GEOARCHAEOLOGY OF THE LANDSCAPES OF CLASSICAL ANTIQUITY

GÉOARCHÉOLOGIE DES PAYSAGES DE L’ANTIQUITÉ CLASSIQUE

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A GIS Based Database to Process Roman Cadastre and Settlements

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Abstract: In the modern study of Roman cadastres and settlements, it is important to systematically import and store the locations and measurements in a database that is able to reproduce not only the data, but also their geographical distribution. Moreover, it is important to link them with other data, such as chronology, date of excavation, reference, aerial photo numbers, etc.

In this paper, we describe an easy and flexible GIS-based database model for the storage of all the data that could help scientists to work on Roman cadastres and settlements. As a pilot study, this method has been applied in the area of Patras, with a remarkable success. During fieldwork, it supported the use of GPS and the instant import of the field data to the GIS of a portable computer. In the laboratory, these data were systematically analysed and the database was updated with other secondary information on each site. In addition, other scientists using a similar GIS-based database will find it easy to communicate and exchange data.

In this paper, we used the Patras area as an example to demonstrate the contribution of modern technology in the manipulation of archaeological data relating to Roman cadastres and settlements. This is a preliminary attempt at recording archaeological data in a GIS-based database instead of a conventional one. The need for this arose from the difficulty of manipulating large amount of archaeological data for numerous sites. GIS-based databases use tools both from GIS and powerful databases, facilitating a series of tasks such as: automatic selections using various fields, data exchange among software, direct import of GPS measurements, automatic field update with values from GIS algorithms, fast and easy reproduction of custom maps and data tables, etc.

We will not expand upon the technical characteristics and benefits of these tools, since most scientists are familiar with the general principles. The main point we would like to stress is that we used the GIS ‘MapInfo’ in connection with the powerful external database ‘Access’. This enables users to analyse their data quantitatively and spatially on a GIS platform, while, behind each map object, Access maintains a variety of information organised in fields and records. It is obvious that instead of MapInfo and Access, other software could have been used, as far as they could communicate through ODBC drivers or other data exchange mechanism.

Importing locations into the computer is simple in principle, but the GIS-based database permits the combined use of the portable computer and the GPS. This enables the correction of the variable error (EPE) that GPS introduces to the coordinates. The correction method was originally developed by our team at the Remote Sensing Laboratory of the Athens University. It has been successfully used many times for geological, geomorphological and environmental purposes and we applied it for archaeological purposes to all the field measurements of Patras area. A simple database is created for the site locations, in which we store the name of the site, the EPE (estimated position error) and the altitude for each measurement. These data are processed by the GIS, and cross checked manually or automatically: a) with the altitude derived from the DEM (Digital Elevation Model) that was digitised before the field work, b) with the altitude value provided by an external altimeter, c) with the boundary area formed by previous measurements of the same named site. If the new data are in conflict with the altitude information or the previous measurements of the position of the same site (using a reasonable tolerance), the point is rejected, otherwise it is imported to the GIS. At the end of the field work, the site data are grouped by name, and the correct site location is taken to be the geometric centre of all the measurements having the same site name.

The related database that was developed for the area of Patras holds all the information in one record, which can be displayed on a single screen layout. Figure 1 shows two different records being displayed, with all the important archaeological fields. Due to lack of archaeological data, these do not represent real archaeological conditions. At the bottom of each record, we can see four image windows. The first two windows represent a general view and a GIS map of the area. The third and fourth images represent the archaeological findings. Other image fields could of course have been added as well.

The databases field structure is described in the following table:
Site No IIV Last Update Date 1/10/98
Site Type ROMAN BRIDGE (EAST PART)
Site Name (Full) ANO AHLADOKAMPOS
Location (Wide) AHAIA
Location (Near) PATRA
Location (Exact) GPS No 27a
X_Coord 38.5654458 Y_Coord 24.5659866 GPS_epe 31 Altitud 35
Architectural Find NONE
Movable Finds FOUND BUT NOT REPORTED YET.
Fieldwork Type EXTENSIVE EXCAVATION
Fieldwork Init Da 1/1/1997 Fieldwork Duration (Day) 270
Site Preservation POOR

Geomorphological Description
1. Allouval deposits (5m)
2. Altitude range : 0–100m

Vegetation Type
OLIVE TREES

Testimony

References

Site Photo Site Map Architectural Finds (Photo) Movable Finds (Photo)

Site No IIIX Last Update Date 07/10/98
Site Type ROMAN SITE
Site Name (Full) KATO AHLADOKAMPOS
Location (Wide) AHAIA
Location (Near) PATRA
Location (Exact) GPS No 41
X_Coord 21.762201 Y_Coord 38.264301 GPS_epe 18 Altitud 60
Architectural Find IF ANY, NOT REPORTED YET.
Movable Finds NONE
Fieldwork Type SURFACE EXCAVATION
Fieldwork Init Da 2/5/1998 Fieldwork Duration (Day) 125
Site Preservation GOOD

Geomorphological Description
1. HIGHLY ERODED SURFACE.
2. WELL DEVELOPED DRAINAGE SYSTEM / GORGES
3. HIGH SLOPES (OVER 100%) / KNICK POINTS

Vegetation Type
VINEYARDS, OLIVE TREES

Testimony
SOME FINDINGS BY FARMES, BUT NOT LOCATED.

