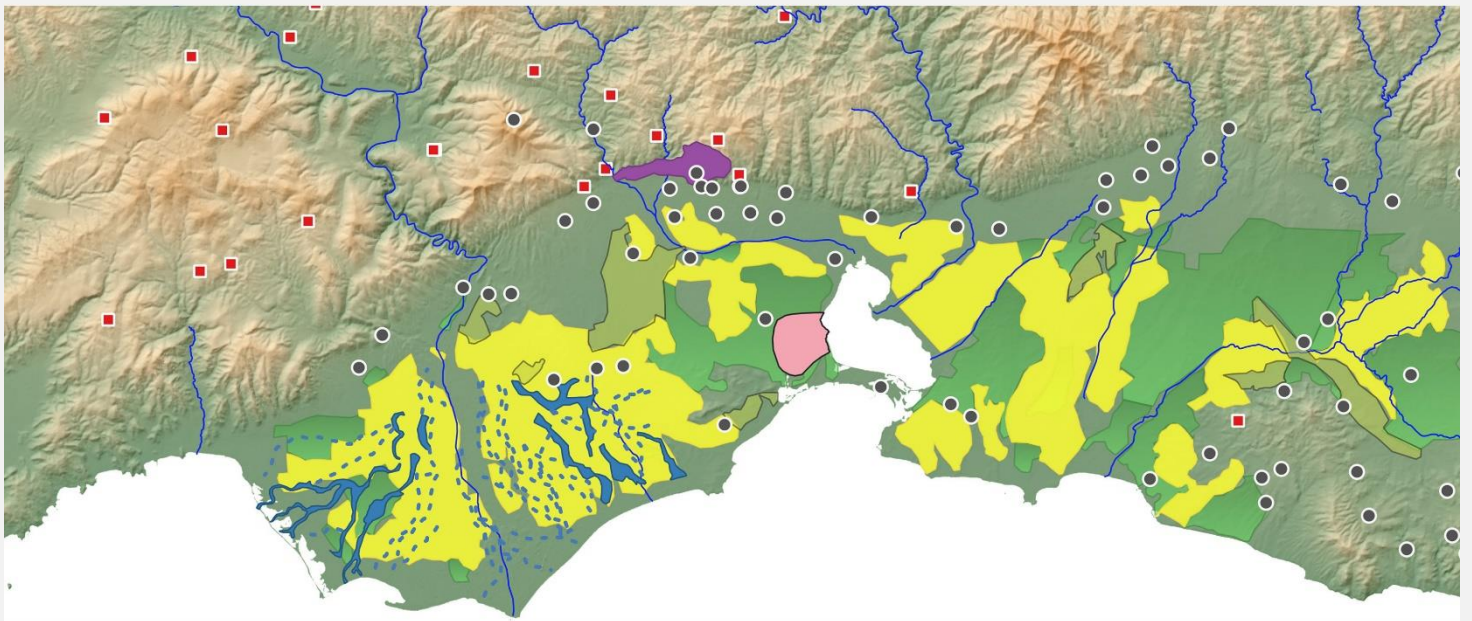


LABORATORY OF ARCHAEOLOGICAL GIS
AEGIS ATHENA

WORKSHOP Hybrid event

**MAPPING
THE PAST
PLOTTING
THE FUTURE**

**GIS IN ARCHAEOLOGY
MATURITY & IMPLEMENTATION**



PROGRAMME & BOOK OF ABSTRACTS



aegis.athenarc.gr

Thursday 30 March 2023
British School at Athens
(52 Souedias Street, Athens)

Workshop (hybrid event) organized by the Archaeological GIS

Laboratory of the ILSP / Athena RC (AeGIS Athena)

Speakers & discussants:

Antoniadis V., Bonnier A., Boyd M.J., Campbell R., Donati J.C., Efkleidou K.,
Evangelidis V., Giannakoula G., Herbst J., Indjerd H., Karta M., Katevaini A.,
Katsianis M., Kennedy W., Kopanias K., Lolos Y., Loy M., Malaperdas G., Meyer N.,
Mourthos Y., Mousouris S., Nenci N., Orengo H., Renfrew C., Sarris A., Tsiafaki D.,
Tzavella E., Vassiliou A.

