



POSTER SESSION

APRIL 3, THURSDAY

GIS study of the soundscapes of Sámi ritual sites in Northernmost Finland

ÄIKÄS, Tiina

Keywords: soundscape, ritual landscape, sieidi, GIS

Sámi ritual sites represent the ancient shamanistic world view and religion of the hunter gatherers and reindeer herders. Therefore they all are in many ways important research branches in the Sámi archaeology, especially because of their symbolic value for the present day Sámi communities.

Types of Sámi ritual sites are numerous. They can broadly be divided into three groups: terrain formations, natural objects or structures. From the written sources the most well known are perhaps the sieidi-stones or rocks which are natural formations with an extraordinary shape.

The aim of my research is to concentrate on the ritual places as a part of a wider context – the landscape. My interest lies rather in the nature of ritual places than in their classification. The sieidi will be seen in connection to their environment.

Landscape studies tend to concentrate on the visual aspects of landscape. Nevertheless landscape constitutes never just the visually constructed environment but also other senses play an important role in experiencing the landscape. We experience with all our senses. In additions to vision also sounds, smells, tastes, and touch are relevant. The term intimate sensing has been used to describe experiencing landscape with all senses.

In this paper I will concentrate on sounds and their meaning in experiencing the landscape. Soundscape can be described as a sound or combination of sounds that forms or arises from an immersive environment. It refers to natural sounds, including animal vocalizations and activities as well as the sounds of weather; and environmental sounds created by humans.

I will examine the ritual sites of Sámi people in their soundscape. The modern noise pollution is not taken into the examination but I try to reach the elements that have not changed in the environment. My analysis is based on the DEM (digital elevation model) with 25 meters grid, layers containing information of for example water elements and the record of known sieidi sites. GIS analyses will be carried out to study the vicinity of sources of noise to the sieidi sites. This will be done by creating buffers around the sieidi sites. The possibility of using viewshed commend in studying soundscapes is also taken into consideration.

Laboratory of Archaeology, University of Oulu, P.O.Box 1000, 90014 University of Oulu, Finland
tiina.aikas@oulu.fi

GIS and remote sensing applications supporting the M6–M60 motorway rescue excavations in Baranya County

BERTÓK, Gábor

Keywords: large-scale excavations, onsite documentation, GIS, aerial photography

Together with the RITA relational database system (see the poster on RITA by G. Kovaliczky) developed for the Baranya County Museum a set of GIS and remote sensing applications have also been used to support the large scale rescue excavations carried out in the county since 2005.

The spatial data related to the archaeological excavations are stored and managed using the commercial GIS package Geomedia Professional developed by Intergraph. Geomedia and its supplements (Grid, ImageStation) are used

- to digitize line drawings,

to combine various types of information from the detailed plan of individual archaeological features to vectorized cadastral maps, orthophotos and topographic raster maps,

- to create terrain models and orthophotos,
- to analyse spatial data, to create maps for reports,
- and to export data for the Mapserver-based presentation module of the RITA system.

There are two ways the GIS can be connected to RITA in order to retrieve, manage and analyse information:

The archaeological features are represented as polygons whose attribute table contains a Feature ID. This ID number serves as a link to the appropriate attributes in the RITA database. The attribute information can be accessed and through ODBC directly from the GIS. With the help of the Feature ID any of the tables in the RITA RDBMS can be joined and queried from the GIS to provide end-products that are mostly thematic maps showing chronological distribution, spatial distribution of certain types of find etc.

The other way to connect is through a hyperlink stored in the attribute table of each feature. Activation of the hyperlink opens a web browser that pops up the WebSys Content Management System GUI showing the appropriate data (description, photos, finds, vertical sections) linked to the feature.

As a useful supplement, the archaeological sites have been photographed from the air on a regular basis. The photos were taken at a near vertical angle using a handheld 8.2 megapixel digital still camera from the altitude of 300–400 metres resulting in a 3–4 cm per pixel ground resolution. DTMs were created as a by-product using geodetic measurements originally made for excavation work. Flight data, camera model information, lens distortion removal and the use of DTM made it possible to reach sub-pixel accuracy in most cases. Aside from being a means of documentation, orthophotos are used to map archaeological features in unexcavated areas around the excavation sites, give background information for progress reports, and provide control information for both digitizers and archaeologists.

Results of GIS applications on a multi-period prehistoric site, Vörs-Máriaasszonysziget, SW Hungary

BIRÓ, Katalin T. – HOLL, Balázs

Keywords: Hungary, Vörs, Early Neolithic, Multi-Period Site, GIS, Environmental Research

Vörs-Máriaasszonysziget is a multi-period site in Western Hungary, in the marshes to the SW of Lake Balaton. It was excavated from the 1950s onwards, with seasons of intensive large surface excavations in 1989–1991 by the Somogy County Museum Directorate and in 1999–2000 by the Hungarian National Museum. This is the location of the northernmost extent of the Early Neolithic Starčevo Culture, as well as other cultural and temporal horizons from prehistory till historical times. In the framework of a National Science Foundation project (OTKA T-046297, 2004–2007), a complex study has been devoted to the investigation of the settlement, its archaeological remains and environmental data. The first steps of the GIS analysis were reported at the UISPP 2006, Lisbon. All the pieces of information relevant to the site were collected into a geographical information system, including topographical data, aerial photography of various techniques, geophysical survey, boreholes deepened for environmental research and clayey raw material prospection as well as sites statistics: numerical information on the contents of the excavation units and results of their natural historical investigation. The GIS setting serves as a basis for the site monograph that is being prepared currently. It is also expected that further research on the site (e.g., Mediaeval remains) can use the same geographical information framework.

References

- KALICZ et al. (2002): Kalicz, Nándor – Biró, Katalin – Virág, Zsuzsanna, Vörs, Máriaasszonysziget. *Régészeti Kutatások Magyarországon/Archaeological investigations in Hungary*. Budapest Kulturális Örökségvédelmi Hivatal és a Magyar Nemzeti Múzeum p. 15–26
- BIRÓ – HOLL (2006): Biró, Katalin T. – Holl, Balázs, GIS applications on a multi-period prehistoric site, Vörs-Máriaasszonysziget, SW Hungary. Lecture presented on UISPP 2006 Lisbon. In press for conference proceedings.

Hungarian National Museum

tbk@ace.hu

holl.balazs@hnm.hu

New “limitatio” grid recommendation around a Pannonian colonia

BÖDŐCS, András

Keywords: GIS, Roman road systems, Hungary

The Colonia Claudia Savaria (CCS) in modern western Hungary was a Roman colony founded in the Claudian era. Although this colony is one of the most significant Roman settlements of the province of Pannonia, research still owes a reconstruction of the ancient landscape in the area. The Roman “centuriatio”-grid around Savaria (modern Szombathely) has not been examined thoroughly yet.

Since the publications of András Mócsy and Endre Tóth (from the 60s and 70s) there has not been ambition to draw the centuriated landscape of the territory of Savaria divided by ancient land surveyors. This problem seems to be a significant question, because we cannot be sure for example, whether the ancient street orientation of the city was deduced from the land division, or was aligned to the main roads.

In the last decade several Roman roads were excavated around Savaria, which could be assembled together as a big “jigsaw puzzle” into one system. This reconstruction attempt is based on the data of these excavations and the GIS based research, in which the main goal was to point out some connections between the orientation of the ancient roads, and also with the orientation of the present day road system.

With the comparison of the directions of the excavated Roman roads and main and accommodation roads, canals and various terminations and margins of forests or settlements registered on the 1:10,000 scale topography maps and on the military maps from 19th century, a new centuriatio grid could be drawn. Because the orientation of excavated Roman roads is known, the applied survey method was an inverse of those attempts that calculate with the statistics of rectangular oriented roads. The digitization method was manual or semi-automated. However, this method was much slower than the fully automated way; by this process every digitized line and its orientation could be controlled.

