Abstracts Volume - 22nd International Conference on Cultural Heritage and New Technologies

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Urban Archaeology and Integration

Combing archaeology, history, and new technologies

The aim of this conference is to enhance the collaboration between historians and archaeologists and related disciplines using new technologies and to showcase best practice applications in multidisciplinary research. The conference organizers invite sessions dealing with one of the following topics or a combination thereof:

- Application of effective 3D-methods for the reconstruction of buildings, integrating archaeological excavation data with historical sources including images, thus increasing our understanding of the past
- Additional digital methods for the combined visualisation of archaeological and historical data (e.g. monitoring changes and preservation of archaeological monuments based on historical images).
- Application of new technologies to assess the archaeological record based on historical data (maps, tax returns, inventories, ship wreck lists, etc.) and/or combining historical sources and archaeological data in a geographical information system for recording the history of urban or rural landscapes.
- Games, apps, and teaching software integrating archaeological and historical knowledge
- Historical data as a basis for checking or validating digital tools applied in archaeology and vice versa.
- Dealing with inscriptions (including cuneiform, hieroglyphs and symbols): digital methods for enhancing readability (e.g. Reflectance Transformation Imaging), pattern recognition of letters or pictograms, comparison of hand writing (same author?).
- Statistical analysis investigating the correlation between historical place names and archaeological evidence.

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Training 1 – Integration of Archaeological, Historical and Surveying Data Documenting a Mining Landscape

(Organisers: Gerald HIEBEL | Klaus HANKE, Austria | George BRUSEKER, Greece)

In particular:

- Application of new technologies to assess the archaeological record based on historical data (maps, tax returns, inventories, ship wreck lists, etc.) and/or combining historical sources and archaeological data in a geographical information system for recording the history of urban or rural landscapes.
- Historical data as a basis for checking or validating digital tools applied in archaeology and vice versa.

The ancient mining landscape of Schwaz/Brixlegg in the Tyrol, Austria witnessed mining from prehistoric times to modern times. These activities left distinct physical structures in the mountains south of the Inn river ranging over 50 km. This area documents the history of mining from bronze age copper mining to medieval and modern times silver mining creating a first order cultural landscape. With our training we want to show a workflow how to integrate archaeological, historical and surveying data on a semantic and geoinformation level. The goal is to combine georeferenced geometric information of mining landscape and structures with a semantic representation of the mining structures thus providing knowledge on functionality and periods of usage. For the workshop sample data of the mining landscape will be provided and a hands on tutorial will introduce attendees to the notion of semantic mapping and be linked to an introduction to an overall semantic data transformation and exploitation workflow.

The first challenge in this process is to integrate different information sources coming from surveying, archaeology, geology and history under one conceptual model. We will demonstrate how to use formal ontologies and in particular the CIDOC CRM, an ISO standard for cultural heritage documentation to model research data as well as geometric data. A series of mini exercises will initiate attendees into the process of semantic mapping of real, sample archaeological data structures.

The workshop will further demonstrate how such mappings can be used to transform information sources to a formal representation of the classes and properties of the ontology using semantic web technologies to create a knowledge graph in RDF (Resource Description Framework), a data format that is able to relate logical statements within a network. In the tutorial presentation the steps and potential tools to execute such transformations will be described.

Saved into a triple store, an RDF graph can be queried using the SPARQL query language to create more powerful searches than available through standard database technologies. For the training, sample SPARQL queries have been built to demonstrate how they can be used on a snapshot of mining, settlement and burial sites in the Bronze Age, or the temporal usage of mines in early modern times. The results of the query are loaded into a Geoinformation system and will be visualized together with a high resolution digital elevation model. Queries and results will be detailed in the tutorial.

The format of the training will be a best practice demonstration on sample data of the mining landscape with exercises in conceptual modelling. The sample data (in all stages of their processing)

and a detailed description of the workflow will be made available online, with the goal that workshop participants will be able to go through the workflow on their own.

***Training 2* – Archaeological Geospatial Infrastructures - Searching, finding and using findings and their documentation with geospatial catalogues**

(Organiser: Markus JOBST, Austria)

Archaeological work comes along with digital excavation maps, measurements, findings, documentation, interpretation and similar location based documentation. Publications and pictures of our CH data are a main result of our work and sometimes are widely used by others. The reason is that these artefacts have to be published and therefore become accessible to others. Some of these topics will be needed in GIS systems for further analysis and work. For this reason we have to share all the contents by publishing their metadata and making the sources available, if we like to do so. And even if collaboration is not our aim, these Web-based systems allow us to efficiently manage and – if done right – sustainably save our constantly growing datasets and documentation. Initiatives like the ARCHES project or Arachne from DAI (German Archaeological Institute) show us the importance, usage and requirements of doing so.

This hands-on workshop on Archaeological Geospatial Infrastructures leads through the basic paradigm of these modern mapping and management technologies. Simple examples in a well prepared software framework (totally based on open source components) explain the basic methods of the Web, Service-Oriented Mapping and its services, Metadata management, publishing of content and the creation of Spatial Data Infrastructures.

The aim is to provide an easy access to Spatial Data Infrastructures and Documentation Management toolset for Cultural Heritage topics – using different metadata catalogues – and to understand their impact for management issues as well as world-wide initiatives for infrastructure harmonisation (like INSPIRE or the UN-SDI).

This workshop is held by the ICA [the International Cartographic Association, [www.icaci.org] Commission on Map Production and Geoinformation Management [http://mapproduction.icaci.org].

***Training 3* – Professional presentations**

(Organiser: Carmen LÖW, Austria | Nadine ALPINO, Germany)

Archaeologists are confronted every day with the task of communicating their work to a diversity of audiences or target groups. Whether it is public lectures for interested people or presentations of prospection results for construction committees in local communities, the speakers are increasingly confronted by an audience that is spoiled by the media with peppy pictures and pithy slogans. Also, the attention span in our multimedia world seems to be decreasing, regardless of the impact of the subject.

Unlike in North America, where school children are already trained in rethorics, such topics are usually not covered, not even in universities, in the German speaking areas. However, in an increasingly international and trans disciplinary, as well as in a more and more competitive Archaeology, these skills are becoming increasingly important.

In the workshop “Professional Presentations”, the general, theoretical background of communication

will be conveyed: How to structure a lecture? How to create a continuous thread for the audience? In what different ways do people acquire knowledge? And what kinds of speakers are there?
For this purpose, the most common presentation tools are presented and illustrated by examples. The workshop will not only deal with the widespread software PowerPoint (and answer questions such as how much text one can use or how much time one has to plan per slide). It will also cover other IT tools, which are trendy in other disciplines – such as Prezi and Impress. In addition, the often inconspicuous classical tools, such as whiteboards and flip charts, are shown with their many possibilities. Participants will be able to explore these and other topics under the expert guidance of the workshop organizers.
The 180-minute workshop is divided into theoretical knowledge transfer and numerous exercises, in which the participants can put their new skills to the test. In an atmosphere of open dialogue, there will be plenty of opportunity for mutual exchange and questions.

Round Table 1 – Interpreting Cultural Heritage during Conversion Projects

(Organiser: Claudiu SILVESTRU, Austria)

Conversion projects are one of the main tasks of contemporary architecture. The reuse of historical buildings through new functions fosters the preservation of cultural heritage and improves public space. Furthermore it strengthens the identity of the general public correlated to its past and provides a status symbol to its users. Preliminary evaluation and building survey are the first steps of each architectural project dealing with the conversion or renovation of existing buildings. As part of these activities aspects of the history of the objects are revealed, which reach beyond what lies within the focus of preservation organizations.

Public dissemination events for this cultural heritage can only be carried out with the participation or at the suggestion of historians, planning architects and their clients because of 2 reasons:

- the low profile little-known aspects of cultural heritage stand out only in the course of building survey and are therefore known only to the parties involved in the conversion project.
- the buildings are accessible only with the consent of the owner during the planning and construction ph After the conversion/reconstruction, even if they aren't completely destroyed or removed, the elements of cultural heritage become mostly inaccessible for the general public.

