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.

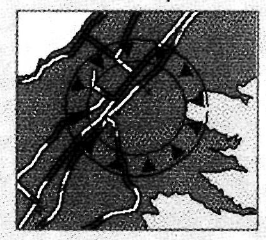
The related database that was developed for the area of Patras holds all the information in one record, which can be displayed on a single screen layout. *Figure 1* shows two different records being displayed, with all the important archaeological fields. Due to lack of archaeological data, these do 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:

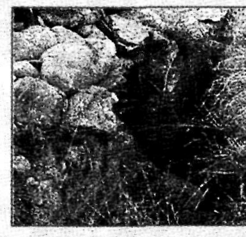
Site No	IIV
Last Update Date	1/10/98
Site Type	ROMAN BRIDGE (EAST PART)
Site Name (Full)	ANO AHLADOKAMPOS
Location (Wide)	AHAIA
Location (Near)	PATRA
Location (Exact)	GPS No 27a
X_Coord	38,5654458
Y_Coord	24,5659866
GPS_epe	31
Altitud	35
Architectural Find	NONE
Movable Finds	FOUND BUT NOT REPORTED YET.
Fieldwork Type	EXTENSIVE EXCAVATION
Fieldwork Init.Da	1/1/1997
Fieldwork Duration (Day	270
Site Preservation	POOR
Geomorphological Description	1. Allouvial deposits (5m) 2. Altitude range : 0-100m
Vegetation Type	OLIVE TREES
Testimony	
References	STRNGFIELD, V.T., LEGRAND, H.E., 1969, Relation of sea to fresh water in carbonate rocks, USA, & Cephalonia (Kephallinia), Greece, p. 387-404.

Site Photo

Site Map



Architectural Finds (Photo)

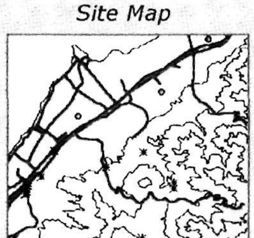


Movable Finds (Photo)

Site No	IIIX
Last Update Date	07/10/1998
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	GLANZ, T., 1965, Das Phanomen der Meermuhlen von Argostolion, Eine hydraulisch - physikalische Betrachtung, Steir. Beitr. Hydrogeol., 17, 113-127.

Site Photo

Site Map



Architectural Finds (Photo)

Movable Finds (Photo)

Fig. 1. – Two typical archeological records.

Field Name	Data Type	Description
ID	AutoNumber	Data Record ID Number
Site No	Text (5ch.)	Site Field Numbering
Site Type	Text (50 ch.)	Site Archeological Type
Site Name	Text (200 ch.)	Site Archeological Name
Location (Wide)	Text (200 ch.)	Site Location (General)
Location (Near)	Text (200 ch.)	Site Location (Approximate)
Location (Exact)	Text (200 ch.)	Site Location (Exact)
Date	Text (50 ch.)	Dating of Roman site
Archeological Finds	Text (200 ch.)	Description of Archeol. Finds)
Movable Finds	Text (200 ch.)	Description of Movable Finds
Fieldwork Type	Text (50 ch.)	Type of Field work
Fieldwork Date	Text (50 ch.)	Fieldwork's initial date
Fieldwork Duration	Number-Integer	Total number of fieldwork days
Site Preservation State	Text (200 ch.)	Site Preservation State
Geomorphology	Text (225 ch.)	Geomorphological Description
Vegetation	Text (255 ch.)	Vegetation Description
Testimony	Text (255 ch.)	Local people Testimony
References	Text (250 ch.)	References relased to sites/findings
Site Map	OLE Object	Local Site Map
Site Photo	OLE Object	General Site Photo
Archeological Finds	OLE Object	Photo of Archological Finds
Movable Finds	OLE Object	Photo of Movable Finds

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.