Department of Archaeological Sciences, Eötvös Loránd University, Budapest

The archeological application of aerial photographs taken by Hyperspectral Remote Sensing Technology in a sample area of Csonrad County, Hungary

EKE, Istvan¹ – MUCSI, Laszlo²

Keywords: remote sensing, hyperspectral, cultural heritage, GIS

In the last 20 years aerial archeological research in Hungary has been playing greater and greater role in the discovery of archeological sites. The major research has been done in the Western and the North-Eastern regions of Hungary. Oblique photographs, multispectral images, satellite images were used mostly as acquisition technologies. Aerial photographs taken by hyperspectral remote sensing technology have not yet been used for archeological applications.

In the sample area of Csongrad county (the zone was situated between Maroslele and Mako and it was 10.6 km long and 1.8 km wide) some aerial photographs were taken by hyperspectral technology in the summer of 2006. The photographs were taken by a sensor Specim AISA DUAL in the spectrum between 0,4–2,4 μm , in 359 bands.

In the course of a topographical field survey 8 certified archeological sites were found. With the aid of photographs we got detailed pictures of archeological phenomena of these sites and their exact size. In addition, we located further archeological sites which had not had superficial traces in the course of facial field survey.

¹ Directorate of Museums of Zala County
ekeistvan@index.hu

² Department of Physical Geography and Geoinformatics, University of Szeged
laci@earth.geo.u-szeged.hu

Complex analysis on an early medieval site: Kolked-Feketekapu

HAJNAL, Zsuzsanna – HOLL, Balazs

Keywords: digital documentation, intra-site analysis, spatial statistics, Kolked, Hungary

In addition to being an important cemetery with more than 1200 graves, Kolked-Feketekapu is the largest excavated Avar period settlement (75% of the burials and 80% of the site is known). It covers 5 hectares and over 550 settlement features comprising about 30.000 ceramic pieces and provides a basis for a complex study on Avar period everyday life and material culture. The site is of outstanding scientific interest not only because it is almost wholly excavated and it served both the living and the dead, but because of the inhabitants'

cultural affiliation. The Germanic population living under Avar rule is well known from written sources; archaeologically, this is well documented at Kölked. Moreover, several high-ranking male and female burials came to light among the graves. The analysis of the grave finds was made by the excavator, the late Attila Kiss, using mostly traditional archaeological methods. A cluster analysis was done by Peter Stadler on the „A” cemetery material, the Reihengräberfeld type cemetery. The work on the settlement material started with building a computer data-base: digital maps of the excavations (both graves and settlement features to use the excellent horizontal stratigraphy of the site) connected with the analysing Excel tables and Access data-base together with excavation photos and the images of archaeological objects. Widely used statistical methods were applied in analysing the settlement material. Cluster analysis for the chronology of the pottery and vessel types calibrated with the well datable burial pots of the same types. Other statistical methods were used for investigating the frequency of use, percentage of existence of each pottery type, the scale of the pottery types in the households, observing the differences among the economic units of the settlement. Spatial analysis was performed to detect the structure of the settlement together with the social and economic analyses of each periods. A new cluster analysis was made on the cemetery material, comparable with the latest Merovingian chronology and typology. Spatial analysis was performed to detect the strong connections between the burial groups and the settlement. The poster will introduce the system of the database illustrated with the preliminary results of the archaeological work and the unique and precious archaeological material.

Hungarian National Museum

Building of GIS database for reconstruction and evaluation of an old excavation record

Excavations (1941–1956) of the Roman governor’s palace in Aquincum, Budapest, Hungary

HAVAS, Zoltán

Keywords: Aquincum, Budapest, governor’s palace, archaeological evaluation, excavation record, GIS database

Connected to the archaeological project concerning a planned great investment on Hajógyári-island, Budapest, we are trying to reconstruct and evaluate the scattered and incomplete excavation report of the excavations 1941–1956 carried out in the Roman period Governor’s Palace.

First of all we collected all available paper documents, planned the order of work in steps, and built up the database structure.

In the second phase we loaded a great volume of description data up in the database that was built in MS Access. We vectorized the ground plan of the excavation, using georeferated tif images and AutoCAD 2005.

The next step will be to complete and refine the ground plan based on detailed drawings thus the description and map data would also be connected.

Finally a GIS database will come into being in format of GeoMedia GeoWorkspace, which is able to receive and connect .mdb and .dwg data. The GIS database will be convenient for filtering, searching, making queries, and thematical maps, helping archaeological analysis.

Historical Museum of Budapest, Aquincum Museum
havas.zoltan@iif.hu

GIS challenges in the research of the Csörsz-ditch

HOLL, Balázs – PATAY, Pál

Keywords: survey, GIS, Csörsz-ditch, Hungary

Csörsz-ditch is an elongated anthropogenic feature over large parts of Hungary. It extends well beyond the territory of present-day Hungary, therefore its mapping and complete study can only be realised on a GIS basis. Archaeological research of the Csörsz-ditch has been carried out for more than forty years. Collection of data started in the „paper age” and only the most recent studies could build on modern technology. Fortunately, since the earliest studies surveys were made with a sound geographical background, making data processing possible in a modern context as well. Several results of the research of Csörsz-ditch have been published already and more are awaiting publication. Masses of data may not be necessarily suitable in themselves for a proper publication, in spite of decades of scientific work invested. By the help of GIS technology these data can be turned into a manageable set of information giving an overview on the state of research. Such an approach gives a proper place for each stray piece of information. We can point at connections and also contradictions among the data. We can detect deficient sets of information promoting further directions in the research. The versatile set of data makes it difficult without a suitable informatical background even to enumerate existing information on certain parts of the ditch.

The aim of our work was to create a comprehensive GIS system on existing results, serving as a framework for publications and also as a basis of further studies. As regards methodology, we were always using the original data sources. This could be archive maps, aerial photography or field survey. Field survey data were considered of primary importance, while archive aerial photographs were considered as secondary sources. Data were digitalised and fitted into the uniform Hungarian coordinate system. Point-like data (excavations, boreholes, photos) were also inserted. Sources of data were supplied as background information that turned out to be important in the scientific evaluation.

References:

Éva Garam – Pál Patay – Sándor Soproni: Sarmatisches Wallsystem im Karpatenbecken, Régészeti Füzetek Ser. II. No. 23. 1983, second editions MNM 2003

Patay Pál: Római út Bácskában?, ComArchHung 2005, p393–406

Patay Pál: A Bácska-Kiskunság-Körösmenti Ördög árka, ComArchHung 2006, p107–122

Hungarian National Museum

RITA Régészeti Térinformatikai Adatbázis **Archaeological GIS Database**

KOVALICZKY, Gergely

Keywords: Archaeological GIS, Web-based

The RITA System was developed in 2005, in the Museum of Baranya County. The purpose of development was building up a network-based, complex, easy-to-use system, which gave the background of the processing and scientific analysis of the M6–60 highway rescue excavations. Important requirements were scalability, and accessing the system via Internet. The base of RITA is a multifunctional server (presently with Ubuntu Dapper LTS operating system), which is a mix of a database server, an enabled web-server (Apache and UMN-MapServer), and a file-server. The data security is ensured with RAID-5 arrays, firewall, and regular backups. The attribute-data of the archaeological objects and funds (properly so-called inventory) are stored in a Relational Database Management System (presently MySQL), while the photos and drawings are uploaded into the file system. The operators and archaeologists can browse, fill, and modify the system through a web-based, and intuitive application after authentication. The base of the application is the WEBSys Content Management System, that was developed by the MarkCon Group (a local IT company), which company is responsible for the software-realizations of RITA, as well. Researchers can browse the rasterized and vectorized GIS layers using a standard web browser (e.g.: Explorer, Firefox, or Mozilla), and they do not need any special application or environment for creating new layers with standard SQL queries. The system gives the opportunity to download documentations (photos, drawings, and inventory in CVS format) of the sites or objects, for migrating the data into another system. Further plans are changing the database server to PostgreSQL or Oracle RDMBS (to store and manage spatial data with the database), and a web-based GIS browser environment (in fact a web-page) to announce the result of the processing.

