

Primary Experiences of Using Mobile GIS Application in Field Survey, and Integration into an Archaeological GIS in Zala County, Hungary

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Abstract

The development of a Geographic Information System ranging over Zala County has recently been started by our institution. Its goal is the in depth investigation of every archaeological site. The result is a prompt and up-to-date data supply for archaeological impact study, for the preparation of excavations and for scientific surveys. Recently we have been using mobile GIS instruments in field survey. By these means earlier surveys can be checked and modified on the spot. Newly discovered site points are recorded, and descriptive as well as map data are connected to the points and then are uploaded into the survey-database. The presentation also describes a site level GIS that contains all the available data of an excavated site, the description and depiction of finds, as well as the results of scientific analyses. The advantage is that all the data of the features of the site can be accessed through one interface. Queries are visualised on result maps (periods, types of features, finds).

Keywords

Archaeological GIS, Mobile GIS, Data integration

1. Introduction

The development of a Geographic Information System ranging over a wide geographical area has recently been started by our institution. Demand for quick and up-to-date information about archaeological sites as well as documentation and scientific analysis of large-scale excavations preceding building projects, inspired this work. The use of an archaeologically driven GIS enables us to handle and integrate different types of data. Our system has two interconnected levels: a topographic and a site level (Eke *et al.* 2006).

2. Archaeological GIS – regional level

The site level is actually an information system processing archaeological sites based on regional field surveys. We intend to create a system that enables the integration of basic archaeological data from different sources, collected for long years in our institution, into a modern digital register. The dramatic multiplication of archaeological tasks demands quick access to reliable and correct information. A site register based on GIS has – besides easy and fast manageability – important scientific results.

The information system has been designed to follow the reporting requirements of the National Office of Cultural Heritage. Our goal was to create a geographic information system, which can provide information for the Cultural Heritage Register.

The site register is based on the digital form of the topographic EOV (*Egységes Országos Vetület*, Uniform National Projection System) map at the scale of 1:10 000, plotted after 1976. The archaeological sites of Zala County are depicted on this map and the descriptive texts are added in the form of a database. The sources of elaborated data are Volume 1 and 3 of the Archaeological Sites of Hungary (Sági 1966; Bakay 1970), and from the surveys derived from the preliminary work for the planned volumes of Archaeological Sites of Zala County. For the rest of the territory reports from the museum's documentation department are used. These are completed by information from archaeological literature as well as historical data concerning medieval settlements. Further information is gained from georeferenced old maps and aerial photos. As the above facts show, we integrate several types of data (text, table, picture, georeferenced map) into our system (*Fig. 1*).

Our system was developed in such a way that different data-types are handled simultaneously on a

