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INTERFACING THE PAST

COMPUTER APPLICATIONS AND QUANTITATIVE METHODS IN ARCHAEOLOGY CAA95 VOL. II

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An application of GIS intra-site analysis to Museum Display

1 Introduction

At CAA94 we showed a research oriented ARC/INFO application of GIS to intra-site spatial analysis (Quesada *et al*. 1995). A topographical map of the 500-plus cremation graves was matched with a complete database including type of grave, area and volume of the tumuli, chronology, sex, different categories of grave goods, two different criteria for assessing wealth (wealth units and number of objects) and other data.

This application provided a quick and easy screen or printed output of different maps according to varying criteria: distribution of graves according to sex, wealth, date and all combinations of these and many other data. Many hypotheses were put forward and tested using these results. It was soon clear that only the use of a computerised GIS database allowed the formulation of many tests, which would otherwise have been very tedious and time consuming, or simply unaffordable in terms of time and the cost of manually producing dozens of different distribution maps. Some preliminary results of this research, involving the initial layout of the cemetery and some spatial analysis based on grave distribution were shown at CAA94. In the near future, the digitized area will be integrated into the wider topographical and archaeological framework of the area, including the settlement situated a few metres away to the east, and the sanctuary, built onto a ridge to the south.

From the very beginning this project was also designed to allow a completely different and complementary approach, using the same set of data and software, and thus maximizing the results of the original digitization and input of data.

The 'El Cigarralejo' site has been excavated for nearly forty years, yielding thousands of objects, so much so that a small but complete monographic Museum was opened two years ago in a small palace near the site, in the neighbouring town of Mula (Murcia). The Museum was specifically designed to house the finds from that site, being intended both as a research and tourist centre. It was then decided that a public access, Museum display oriented application should be designed, for use only in this Museum, taking our research database and maps as a starting point, and thus optimizing our efforts. This is the application we are presenting now: it is intended in the first place as tool for the small Museum staff and visiting researchers, not conversant with the intricacies of AML programming, and, secondly, for gallery display. In the latter case, some features shall be simplified, some options blocked to avoid a too complicated interaction with visitors, and, if possible, a touch-screen will substitute the mouse.

The application has been designed using our main research tool, ARC/INFO, as its information is originally intended for complex use including 3-D data, but it will be soon adapted into AVENUE for use in a PC environment, which any small museum can afford.

2 The site

El Cigarralejo (Mula, Murcia) is one of the best known Iberian cemeteries. More than 500 graves have been excavated, accounting for almost all the space in the cemetery. Only 350 of these have been published so far (Cuadrado 1987), but our work takes all the graves in the site into account. The site was used between the first quarter of the 4th century BC and the end of the 2nd century BC, although most of the graves can be dated to the 4th century BC.

The funerary rite used was the usual in the Iberian culture: cremation of the body — outside the grave enclosure — moving of the ashes to the grave; and deposition of the cremated remains in an urn or directly in a grave or pit, together with a fairly large number of grave goods. The graves can be divided into two basic types: simple burials in an uncovered shallow pit, and burials in a pit covered by a quadrangular or rectangular tumulus of stones and mudbricks with a small mudbrick tower on top, or even with a stone monument (a tower-like *stele* or pillar), decorated with anthropomorphic or zoomorphic stone sculptures.

Because of the shortage of available space, or for social, religious or other reasons, the graves were literally heaped together in a very confined space, and as many as eight levels of tumuli overlap each other. These overlapping levels (an average of four in the cemetery as a whole) considerably hamper excavation and interpretation, but are of great assistance in establishing the relative and absolute