- | | |
|--------------|---|
| 9.15 - 9.30 | <i>Welcoming</i>

G. Mouratidis (Assistant Director of British School at Athens)

I. Emiris (General Director and President of the board,
Athena Research Center)

V. Katsouros (Director of Institute for Language and
Language and Speech Processing) |
| 9.30 - 9.45 | <i>Introduction</i>

D. Tsiafaki |
| 9.45 - 10.15 | <i>The Polymorphism of Archaeological GIS. Unfolding the
Archaeological Dimensions of GIS</i> |

- (via zoom) A. Sarris
- 10.15 - 10.35 *From Intra site to Macro Scale GIS analysis. The work of AeGIS Lab*
V. Evangelidis, M. Karta, Y. Mourthos
- 10.35 - 10.55 *Assets and Liabilities of GIS in Regional Landscape Studies: Some Examples from Greece*
J.C. Donati
- 10.55 - 11.15 *Mapping long-term habitation in the landscape with the use of GIS*
(via zoom) K. Efkleidou
- 11.15 - 11.30 Discussion
- 11.30 - 11.45 Coffee Break**
- 11.45 - 12.05 *Methodology and challenges in geovisualizing excavation data: the case of Sikyon*
Lolos, Y., S. Mousouris, Ch. Giannakoula
- 12.05- 12.25 *Uses of the GIS in recent archaeological and topographical research in Sparta and Laconia*
(via zoom) N. Nenci
- 12.25 - 12.45 *KoBo Toolbox and on-the-fly recording for archaeological GIS and database workflows on Samos*
M. Loy, A. Katevaini, A. Vassiliou

- 12.45 - 13.05 *Bridging the Gap: Embedding Spatial Analyses in Culture-historical Discourse. Experiences from Jordan and Cyprus*
W. Kennedy
- 13.05 - 13.25 *Methods of integration: Combining archaeological and palaeoenvironmental datasets within a GIS framework*
(via zoom)
A. Bonnier
- 13.25 - 13.45 *Optimal Paths, Slope-dependent Functions and Digital Elevations Models in the Greater Knossos Area*
V. Antoniadis
- 13.45 - 14.05 *3D GIS in archaeological excavations: Linking documentation with analytic and synthetic workflows*
M. Katsianis
- 14.05 - 14.30 Discussion
- 14.30 - 15.30 Lunch Break**
- 15.30 - 16.00 *Spatial-based analyses in archaeology: from GISystems to GIScience*
(via zoom)
H. Orengo (keynote lecture)
- 16.00 - 16.20 *Integrating field and specialist data in a 3D GIS framework: a holistic solution*
R. Campbell, M. J. Boyd, J. Herbst, H. Indgjerd, N. Meyer, C.

Renfrew

16.20 - 17.20 *Round table: GIS in Archaeology. Maturity and Implementation*

V. Evangelidis, K. Kopanias, G. Malaperdas, E. Tzavella

17.20 - 17.30 Closing remarks

The Polymorphism of Archaeological GIS. Unfolding the Archaeological Dimensions of GIS

Apostolos Sarris (University of Cyprus)

Abstract

Having travelled through more than 30 years on the chariot of GIS, archaeology has been benefited significantly from its tools and functionalities trying to identify its matching with it on both a theoretical and practical level. Independent of the applications that have been carried out, micro or macro, 2D, 3D, 4D, geostatistical or descriptive, locational and predictive analyses or monitoring, GIS has unfolded new dynamics in archaeological research, moving away from simple mapping, visualization and geotagging to address challenging tasks of analysis that combined diverse geographic, temporal, environmental, climatic and cultural datasets. It has been an expected evolution as the science of Geoinformatics has been accelerated through the recent developments of smart sensors and imaging technologies from space, air, land and underwater, the fusion of different datasets, the exponential increase of data that led to the rise of Big Data, the advancement of processing algorithms through ML and AI techniques. We are definitely experiencing the impact of the new generation of GIS in archaeology. But is the archeological community ready for the next step?

From Intra Site to Macro Scale GIS analysis. The work of AeGIS Lab

Vassilis Evangelidis (ILSP / Athena RC)

Melpomeni Karta (ILSP / Athena RC)

Yiannis Mourthos (ILSP / Athena RC)

Abstract

Since the first introduction of the term GIS in archeology, the archaeological community has made great strides in integrating GIS technology into its daily practice and many have recognized the value of geographic databases, digital cartography and spatial analysis in the management representation and analysis of the archaeological information. Over the last twenty years, research conducted at RC Athena and more recently at the Archaeological GIS Laboratory (AeGIS Athena <http://aegis.athenarc.gr/>) has sought to employ geospatial technologies in the archaeology of Northern Greece and to shed new light on the enormous potential of their application in the archaeological research. The purpose of this paper is to show and discuss the different possibilities and contribution of GIS applications through the employment of certain case studies. Moving from intra site analysis and data handling (University excavation in Karabournaki), to macro scale analysis (the study of the relationship between environment and settlement in Aegean Thrace) and the integration of GIS data with UNITY 3D we want to highlight the role of GIS systems as heuristic devices that will help us think about our assumptions and formulate our archaeological questions.