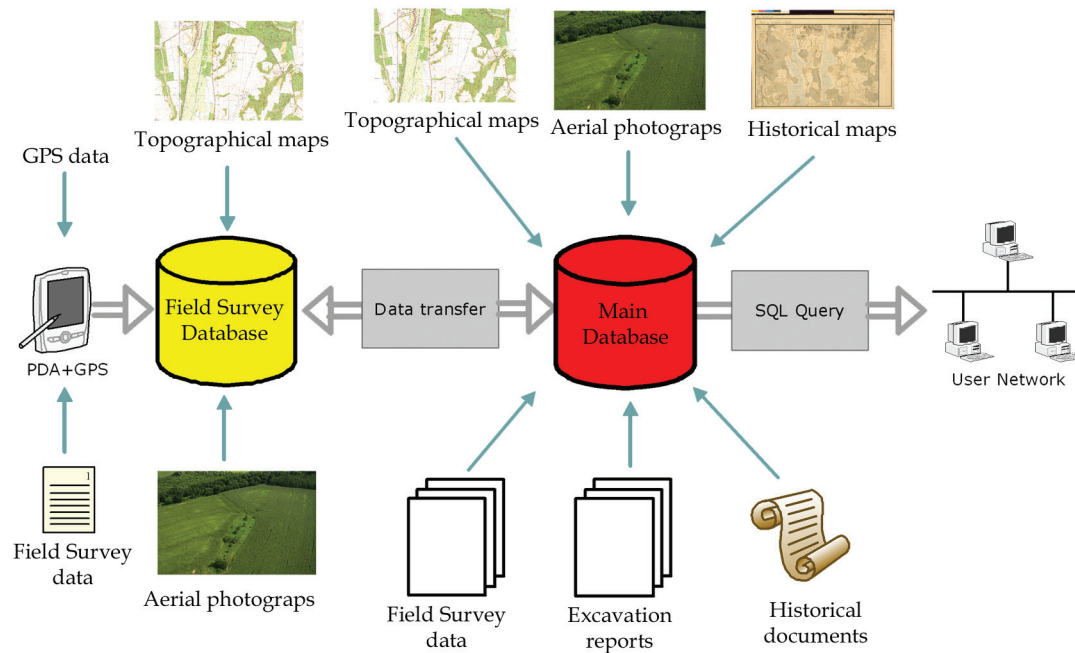


Fig. 1. The Geographic Information System used in Zala County – regional level.

single interface. The software used is ESRI ArcGIS, a complete system for building-up, managing and integrating data and performing advanced analysis of geographic information. The available information is systematized into an Access database which constitutes the basis of our main database. Sites, discovered in the course of the surveys and marked on the map sheets, are traced on the digital map as polygons, and descriptive texts are added in the form of a database. The description of archaeological features were integrated into a relational database. The main table (Site) contains the detailed description of the site. Activities connected with the site, as well as the discovered archaeological features and the information of the topographic map, are defined in the related tables (Activities, Feature, Map). The IDs of the sites are identical with the identification numbers of the National Office of Cultural Heritage's (KÖH) register. The main goal is the up-to-date elaboration of every archaeological site in Zala County. The result is a prompt and current data supply for archaeological impact study, for the preparation of excavations preceding building projects, as well as for scientific surveys. The system enables a large variety of queries, e.g. archaeological sites of a modern settlement or of a river-valley, and sites of a certain period.

3. Using mobile GIS application in field survey

Recent development of IT devices opens up new vistas of field survey (Campana 2005; Tripcevic 2004). This resulted in important changes in detecting and documenting new sites. The field survey device and the database developed for topographic survey and recording geodetic position used in our institution gives great support. The required hardware is a PDA with a GPS recorder (either built in or handheld). In our field-work we currently use a HP iPAQ Pocket PC. The handheld GPS-receiver (Royal-Tek - Mini



Fig. 2. The field survey device and database used in Zala County.

XTrac) is connected via Bluetooth technology. The accuracy level is within 1 meter if enough satellites can be detected. The software used is ESRI ArcPad, a complete mobile mapping and field data collection solution that provides database access, mapping, GIS and GPS integration. This is completed by a database de-

veloped specially for archaeological field survey. The mobile device supplied with the above detailed hardware-software and database trio is suitable to record all data of archaeological field survey (Fig. 2).

The field survey database contains the data needed to identify existing sites or to record new ones in a simplified form. The geographic position is recorded on the basis of the coordinates determined by the GPS-receiver. Different attributes are connected. The recorded data can be a single point of the site with identification data (Site ID and name, feature, period, intensity). The characteristics of discovered archaeological features and artefacts (denomination, period) can also be recorded. The extension of the site can be sketched as a polygon on the basis of the recorded points. These data can be integrated into the main database. Teams of at least three people can execute efficient field data collection: one person marks the finds and the features. Another records data and the third wraps the artefacts and collects the marking bars.

In the case of a control survey, existing data (topographic, attributive, map) are loaded into the PDA and they are defined on the spot. If the survey is in connection with a specific building activity, the outlines or the track of the investment are loaded and controlled.

The use of the GPS is influenced negatively by the following two factors. If there are thick clouds not

enough satellites are detected and the positioning becomes unreliable, in the worst case impossible. Forests affect reception in the same way. In such areas accurate measurements can be taken only outside of the growing season. Experience proves that the described method of field survey can improve existing site information when geographically accurate data and new sites are recorded correctly. Recent data can easily be integrated into the main database.

4. Archaeological GIS – site level

Besides the topographical site register and field survey register, a third application, a site level GIS system has been created. It has been applied mainly for large-scale excavations preceding the construction of motorways M7 and M70. The 65 sites and more than 100 000 features excavated between 1999 and 2007 exceed the capacity of traditional processing and this fact has motivated the elaboration of the site level GIS application. We needed a system that enabled easy handling of both site and feature data, and at the same time helped primary and scientific processing as well. We made use of the GIS's capacity of data integration that enables us to compile various types of data in one system. Our system is based on ESRI ArcGIS software.