Goal of the round table

The different approaches on cultural heritage within conversion projects leave seldom space for public dissemination. The result is that elements of cultural heritage which are accessible to the broad audience only during the development phase or through challenging integration in the development project never make it to the public. The goal of this round table is to identify the common ground of the parties involved in the survey and development process. Furthermore it will initiate a discussions on approaches, strategies and presentation technology which foster a win-win situation from which developers, planners and researchers as well as future users and the general public can profit.

Structure of the round table

To begin with, three impulse keynotes – one from each category of participants – will present the different points of view and approaches.

Further on the roundtable will discuss the following topics:

- the meaning, relevance and value of cultural heritage for the different actors
- the responsibility of public dissemination and who to address it
- spatial and temporal restrictions: challenges for dissemination during ongoing construction sites
- economical restrictions: ways of low cost and high impact presentation technologies
- generating win-win situations

Participants group

- researchers: historians, archaeologists
- contractors: real estate developers, infrastructure providers
- planners: architects

Round Table 2 – The Application of Games, Immersive Environments and Role-Playing in Cultural Heritage

*(**Organiser: Anna Margherita JASINK, Italy | Co-Organisers: Giorgio VERDIANI, Italy | Willem BEEX, The Netherlands**)*

These applications combine the attraction of a contest with an easier approach to understanding heritage information for people of any age. The interpretation and translation of basic historical information into a gaming environment is probably the most important milestone in the creation of such applications.

This "gamification" process has created a number of different experiences, often combining real and digital artefacts into a new reality. As a spin-off from the session "New Realities 3" this round table is dedicated to games and digital environments for museums and exhibitions, which are presenting the history of a place, a specific event, the evolution of a settlement, or the life of some ancient character. Special attention will be given to the shape of a game, proposed rules, digital environments, the gameplay, and on-line or on-site solutions. This Round Table will be the place to discuss general issues, rules, and lessons learned. It will also create the right conditions to enhance the common experience about this kind of very important developments.

Cristiana BARANDONI, Italy

Games in museums. A necessary evil?

Keywords: games, gamification, education, museum

Abstract:

In recent years, the relationship between games and virtual or real museums is strongly debated. According to the latest digital communication experiences, in good interactive exhibits, it seems that game is gradually playing a substantial role in museum practices, especially focusing on engagement of an ever-wider public. Gamification, the process of applying game principles to non-game activities, has increasingly gained position in numerous efforts to integrate an interactive, game-based dimension into the museum experience, opposing to standardized strategies to introduce collections to public.

But contrary to what one can think of, games are not just referring to specific targets (i.e. children or adolescents): in museums, as well as high-tech strategies, it has become a mass communication tool.

This report purposes to review some of the latest experiences (Meanderthal by Smithsonian, LaunchBall by Museum of Science in Boston, Eduweb's augmented reality app MoonWalking, Father and Son by Museo Archeologico Nazionale of Naples, Race against Time by Tate Gallery), from the technical and analytical point of view, analyzing the critical impact on the public, observing if quantifiable outcomes are realistic. Finally this report hints on our board game on Minoan Crete, easy-playable, by everyone, young and old, individuals and schools, whose aim is to both teach and entertain.

Relevance conference / Relevance session:

To analyze the approach of games in museum practices

Innovation:

Comparison between digital games and board games for educational purposes.
We will discuss in general about games in museum and specifically onto three of them.

Eytan MANN, USA

Pervasive Gaming and Cultural Tourism in Kyoto

Keywords: gamification, cultural tourism, objects, urban game

Abstract:

The paper will discuss the possibility of pervasive gaming, collaborative activities done in real urban environment, and its potential for initiating new possibilities of interaction and perception of cultural sites.
To discuss pervasive games, the paper will bring forward a research on that matter, done at Kyoto as part of a joint project between Massachusetts Institute of Technology and Kyoto Institute of Technology in the winter of 2017 (led by Prof. Takehiko Nagakura). The gamification of sites in Kyoto attempts to assist the city in facing a challenge with the decrease of tourism to its temple compounds. Miidera Temple, one of the largest cultural attractions in the Kyoto area, is facing a depletion of visitors, especially young crowds. A possible game platform sketch has been developed to seek new possible activity in Miidera through linking with other tourist attractions in Kyoto.
In Kyoto Displaced Objects game, one takes objects from Nishiki Market (Kyoto's traditional marketplace) and places them, out of context, in various places in Miidera Temple. The game objective then, is find the displaced objects, collect them, and place them back at their origin store at Nishiki Market.
Focusing on objects, the urban game takes from strategies developed by surrealist games. Experiments such as the Psychogeography of the French philosopher Guy Debord used games as new media through which one can re-visit the city and imagine new possibilities of usage.
The paper will show that pervasive gaming in cultural sites in Kyoto, bears the potential to re-define historical artifacts.

Relevance conference / Relevance session:

The paper discusses the boundaries of what is referred to as Cultural Heritage, and new media that disrupts those boundaries.

Innovation:

Unity game engine is used to interact with virtual objects and architecture, scanned in the actual site using photogrammetry.

References:

1. Nijholt, Anton. "Playable Cities." (2017).
2. Candlin, Fiona, and Raiford Guins. The object reader. Routledge, 2008.

Figure:

Elisabeth MONAMY, Austria:

A culinary timetravel – A teambuilding game

Keywords: cookery, teambuilding, gamification, senses

Abstract:

Teambuilding events are totally in fashion since some years in Austria. Companies or departments take their employees to outdoor survival adventures or to locked rooms where they have to achieve tasks together to get out or to reach safely at destination. Archeomuse's goal is to take people back in time and show them one aspect of daily life: eating and cooking habits. A culinary time travel is a new model to introduce a wide audience to historical facts in a funny and playful environment. The concept is quite simple: the group is taken to a kitchen where they get a short historical and archaeological introduction to the Roman Empire. Then they get the Latin original recipes and have to create a menu that will be eating by all the participants. It is a teambuilding process companies go back to in order to simplify or even facilitate understanding and communication within a group or department. This game about food in antiquity let people immerge into the life of their ancestors and at the same time they can learn about groceries known and used at that time, cooking methods and prices or even trade routes. In this short presentation I would like to present this concept of gamification although it is not digital nor a real role-playing. It is a unique way to entertain and teach or explain archaeology at the same time.

Relevance conference / Relevance session:

A special concept to take people back in time and introduce them to aracheological and historical facts.

Innovation:

This game as a teambuilding is a new approach to immerge into archaeology and history.

Livia STEFAN | Dragos GHEORGHIU, Romania

After Pokemon: Discovering The Local Heritage By Gaming

Keywords: location-based/Augmented Reality mobile applications, Pokemon, heritage

Abstract:

With this presentation, the authors will share their previous experience in the domain of location-based/Augmented Reality mobile applications for heritage and will propose a game-play scenario.

The research idea was to design a discovery mobile game, similar to the well-known Pokemon. This game should help players, and especially the younger ones already trained with the Pokemon game-play, discover the local heritage under the form of hidden Points-of-Interest (POIs). In an area around the heritage locations several information are superimposed over the real-life landscape, not in a chronological order, but under the form of cultural categories, e.g. HISTORY, HISTORIC ART, HISTORIC ARCHITECTURE. Depending on the location in which the player is situated, he will receive one or several informative layers. Some layers will indicate explicit POIs of objectives, while others will invite to POIs' discovery. Here comes into scene the gaming part, i.e. these layers will provide hints to help players find the POIs, and also to reach a new gaming level with richer multimedia information (videos or small 3D reconstructions). The hints will also involve information learned from previous levels.

Unlike Pokemon which is more a gamification application with the objective to entertain the players while learning biology, the present concept scenario is more a serious game, with greater educational and cultural awareness impact.

Different challenges, e.g. the design of an engaging AR game, either single or multi-player, or which technologies best serve the objectives, can be discussed.