Assets and liabilities of GIS in regional landscape studies: some examples from Greece

Jamieson C. Donati (Democritus University of Thrace & University of Crete)

Abstract

This paper explores the application of geographic information system (GIS) in landscape studies to investigate the trajectory of regional settlement patterns over the long term and the inter- and intra- organization of settlements. By now GIS is a core component of archaeological research to visualize, organize, and examine complex datasets, although the spatial tool does not come without constraints. One issue faced is how best to translate GIS analyses in human terms and to make sense of spatial configurations or statistics in specific (yet multifaceted) historical settings. The (in)visibility of the archaeological data can also bring about potential misinterpretations. Touching upon some of these topics, the paper considers case studies from Greece using proximity studies, cost surface analysis, and viewshed analysis, among others.

Mapping long-term habitation in the landscape with the use of GIS

Kalliopi Efkleidou (Aristotle University of Thessaloniki)

Abstract

GIS have been widely accepted by now as a core analytical tool in archaeology and their use over the years has sparked significant discussions over epistemological and technical issues. An aspect of GIS applications, however, that is not being widely discussed is that of scale – both spatial and temporal. GIS applications in archaeology tend to analyze data either on a local scale (corresponding to the intra-site analysis of data that cover limited time periods) or on a regional scale (corresponding to the inter-site analysis of data associated mostly with regional surveys which cover very long periods of time).

The current presentation will discuss GIS analyses that take place on an intermediate-level spatial scale corresponding to an archaeological site and its immediate surroundings. Such case studies analyze archaeological data over the *longue-durée* aiming at reconstructing the biography of a locality in the landscape. This type of analysis looks at human occupation in the landscape as a continuum disregarding the practice of retrospectively and arbitrarily imposing time and spatial boundaries in human-landscape interaction.

Methodology and challenges in geovisualizing excavation data: the case of Sikyon

Yiannis Lolos (University of Thessaly)

Spiros Mousouris (University of Thessaly)

Christina Giannakoula (University of Thessaly)

Abstract

The recent excavations of the Archaeological Society of Athens at Sikyon around the agora of the city revealed structures of different periods and purpose over a surface area of more than 2000 m² and recovered a score of artifacts and ecofacts. Visualizing the results of this artifact-rich excavation and making them available to the public through an open-access digital platform posed great challenges. This paper presents the methodology followed to design and develop a web app that geovisualizes different levels of granularity for excavation data. Focusing on the interface, the steps, challenges and implementation tools are described in an effort not only to share knowledge about the specificities of the Sikyon excavation, but also to define general guidelines, applicable to other excavations too. The aim is to ignite a discussion to methodize the process of geovisualization for similar apps, producing information using visuals and based on archaeological methods.

Uses of GIS in recent archaeological and topographical research in Sparta and Laconia

Nicola Nenci (University of Roma Tre)

Abstract

Geographical Information Systems are now employed in a wide range of disciplines, including those investigating the Ancient World. Although the use of GIS is now well established in the archaeological research, modern studies focusing on ancient Laconia have benefited from this resource only in relatively recent years.

This presentation gives an overview on some current projects having GIS as the core tool for investigating ancient Sparta and Laconia. Adopting a multiscale perspective, the presentation shows GIS implementations in documenting the ongoing archaeological excavation at the Amyklaion; in mapping the urban area of the Hellenistic and Roman Sparta; and in collecting archaeological and topographical data to a regional scale, encompassing the Eurotas Valley, ancient Laconia and to some extent Messenia.

In particular, the contribution discusses problems encountered and methodologies adopted in digitizing non-native GIS data for their usage in Geographical Information Systems. This work aims to show how old data can convey new meanings when they are assembled and combined onto a GIS platform, and how these new meanings can be beneficial to our research on ancient Sparta and Laconia.

KoBo Toolbox and on-the-fly recording for archaeological GIS and database workflows on Samos

Michael Loy (University of Cambridge)

Alexandra Katevaini (National and Kapodistrian University of Athens)

Anastasia Vassiliou (Harokopio University)

Abstract

The landscape of west Samos between Karlovasi and Marathokampos is currently under investigation by the British School at Athens, in a five-year intensive field-survey project that aims to explore diachronic patterns of land-use, economic resource and settlement pattern. The primary data collection strategy of the project involves teams of field walkers surveying a predefined grid of 50x50m tract units, noting both features of the landscape and the concentration and condition of surface finds. All fieldwalkers are issued with project tablets in the field, where they register data through the open source platform KoBo Toolbox, using especially designed forms, controlled vocabularies, and guided data-entry procedures. Data are subsequently downloaded to the project filespace at the end of each working day, where field information is cleaned and linked into a GIS to help inform the ongoing field strategy and to generate working research visualizations on-the-go.