Baranya' County Museum's Directorate, Department of Archaeology, H-7621 Pécs Káptalan u. 5.

A predictive model applied to the Pisa Coastal Plain: Preliminary results

LANDESCHI, Giacomo

Keywords: GIS, Predictive modelling, Landscape archaeology

This paper presents the results obtained through the application of a predictive model within a portion of the Pisa coastal plain, expressing different levels of archaeological risk, understood as the possibility of finding new archaeological evidences in the study area, that nowadays is facing a very strong urbanization process, which made necessary the creation of a specific tool for the preservation of the archaeological deposits that could be accidentally found during infrastructural works carried out in this territory.

This work is part of my PhD research project having as a final goal the implementation of the predictivity map in a 3D environment, to be visualized in a Web Gis; the model started from an inductive kind of a approach, considering the influence of some environmental variables on the distribution of already known sites, in order to predict the more suitable areas for the location of new archaeological finds in parts of the territory that have not yet been surveyed.

The final predictive model was the result of a raster overlay in which each cell represented the mean value of all the values contained in each predictor at the same spatial coordinate. The map obtained was also compared with many others kind of sources (ancient cartography, palaeoenvironmental maps and so on) in order to make a good assessment of the reliability of the prediction.

Technologies and Management of Cultural Heritage at IMT, Lucca (Italy)
g.landeschi@imtlucca.it

A proposal for Pompeii: GIS solutions toward an integrated approach to the interpretation of archaeological data

MARATINI, Chiara – ZACCARIA, Annapaola – TRAVIGLIA, Arianna

Keywords: intra-site GIS, stratigraphic deposit, artefacts

This poster illustrates the aims and results of an experimental intra-site GIS, realised in order to manage the excavation area of Pompeii Regio VI insula 7. The Archaeological Mission of Ca' Foscari Venice University is involved in a larger research project (*Regio VI. I primi secoli di Pompei*, Regio VI. The first centuries of Pompeii), whose purpose is to study the urbanization of the ancient site, from archaic and samnitic periods to the Roman phase. During the past years, a very large quantity of different types of data has been collected, as results of different activities like archaeological excavation,

architectural survey, finds classification and analysis. A GIS platform provides a suitable solution to best exploit the meaning of the data and of the relationships occurring between different items of investigation. The main goal is to manage all the different kinds of information (alphanumeric, photographic, cartographic), recorded as descriptive (such as SU -, Stratigraphic Unit- forms, reports of excavation, catalogues of finds), graphic and cartographic data (detailed plans of the site, 1:100, and layer plans, 1:20, after vector processing and georeferencing with topographical co-ordinates) in a relational database (MsAccess) and a spatial relation management software (ESRI ArcGIS). Prior to implementing the GIS, we identified and established the conceptual levels that would be displayed as thematic overlays, focusing on the complexity of the archaeological evidence (specific paths dedicated to the analysis of the stratigraphic deposit, wall structures and classes of finds: pottery, frescoes fragments, glasses, coins, metals, faunal remains, charcoals). Any object represented within the GIS (such as finds and SU) is immediately identifiable by clicking on it: the record sheets that appear display all the information (mainly concerning stratigraphy and typology) linked to that entity in the Geodatabase. The navigation starts from the map of the insula 7 of *Regio VI*, overlaid on the aerial photo of the site of Pompeii. Zooming in, the excavated areas within the insula are highlighted in different colours (sorted by year and trench). At a more detailed visualization, it enables the representation of specific symbologies and chromatic gradations of the thematic layers: chronological phases of stratigraphic units and wall structures, typological datations of artefacts sorted by class; pottery's distribution on strata's surfaces is represented by quantitative items (for example, the numeric counts of different entities or of a specific pottery class in a particular SU) and qualitative ones (sorting by significant features, such as clay fabric for pottery or building techniques for wall structures).

Department of Antiquity and Near East Sciences, University Ca'Foscari of Venice, Italy
traviglia@unive.it

Neolithic and medieval settlements on Debela šuma (Đakovo) site: Possibilities for presentation

MILOGLAV, Ina – ŠOŠIĆ, Rajna – FILIPEC, Krešimir

Keywords: large-scale rescue excavations, orthophoto, 3D relief model, aerial photography, Croatia

During 2006 and 2007 mayor rescue excavations were conducted on the Croatian part of the Vc motorway (Budapest-Ploče). This poster presents preliminary results of the site Debela šuma in the vicinity of Đakovo from the Late Neolithic and medieval periods. On the site remains of the settlements with infrastructure were recovered. These two periods are represented in more or less equal proportions on the investigated surface. Through horizontal distribution different settlement patterns during the Neolithic and Middle Ages are clearly observed. While during the Neolithic, the vast majority of the settlement area

is concentrated on the slight elevation, during Middle Ages, in the lower part, closer to the stream. Both populations were obviously using the same water source, which was probably the reason for the inhabitation of this particular area. On this poster, the excavated area will be presented with aerial photography, 3D relief model, and ortophoto. On those maps, a detailed ground plan processed in AutoCad with all the features is included.

University of Zagreb, Faculty of Humanities and Social Sciences,
Department of Archaeology Croatia
imilogla@ffzg.hr
rsosic@ffzg.hr
kfilipec@ffzg.hr

Digital documentation in a liminal landscape

NJØS, Grunde

Keywords: rescue excavations, digital documentation, GIS, 3D modelling, Norway

The Rena River Project is part of the Grafjell (“Grey Mountain”) Project, one of Norway’s largest archaeological field projects up to this date. The Grafjell Project has run from 1st of April 2003 and will be concluded on the 30th of September 2008. The location is a 193 square km woodland and mountain area in Amot municipality, situated about 170 km north of Oslo.

The background for doing archaeological investigations in this area is the parliamentary decision of making Grafjell a training range for the army. The Museum of Cultural History, University of Oslo is responsible for the archaeological investigations. The aim of the project is, through excavation and investigation of some of the 2200 listed cultural remains, to broaden and deepen understandings concerning resource use, patterns of habitation and cultural interactions in this area from the Stone Age up to present time.

Digital documentation is an important part of the project. All projects of a certain size in the Museum district are instructed to deliver digital data for the archive at the projects conclusion.

This should consist of survey data, GIS-data (maps, 3D-models, georeferenced photos/old maps) databases, drawings and pictures. The projects are as a natural consequence also instructed to use digital surveying equipment in the field.

This poster will present some of the implications of doing digital surveys in a forest- and mountain landscape with dispersed archaeological localities. The landscape, vegetation and the location of archaeological objects provides part of the basis for choosing methods, equipment, routines and logistics for surveying.

Modelling Iron Age Settlement in South-western Finland

OKKONEN, Jari¹ – KUUSELA, Jari-Matti¹ – TIILIKKALA, Jasse²

Keywords: Iron Age, settlement pattern, GIS

One of the most prominent features in Finnish Iron Age research today is the fact that very little is known of the actual dwelling sites. This phenomenon is related to the fact that Finnish Iron Age settlements have not left easily observable traces on the landscape and therefore their marks are difficult to detect with standard archaeological field methods. Due to this, Finnish Iron Age research has almost exclusively concentrated on the study of burial sites and individual graves and analyses of the society and settlement patterns are both based almost solely on analyses of material found at the burial sites.

The study is based on the locations of the known medieval villages, the Iron Age burial sites and stray finds. Archaeological data is analysed together with soil type data acquired from the geological maps. The aim of the study is to construct the theoretical model of the Late Iron Age (approximately 800–1100 AD) settlement pattern for the inland region of south-western Finland. The work is based on the well-grounded assumption that the medieval villages and farms in certain extent correlate positively with the Late Iron Age settlement.