Round Table 3 – Data model beyond the digital 3D model: Towards a harmonised digital 3D research data

(Organisers: Piotr KUROCZYŃSKI, Germany | Fabrizio APOLLONIO, Italy, | Jonas BRUSCHKE | Oliver HAUCK, Germany)

The digital hypothetical 3D reconstructions, known as Virtual Reconstructions since the beginning of the 1990s, are already an established visualisation and dissemination method in archeology, art and architecture history. Besides the impressive visualisation results of the digital models and virtual scenes, the knowledge beyond the textured geometry is still not accessible after the project is finished. Locked in the mind of the project participants, the analogue/paper folders at or in best case in the repositories of the research institutions there is no available added value. The interoperability, sustainability and accessibility of the research results are limited to the publication in a print medium or in a film animation.

In regard to the immense interpretative research work and the knowledge fusion during a digital hypothetical 3D reconstruction as well as the high cost of the projects this situation is unsatisfying. In the last five years we recognise an emerging interest in the Semantic Web Technologies and the harmonisation of the digital research data – the main raw material of the information society. There are

several research projects and research papers on documentation and an adequate data model for the 3D visualisation and the 3D data sets of the hypothetical 3D reconstruction. But still there is no common approach and a lack of knowledge exchange in this specific research field.
The round table invites players from the 3D community to discuss the documentation approach and the design of the data model for digital 3D reconstructions. The participants will deal with the crucial role of the authority files, controlled vocabularies and customised thesaurus-editors (labelling systems) as well as the leading reference ontology CIDOC CRM and the Linked Data requirements in general. In addition the 3D data format and the web-based processing of the interactive visualisation will be of interest too. Here the visualisation and documentation of the hypothetical value within the versions and variants of a reconstruction will be discussed.
The goal of the round table is to clarify the positions and to agree to a documentation standard on the basis of a core data model as a common denominator, or at least to make a step in the direction of human and machine readable interoperable 3D models and visualisations.

Fabrizio Ivan APOLLONIO, Italy

Conceptual modelling of information management related to the reconstruction and cognitive process in Virtual Heritage

Keywords: Digital reconstruction, Documentation, Paradata, Metadata, ConML

Abstract:

The virtual reconstruction practice requires a scientific methodology, concerning the documentation of the reconstruction process itself and related documentary sources, able to display the data-processing behind any 3D modelling practice, and to cover the gap between the interpretation and the original data sources.
This documentary base has to be able to assure the “preservation of knowledge”, to qualify the outcomes carried out (reference ontology, application ontology), and to record/document the creative process adopted behind any reconstructive process. Such reconstructive process has to be focused/designed not only on “documenting” data sources and reality data used, but on “documenting” the process of knowledge reconstruction too.
As stated in the Seville Principles (Principle 7, 7.3) the incorporation of Metadata and Paradata is crucial to ensure scientific transparency of any virtual archaeology project.
An appropriate methodological approach to Paradata Documentation is aimed to creating a conceptual scheme able to clarify the relationship between research sources, implicit knowledge, explicit reasoning, and visualization-based outcomes, related to the reconstruction and cognitive process in Virtual Heritage.
This should be done through a Conceptual Modelling simple, affordable, and easily understandable by non-experts in information technologies, but mainly able to incorporate intricate and fuzzy temporality issues, ontic vagueness (i.e. imprecision) and epistemic vagueness, as much as the subjectivity of the observer.
ConML can be a plausible and appropriate alternative to CIDOC-CRM?

Piotr KUROCZYŃSKI | Oliver HAUCK | Martin SCHOLZ, Germany

Scientific Documentation for Hypothetical 3D Reconstructions

Keywords: digital hypothetical reconstruction, scientific documentation, data model, CIDOC CRM

Abstract:

The 3D reconstruction of the lost cultural heritage is a well-known and practice-oriented visualization method. Although the 3D models are based on different source evaluations and interpretations the documentation of the resulting spatial and visual hypothesis is still not provided. From the scholar point of view the method is of low value.

The presentation reveals the general concept for the design of a documentation standard in the light of the Semantic Web technologies and Linked Data requirements. The focus lies on the top level classes, derived from the long-term experience with digital sourced-based 3D reconstruction in the academic field, and the presentation of the core entities and properties for mapping the research process referenced to the CIDOC CRM ISO 21127:2006. The aim is to reveal the triples of an application ontology behind the front-end entry mask of a customized Virtual Research Environment. The visual presentation of the data model with the triples will provide an understanding for the further discussion on common core documentation standards.

Jonas BRUSCHKE, Germany

Applying the CIDOC CRM to DokuVis – Implementation, limitations, suggestions

Keywords: digital reconstruction, documentation, CIDOC CRM

Abstract:

Digital reconstruction is becoming ever more common in archaeology, architecture and other disciplines. Lost, but also present structures are being visualized to enhance the understanding of artifacts and point out historical and constructional relationships of the objects under consideration. Furthermore, the process of reconstruction leads to an aggregation of knowledge, becoming a substantial part of historical research. To preserve this knowledge, a proper documentation of the reconstruction projects is essential, but barely applied.

DokuVis is a system that aims to facilitate the documentation and development processes in such a way that the input of data becomes simple and intuitive. It is considered to be both a collaboration platform and a research environment, complying with guidelines and metadata standards, such as the London Charter principles and the CIDOC CRM.

The CIDOC CRM, however, has its limitations, when it comes to digital objects, uncertainty, and hypotheses. While there are already extensions for other fields, digital reconstructions as part of cultural heritage still lack of a common accepted standard for metadata.

As part of a broader discussion, this contribution will present the current implementation of CIDOC CRM in DokuVis and outline those situations, where the core CIDOC CRM lacks of suitable classes and properties and where an extension for this specific scope of cultural heritage might be essential.

ABSTRACTS – SESSIONS

Keynote Speech

Martin SCHAICH, ArcTron GmbH, Germany

Vianden Castle^{3D} – "linked" in space and time for historical building research, visualization and presentation

Abstract:

The digital recording of Vianden Castle in Luxemburg aimed at realising a complete photorealistic "as-built" documentation. The full data acquisition and modelling was an ArcTron 3D research process for more than 10 years. During this time all interior rooms, the exterior structures and the surrounding landscape (16 km2) were documented with latest surveying technologies including terrestrial and airborne 3D scanners. Especially exciting were new approaches to complement the 3D model with brand-new technologies. In 2015 ArcTron and RIEGL realised to scan parts of the castle again using the RiCopter-UAV with the VUX-1 airborne scanner in combination with terrestrial laserscanning and SFM-photogrammetry! Some of these "fused" 3D data, organized in a special 3D information system, can and are enriched with additional archaeological, building research and historical information. Among other topics six different building phases are scientifically reconstructed to supplement the documentation of the current status. The 3D documentation is intensively supported using aspect3D, ArcTron´s own 3D information system and SFM photogrammetry software.

For exhibition purposes data are integrated in 3D animations, serious game developments, stereoscopic, interactive and/or immersive visualisations (AR/VR). Also different 3D model building concepts using CNC milling and 3D printing technologies were realized.

Thus the data of Vianden Castle is not only the foundation for research purposes and architectural questions, it is also elementary for producing a new museum movie and 3D exhibition concept with interactive VR and AR.

Session – Integrating historical maps and archaeological data using digital technologies
(Chairs: Irmela HERZOG | David BIBBY, Germany)

The aim of this session is to showcase best practice applications that derive new archaeological insights from analysing historical maps by using digital technologies. Detailed historical maps indicate the locations of possible archaeological features such as buildings, bridges, and wells or even complete deserted settlements. Historical maps can clarify the interpretation of features detected in aerial photographs, Lidar data or by other archaeological survey techniques. Some historical maps depicting territories outside of Europe allow the reconstruction of land use patterns before the onset of colonization by Europeans. If the relief of a landscape has changed due to river regulations or bulk material extraction such as quarries or open-cast mining, historical maps may still show the landscape before these immense modifications. Therefore, historical maps are often an indispensable basis for archaeological landscape analysis.

