SETTING UP A DATABASE TO RECORD PREVENTIVE AND SALVAGE ARCHEOLOGICAL EXCAVATIONS

REALIZAREA UNEI BAZE DE DATE PENTRU EVIDENŢA SĂPĂTURILOR ARHEOLOGICE PREVENTIVE ŞI DE SALVARE

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Abstract: *Considering the large amount of data that preventive archaeological research produces at a certain time and considering the irreversible nature of archaeological research, the data modelling and digital management possibilities available now can be used to obtain databases, associated maps, reports, analyses and so on.*

Rezumat: *Având în vedere cantitatea mare de date apărute la un moment dat în urma unor cercetări arheologice preventive, a caracterului ireversibil al unei cercetări arheologice, precum şi a posibilităţilor actuale de modelare şi gestionare digitală a datelor, se va impune necesitatea gestionării şi modelării digitale a acestora în vederea obţinerii unor baze de date, hărţi asociate, rapoarte, analize etc.*

Key words: *GIS, spatial data, archaeology, integration, modelling, interrogation, analysis*
Cuvinte cheie: *GIS, date spaţiale, arheologie, integrare, modelare, interogare, analiză*

INTRODUCTION

Topographical survey activities involve both field activities - such as charting archaeological research units, surveying details of archaeological interest and setting up topographical surveys if they have not already been digitized- , as well as office activities – such as downloading data from topographical equipment through transfer software, data calculus and processing, designing plans and creating a GIS project in order to manage topographical and archaeological elements which are going to be used.

MATERIALS AND METHOD
THE SPATIAL DATA SOURCES
In general, the spatial data can come from different sources:
- Measuring equipment (total station);
- Photogrammetric methods (based on sky photos);
- GPS (global positioning system);
- Underground radar (when the location of underground objects is unknown);
- Laser scanning methods (land digital models only);
- Video cameras;
- Scanning plans in an analogical format, implicitly turning them from a raster to a vector system through graphic referencing;
- Registers and files;
- Databases executed with compatible or conversion-ready programmes.

THE NON-GRAPHIC DATA SOURCES
In the case of a GIS in archaeology, namely preventive and salvage archaeological excavations, the non-graphic archaeological data sources are excavation reports, site logs, overview photographs regarding archaeological research units (surfaces, panes, sections,

boxes) and detail photographs of archaeological clusters and various artefacts discovered in the excavation, archaeological publications, legal data regarding he archaeological legislation in force, data related to service providing contracts for archaeological discharge, statistics, results, etc.

ESTABLISHING LAYERS WITHIN THE GIS APPLICATION

The layers to be included in the GIS project will be shown within three points. The manner in which the layers mentioned below will be selected and displayed will be based on the field data.

A. Topographic measurements: support network, matching new points, surveying network.

B. Geographic data: contour lines, access routes, hydrography, land improvements.

C. Archaeological data: properties subjected to archaeological research, archaeological research units, and archaeological clusters.

DATA IMPORT AND POINT VIEW

The points forming the "gross" database were collected with the total station Leica TC 302, and then downloaded with the transfer software Leica Survey Office into pre-defined formats (txt, idx, scr, raw). Leica Survey Office also opens the coordinate file lumea_noua.idx for data viewing and preparing for a Microsoft Excel conversion. Next, we open Arc Map and execute the data import through Add Data and selecting the *.dbf file as points.
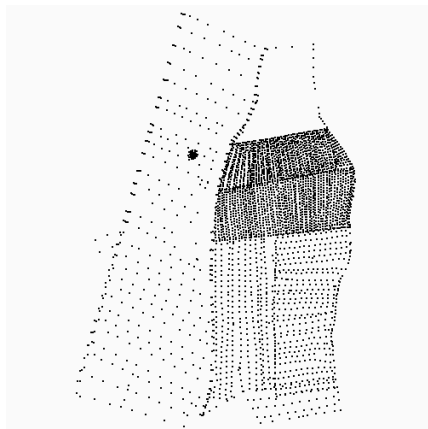

Figure1. Point view in Arc Map

DESIGNING THE DATABASE

The database design implies determining the study area, the used coordinate system, the layers necessary to the study, the data included in each layer, the attributes necessary to the description of each data, the manner in which attributes are encoded and organized. For instance, the following fields were entered for this shape file: ID_UNIT_C (current number of research units), TIP_UNIT_C (type of research units), AUT_SAP (excavation approval), AN_CERC (year of research), PERIOADA (period when the archaeological excavation was carried out), PROPRIETAR (the owner's name), LUNGIME (the longest side of the archaeological research unit), LATIME (the shortest side of the archaeological research unit), SUPRAFATA (the area affected by the excavation), VOLUM (the product of the area affected