The Iron Age agricultural societies in the study area were largely dependent on the land suitable for cultivation and cattle breeding. Thus the Iron Age settlement pattern in southern Finland was very much determined by the distribution of both arable land and water resources. The Iron Age sites are often located on moraine or sandy hillocks or in some cases on rock, but the surrounding soil types are often either silt or clay. It has also been observed that although the sites are not directly shore-bound, water has been an important factor in the location of the sites. In addition to the soil-type also the location of other sites, paths and routes as well as other topographical features, such as ridges protecting from the cold northern wind or large swamps, possibly creating a favourable microenvironment for agriculture played an important role when choosing an area for dwelling.

¹ Laboratory of Archaeology, 90014 University of Oulu, Finland

² Department of Archaeology, 20014 University of Turku, Finland

An application of GIS Spatial Analysis Method to explore the possibility for the location of ancient wreck

PAI, Pi-ling

Keywords: GIS, spatial analysis, ancient ship wrecks, Taiwan Strait

There are a lot of factors that could make a ship sink, such as marine meteorology, sea war, collision, the malfunction of vessels and some uncertain reasons. In the field of maritime archaeology, some researches have tried to integrate geophysical factors into the surveys of maritime sites by the classification scheme based upon specific variables, so as to produce indices for wreck-prediction.

The research aims at long-term water factors in order to explore the location of hazardous waters to sail around the Taiwan Strait. The digital spatial data are used in analysis of the location of ancient wrecks including bathymetric data, ocean currents, seacoast topography and basic hydrological data. In addition, the research will integrate the date of ancient and modern sea routes, the map of undercurrent, and reef near the routes

The research result tries to find out the distribution of hazardous degree for sailing, so as to evaluate and simulate the probability for wrecks-occurred in the study area. Furthermore, the analysis is for verification accuracy with giving known wreck positions on the charts.

Department of Geography, National Taiwan Normal University, Taiwan

Reconstruction of Mohi medieval market town with GIS methods

PUSZTAI, Tamás

Keywords: GIS, aerial photography, medieval settlement structure, Mohi, Hungary

The Herman Ottó Museum (Miskolc) and the Archeological Department of ELTE (Budapest) initiated the archeological excavations of the medieval Mohi market town in 1995–2003.

The underground remnants of Mohi are situated in the Northern part of Hungary, in the former Borsod County. This market town was established in the Middle Ages, by the side of a trading route that went along the transition line of the Great Hungarian Plain and the mountain ranges. According to the archeological finds, the settlement was inhabited continuously between the 13th Century and the end of the 16th Century. A census in the 16th Century registered 100 inhabited building plots. In the Middle Ages, there was only a few real towns in the Northern part of Hungary. Market towns took the function of the real ones in this region. The former market towns of medieval origin in the area – like Miskolc,

Tokaj or Gyöngyös – are still habited, where the new buildings have destroyed the strata that remained from the Middle Ages.

The area of Mohi has been used as a plough-land since the 17th Century. This speciality of the archeological site offers an opportunity to reconstruct the entire structure of the settlement.

During the reconstruction of the medieval settlement structure with GIS applications

- finds of the excavations (1995–2003) of the main street,
- maps developed through the relief analysis of the area
- aerial photographs

Comparing the results of the above mentioned surveys, it is discernible that the broad, gravelled main street can be identified with the darker zone on the aerial photograph. The systematic surface analysis revealed a belt with smaller find density. The main street can be detected along the axis of the hill that hosted the settlement previously. Based on these findings, the structure of the medieval settlement can be described. Mohi was a “one-street” settlement. The main street broadens out in the middle of the town – around the church – and forms a square (market-place).

Certain surface patterns, where the aerial photographs and the findings proved the existence of buildings, were marked on the map. Moving to NE direction from the church, a specific situation can be observed. A spot of a building can be found right at the church, which is probably the same as the site that was mentioned as *a house at the church* in the diary of the excavations in the 1930's. May be one of the “*two mansions*” stated in a source from 1563 can be also found here. In the further NE direction, the ruins of buildings that stretch parallel with the main street, appear on the street and close it down in some 80 meters' distance to the church. This closure – which can be also observed on aerial photographs – cannot be linked with the finds of the systematic surface surveys. The indicated archeological phenomena have not been identified yet.

The main street of the medieval settlement was around 720 meters long and 36 meters wide in the excavated area (27–36 meters in the other parts) in the period of the highest level of development. The width of the area covered by buildings was 35–45 meters. One building plot was 22 meters wide. The inner, built part of the settlement (including also the main street) presumably covered an area of 7–8 hectares.

The Hungarian Cultural Heritage Office's official archaeological register on map

REDENCKI, Antal

Keywords: database of archaeological sites, GIS, data integration, Hungary

In 2000 the Hungarian Cultural Heritage Office launched a new project to collect and store survey data of all of the known archaeological sites in Hungary. The process is almost complete, but most of the archaeologists cannot make use of the benefit of displaying the spatial data from the database, and thus are unable to create maps along these data. The reasons are that the data are in various projection systems, the data structure is not open, the great GIS systems and the digital basemap background are not accessible everywhere. So there is a topographical database without the opportunity of using the vast amount of data.

Our mission is to help the scientists to get the profit from using the GIS approaching of archaeological data with the supplement of a new viewpoint to the official database of archaeological sites.

Our new data-integration solution, the Anonymus Map Modul is developed to serve this mission with resolving the problems mentioned above:

- displays the spatial data from the database (at once filters and displays the errors about them) with automated projection recognition and coordinate-transformation
- only requires elementary IT and GIS knowledge
- uses the user's basemaps or free maps/satellit images from Internet
- provides practical tools to make custom maps

The poster presents the basic data (the official database and the basemap sources), the methods of the data integration process (including database procedures and GIS tools), and the benefit of using GIS in archaeological topography at the same time.

Archeoline Kft. (Szeged)
redencki@archeoline.hu

Geophysical Investigations at Palaipaphos, Cyprus

SARRIS, A.¹ – KOKKINO, E.¹ – SOUPIO, P.¹ – PAPADOPOULOS, E.¹ – TRIGKAS, V.¹ – SEPSA, U.¹ – GIONIS, D.¹ – IACOVOU, M.² – AGAPIOU, A.² – SATRAKI, A.² – STYLIANIDES, St.²

Keywords: geophysical survey, 3D digital land relief, Palaipaphos, Cyprus

The project entitled “A Long-Term Response to the Need to Make Modern Development and the Preservation of the Archaeo-Cultural Record Mutually Compatible Operations – Pilot Application at Kouklia-Palaipaphos (CYPRUS)” is an Applied Research Project funded by the University of Cyprus which was initiated in 2007.

The project is based on a collaboration between the Archaeological Research Unit (ARU) of the University of Cyprus and IMS-FORTH. It aims to define a framework of principles for the management of regions of archaeo-cultural value, which are destined to sustain modern development. Under pilot study is the wider region of Kouklia-Palaipaphos in Cyprus. The project combines extensive geophysical surveys and small-scale excavations in high risk plots, production of a 3D digital land relief of the entire archaeological zone, with current property and land-use status, and the development of a multidimensional digital platform (with Geographical Information Systems), which will combine cartographic information with archaeological data. The final product of the project will be an electronic tool for the macro-scale management and planning of the region.

Within the framework of the program, an extensive geophysical survey was carried out by a team from IMS-FORTH and the ARU, in the wider region of Kouklia-Palaipaphos. Geophysical campaign employed resistivity, magnetic and GPR techniques. Soil resistance techniques made use of a Twin probe electrode configuration. Magnetic measurements were carried out using FM256 and GRAD601 fluxgate gradiometers. A Noggin Plus GPR with 250MHz antenna was also used in the field. Most areas were scanned by more than one technique resulting complementary information. The use of multiple methods was needed since the area has been under intensive cultivation which has destroyed the upper layers of the subsurface. A total area of more than 50,000 sq. m was scanned and indicated a number of promising targets. Some of them show good correlation with the surface monuments and the results of the past excavations. All maps and the corresponding interpretation of the geophysical features were registered to a GIS application, after an intensive DGPS survey. The customized GIS platform consists of aerial and satellite imagery and digital products of the land-use and its geology. The results of the geophysical survey will guide the future excavations in the area of Kouklia and will contribute to the enhancement of our knowledge for Palaipaphos.