Only with historical expertise, the full potential of an old map is exploited. Archaeologists working with

historical maps should be aware that these maps show the aspects of a region that were important to the map maker or those who commissioned the maps. Distortions and omissions may result from deliberate decisions or lack of skills.
This session invites papers dealing with topics such as

- Assessing the positional accuracy and rectification of historical maps with the aim of mapping past buildings and other archaeological sites and other features of interest as exactly as possible.
- Combining archaeological data and data recorded on historical maps in a geographical information system for presenting or analysing the history of urban or rural landscapes.
- Landscape analysis: reconstructing the land use and/or the relief based on historical maps.
- Use of historical maps in an agent-based approach, for estimating the carrying capacity of the landscape or for any other archaeological analysis
- Validating archaeological approaches based on data derived from historical maps.

All contributions that integrate data derived from historical maps and archaeological data by applying digital technologies are welcome.

Elisabeth GRUBER, Austria

Mapping Urban Topography: The Historical Town Maps and Digital Cartography

Keywords: Urban History, Historical Town Atlas, Topography, Middle Ages

Abstract:

In my paper, I want to take a critical look from a historian's perspective on the role of Historic Town Maps basing on 19th-century-cadastral maps as a source for a comparative topographical research of urban space.

After the rather recent 'spatial-turn' in historical research during the 1990s, the attention of urban historians also turned (back) to topographical and spatial issues. General approaches such as social topography, the everyday and ceremonial usage of urban space(s), the interaction of the different social spheres, the role of geographical conditions determining urban development are nowadays in focus. This approach has already been taken up within the framework of the European Town Atlas project that was established by the International Commission for the History of Towns during the 1960ies. Since then, eighteen countries have published more than five hundred town atlases with the aim to provide a basis for the comparative topographical research whereas only some countries – including the Austria – provide a digital and web-based version of the town maps. Being based on cadastral maps dating from the 19th century, the town maps provide an ideal source for exploring the morphogenesis of any given town communicating complex material on the fabric of a town at a particular point in time in the period. Along this lines, the paper discusses the possibilities, difficulties and limits of using the digital historic town maps as 'sources' for approaching diverse aspects of urban topography, spaces and communities in medieval and early modern Austria by connecting the historic town atlases to wider debates and developments in digital cartography and spatial technology.

Relevance conference / Relevance session:

Using the digital historic town maps as ‘sources’ for approaching diverse aspects of urban topography sheds light on the need of a close collaboration between historical and archeological research.

Innovation:

Analysing production and use of urban space in the Middle Ages by using digitised Historic Town Maps as source offers a perfect base for both, archeological and historical approaches.

References:

1. Lords and Towns in Medieval Europe. The European Historic Towns Atlas Project, ed. by Anngret Simms and Howard B. Clarke, Farnham 2015.
2. Städteatlanten. Vier Jahrzehnte Atlasarbeit in Europa, hg. von Wilhelm Ehbrecht, Köln 2013.

Thomas ERTL | Paul MITCHELL | Martin MOSSER, Austria

Bringing neighbourhoods to life in Medieval Vienna

Keywords: urban history, house ownership, GIS, town plan

Abstract:

In 1448 the inhabitants of the Widmer Quarter – one of the four districts of late medieval Vienna and including areas within and without the city walls – were listed for reasons not now precisely understood. Unusually, this list, now in the Austrian National Library, includes not only the owners of each house plot, but also other men (tenants, employees…) and occasionally women living there. The plots are grouped in neighbourhoods, some of which are identifiable today. Three in particular cover a large connected area now known under the names Am Hof, Färbergasse and Tiefer Graben. This area can be reconstructed in astonishing detail:

The house plots can be reconstructed on the basis of the accurate city map by Werner Arnold Steinhausen (1710), tempered with information from the maps by Wolmuet (1547), Suttinger (1684) and others. Numerous archaeological projects, including major excavations, which have taken place in the area, enable us to further adapt the street plan and even some house plans.

The 1448 list will be compared to the plot-by-plot study of house owners and property transfers compiled by Paul Harrer in the mid-twentieth century, an unpublished work held in the City Archives. Recent archaeological work covering six medieval plots has included the re-analysis of property registers. Thus it will be possible to place dozens of householders and other people on the plots on which they lived. The area can be a Viennese test case for the GIS-powered connection of textual data to plot maps, as pioneered in other cities and exposing the social-spatial structure of the city in the later medieval period. The possibilities for historians, archaeologists, museum professionals and others interested in the Middle Ages are considerable.

Imagine walking through a medieval district and greeting the inhabitants by name as though you had lived there all your life.

Relevance conference: / Relevance session:

Show how digital technologies are revolutionising the practice of established disciplines

Innovation:

A new level of detail in analysing the medieval city and the first time in Austria for methods pioneered elswhere.

References:

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2. Günther Buchinger, Paul Mitchell, Bau- und Besitzergeschichte des Hauses Wien 1., Annagasse 12, Fundberichte aus Österreich 52, 2013, D5557-D5585.

Elien VERNACKT, Belgium

Combining retrogressive research with a historic snapshot: HisGIS as a tool for Bruges

Keywords: HisGIS, historical cartography, combining digital technologies

Abstract:

Archaeologists performing background research in Bruges always had quite favourable conditions to work with. The history of Bruges is documented pretty well and they have an extraordinary detailed historical map at their disposal to clarify the interpretation of archaeological data. The map of Bruges by Marcus Gerards in 1562 shows the city in an interesting timeframe: right after Bruges' commercial peak period and right before the religious unstable times of the sixteenth century.

About five years ago, this bird's-eye view on Bruges by Marcus Gerards was digitised with GIS technology. It became the foundation of a dynamic information system on the history of Bruges in and around the middle ages. This database, MAGIS Bruges, was an added value for researchers. The very useful historic map became freely available online and it also included tons of information on the history of Bruges.

For archaeologists in particular, all this became even more interesting in 2014, when the website www.kaartenhuisbrugge.be was founded, a real HisGIS for Bruges. It combines an atlas with more than 25 historic maps of Bruges, historic building research linked to a present-day georeferenced parcel plan ánd MAGIS Bruges. The parcel plan can be queried by address, which leads the user to all kinds of data linked to that spot. These data being MAGIS Bruges with all the linked thematic information and the historical bird's-eye view itself, data from the city archives of Bruges – both of which are counting on a lot of volunteers –, archaeological data and reports, protection resolutions, links to the inventory of immovable cultural heritage, and so on. By combining these quite diverse existing instruments, a new tool is created that is even more useful to researchers and archaeologists, but also fascinating for whoever is simply interested.

Relevance conference / Relevance session:

This project is an example of new technologies that are used for the benefit of historians and archaeologists that want to visualise their research in a particular case of urban history: Bruges.

Innovation:

The project treated in this paper is a unique co-operation of several partners and combines diverse approaches to historical and archaeological research.

Combining archaeological data and data recorded on historical maps in a geographical information system for presenting or analysing the history of urban or rural landscapes.
New technologies as a research tool and at the same time a way of unlocking research to a large public.

Jaap Evert ABRAHAMSE | Erik SCHMITZ | Rovin VAN LANEN, The Netherlands

Towards a reconstruction of medieval urban structures in the Dutch delta

Keywords: The Netherlands, urban development, GIS, Jacob van Deventer, medieval towns

Abstract:

The cities in Holland are famous because of their emergence as commercial and industrial centres or maritime powers in the Dutch Golden Age, from the late 16th century onwards. Most medieval towns, especially Amsterdam, were hubs in a rapidly expanding network of trade relations and became the centres of much larger towns. This development wiped out most of the medieval townscape, not only its buildings but also parts of its functionality. The few remaining medieval buildings, such as churches, gates, towers, and monasteries, were much altered in later periods. What is left in most places is the pattern of streets, canals, and blocks.
The highly accurate set of city plans from the 1550s and 1560s by the famous cartographer Jacob van Deventer has been the starting point for scholars to look back into city's past ever since their discovery in the 19th century. Recently, these plans were combined with a reconstruction of the infrastructural system and the palaeogeography and put into GIS by the Cultural Heritage Agency of the Netherlands.
How to reconstruct medieval towns from this end situation? From the above it is clear that reconstruction is not only reduction – a past city cannot be reconstructed by leaving out later changes, such as city extensions, infrastructural improvements, new public buildings. The effects of the transformation and modernization of pre-existing structures is important as well, for instance building in brick, densification, regularizing street plans, and the development of harbours and markets. Geographical, archaeological, and archival data need to be integrated to create the overall picture.
On the basis of a multidisciplinary approach we will present the functional development of three towns, located in very different landscapes: Dordrecht, the oldest town of Holland, located in a highly dynamic river landscape, Haarlem, located on a beach ridge near the river Spaarne, and Amsterdam, located in a peat bog on the IJ sea-branch.