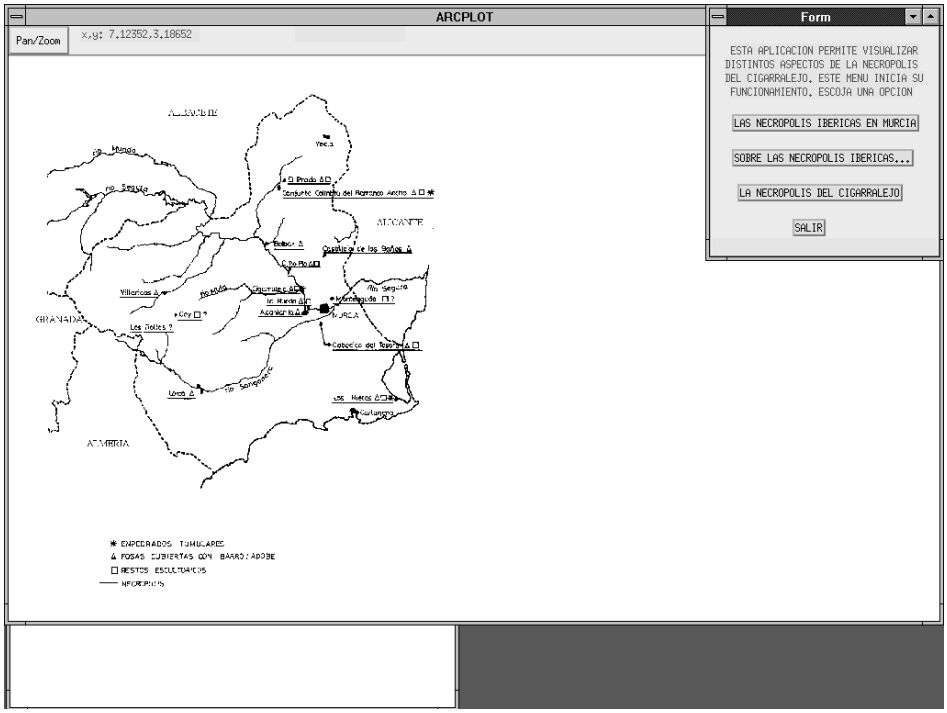

Figure 1. The Main Menu.

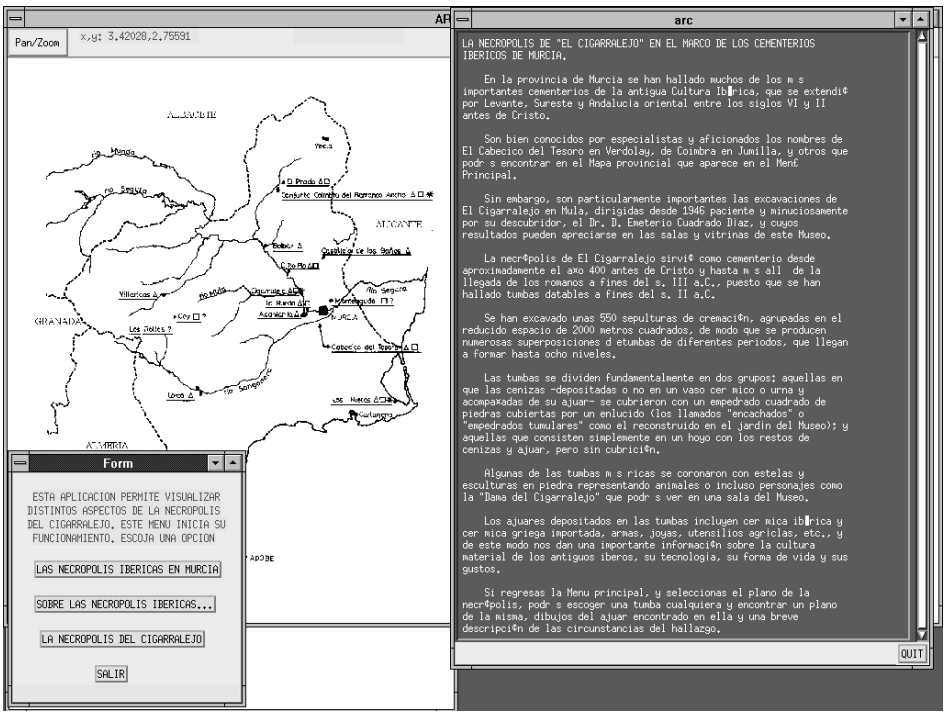

Figure 2. A short description of the 'El Cigarralejo' site in its regional context.