¹ Laboratory of Geophysical – Satellite Remote Sensing & Archaeo-environment, Institute for Mediterranean Studies, Foundation for Research & Technology, Hellas (F.O.R.T.H.), Rethymno 74100, Crete, Greece
asaris@ret.forthnet.gr

² Archaeological Research Unit, Department of History-Archaeology, University of Cyprus, Kallipoleos 75, P.O.Box. 20537, Nicosia 1678, Cyprus
mariai@ucy.ac.cy

Kronoscope: a way to show the Past

SZENTGÁLI, Ádám¹ – HOLAKOVSKY, László²

Similar to a standing revolving telescope for tourists, the Kronoscope projects virtual ancient buildings over actual ruins

Visitors to the ruins of a medieval castle or of Roman settlement can walk through the ancient remains and stop at one of the Kronoscopes to see the buildings in a reconstructed

form. Turning the Kronoscope to the left and right, tilting it up and down, all the buildings in view rise above the ruins in actual size and perspective.

The images blend the present into the past and imagination into reality. Part of the picture is the original, the ruins and roads, trees and bushes as they are there at that particular time under those particular environmental conditions. But over the remains rise the old buildings reconstructed by the computer. There is no break between reality inside or outside the Kronoscope, between what the viewer sees in the focus or the corners of his eyes. The experience is complete.

By pressing another button, parts of the walls of the buildings can be made transparent and the interior can be seen. Alternatively, different building phases over time periods can also be shown.

The picture the viewer sees is produced by a software which combines video and computer technology in an entirely novel way. The international patent procedure of the Kronoscope is under way.

Since June 2005 two kronoscopes are in operation at the Aquincum Museum in Budapest, showing the centre of the municipium of the Roman city of Aquincum. Since July 2006 the medieval castle of Diósgyőr in Miskolc, Hungary is also equipped with two kronoscopes.

¹ Stubenvoll BT, Sopron, Hungary

² CORTEX Kft, Budapest, Hungary

Complex engineering services in the field of Cultural Heritage: Reconstructing the high-altar of Kisszeben, Hungary (c. 1490)

VÉGVÁRI, Zsófia

Keywords: industrial application, cultural heritage, Complex Engineering Services

Our company, TONDO BT provides custom-made solutions for the market; it is the first to bring together the state of the art industrial application with cultural heritage. We attach importance to bring near up the industrial application to the everyday life through our company.

The Complex Engineering Services was developed for the industrial applications at first but soon it became evident that this application is also great to make new researches in the field of cultural heritage. The parts of the complex engineering services are the followings: 3D surface scanning/3D measurement system in color mode, 3D rapid prototyping (3D printing) also in colour mode, reverse engineering with the state of the art software like Geomagic and Rapidform.

On the poster we are going to present different applications and examples:

- 3d scanning for measuring & investigation of the surfaces in color mode, 3D triangulation mesh from point cloud

- Virtual reconstruction by using the reverse engineering technique to rebuilt ancient buildings and forms, integrating the 3D scanned model into a 3D virtual reality
- Computer Tomography to research for the invisible, hidden structures, cracks and different layers of the art pieces
- Rapid Prototyping for making certified copy for the museums, and make „architectural” models as a touchable one in colour mode using the new rapid prototyping system

Tondo Bt, Hajógyári sziget 323, H-1036 Budapest, Hungaria
 Tel: +36 1 202 6774, Fax: +36 1 202 6774
 vegvari@tondo.hu; www.tondo.hu

Thematic cartography in archaeology: Colour in viewshed

ZAMORA, Mar

Keywords: viewshed calculating, cartography, colours

Since the arrival of Geographical Information Systems, an unusual set of abstract features and geographical categories has been introduced in the language of cartography. One of those features is the viewable area around a particular viewpoint.

Visibility is a human perception that researchers try to represent as a geographical feature. But this representation still lacks a conventional language.

This poster shows some ways to represent viewshed on 2d maps using GIS. The aim is to assess all possible representations and to find the best option in each case.

Some different kinds of viewshed are considered: cumulative viewshed (calculated from several archaeological sites and from just one site), simple viewshed, as well as the line-of-sight tool. Different ways of representation are assessed (coloured viewable area; coloured hidden area). Special importance is given to colours: since visibility is not a feature of the terrain, it has to be represented with different colours than those of the conventional maps, avoiding difficulties in map-reading. The GIS properties (colour ramp) also play an active role in the way we can represent viewshed.

In short, this poster shows a proper way to represent viewshed according to:

- colour conventions in cartography
- perception of colour
- characteristics of each viewshed type (simple and cumulative)
- technical capabilities of GIS software.

The poster's viewshed calculations refer to a group of 2nd Iron Age sites from Genil river valley (Andalusia, Spain), along the river's stretch shared by the present-day provinces of Cordoba and Seville.

The Digital Terrain Model for calculations has been obtained from 1:10.000 digital cartography including both contour lines (10 m interval) and their intermediate height points.

Sites have been understood as a group of points over hillforts' surface, as well as over their respective nearby hilltops, with a culturally appropriate offset A.

All computer tasks have been carried out using ArcGis.

Istituto Geográfico Nacional, Universidad Autónoma de Madrid
mar.zamora@uam.es



POSTER SESSION

APRIL 4, FRIDAY

NetConnect – Connecting European Culture

BEUSING, Ruth¹ – BERTACCHINI, Pier Augusto² – TAVERNISE, Assunta²

Keywords: 3D; Environmental Reconstructions; Modelling; GIS; Mobile Guide; Teaching; Virtual Reality; Work in Progress (Project)

NetConnect is a consortium of 7 academic institutions from 5 countries, funded by the European Union within the theme of Cultural Heritage. The broad aim of the consortium is to deploy emerging information technologies to make accessible to a wide cross section of the public the richness and connectivity of important archaeological sites in Europe. The three year project will focus on the three sites: Biskupin in Poland, Glauberg in Germany and Magna Graecia in Italy. The objectives of the NETconnect consortium are as follows: Many visitors cannot access the information available on archaeological sites due to the lack of interoperability or proper media. NETConnect will work to overcome such a gap by providing:

- Internet and desktop-based virtual environments, mobile and GIS applications representing three archaeological sites across Europe. Harmonization and spreading of know-how and successful benchmarking cases on the use of ICT in Cultural Heritage in order to address the impelling need to control the physical impact of mass tourism on cultural assets.
- Low-cost and wide access to cultural content by the broad public, including young, elderly and disabled people, aiming at mutual understanding between cultures.
- Advertisement and promotion of tourism in the archaeological sites and the cultural scenarios areas. Based on three archaeological sites and their surrounding landscape, the project will develop a sustainable methodology for connecting the sites as a basis of a European network. In fact, the results of the project will be initially applied to three major EU archaeological sites: the Magna Graecia of Calabria, in the south of Italy, Glauberg in Germany and Biskupin in Poland. These three sites will thus become the main core of a network of interconnected cultural scenarios.

¹ Roman Germanic Commission EU project NETconnect Palmengartenstraße 10–12
D-60325 Frankfurt/Main
beusing@rgk.dainst.de

² University of Calabria Campus di Arcavacata via P. Bucci 87036 Arcavacata di Rende (CS)
(+39) 0984 4911

A new approach to align multiple 3D acquisitions

BRUNO, F. – LUCHI, M. L. – MUZZUPAPPA, M.