Relevance conference / Relevance session:

We will present a new multidisciplinary approach to the reconstruction of medieval urban structures, based on new digital cartographic resources.

Innovation:

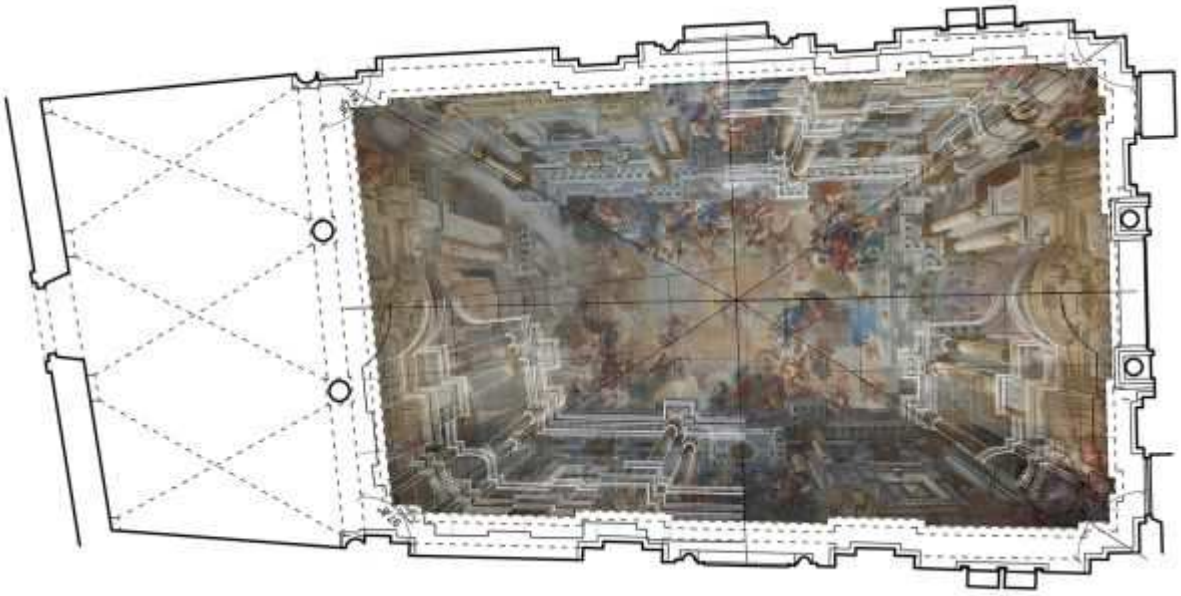
We will combine new techniques and a variety of sources for this reconstruction.

References:

1. R.J. Rutte & J.E. Abrahamse (eds.), Atlas of the Dutch Urban Landscape. A Millennium of Spatial Development, Bussum 2016.

2. K. Zweerink, ‘The spatial maturity of Dutch towns (1200-1450). A comparative analysis of the emergence of the outlines of the Randstad, with reference to town maps’, OverHolland 10/11 (2011), 149-171.

Figure:



Menne C. KOSIAN | Rowin VAN LANEN, The Netherlands

The Limits to Growth. Using historical maps and archives for present-day solutions

Keywords: Climate adaptation strategies, GIS, historical maps and archives, water safety

Abstract:

Since the Netherlands are low lying and prone to flooding, for centuries dikes and polders were constructed in order to manage the water. From the medieval period onwards, an elaborate organisational system was set up for their maintenance: the water boards. Next to these administrative bodies, the cities of Holland often had their own political needs, strategies, and ideas for water quality and safety.

The cities of Holland not only had water-related problems, during the Dutch Golden Age their incredible growth led to a huge increase in energy needs. For industrial purposes this energy mainly came from wind mills, but in urbanized context peat was the main source of fuel. Peat extraction, however, causes land erosion and subsidence, and consequently to higher risk of flooding. A lot of cities and water boards knew strict rules and regulations for peat extraction, but not all, and they were not always observed.

Modern research into historical maps and archives on water management show how an integrated policy connecting urban and water board administrations led to a safe environment. In contrast, places where this integrated policy was traditionally lacking often are still characterized by very persistent problems with flooding and subsidence. This underlines the importance of old policies, and visions, since they clearly still influence the present-day landscape. Understanding these systems could even provide solutions to future problems we face regarding climate change, soil erosion, and subsidence.

In this paper we will present the research into (historical) water systems we have conducted at the Cultural Heritage Agency of the Netherlands. The focus will be on the methodology of integrating maps, archives, and historical solutions by means of GIS modelling into recommendations on climate-adaptation strategies. Not only guaranteeing the preservation of cultural heritage in present-day environments, but also demonstrating its importance for facing modern challenges.

Relevance conference:

Research into cultural heritage can add serious solutions to present-day environmental problems.

Relevance session:

This presented research shows the integration of historical maps with landscape archaeology in a GIS environment that can, and will, be used in present-day planning.

Innovation:

Combining multi-period maps and research into a tool for present-day strategists working on not-necessary cultural heritage related environmental problems.

References:

1. Manual Heritage and Environment, Water: https://cultureelerfgoed.nl/publicaties/handreiking-water-erfgoed-en-ruimte#overlay-context and https://cultureelerfgoed.nl/sites/default/files/publications/handreiking-water-erfgoed-en-ruimte.pdf
2. Manual Energy, Heritage and Environment: https://cultureelerfgoed.nl/sites/default/files/publications/manual_energy_heritage_and_environment.pdf

Sara ZANNI | Biljana LUČIĆ | Alessandro DE ROSA, France

From the Sky to the Ground. A spatial Approach to reconstruct Roman Roads in Srem Region

Keywords: Serbia, satellite remote sensing, Austro-Hungarian maps, GIS

Abstract:

The research presented is part of the project “From Aquileia to Singidunum: reconstructing the paths of the Roman travelers – RecRoad”, developed at Université Bordeaux Montaigne in collaboration with the Institute for Protection of Cultural Monuments of Sremska Mitrovica. The main goal of the project is the detection and reconstruction of the Roman viability connecting the Roman cities of Aquileia (Aquileia, Italy) and Singidunum (Belgrade, Serbia) using different sources and methods, among which are Sentinel-2 multispectral imageries, historical maps and surface survey results. The project provided a first useful testbed for the use of Sentinel-2A images in the archaeological field to detect the presence of buried archaeological sites and remains of Roman roads, with outstanding results in the Srem district (Serbia). The research workflow integrated the remote sensing analysis with the interpretation of historical maps, such as the Josephinische Landesaufnahme (1763-1787), the Franziszeische Landesaufnahme (1808-1869), the Franzisco-Josephinische Landesaufnahme (1869-1887) and the Spezialkarte der Osterreichisch-Ungarischen Monarchie (1877-1914). The historical maps were geo-referenced and overlaid to the satellite imageries inside a GIS platform to succeed in the interpretation of the anomalies detected in the Sentinel-2A images. Finally, a surface survey was

performed to check the effective presence of the Roman road traces and of other buried sites. This paper will specifically present the identification of a buried archaeological site connected to the road where it was possible to collect pottery that will allow to date the human activities on the area.