This presentation introduces the KoBo Toolbox workflow, outlining both why and how the platform has been employed by the Samos team and its incorporation to the GIS environment. It will discuss both the benefits and

challenges that the team has faced through two years of trialing this system, while also suggesting further areas for development, for an even smoother integration of field and research data in our particular case.

Bridging the Gap: Embedding Spatial Analyses in Culture-historical Discourse. Experiences from Jordan and Cyprus.

Will Kennedy (German Archaeological Institute)

Abstract

The application of spatial analyses in archaeological research can be considered as both a standard procedure to achieve specific research aims, but it can also very much test the limits of core competencies required by the different archaeological disciplines. There are therefore both advantages and disadvantages when conducting spatial analyses. On the one hand, as a method, it is independent from archaeological (sub-)disciplines and, as a multi- and interdisciplinary approach, it allows for a broad applicability of different research questions.

On the other hand, depending on technical skills and training background, possibly problematic premises of analytical methods are often not fully recognized or discussed. Alternatively, as the learning barrier as well as the required time and work effort may become too great, there is also the risk of falling into the “methodological trap” and focusing too strongly on the uncritical development and application of analytical methods. Often, this results in an insufficient consideration of more in-depth culture-historical, archaeological discussions.

This paper therefore calls for bridging the gap between and critically embedding quantitative, spatial analyses within a more qualitative, culture-historical discourse.

In doing so, two landscape archaeological projects in the Eastern Mediterranean (i.e. the hinterland of Petra in modern-day Jordan and the rural environs of the kingdom of Idalion in Cyprus) shall serve as case studies and basis for further discussion.

Methods of integration: Combining archaeological and paleoenvironmental datasets within a GIS framework

Anton Bonnier (Uppsala University)

Abstract

We live in a time of environmental anxiety with global concerns for climate and environmental change. It is therefore hardly surprising that aspects of human-environment interactions have increasingly come to the fore within archaeological research in the past decades. As much recent research highlights, studying such human-environment dialectics demands that we make use of both human and paleoenvironmental archives and proxy data. We are, however, still faced with challenges in terms of how to integrate and compare different strands of evidence. In my presentation I will focus on how GIS can be used as a suitable tool-box for integrative research using paleoenvironmental and archaeological evidence, both in terms of spatial mapping as well as in regards to quantification of land use patterns and diachronic developments over time. Using specific examples from Attica and the Peloponnese, I will discuss the methodological challenges that persists but also the possibilities for GIS-based research for exploring socio-environmental dynamics in landscape archaeology.

Optimal Paths, Slope-dependent Functions and Digital Elevations Models in the Greater Knossos Area

Vyron Antoniadis (Institute of Historical Research, National Hellenic Research Foundation)

Abstract

Least Cost Path (LCP) analysis is a GIS tool that computes the optimal route from one location to another according to a friction cost on an accumulated cost surface. Functions use slope rasters derived from Digital Elevation Models (DEMs) to calculate cost. Slope is an essential factor for computing optimal paths. However, different slope-dependent functions may produce different outputs. This paper tests a series of functions, LCP applications and DEMs of different resolution in the landscape of the greater Knossos area with monuments dating to the Minoan and the Early Iron Age. The aim of this paper is to determine which slope-dependent functions, DEMs and LCP outputs fare better with the archaeological finds indicating the course of ancient roads. Combing the most suitable LCPs with the archaeological and topographic evidence will lead to a more accurate reconstruction of ancient routes and roads.

3D GIS in archaeological excavations: Linking documentation with analytic and synthetic workflows

Markos Katsianis (Department of History and Archaeology, University of Patras)

Abstract

Over the last twenty years GIS have played an ever-increasing role in the archaeological excavation documentation. Several case studies have experimented with 3D workflows, while at the same time developments in 3D data capture and GIS software have greatly improved their integration in intra-site archeological research. Still, 3D GIS have yet to explore their full analytic and synthetic possibilities in the context of archaeological excavations. We have been a lot more successful in bringing data to 3D than actually using them for stratigraphic analysis, patterning exploration, interpretive work and, ultimately, knowledge building. Persisting problems are related with several factors, including existing documentation workflows, technological change, data bottlenecks, organizational capacities, or work mentalities that this presentation will attempt to showcase. This is especially true in the Greek context, where the adoption of digital methods is very diverse across the archaeological sector. However, perhaps the underlying question is whether we are ready to accept the mediation of digital tools within the archaeological process and explore their potential, as this may require major shifts in our perceived typical archaeological roles and research activities. In the end, even if we manage to integrate 3D spatial technologies in our daily practice, do we have a plan of how to explore or streamline their possibilities?

