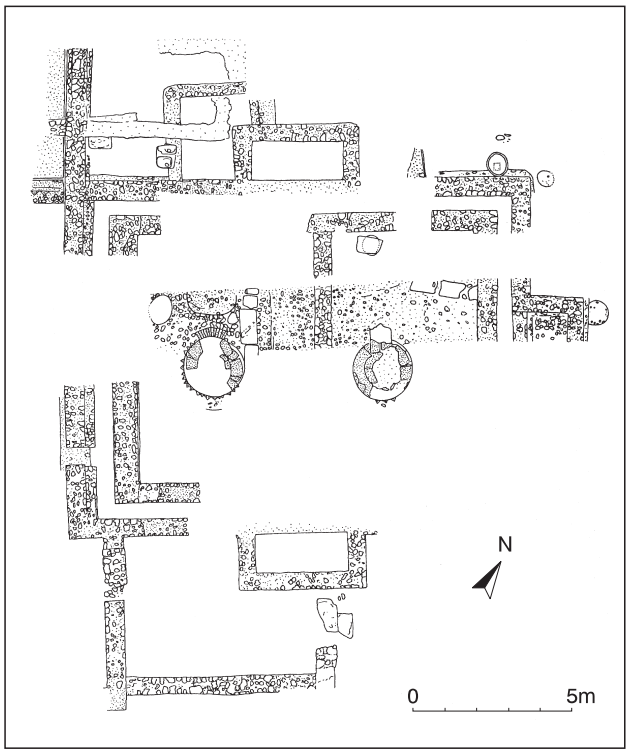

Figure 4. Compiled drawing of the double walled construction.

examples presented here include floors with geometric patterns that could be completely reconstructed (fig. 2), and floors with figural decoration that could only be partially reconstructed.

A special advantage of digitalized drawings is that the material becomes accessible for computerized image processing for the purposes of publication (Gabler/Redő 1994). Colour pictures as well as black and white half tone reproductions can be equally created: the excess information included is an excellent means for mediating our expertise.

4 Three-dimensional modelling of different features

The third area of use is a novelty both in the analysis of this site and in our personal experience. This is the topic of 3-D modelling.

It has been a challenge for a long time, that following the reconstruction of hills and valleys including the roads and water surfaces, the villa itself should be 'built' within this landscape. This would be a formidable task, however, at this point it has to be abandoned in the absence of additional data. First, further details of the site plan must be recovered. Even full knowledge of the building's plan, however, would not shed light on the structure of vertical

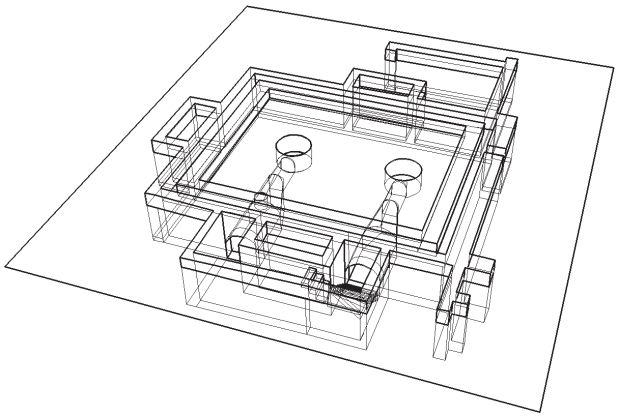

Figure 5. A transparent perspective view of the feature.

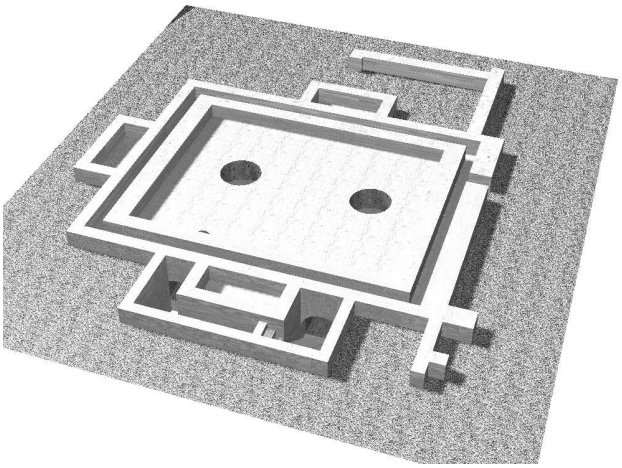

Figure 6. The double walled feature viewed from the north.

walls which therefore remain unknown. Reconstructing these, as well as the roof and windows of the villa would introduce a speculative element in the reconstruction that could not be controlled by the archaeologist alone.

Possibilities of 3-D modelling were therefore tentatively used in solving a specific problem. There is a section within the villa that could not be identified (fig. 3). Specialists neither in Italy nor in Hungary could even comment on this detail. Aside from the rarity of the feature in question, its mysterious character is partly due to the fact that it has never been fully visible and it could therefore not be appropriately presented for the purpose of consultations. The site's location at an altitude of 1000 m as well as the frost that may last for five months every year make the annual re-burial of each excavated and documented feature necessary. As a result, the feature under discussion here was excavated in three consecutive seasons and could never

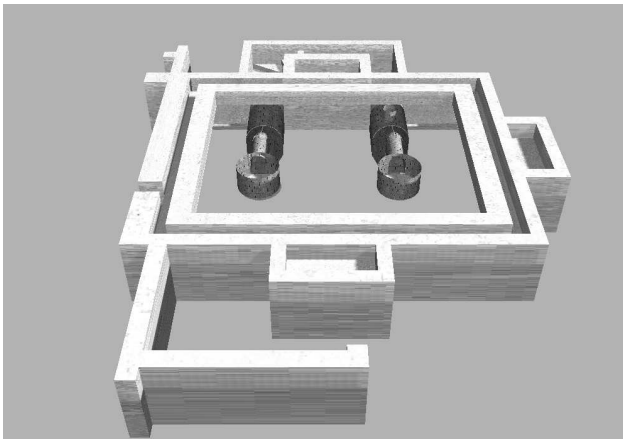

Figure 7. The double walled feature viewed from the sorth (without the surface).

Figure 8. An inner view of the western tunnel of the double walled feature.

be entirely seen. In addition, some of its sections still lay unexcavated (fig. 4).

This feature is particularly suited for the purpose of 3-D documentation, since it extends 2.8 m below the surface and is interrupted by tunnels and shafts. In other words, it is an unusually complex structure whose 3-D reconstruction can be carried out without unnecessary speculation. All sections and aspects of this feature were digitalized providing data for the construction of its computerized model. The result of our work can be viewed and measured from any angle (fig. 5). Its data points, edges and surfaces can be made visible or removed from the picture as requested.

It must be mentioned here that the working process itself, the unambiguity required by the technical solution, helped clarify our thoughts and refine the relevant hypotheses. Real results, however, will facilitate the selection of the most characteristic aspects, help 'walking around' the feature's subterranean sections and offer an inside look at the construction (figs 6, 7, 8). This high quality information will permit the presentation of the identification problem in a way that can be appreciated and discussed by an international audience of experts.

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