The GIS database is divided in three parts:

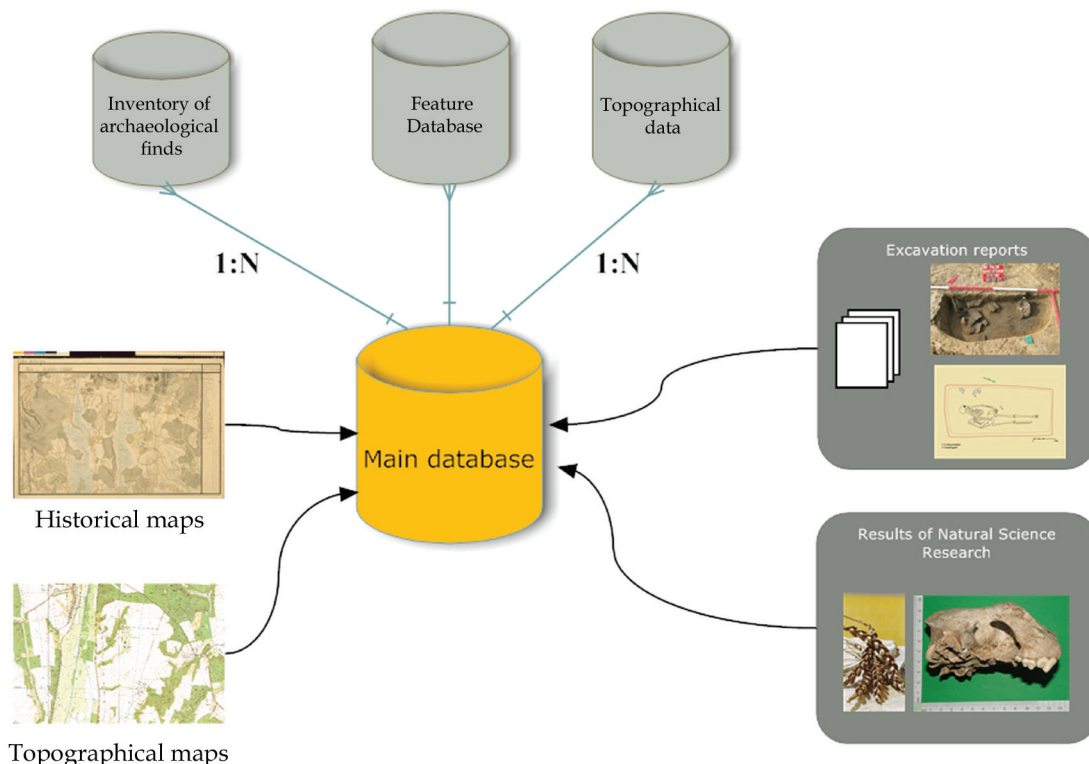


Fig. 3. The Geographic Information System used in Zala County – Site level.

Maps and drawings: the sites are always depicted on 1:10000 topographical maps. We also use historic maps (usually The First Military Survey taken between 1766 and 1785) to identify deserted medieval villages or buildings.

The digitalized and georeferenced site maps and the feature ground-plans also belong to this group.

Attributive data: a database containing the information of archaeological features is linked to the drawings. It is filled with the descriptive data registered on the spot by the archaeologist. These can be considered as the essential data of the features. The database has been designed in accordance with the field data sheets.

Tables containing information gained during primary analysis (inventories, natural scientific results as archaeobotany, archaeozoology and other archaeometric investigations, natural environmental analysis) are linked.

The features' sectional and detailed drawings as well as the photos are linked as supplements.

The inventory database contains descriptions of artefacts, their photos and drawings.

We wish to create a system that enables the integration of the basic information from the excavated sites used during their analysis. The system enables easy processing and systemisation of the huge amount of information gained during the 8 years of excavations (*Fig. 3*).

Operation with data (collecting, filtering, grouping) is assisted either by built-in or by user-defined queries.

At present data input and system testing is in progress, with the data of excavations completed between 1998 and 2007 (altogether 300 excavations). We are working simultaneously on the further development of the system.

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