References

Site Photo Site Map Architectural Finds (Photo) Movable Finds (Photo)

Fig. 1. – Two typical archeological records.
<table>
<thead>
<tr>
<th>Field Name</th>
<th>Data Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ID</td>
<td>AutoNumber</td>
<td>Data Record ID Number</td>
</tr>
<tr>
<td>Site No</td>
<td>Text (5ch.)</td>
<td>Site Field Numbering</td>
</tr>
<tr>
<td>Site Type</td>
<td>Text (50 ch.)</td>
<td>Site Archeological Type</td>
</tr>
<tr>
<td>Site Name</td>
<td>Text (200 ch.)</td>
<td>Site Archeological Name</td>
</tr>
<tr>
<td>Location (Wide)</td>
<td>Text (200 ch.)</td>
<td>Site Location (General)</td>
</tr>
<tr>
<td>Location (Near)</td>
<td>Text (200 ch.)</td>
<td>Site Location (Approximate)</td>
</tr>
<tr>
<td>Location (Exact)</td>
<td>Text (200 ch.)</td>
<td>Site Location (Exact)</td>
</tr>
<tr>
<td>Date</td>
<td>Text (50 ch.)</td>
<td>Dating of Roman site</td>
</tr>
<tr>
<td>Archeological Finds</td>
<td>Text (200 ch.)</td>
<td>Description of Archeol. Finds</td>
</tr>
<tr>
<td>Movable Finds</td>
<td>Text (200 ch.)</td>
<td>Description of Movable Finds</td>
</tr>
<tr>
<td>Fieldwork Type</td>
<td>Text (50 ch.)</td>
<td>Type of Field work</td>
</tr>
<tr>
<td>Fieldwork Date</td>
<td>Text (50 ch.)</td>
<td>Fieldwork’s initial date</td>
</tr>
<tr>
<td>Fieldwork Duration</td>
<td>Number-Integer</td>
<td>Total number of fieldwork days</td>
</tr>
<tr>
<td>Site Preservation State</td>
<td>Text (200 ch.)</td>
<td>Site Preservation State</td>
</tr>
<tr>
<td>Geomorphology</td>
<td>Text (225 ch.)</td>
<td>Geomorphological Description</td>
</tr>
<tr>
<td>Vegetation</td>
<td>Text (255 ch.)</td>
<td>Vegetation Description</td>
</tr>
<tr>
<td>Testimony</td>
<td>Text (255 ch.)</td>
<td>Local people Testimony</td>
</tr>
<tr>
<td>References</td>
<td>Text (250 ch.)</td>
<td>References released to sites/findings</td>
</tr>
<tr>
<td>Site Map</td>
<td>OLE Object</td>
<td>Local Site Map</td>
</tr>
<tr>
<td>Site Photo</td>
<td>OLE Object</td>
<td>General Site Photo</td>
</tr>
<tr>
<td>Archeological Finds</td>
<td>OLE Object</td>
<td>Photo of Archeological Finds</td>
</tr>
<tr>
<td>Movable Finds</td>
<td>OLE Object</td>
<td>Photo of Movable Finds</td>
</tr>
</tbody>
</table>

This table can be modified; it reflects the data we intend to classify at Patras. If the model were applied to a different area, or archaeologists provided us with more or different data types, the flexibility of the database’s structure would permit fast and efficient modifications.

Apart from database and other capabilities, GIS tools provide spatial distribution analysis of the sites and in particular, the ability to select all the objects (sites) from a specific territory within the area being studied. For our example, Figure 2 shows the relief of the Patras area coloured differently for each altitude range. On this map, we can also see the 17 points that represent the exact positions (retrieved by GPS) of archaeological sites.

Having imported all these data to the database and connected it with the GIS, we can automatically retrieve or update data in the database, while having a map window and viewing all the sites. Moreover, the user can apply complex queries to the GIS, concerning both geographical/geomorphological characteristics and database information. For example, we asked the GIS to select and mark all the sites that are situated at an altitude less than x m, have age of y years, and distance from the sea less than 300 m. To conclude, GIS and GPS technology reduce the time and effort needed to query a large database, while increasing the accuracy and the efficiency of the working team.
Fig. 2. – GIS-map of the Patra area.


NOTES

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Introduction


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