Figure 3. A map of the 'El Cigarralejo' site.

Figure 4. Zoomed in on the map of the 'El Cigarralejo' site.

dating of the various burials. By combining the stratigraphic sequence of the superimposed graves with the dates provided by the abundant black glaze imported pottery that appears in a large proportion of the grave goods, it has been possible to propose a fairly precise chronology for most of the graves, with margins of error of as low as 25 years.

The concentration of many graves within such a small space produces a great deal of archaeological 'noise', because the graves of different periods and characteristics have become intermixed. Any attempt to carry out a social analysis of the cemetery (horizontal stratigraphy, family clusters, hierarchical stratification of the community, sexual distinctions, etc.) had to start with the production of a great many thematic maps.

3 A museum-oriented application

This application has been built using the AML programming language, used by the ARC/INFO package used by our team in the different GIS studies within our general research Project 'GIS and Spatial Archaeology', funded by the DGYCIT and carried out in the Dept. of Prehistory and Archaeology, Universidad Autónoma de Madrid, together with the Cartographic service of this University.

The structure of the application, built on the abovementioned databases (ARC/INFO digitization modules and dBASE III+ character and numeric fields), has been kept deliberately simple and straightforward to allow its use by non-trained staff and visiting scholars to the Museum, although a further simplification will probably be necessary to eliminate any possible 'bugs' which can hinder the smooth running of the program in the hands of non-experts.

The Main Menu (fig. 1) offers three options and a fourth, 'Exit' option:

A This option shows a general map of the Murcia province, and the distribution of known Iberian Iron-Age cemeteries. For the moment, this is a simple PCX-format scanned and modified published map (using HP Scanjet Scanner and Photostyler software); but in the future it will be feasible to introduce it as a coverage, using ARC/INFO modules, to allow further development (pointing to different sites in the region and obtaining more information on them).

B This option displays as a new window a short ASCII format textfile. It includes a short description of the 'El Cigarralejo' site in its regional context (fig. 2). The last paragraph invites the reader to quit and return to the Main Menu to display a detailed map of 'El Cigarralejo'.

C This option, 'La necrópolis de El Cigarralejo', initializes the main module, and the user starts a detailed session on the site. There are several options which allow simple and more complex queries.

The available options are as follows:

1/2 'DIBUJO' draws a map of the site (fig. 3). It may be combined with the 'IDENTIFIERS' option to visualize on screen the number of the actual graves, and it can also be combined with the 'zoom' options (fig. 4) which produces redraws of the selected areas in greater detail. As the structure of superimposed tumuli made it difficult to use polygons, each grave has been drawn using arcs.

3 SELECTION. The next option, 'selection', is more complex. By pressing it, a new pull down menu appears (fig. 5). It contains a help window to navigate first-time users, and a series of sub-menus to make selections, which will then appear, highlighted, on the site plan below. For example, it is possible just to write a grave identifier, and the particular tomb will be highlighted in red (using the option 'selection by tomb number'). Much more complex selections can be made by using the next buttons (field, logical condition, value selection) (see fig. 6). It is thus possible to produce partial on-screen maps of the site according to different criteria, such as for instance chronology, sex, wealth, size or any combination of these. The procedure is as follows: first, 'selección del total' starts from the whole database; then, field (sex, size...) and logical and value conditions for them (e.g., whole site/wealth/greater than/66 wealth units). The 'results' button on this pull down menu redraws the screen and plots the tombs fulfilling the desired requirements. This selection process is probably too complex for visitors to the Museum, and should be blocked in a Gallery display.

4 'COLOURS' option: A pull down menu allows the user to change colours or adopt dotted or dashed lines for tombs with a view to printing.

5 'CLEAR SCREEN': A CLS option allows to clean the screen and start again.

6/7 'ZOOM' options are meant to be used in combination with 'draw' and 'selection'. The process of selecting and zooming into a small area of the site by drawing a window with the mouse is explained by a 'help' window. As the layout of the site is complex, this is a very useful option.