Relevance conference / Relevance session:

The paper shows how it is possible to improve our knowledge of the Roman road network through the integration of modern techniques, such as innovative satellite imageries, and traditional sources.

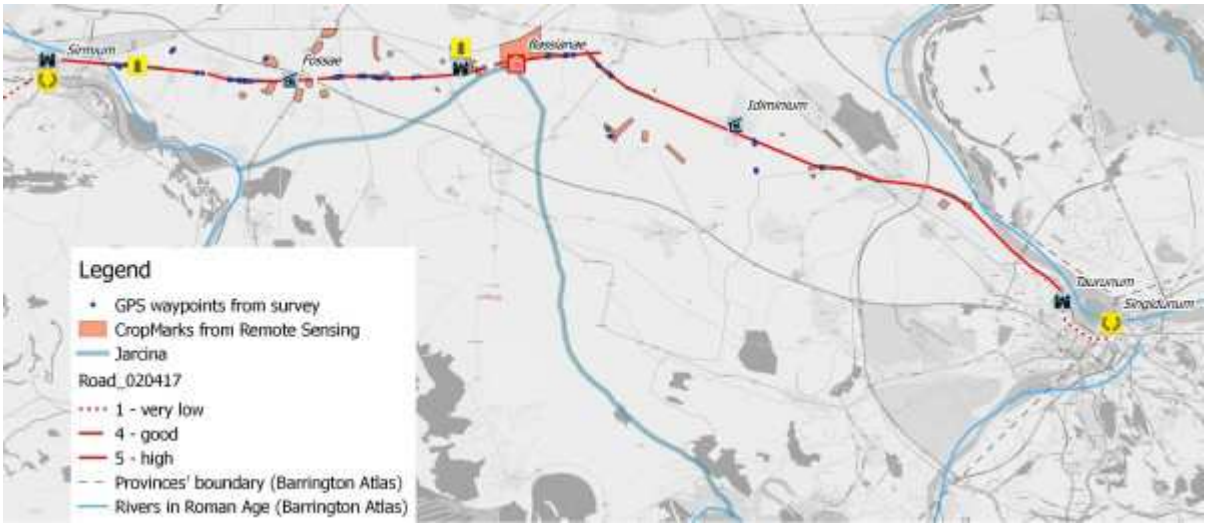
Innovation:

Beyond the integrated and multi-disciplinary methodology, the paper presents the first attempt to use Sentinel-2A satellite imageries to detect archaeological buried sites.

References:

1. Gračanin, H., 2010. Rimske prometnice i ckomunikacije u kasnoantickoj juznoj Panoniji. Scrinia Slavonica, (10), pagg.9–69.
2. Molnár, G. & Timár, G., 2009. Mosaicking of the 1:75000 sheets of the Third Military Survey of the Hasburg Empire. Acta Geodaetica et Geophysica Hungarica, 44(1), pagg.115–120.

Figure:



Irmela HERZOG | Vincent MOM, Germany | The Netherlands

Reconstructing the military infrastructure of Curaçao in the late 18th century

Keywords: Curaçao, forts, historical sources, aerial photographs, landscape analysis

Abstract:

The Caribbean island Curaçao has about twenty bays and natural harbours that allowed landing of smugglers or enemy boats. In the late 18th century, the defence system of the island mainly consisted of forts located close to these places. The aim of the project to be presented is the collection and analysis of all data on possible points of attack or landing smuggler boats as well as data on the location and size of the Dutch forts on the island in the late 18th century. The research relies on historical documents listing and describing the forts with their facilities and on historical maps showing some of the forts as well as the landing places, the latter sometimes with classifications like “for barks”. The remnants of some of these forts can be visited today, but most of the forts disappeared from the modern maps. For the majority of the forts listed in the historical documents, only the

corresponding bay to be defended by the fort is known. These bays are readily identified on modern maps or their rough location can be derived from their sequence in a list sorted from south to north. But where were the forts located with respect to the corresponding bay? The approximate location for only one of the disappeared forts could be reconstructed based on old maps. The freely available (aerial) photographs in some cases allowed the detection of possible fort remains. These results are supplemented by methods known from landscape archaeology for identifying suitable fort locations.

Markos KATSIANIS | Annita THEOCHARAKI | Leda COSTAKI | Maria PIGAKI | Vada PAPAEFTHIMIOU, Greece

The City Walls of Athens: Reconnecting a fragmented monument through digital mapping.

Keywords: rescue archaeology, GIS, historical maps, repeat photography

Abstract:

The fortifications of Athens have been a recurrent theme of archaeological investigation and a dominating feature in the early historical maps of the city. In the past two centuries, and especially during the two building booms of Athens (mid-19th and post mid-20th century), parts of the walls have been located during rescue interventions in numerous sites in the urban fabric.

At present, the visibility of the entire monument remains rather low as the traces of the walls are hidden beneath the modern city, marginalized within larger archaeological sites or preserved entirely by record. Despite the high level of scholarly work devoted to synthesise the available material (e.g. excavation reports), the volume of information that has accumulated over the years requires a novel approach that would systematise different types of evidence using digital media.

In this respect, we attempt to revisit the ancient walls of Athens through the use of geospatial technologies, historical cartography and repeat photography. Our research employs published and archival material (e.g. excavation drawings, representations, maps) and digital data re-use (e.g. consolidation of existing spatial digital datasets). We target the informed development of an efficient GIS platform to record, store, integrate, explore and eventually disseminate resources on the Athenian fortifications that could further serve as a sound infrastructure to record the history of urban archaeology in Athens.

We have used early aerial imagery and cadastral maps to ensure more accurate registration of the first historical maps depicting the remains of the ancient city wall, and we have proceeded in greater resolution by georeferencing old excavation plans using their contemporary plot configuration. In this presentation we will focus on the problems encountered, the breakthroughs achieved and the ideas that have emerged in our approach to urban archaeology as an active and dynamic layer in the city palimpsest.

Relevance conference / Relevance session:

A case study for enhancing urban archaeology results through data integration from multiple sources.

Innovation:

Combination of geospatial technologies, historical maps and repeat photography to identify archaeological remains and track different phases in their recent history as heritage assets.

References:

1. Grava M., 2012. An information layer for the historical mapping of Pisa, in MapPapers 6EN-II, pp. 235-246
2. Theocharaki, A. M. 2011. The Ancient Circuit Wall of Athens: Its Changing Course and the Phases of Construction, Hesperia 80 (1), 71-156

Figure:

Session – 3D Documentation in Underwater Archaeology: Photogrammetry, Georeferencing, Monitoring, and Surveying

(Chairs: Marco BLOCK-BERLITZ, Germany | Luca BEZZI, Italy | Moritz MENNENGA, Germany)

Archaeological underwater excavations are destructive and unrepeatable processes. The workflow of underwater site documentation is still complex and expensive. Diving operations, especially when photogrammetry is applied, need to be planned carefully. Sufficient, near-constant light conditions across several viewpoints and angles are required during image capture. Scientific drivers need special training and their diving times are strictly limited. Underwater georeferencing is another crucial challenge, because no GPS signal is directly available.

Beside the documentation of registered archaeological sites, the exploration of potential sites is a topic that attracts more and more attention. Unmanned Underwater Vehicles (UUVs,) can be used in both cases, careful and systematic excavation under water is still a domain of manual human labor.

Focussing on key aspects of managing underwater surveys, this session invites papers dealing with topics such as:

- complete workflows and case-studies,
- decision/planning support processes for excavation campaigns,
- camera and lighting solutions for underwater archaeology,
- monitoring: continuous excavation and site recording for conservation and long-term studies,
- and data management solutions for recorded data and long-term accessibility of 3D data.

Contributions and perspectives are welcome, and may include the topics listed above or further improve established practise and processes.

Damien CAMPBELL-BELL, UK

Gaining Control: Photo Modelling as a Tool for Recording Built Heritage

Keywords: Photogrammetry, Built Heritage, Photo Modelling

Abstract:

Wessex Archaeology has been carrying out in–house development of the use of digital photogrammetry in Historic Building Recording over the past two years. Development is currently at an advanced stage and it is hoped to ultimately prove to be the most efficient, accurate and cost effective way of capturing 3D data of a variety of buildings and monument types.