Keywords: 3D scanning, mesh registration, point cloud alignment

Topics: - 3D Data capture and visualization

- Authenticity and accuracy of virtual reconstructions – a critical approach

During archaeological excavations and recognitions, all the objects that come to the light have to pass through a series of analyses. First of all, before the removal of a find from his collocation, their position in the excavation area must be localized and recorded. Subsequently the finds have to be measured and catalogued. If fragments are found, those pieces must be combined to try the reconstruction of the object in its original shape, when it is possible. Those operations are very complex and delicate, due to the fragility, the high number and the scattering of the finds in a site. The development of 3D scanning technologies has tried to satisfy those needs, leading to the development of many typologies of 3D Scanners, which differentiate each other depending on the utilized technology, the precision and the dimension of the acquisition area. One of the most discussed issues in the field of 3D Scanning is the registration of several acquisitions. The most widespread technique is the three-point alignment, that requires the individuation of at least three common points for each couple of point clouds. Obviously the operator must ensure that some overlapping areas are present among the different acquisitions. The three-point alignment technique, even if it is the most widespread for merging different acquisitions, has considerable limits when used in certain situations. As an example, this technique does not allow to align different acquisitions which do not have sufficiently ample overlapped parts, in order to identify the common points. Moreover, in some cases the surface of the scanned object is so uniform and smooth that it becomes difficult to identify the points required for the alignment process. In those cases, reference markers are applied on the surface to make the alignment easier. But this procedure does not always work, because it can damage the surfaces and thus it cannot be used on valuable finds or works of art. This paper presents a technique that allows researchers to align many acquisitions, obtaining a unique Cartesian reference system for all the acquired point clouds, without having to individuate common points between each couple of acquisitions. This technique is based on the combined use of a theodolite and a 3D scanner. Three markers are placed over the scanner and their positions in the space are traced using the theodolite. When the scanner is moved it is necessary to individuate the new position of the markers with the theodolite. In this way the movements of the scanner are calculated and, through opportune geometrical transformations, all the point clouds are aligned and referenced to a common coordinate system. The adoption of this technique in archaeological excavations could allow the employment of different scanning technologies to digitally reconstruct both the single finds and a comprehensive model of the excavation site, conveying all the information in a unique multiscale model, which is able to represent in a unified way both a global view

of the site and the detailed models of some objects, located in the position in which they have been found.

Università della Calabria, Arcavacata di Rende (CS), Italy
f.bruno@unical.it

Digital survey and investigations on the shape of the ribbed vault of Villa Adriana's Serapeo

DI TONDO, Sergio¹ – NICOLI, Silvia²

Keywords: Remote sensing: Geophysics, LIDAR, Satellite Images GoogleEarth;
3D Data capture and visualization, Virtual reconstructions and visualization:
Problems with uncertainty; Archaeological theory and computers:
Beyond the quantitative debate

Purpose: Villa Adriana is one of the most famous and visited Italian archaeological sites. It is part of the World Heritage and still now is object of excavation and research that cyclically allow us to develop our knowledge on numerous unknown or neglected parts of the Villa. Notwithstanding, amongst the elements to study in detail concerning the buildings present in the archaeological park, there are some of them that are linked with the morphological conception and with the building techniques regarding the so-called “*volte a ombrello*”.

A very well-known example of this covering solution is the ribbed vault of *Serapeo*. This vault of the Villa has been largely documented by drawings that always show the presence of a massive collapse of the front towards the long “*euripo*” of the *Canopo*.

The collapse drove to a structural loss, which in part compromises the cognitive accessibility of the real project made by Adrian's architects. In September 2007, a survey was carried out using laser scan technology in order to document the morphology of the collapsed parts, giving important evidence of the original shape of the building.

Methodology / Approach: The aim of this project is to comprehend the building's shape and the characteristics of the principal front of the edifice. A survey has been done which has supported a total documentation about the building's big vault, the collapsed fragments, and side halls.

We aim to reach a reliable reconstruction, not just based on a typological comparison (however, in this case very complex because of the singularity of the formal solution of this covering).

The entirety of the digital survey together with a topographical net allow us to support the restoring hypothesis on a solid morphological basis, otherwise hardly obtainable through traditional instruments.

Once point cloud model has been turned into surface model (mesh), both the generating arches and the web's directrix that constitute the ribbed vault shaped like an umbrella have been identified on it.

Results: The virtual replacing of the collapsed parts has confirmed the formulation of hypothesis about the nature of intrados surfaces of the dome, giving an important indication about the principal front of the building. This outcome makes a virtual or real restoration of the edifice possible, or it can be a source of studying other hypotheses about the original shape of the *Serapeo*.

¹ University of Florence c/o Giorgio Verdiani, Facoltà di Architettura Piazza Ghiberti,
27 50100 Firenze – Italy
sergioditondo@inwind.it

² University of Florence c/o Giorgio Verdiani, Facoltà di Architettura Piazza Ghiberti,
7 50100 Firenze – Italy
nixilvia@tiscali.it

Of Mashups and Data Management: A case study from the Villa Magna Project

DUFTON, Andrew

Keywords: open source, digital recording, ARK, Web 2.0

The Villa Magna Project was started in 2006 as a comprehensive investigation by excavation and survey of a large imperial Roman villa and its estate, the subsequent late antique fortification of the site, and the 10th century construction of a monastery among the ruins. In order to successfully manage and distribute increasingly digital data associated with the project on a limited research budget a mashup of existing open source software packages was created. At the core of the recording system is the ARK digital software, an open-source MySQL database system. The modular nature of the ARK code allows easy integration of other software packages.

To facilitate the creative involvement of all members of this international project a website (www.villa-magna.org) was created using the content management system Textpattern. Other available software, often designed for use by personal bloggers, was also easily adapted to suit the needs of archaeological excavation. The result is a Web2.0 community that has been readily adopted by the project team. The experiences of the Villa Magna project will serve as a practical example of the benefits and limitations of relying on established open-source communities outside the realm of archaeology for the management and distribution of data from large-scale archaeological projects.

L – P : Archaeology The Truman Brewery 91 Brick Lane London E1 6QL
london@lparchaeology.com

Current state and the future of QuickBird satellite imagery interpretation at the Department of Archaeology in Plzeň (University of West Bohemia)

JOHN, Jan

Keywords: multispectral satellite imagery, QuickBird, Bohemia

There is no doubt that high-resolution satellite images are becoming increasingly available for archaeological applications. Beside the clear advantages, however, satellite technology has many limitations as well. Therefore, different softwares and mathematical methods should be discussed.

This poster focuses on a project testing the potential of multi-spectral QuickBird satellite images for the identification of archaeological features and their crop marks in a selected area of Bohemia. The project consists of three parts: 1) panchromatic and multi-spectral satellite picture acquisition; 2) processing using computer algorithms (pan sharpening, calculation of vegetation indexes); 3) interpretation of anomalies and their confrontation with results of the simultaneous aerial survey of the same area.

University of West Bohemia – Department of Archaeology

The D.E.A.D. Project: A prototype application for the digital recording of archaeological data

KAKARGIAS, Antonis – VARYTIMIADIS, Savvas – STERGIPOULOU, Eleni

Keywords: PDA, archaeological excavation, data digitization, data archiving, archaeological databases

The lack or the limited use of advanced methods for digital recording of archaeological data constitutes in delaying the exhibition of archaeological discoveries to public and the publication of the archaeological research. One way of addressing this problem is the direct digitalization of the archaeological discoveries on site and the automation of the archiving of the archaeological data in compatible databases.

This poster presents the prototype of a PDA application (D.E.A.D.) for use during an archaeological excavation, adjusted to the archaeological excavation requirements, in order to aid the processes of data collection on site and later the archiving of the digitised data in digital files. The application follows the classic way of collecting data during an excavation and is designed only for the collection of the most important data of an excavation. It is based on WiFi hotspot technology and all the PDAs report directly to a centralized database where the data can be modified, inspected and distributed at any time. The D.E.A.D.

application will also use the GPS technology for collecting the coordinates of the data. The application is designed to be used in different kind of platforms (laptops, desktops, PDA).

The application is in the process of the final evaluation and the main objective is to observe in a real excavation if the use of the D.E.A.D. can accelerate the process of digitization and archiving of archaeological data.