by excavation and the average depth after the archaeological discharge of the unit) and RESP_SANT (name and position of the site responsible). Similarly, all the shape files were created within the GIS project of integrating topographic and archaeological data.
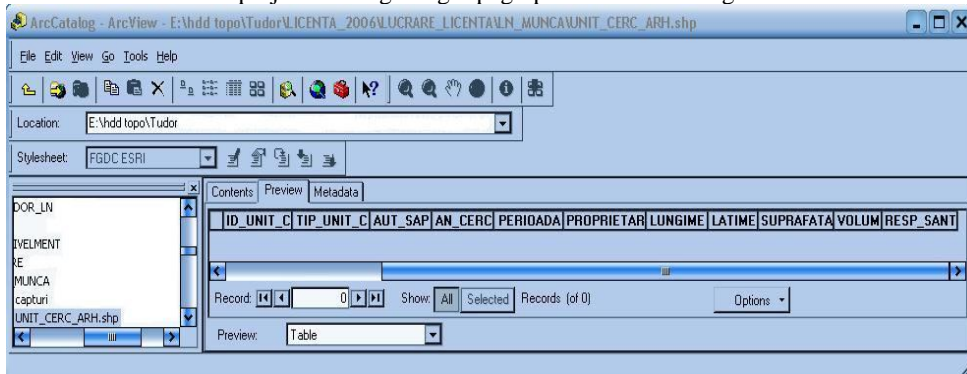

Figure2. Arc Catalog – fields available for UNIT_CERC_ARH

CREATING DIGITAL MODELS IN ARC GIS

The use of digital instruments and computerized data for topographic research is an advantage for a more flexible recording of site morphology and of the topographic context as compared to static plans, so that Arc GIS allows rendering 2D solid and 3D digital models (DTM – digital terrain modelling). Thus, a digital 2D solid model of the investigated area can be shown, which provides an easier interpretation of data connected to land morphology.
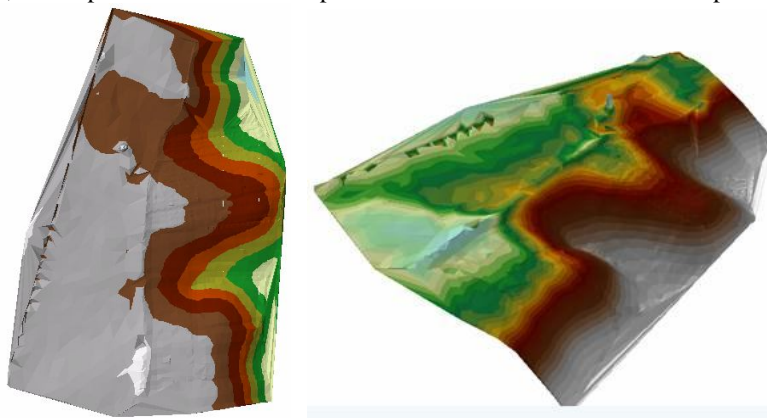

Figure3. 2D and 3D solid models of the Lumea Nouă site

DATABASE QUERIES

Data queries identify elements and show them as a graph, a spreadsheet. It can also identify all the elements that satisfy a certain condition. Spatial queries can be created, namely finding all the elements that are found within an area or a selection of topics depending on their positions related to the elements of another topic.

AN EXAMPLE OF NUMERIC DATA INTERROGATION IN AN ATTRIBUTE TABLE

We take for instance the attribute table of the topic UNIT_CERC_ARH (archaeological research units). We open the table of attributes and we want to find the total

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surface for the field SUPRAFATA: right click on the field SUPRAFATA – choose ∑ Statistics; certain indices that are relevant for the field will be presented here – minimum area, maximum area, area sum, an area average depending on the frequency of distributions and a standard deviation. Below is a graph presenting the frequency of distribution on the area values.
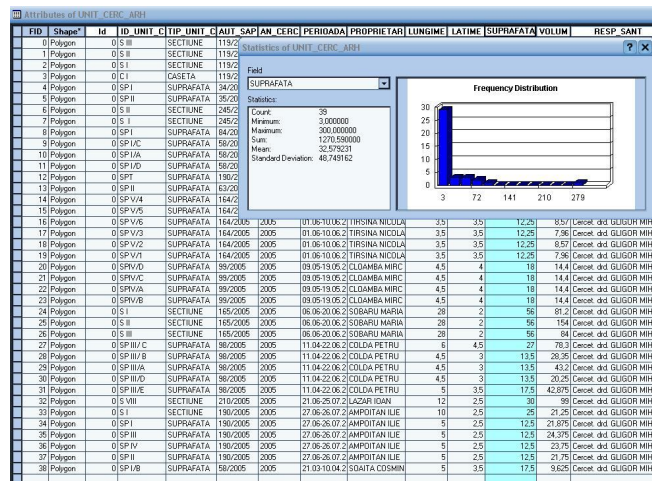

Figure 4. Arc Map – query model through statistical methods

Thus, we were able to find out the total surface, which is of 1270.590 square meters.