8 'IMAGENES'. This option, which has its own on-screen help window, works as follows: The user selects a particular tomb by using the mouse (fig. 7) or by touching the screen. A pair of windows in the shape of a book then appears showing different 'pages' (fig. 8) which can be opened pressing an icon. These pages contain images of the tomb plan and sections, drawings of the grave goods, and a short explanation of its contents, date and other characteristics. For more advanced users, it is possible to access to a new pull

Figure 5. The "selection" option.

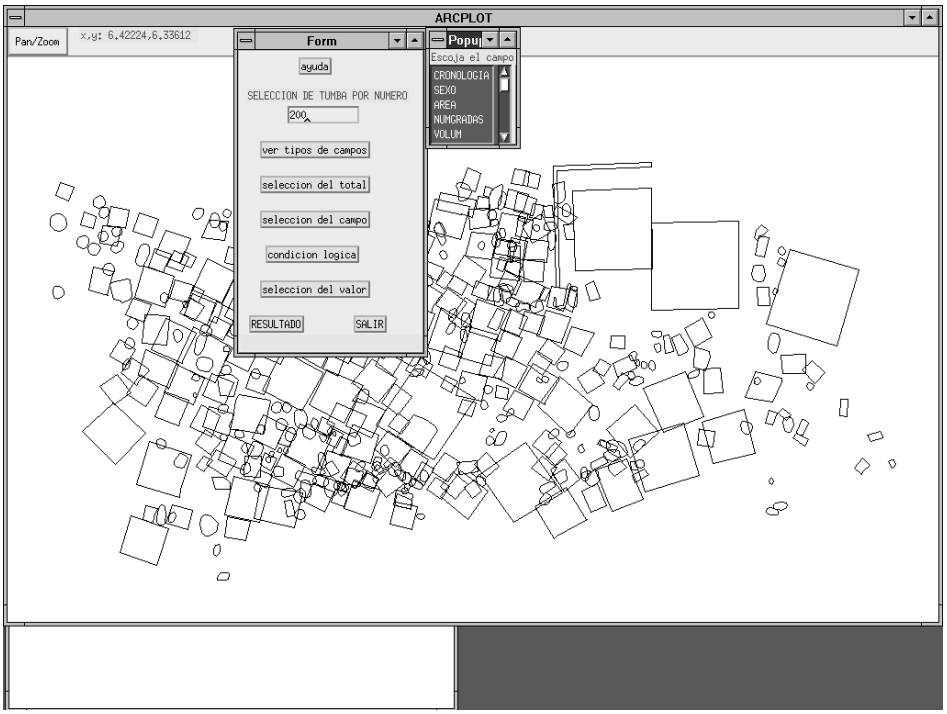

Figure 6. More complex selection options.