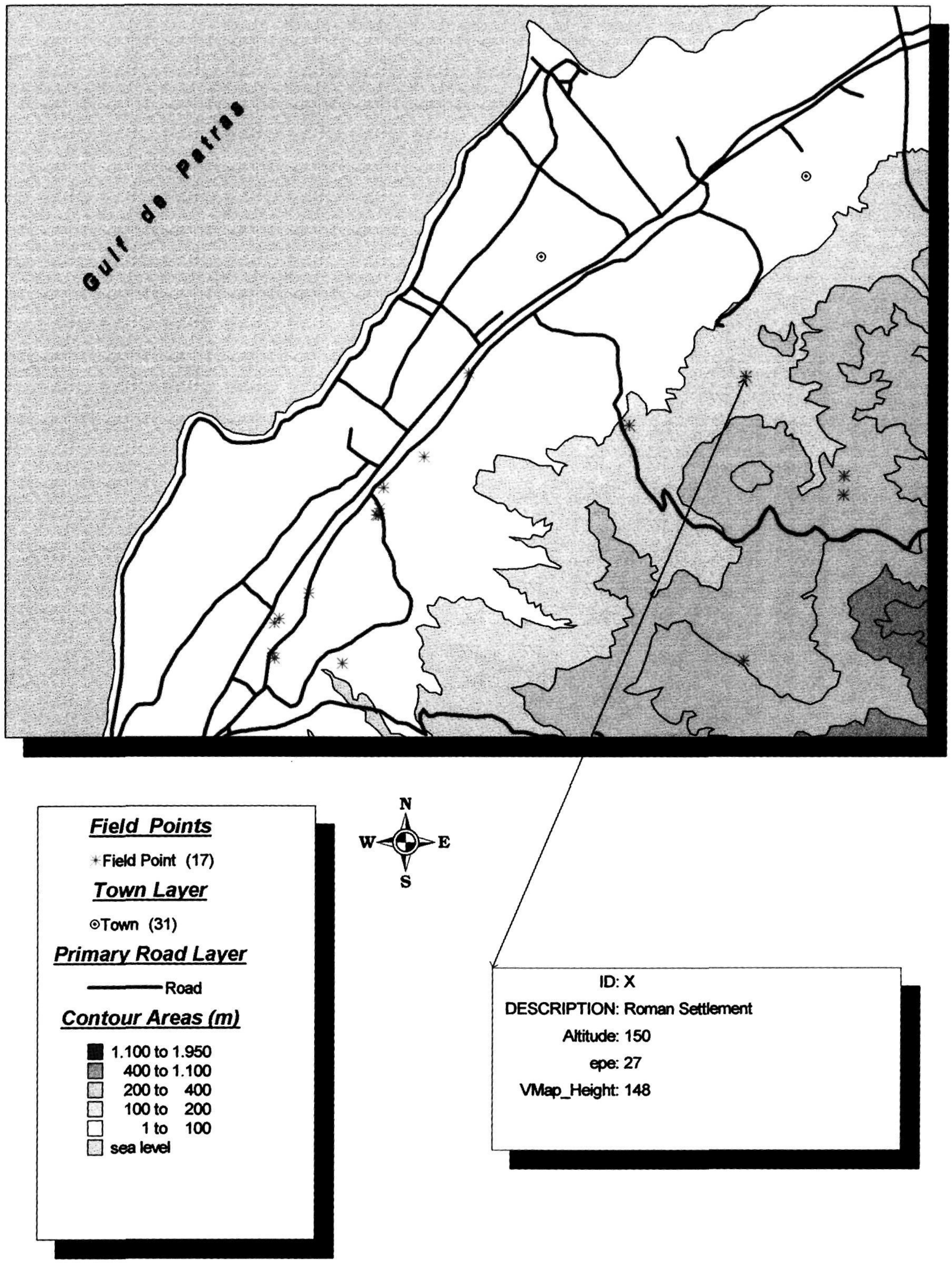


Fig. 2. – GIS-map of the Patra area.

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NOTES

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