AN EXAMPLE OF SIMPLE SYMBOLOGY QUERY

Inside the topic COMPLEXE_ARH (archaeological clusters), we can observe the symbols of the type point attributed according to types of archaeological clusters: right click on COMPLEXE_ARH – Properties - Symbology – Categories – Value Field (TIP_CPL).
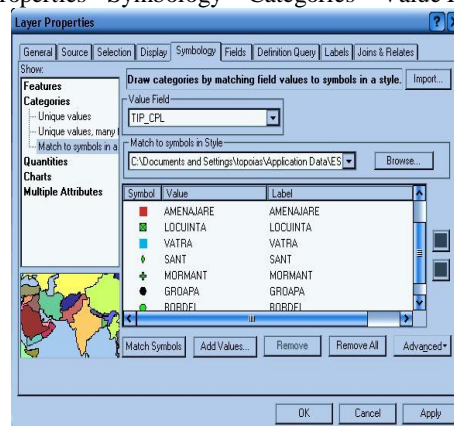

Figure 5. Arc Map – a simple symbology query model

FINDING ELEMENTS THROUGH A SQL EXPRESSION SEARCH

For a query of the type –" where are archaeological clusters of the VATRA type found and how many are they?" we will follow the steps:

Selection – Select by Attribute – click on Layer, choose the layer COMPLEXE_ARH – double click on the field TIP_CPL – click on an operator (=) to add it in the textbox of the expression – select Verify button to check the syntax or if the criterion that we have introduced will select any element – OK.
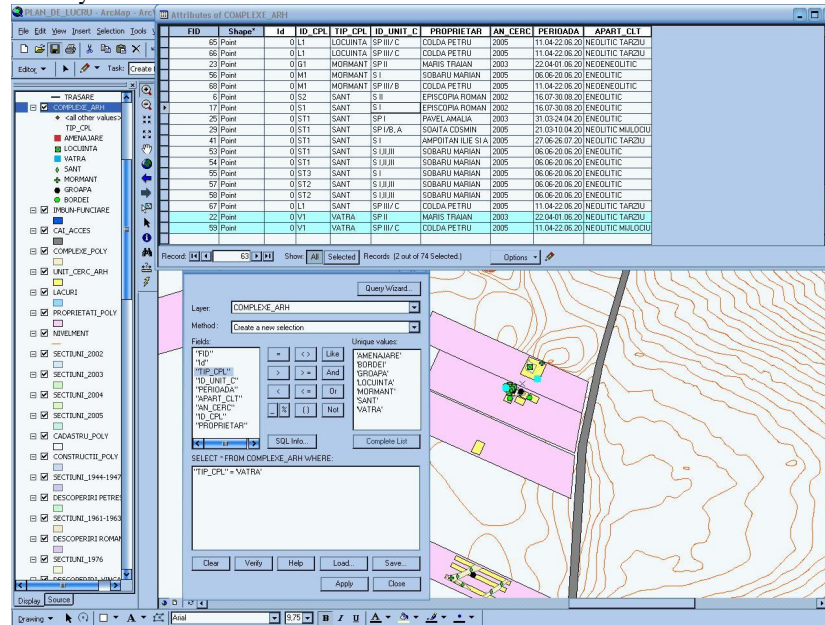

Figure 6. Arc Map – finding VATRA clusters through a SQL expression search

We will notice that the query produces an answer: there are two VATRA clusters, one on Maris Traian, and the other on Colda Petru. This is signalled in the attribute table and on the map.

RESULTS AND DISCUSSION

The high importance of topographical work, digital recreations and GIS projects destined for archaeology resides in the following aspects:
- an easier handling, storage and management of information in a digital system as compared to the analogical system;
- the possibility to list and visualise maps at different scales in a digital format, and the advantages of correcting digital maps;
- the possibility of generating 2D solid and 3D digital models;
- the possibility to associate graphical elements and their image (obtained through digital photography or photograph scanning in an analogical format);
- the possibility to comprise in a GIS project graphical and non-graphical data in a unitary form, with well determined connections and access in both directions – from a graphic element to a database registration and from a database registration to a graphical element.

CONCLUSIONS

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The research would be advisable to continue in an interdisciplinary manner, with the results materialised in a more complex GIS project, following subsequent archaeological work on the spatial distribution of a type of object discovered and correlations between objects found on different treading levels,   percentage analyses regarding the presence of objects or archaeological clusters on layers, on spread levels or areas, analyses to determine the limits of an archaeological site, through digging, drilling, geophysical prospecting, geological and soil analyses, proximity analyses resulting in the source areas of materials.

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