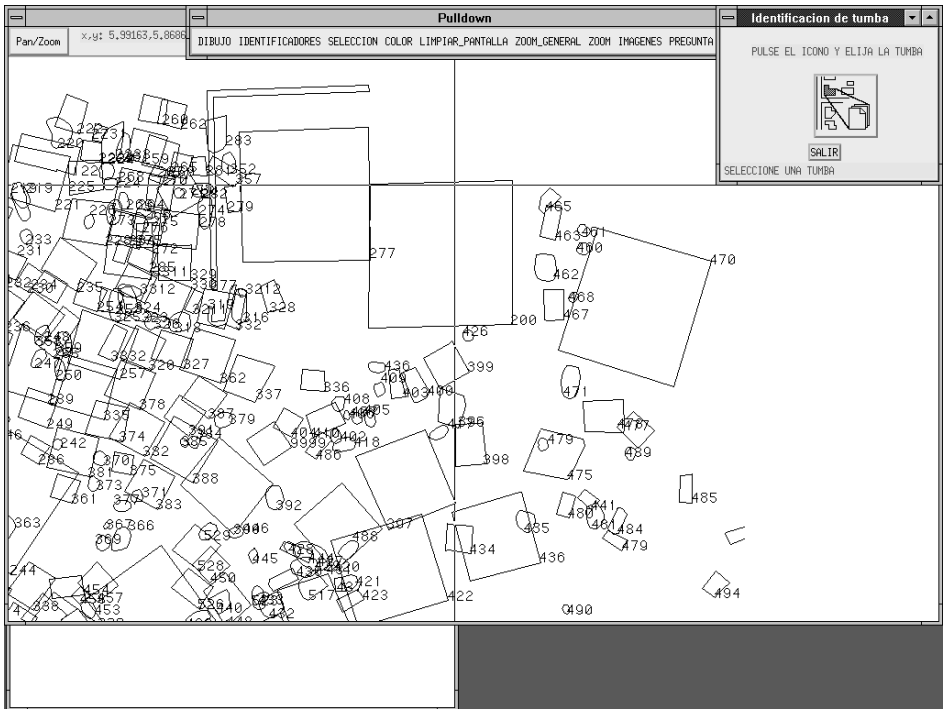

Figure 7. Selection of a particular tomb.

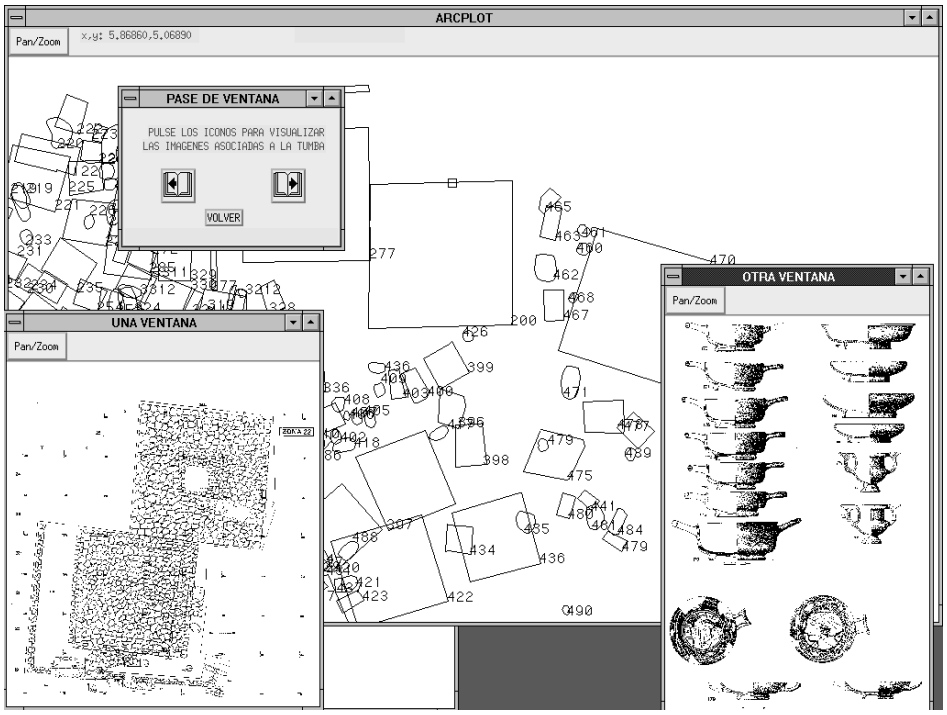

Figure 8. Information about a particular tomb.

down menu (Pan/Zoom) with more complex options, such as Zoom in/out, Scale 1:1, etc., which can be useful for visiting scholars.
Not all the grave goods have yet been scanned and introduced into the database, but it is has been calculated that the whole documentation in PCX format will occupy about 1.8 Gbytes of memory.

9 'PREGUNTA'. The query option allows Museum staff and/or visitors a direct access to the alphanumeric database, by an interactive selection with any tomb chosen from the on-screen map. All data on the particular tomb (size, grave goods, chronology, etc.) can then be visualized or printed, as well as other data such as the room/case/magazine in which the grave goods are displayed/stored, and, if necessary, inventory numbers and photographic records.

10 'SALIR'. Finally, the 'quit' option returns to the Main Menu.

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