New approaches to spatial analyses in archaeology: from GISystems to GIScience

Hector A. Orengo (Catalan Institute of Classical Archaeology)

Abstract

During the last 30 years or so GIS has become an important tool in the archaeological toolbox. It's conceptualisation and application has gone through different phases, which have been marked by the increasing availability of software, data, computation, and expertise but also by changing theoretical and disciplinary approaches. From the initial use of CAM, CAD and raster analysis tools to the boom of archaeological GIS in the mid-90s, and the higher accessibility of integrated raster-vector platforms and topographic analyses in the 2000's. After these initial years of button pressing and viewsheds, GIS became a kind of technical subdiscipline. Despite the increased availability of expertise, software, data, and computing power, the mid-2010s marked the bottom of the GIS hype cycle. GIS-based analyses became more difficult to publish while postprocessual criticism of GIS finally caught up.

The last years have seen important changes: (1) the increase of public geographic data availability thanks to the Inspire Directive, the Copernicus programs, and other initiatives; (2) the appearance of new sensors, platforms and types of data; (3) an emphasis on the use of big-data and new types of analysis that can deal with them (statistics-based analyses/modelling, machine learning, ABM); (4) new computing capabilities and platforms providing cloud access to parallel and GPU-based computing; (5) an increased focus on reproducibility, reuse and code transfer; and (6) new topics and subjects of interest (such as cultural evolution, digital humanities, etc.).

This talk will aim to discuss the role of GIS today and the need to move from GISystems to GISciences/Geosicences. Only by adopting flexible and integrative approaches that go beyond any set of programs, we will be able to successfully integrate and exploit all these new changes.

Integrating field and specialist data in a 3D GIS framework: a holistic solution

Rosie Campbell (McDonald Institute for Archaeological Research, University of Cambridge)

Michael J. Boyd (Science and Technology in Archaeology and Culture Research Center, The Cyprus Institute, and McDonald Institute for Archaeological Research, University of Cambridge)

James Herbst (American School of Classical Studies at Athens)

Hallvard Indgjerd (Museum of Cultural History, University of Oslo)

Nathan Meyer (University of California, Berkeley)

Colin Renfrew (McDonald Institute for Archaeological Research, University of Cambridge)

Recent excavations on the central Aegean island of Keros utilised a number of born-digital approaches to data recording. In preparation for the publication process the aim was to create a visual database within which all types of excavation and specialist data could be held, cross referenced and analysed.

Digital approaches during the excavation process included iPad-based recording of geo-located field information combined with a use of photogrammetry to replace paper-based recording approaches such as plans and sections. Photogrammetric recording of every excavation unit has created a wealth of 3D documentation which in theory allows for the digital re-excavation of the site.

Given our emphasis on photogrammetry as the primary visual recording technique for the site, the ability to absorb and interpret this mass of data becomes paramount.

This paper describes the creation of a 3D tool which aims to be a 'one-stop shop' for the interpretation of the excavation, including multi-layered 3D views of the site and all geo-located data resulting both from the excavation and from subsequent specialist survey. This is a true 3D GIS system, encapsulating all the abilities of a traditional GIS, including data entry, database management, data analysis and manipulation, and gives access to all excavation data within a single platform, making the tool data-driven and research-oriented.

We discuss some of the experiences and challenges encountered when implementing the system and opening it for use by project participants. We highlight areas where the system added analytical value, but also pinpoint pitfalls and propose workarounds for future implementations.

Round table: GIS in Archaeology. Maturity and Implementation

George Malaperdas (University of the Peloponnese)

Konstantinos Kopanias (National and Kapodistrian University of Athens)

Elli Tzavella (Ephorate of Antiquities of Boeotia)

Vassilis Evangelidis (ILSP / Athena RC)

The second part of the workshop involves a round table that aims to share insights and challenge opinions about the application of GIS in archaeological practice taking as a starting point the presented papers but going beyond them. The goal is to trigger an exchange of viewpoints among the speakers and the audience with the contribution of four discussants (names) who will focus on four different points/topics.

1. The use of GIS as analytical tool in archaeological research as presented through the papers
2. What is the necessary toolkit for creating, viewing, sharing, and analyzing GIS data in Archaeology?
3. What are the practicalities and difficulties an archaeologist without a technical background may face in using the GIS technology?
4. What does the development of a new academic curriculum require?

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