Computerization's department, Library of the University of Aegean, Imvrou 3,
GR - 81100 Mytilene, Greece
kakargias@aegean.gr

Structuring the Semi-Structured – The Real-life, Large-scale Image Archive Arachne

KUMMER, Robert¹ – WILLEMS, Florian¹ – SCHÄFER, Felix²

Keywords: Database, Mass digitalisation, Real world project

Together with a live demonstration, this poster will present a viable advance in structuring huge amounts of pictorial data and metadata on archaeological subjects.

Recent developments in digital photography and retrodigitalisation have led to large amounts of digital image data. For example, the joint project Emagines of the DAI departments Athens, Istanbul and Cairo took a great part in boosting Arachne's stock of images to 220'000 and the count of contextualised data sets to 180'000, with each number increasing by about 400 every week. Subsequently, new paradigms for low-money, high-volume structuring tools need to be established and, as the outcome of this, software needs to be developed that meets the new requirements.

These tools facilitate a valid and lowoverhead workflow that exploits inherent metadata of any structure the incoming data might have. Examples of different image sources include the retrodigitalisation project Emagines of the DAI and the FA (the data of which is structured and heavily contextualised, like the rest of Arachne), excavation data and day-to-day archive digitalisation from the different departements – especially Rome (12'000 so far) – of the DAI, and the retrodigitalised archive of Sal. Oppenheim (13'000) – all of which may count as “semistructured”. The live demonstration will include a software tool that has been developed in the course of the project and that makes “structuring the semistructured” nearly an automatic process.

¹ FA – Forschungsarchiv für Antike Plastik, Köln

² DAI – Deutsches Archäologisches Institut, Berlin
arachne@unikoeln.de

Constructing virtual church – 3D Data capture and visualization of the John the Baptist's church in Starý Plzenec

MALINA, Ondrej

Keywords: 3D modelling, vizualization, documentation, reconstruction

Increasing use of 3D models is causing testing of various new methods and procedures. One of the main aims of the chosen approach is to present the possibility to integrate 3D data captured by Total Station (TPS) with specialized software for 3D modeling. The TPS is employed for several years by our department but the results have been used only in GIS. The current state of the church of John the Baptist's is the result of complicated architectural development which is apparent for example on the irregular course of the cornice. This building was therefore found optimal for testing the method which is illustrated for example on the cross-section of the nave. During the process of measuring was gained substancial experience. For example the number of measured points depended on the input questions, i. e. the biggest amount was measured in the nave and the smallest on the ceiling. Attention was paid also to the problem of textures. Samples were taken without special care and without a tripod. The effect was relatively sufficient although the method was very simple. The poster should present current results of the model on several glossed pictures. Short texts will summarize the experience gained and the last part of pictures will deal with possible reconstruction of the vaults.

Department of Archaeology – The University of West Bohemia
omalin@kar.zcu.cz

Osteometric identification of semi-domesticated reindeer (*Rangifer tarandus tarandus*) and wild forest reindeer (*R. t.fennicus*)

PUPUTTI, Anna-Kaisa

Keywords: reindeer bones, osteometry, multivariate statistics

Reindeer (*Rangifer tarandus*) bones are common finds from archaeological sites in Fennoscandia. The archaeological interpretation of reindeer bone finds is, however, often hindered by the difficulty to separate different subspecies of reindeer from postcranial skeletal morphology. In this study, skeletal measurements of modern semi-domesticated reindeer (*R.t.tarandus*) and wild forest reindeer (*R.t.fennicus*) from the collection of the Zoological museum in the University of Oulu are used in subspecies identification.

Discriminant analysis and logistic regression are used to explore the differences between these two subspecies, and principal component analysis is used to address the problems arising from the sexual dimorphism of reindeer. The generated discriminant functions and logistic regression equations are then applied to archaeological reindeer bone finds from urban archaeological sites in Northern Finland. Multivariate statistical methods appear to be useful in identifying reindeer subspecies, although pronounced sexual dimorphism of this species complicates the analysis. The results of archaeological applications can be used in discussing exploitation of different reindeer subspecies and the use of wild and domestic resources.

Laboratory of Archaeology, P.O Box 1000, 90014 University of Oulu
anna-kaisa.puputti@oulu.fi

The architectural history of the Roman villa of San Potito (AQ), Italy: 3D reconstructions

REDÓ, Ferenc¹ – VASÁROS, Zsolt²

Keywords: 3D reconstruction, Roman villa, earthquake, San Potito di Ovindoli

A Hungarian archaeological group has been carrying out excavations in a town of Abruzzo, San Potito di Ovindoli (AQ) since 1983. There is a two-hectare large Roman villa in the site, which was populated from the time of emperor Claudius to the middle of the 3rd century. A small church and a cemetery functioned above the ruins of the villa in the Middle Ages. At the end of this period a lime-kiln worked here.

We have already shown the 3D image of an industrial building of the villa to the community of CAA at the conference held at Leiden in 1995. This construction was partly subterranean, and its function is still unclear. 90% of the whole complex of the villa has been excavated until now, therefore we would like to present the 3D processing of the villa in his historical changes at the next conference.

The villa might have been the property of a member of the aristocracy of Alba Fucens, in its first period, and was a relatively modest construction. The owner could be changed in connection with the intensive land-concentration during the first third of the 2nd century, and the villa grew to several times of its original measure, moreover, it has been transformed structurally too.

The villa was damaged by an earthquake sometime at the end of the 2nd century or at the beginning of the 3rd. After its reconstruction the function of the villa changed, too. Its character became much more economical, the facilities of the earlier high quality comfort

mostly disappeared. The architectural solutions at this closing phase of the history of the villa are really poor.

We would like to present our reconstructions embedded in the landscape.

¹ Archaeological Institute of Hungarian Academy of Sciences
redof@archeo.mta.hu

² Research Institute for Visualization, Architecture and Archaeology
rivaa@t-online.hu

Magnetic survey on antique monuments of Crimea (Ukraine) and Tamansky peninsula (Russia) in 2007

SMEKALOV, Sergey

Keywords: Magnetic survey, Antique archaeology, Crimea, Taman

In the poster are presented the results of a magnetic survey which was carried out in 2007 on 8 Ancient monuments in Crimea (Ukraine) and on Tamansky peninsula (Russia)

Use of magnetic survey for inspection of territory of archeological monuments was included into the arsenal of archeologists already more than 30 years ago. The basic methods of the field works, and interpretation of data are already well developed and are more or less identical to all geophysicists working in archeology. Now, apparently, the core question is the increase of efficiency of the organization of performance of these works, from the point of view of cost and time. Magnetic survey projects, as well as other geophysical works can be, conditionally, divided into two types of projects: The long-term and applied. The firsts are directed on research of greater territories (conditionally, 5 hectares and more) during more or less significant time and demand separate and independent budget. The second is directed into inspection of concrete sites of prospective excavation during a short time interval previous to the excavation and have the practical purpose to help to choose the place for excavation squares (in many cases the area inspection makes 0,2–2 hectares). In this case the organization of special geophysical expedition for a separate monument is often impossible for economic reasons. However, if several archeological monuments are situated within the limits of one region, it is possible to combine the survey of several objects during one geophysical expedition. In the poster results of works of the second type are presented. These are the results of a magnetic survey which was carried out in 2007 on 8 Ancient monuments in Crimea (Ukraine) and on Tamansky peninsula (Russia) with the purpose of the analysis of the sites which are outlined for excavation by several archeological expeditions of Russia and Ukraine. The time of investigation on each monument was from one to five days. The territorial nearness of objects has allowed to lead inspections within the limits of one field geophysical expedition that has essentially lowered the cost of organizational expenses. The works were spent with new Russian quantum magnetometer PQM-1 (National Company Geological Survey, Saint-Petersburg, Russia). This instrument has high precision and speed, small size and its price is several times less than the price

of similar devices manufactured in other countries. It also essentially reduces cost of researches. With results of magnetic survey are created the interpretation maps used by archeologists at the organization of excavation. Magnetic maps are included in the information system of archeological monuments of Crimea and Tamansky peninsula. The works supported by Russian-Ukrainian grant RFH-NAS25-01/07-01-91103à/Uk.