In 2015, initial trials were carried out on a small basis to assess the quality and effectiveness of this technique when used specifically within the built heritage environment. As part of the trials, survey control was imposed to assess the accuracy of any finished model. Early efforts confirmed that, while a high level of survey control accuracy was possible, texture resolution was less than acceptable for presentation and archive record.

Further advances, in both data capture technique and quality of software processing, has led to a measured and noticeable improvement of image and survey quality which is presently able to rival traditional rectified photography and survey techniques. The combination of three key associated elements, first class photographic data, accurate survey control and improved processing software, has provided tangible improvements in photogrammetric recording for buildings.

The experience gained in the use of UAV's for high level image gathering and the use of fixed camera masts, where UAV's are not permitted, has enabled previously difficult areas to be accessed and 3D models to be completed. This paper will detail the photogrammetric journey Wessex Archaeology have been on over the last two years and demonstrate how photogrammetry can be used as a serious archaeological tool and not just a show piece.

Relevance conference / Relevance session:

This paper examines the use of a digital technology which has seen wide popular use in recent years, but little critical examination in commercial archaeology.

Innovation:

This paper describes how photogrammetry is now being used as a reliable replacement for more traditional techniques such as rectified photography due to the quality we are now able to achieve.

References:

1. McCarthy, J. (2014) Multi-image photogrammetry as a practical tool for cultural heritage survey and community engagement, Journal of Archaeological Science, Vol. 43, 175-185
2. Historic England (forthcoming) Photogrammetric Applications for Cultural Heritage

Michaela REINFELD, Germany

Best practices and cost-effectiveness. Documentation methods on transport ships in the Werbellinsee (Brandenburg, Germany)

Keywords: Werbellinsee, transport shipping, Kaffenkahn, sector scan sonar, 3D modeling

Abstract:

In the 18th and 19th centuries, wooden barges, the so-called “Kaffenkähne”, were particularly essential for the transport of building materials, food and other goods within the Mark Brandenburg. They are also an integral part of the contemporary cityscape of Berlin. The few well-preserved witnesses of the Wilhelminian era or “Gründerzeit” are now lying on the bottom of lakes and rivers. At least ten such boats are located in the Werbellinsee in the district of Barnim in Brandenburg. According to our current knowledge, they all date into the 19th century. Since 2007, the shipwrecks are documented and researched by the association Kaffenkahn e. V.

The paper gives an overview on the importance of the ships for inland navigation and transport history in the Berlin-Brandenburg area. In addition, the methodological approach in the documentation of up to 40 m long barges is discussed. Considering the size of these shipwrecks in combination with the difficult working conditions in the Werbellinsee, for example poor visibility, low temperatures and great depths, modern remote sensing and documentation methods are an indispensable part of the archaeological work under water. Which aims, questions as well as problems are connected with the application of modern documentation techniques, is also discussed.

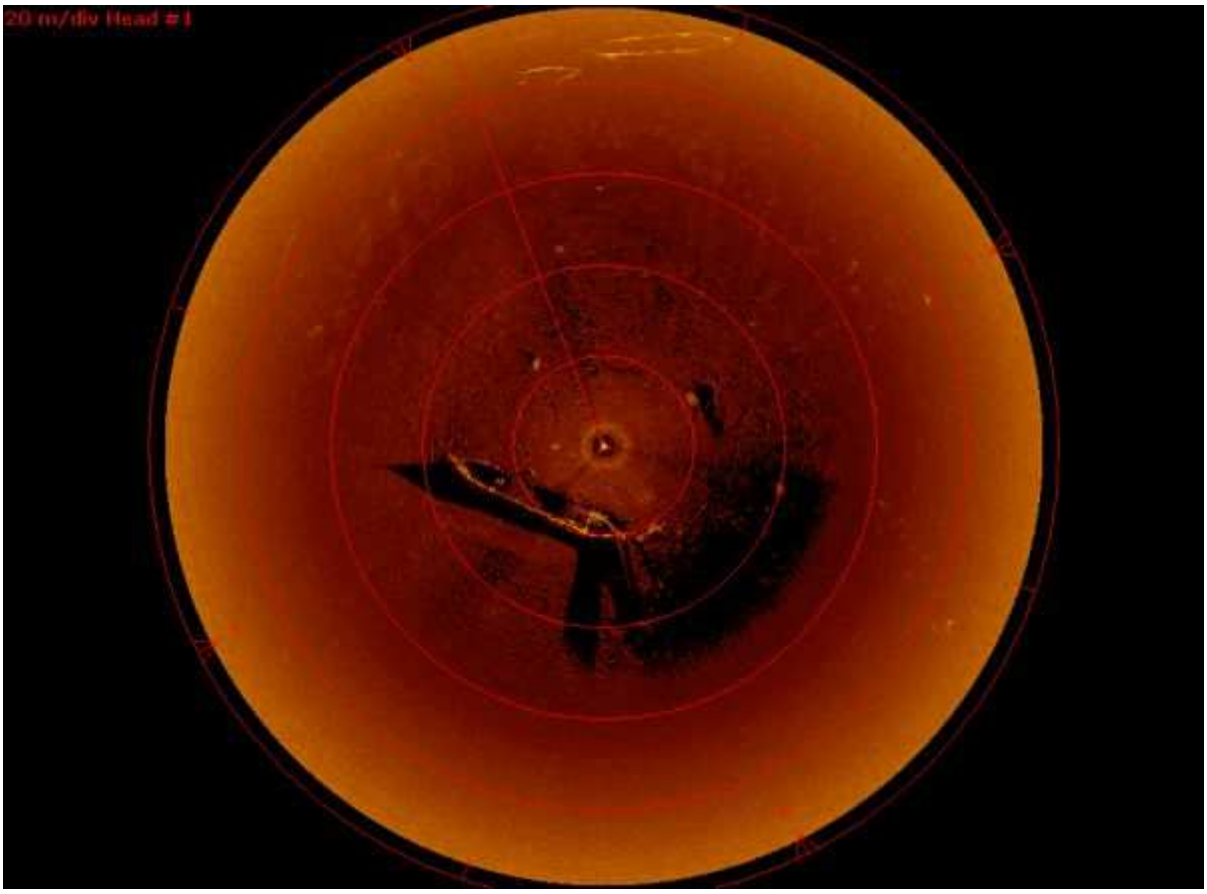
Relevance conference:

The shipwrecks in the Werbellinsee are documented not only with traditional surveying methods but also modern methods and are important witnesses of the industrial and economic history of Berlin.

Relevance session:

Cost-effective methods of three-dimensional documentation under water are presented.

Figure:



Giacomo LANDESCHI | Björn NILSSON | Arne SJÖSTRÖM, Sweden

Integrated digital methods for investigating submerged sites in the Baltic Sea

Keywords: 3D archaeology, GIS, photogrammetry, multibeam data

Abstract:

This paper seeks to explore innovative ways of employing imaged-based 3D modelling techniques for investigating a portion of the Early Holocene submerged landscape in Southern Sweden. As part of a recently-funded research project named 'Blue Archaeology', main objective of our research team is to take advantage of an entirely-three-dimensional dataset to map in a 3D GIS platform, sites dating to the Mesolithic and to put them in relation to the surrounding maritime environment to analyse and monitor their state of preservation in a diachronic perspective. To reach this goal, a geodatabase data structure needs to be created to collect multibeam sonar datasets, extracted DEMs, textured 3D surface models. The multiscale nature of this project will allow to address specific problems related to the representation of single sites and to put them in relation with the wider submerged landscape where significant mechanical and biological actions threaten the preservation of those sites. Image-based 3D modelling constitutes an interesting option to deliver models with sufficient spatial resolution which can be used to conduct a careful and constant assessment of the surface erosion. Some preliminary results of this study will be presented with a special focus on the methodological implications raised in connection to the problematic conditions of data acquisition experienced in an underwater environment.