Contact Baltic State Technical University Physics department Saint-Petersburg Russia
slsmek@mail.ru

New possibilities for intensive field survey in the region of Nak, Lápafő and Várong (Tolna County, Hungary)

SZABÓ, Máté

Keywords: aerial photography; photogrammetry; mobile GIS applications; work in progress

Study area. The vicinity of the modern villages of Nak, Lápafő and Várong were selected as study area due to the lack of previous research in the region and based on my previous experiences in the Aerial Archaeological Archive of Pécs. The last systematic survey in this part of Tolna County was carried out by Mór Wosinsky more than a century ago. Due to the considerable changes in methodology since that time, these data are in need of a revision. The Aerial Archaeological Archive of Pécs has a large number of aerial photographs of the region, the use of which may enable us to significantly enhance the amount of available archaeological data.

My aim is the preparation of an archaeological gazetteer through the combination of modern aerial photography, photogrammetry, GIS and field survey methods. Through this work in a previously understudied area, I plan to highlight the possibilities and limitations of these new technologies.

Methods. The Aerial Archaeological Archive of Pécs has photos of the area taken many years ago. These have been augmented by our recent images. Archaeological data were collected before the photogrammetric processing and vectorization of these images. Field survey proved data on the size, structure and date of the sites.

Field survey was carried out in knowledge of the information collected through aerial photography and with the help of a mobile GIS. The preliminary information was uploaded into a PDA with a GIS, and with the help of GPS I managed to collect and record data even at the level of archaeological features. Data on the size and characteristics of the sites were recorded on site.

The preliminary aerial archaeological data were controlled during the field survey and the information was expanded with the help of mobile GIS. Information on the sites was completed through the analysis of the collected material and the available literature.

Thanks to the possibilities of GIS, we could collect data on the environment of the sites as well.

University of Pécs, Aerial Archaeological Archive

“Propylaeum”

THÄNERT, Sabine – SCHÄFER, Felix

Keywords: digital collections, web-portal, virtual libraries, e-publishing

This poster will present the „Propylaeum” project, a Virtual Library for Classical Studies, which has been set up by several German institutions in summer 2006 and since then is funded by the German Research Foundation (DFG). Designed as a specialised internet portal “Propylaeum” assembles scientific information from different disciplines like Egyptology, Ancient History, Classical Archaeology Classical Philology and Pre-and Early History. Current plans aim to also integrate the areas of Ancient Near East, Byzantine Studies, Medieval and Neo-Latin Philology. The primary purpose of “Propylaeum” is to serve as a web-based platform for research, teaching and study with regard to all aspects of the Ancient world. For the first time in Germany, there is a central pool which brings together reams of widespread, locally stored digital resources (often with restricted access) in order to help disseminate and make utilisable their contents for the whole scientific community. Thus the system offers direct access to distributed electronic primary and secondary sources and contains search, information retrieval and publishing tools for students, researchers and the general public. Besides library catalogues, lists with recently acquired books, e-journals and specialised databases the portal provides links to digitized historic literature and selected Internet-resources which have been classified according to their relevant content. An extensive scientific alerting service informs about news and notices about upcoming events. Furthermore, “Propylaeum” provides the possibility of publishing scientific texts in electronic form. Within the near future specific subject-oriented “sub-portals” will be implemented and the navigation of the page will be translated into English. A key feature is “Propylaeum-Search” – a meta search engine which allows queries from one starting point either within one category of data source or across several catalogues, databases, web-pages, etc. During the next period of funding further systems will be integrated into “Propylaeum” to enlarge the amount of information available. It is also envisaged to test how conceptual models for bibliographical metadata (FRBR) and for cultural heritage documentation (CIDOC-CRM) can be made interoperable with the data provided via “Propylaeum”. Project partners are the Bavarian State Library Munich, the University Library Heidelberg, the Institute for Classical Philology at the Humboldt-University Berlin and – as cooperative partners – the German Archaeological Institute Berlin and the Chair for Ancient History at the Catholic University Eichstätt.

DAI – Deutsches Archäologisches Institut, Berlin

Mapping the past using RS: New satellite applications for uncovering archaeological remains at Angkor

TRAVIGLIA, Arianna

Keywords: Remote sensing, Angkor (Cambodia), satellite images, multispectral analysis.

This paper will focus on the results of a joint international project (a partnership between the University of Sydney and the University of Venice) that develops and applies sophisticated satellite remote sensing methodologies for finding and mapping unknown archaeological sites in the surroundings of Angkor, in Cambodia. Long famous for its temples, this World Heritage site is now increasingly recognized as a vast, low-density urban landscape. By applying technologies such as multispectral imaging, the current research aims to scan vegetated and bare soil areas in order to clarify features that are ambiguous in existing maps and reveal features which would otherwise remain undetected. The innovative approach of the project consists of using the spectral content of remotely sensed images to reveal the presence of buried sites and structures of the ancient Khmer landscape on the basis of the different spectral characteristics of the terrain and vegetation. Multispectral (simple on-screen visual investigation) and radar data have already been adopted in previous research of the University of Sydney team to detect and draw maps of archaeological monuments or possible archaeological features. The outcomes of the use of remotely sensed data so far have been satisfactory leading to detection and mapping of a large number of features, but the process is still incomplete as regards specific areas due to particular environmental conditions (for example, a large part of the investigated area is strongly forested). Significant new results are now available exploiting the spectral characteristics and contents of the satellite images through advanced and carefully-designed processing of the images. Various satellites images (ASTER, Landsat TM, Ikonos, Quickbird) are submitted to several image processing techniques, accordingly to the type of natural environment of the target area they represent. Particular emphasis is attributed to different and appropriate Vegetation Indices: the vegetation covering archaeological features and hiding them to a pedestrian, aerial or radar survey have in fact specific spectral signatures that can be detected through image processing and spectral analysis and lead to the identification of subsurface archaeological structures. The results of these processes augment the current map of greater Angkor and are crucial for a correct understanding of the extension of the Khmer settlement and of the processes which led to its decline and abandonment.

Department of Antiquity and Near East Sciences, University Ca'Foscari of Venice, Italy
Department of Archaeology, University of Sydney, NSW, Australia)

Data redundancy and results validation: Dealing with production and overproduction of processed hyperspectral data

TRAVIGLIA, Arianna

Keywords: Remote sensing, hyperspectral images, image processing, GIS, Aquileia (Italy)

The application of hyperspectral images in archaeological research in the last years has demonstrated that this kind of data, under certain conditions, can represent a valuable resource as a complementary source of information for archaeological goals when integrated with other data. Various processes, delivering more or less effective and debatable results, are normally applied to part or to all of the image bands, creating an issue with the number of generated images. When dealing with one or more images formed by a number of bands, which can be over a hundred, even considering realistically to use a small part of these bands for multiple processes, the result is inevitably that the number of images that must be subjected to visual analysis and interpretation is too large. While presenting the results of the application of several image processing techniques in a target area, like ratios, vegetation indices, PCA and its derivative, the current paper will focus on the necessity to define a set of procedures to reduce the number of final images to be used, selecting the ones that do not carry redundant information. Consequently, comparison tables, cross process coverage tables, correlation and selection matrixes will be debated and the results of their application discussed in order to provide suggestions about how to reduce the images to a small number and be able to insure the complete coverage as regards to the detectable traces. This innovative type of solution has been applied in a research based in the area of Aquileia (NE Italy), both to reduce the number of used images in process cycles that could generate multiple images as results and to select the images carrying the most significant information. The set of chosen images has been managed through a GIS that provides also the archaeological and topographical data necessary to eventually recognize the detected surface feature as ancient origin traces, attributing each of them a value of visibility and archaeological reliability as result of the interpretation process.

Department of Antiquity and Near East Sciences, University Ca'Foscari of Venice, Italy
Department of Archaeology, University of Sydney, NSW, Australia)