Relevance conference / Relevance session:

It provides innovative way of using 3D technology in archaeology

Innovation:

Multi-beam data are used in combination with image-based 3D modelling-derived data to better assess the preservation of submerged sites.

References:

1. Landeschi, G., Nilsson, B. & Dell'Unto, N. (2016).
2. Holmlund, J., Nilsson, B., & Rönnby, J. (2017).

Feiko WILKES, Germany

Computer Vision Photogrammetry for recording and monitoring in visibilities of less than 50 centimetres

Keywords: Underwater Archaeology, Monitoring, Recording, Photogrammetry, Agisoft PhotoScan

Abstract:

Very low visibility of mostly less than 0.50 meters is the main obstacle for underwater archaeological work on sites in the limnic waters of Northern Germany. Coupled with the loose sediments and low natural lighting often encountered on such sites the toolset typically used for recording in underwater archaeology can't be applied here for the most part. This paper shows the workflow and experience gained by applying Computer Vision Photogrammetry in such an environment for recording and monitoring with a cost-effective approach, using GoPro cameras and Agisoft PhotoScan. It is based on the archaeological surveys conducted on the Fahrdorf wreck site in the Schlei fjord from 2015 to 2017 by the Study Group for maritime and limnic Archaeology of the University Kiel (AMLA). This early 12th century wreck located in shallow waters with a visibility of usually around 30 and never exceeding 50 centimetres was documented by video with different camera and lighting configurations and settings. A georeferenced system of permanent markers was established, allowing us to link the results of different campaigns for monitoring purposes and to extend the survey area without the need for further measurements. Different ways of extracting single frames from video were tested and compared regarding the quality of the results and the time required both for generating the pictures and the duration of processing with Agisoft PhotoScan.

Marco BLOCK-BERLITZ | Dennis WITTCHEN | Benjamin GEHMLICH | Sven ZEISBERG, Germany

Archaeonomous: Towards semi-autonomous underwater documentations at "See am Mondsee"

Keywords: UUV, 3D reconstruction, SfM, underwater archaeology, autonomous

Abstract:

Archaeologists have highly profited from developments in UAV and progress in camera technology. However, the recording methods currently used in underwater archaeology are still complex and expensive. The importance of the photogrammetric approach in this area is therefore analogous to that in aerial documentation, and the use of underwater photogrammetry is accordingly on the rise. In

our experience with recording data while moving, videogrammetry is the more fault-tolerant, more cost-effective and easier-to-use approach. To pursue the aims of documenting archaeological sites and exploring unknown areas, the small submarine “Eckbert-II”, based on the OpenROV, was developed in the project Archaeonautic, with an aim towards semi-autonomous underwater documentations.

A key technological challenge in this context is providing positional data for underwater navigation and georeferencing. Localization in known or unknown environments is a well known problem, which has been studied for decades in the field of robotics as a building block of simultaneous localization and mapping (SLAM). In the last two decades, camera as the only sensor became a more and more popular means of solving the SLAM problem, because of their extremely low size, weight and power footprint, as well as the growing computational capabilities of recent hardware to calculate camera poses of consecutive images (e.g. video stream) in real-time. In the field of archaeology, visual (V-)SLAM is a feasible method for repeatable (semi-)autonomous monitoring of small or large scale sites, where Photogrammetry or Videogrammetry is used to create 3D-models of the excavation area. Whereas the underlying SfM processing is done offline and can take from hours to days for calculating a complete 3D-model, V-SLAM can give quick feedback to the user by providing a sparse representation of the processed area in real-time.

Relevance conference / Relevance session:

The conference is focused on cultural heritage and new technologies as we do in our paper.

Innovation:

Low-cost, easy-to-use UUV documenting underwater situations semi-autonomously.

References:

1. archaeonautic.de

Figure:

Luca BEZZI | Alessandro BEZZI | Tiziano CAMAGNA, Italy

Documentation and sampling strategies in underwater archaeology, general criteria and specific solutions

Keywords: Underwater Archaeology, 3D Documentation, SLAM, Open Source, Open Hardware

Abstract:

Underwater archaeology is probably one of the most complex branch of our discipline, due to the fact that, more than in other specific fields (e.g speleoarchaeology, glacial archaeology, etc…), the traditional and well tested methodologies have to be adapted to the peculiar characteristics of the area under examination. This paper tries to describe the common methodologies used to explore, document in 3D and analyze underwater archaeological environments, comparing them to specific case studies in which new solutions have been adopted to face logistical problems. More specifically will be analyze the use of the open Hardware ArcheoROV during different archaeological missions in 2016 and 2017, from simple exploration projects to 3D documentation with open source SfM and SLAM techniques, both of horizontal (e.g. small shipwrecks) and vertical (e.g. submerged forests) archaeological context. Moreover other open hardware tools will be described, such as a modified underwater drill to collect sampling for wood science analysis. The main purpose of the paper is to open a discussion about the differences existing in underwater archaeology, trying to focus the attention on the peculiarity of the missions in “internal waters”, which often presents specific problems in 3D documentation, derived by the surrounding landscape (such as low visibility or different decompression time tables for high altitudes).

Relevance conference / Relevance session:

It follows an open research approach based in archeology, sharing tools (software source code and hardware schema and specifications), data (archaeological results) and knoledge (know-how).

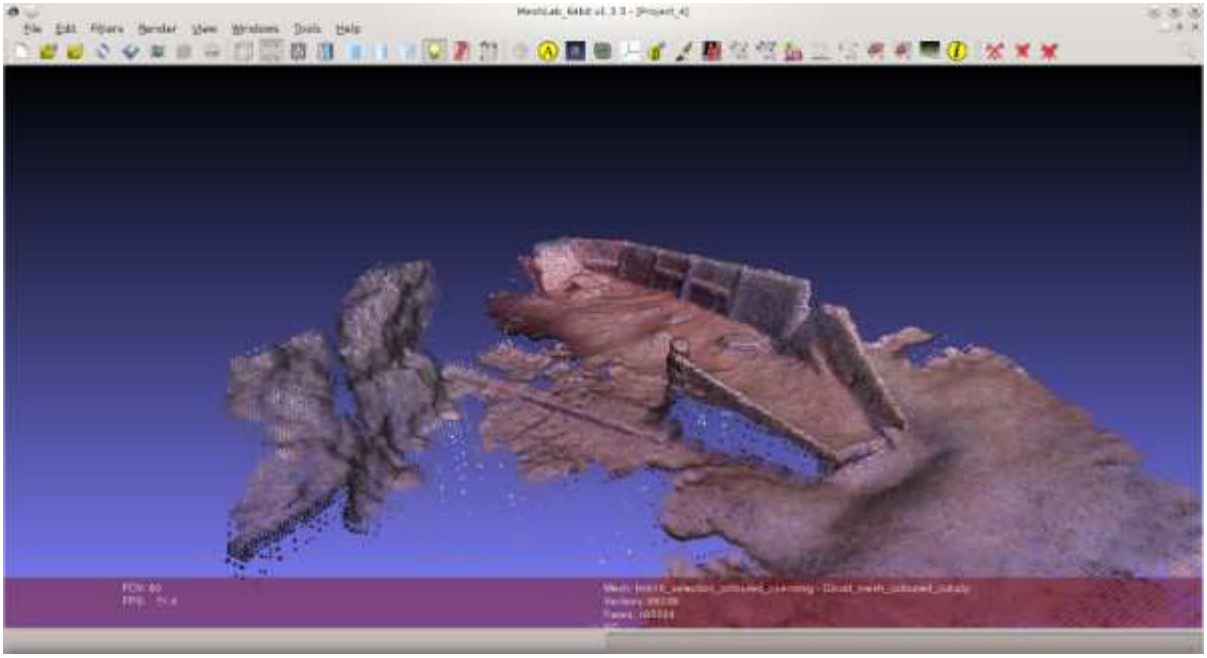
Innovation:

It describes the latest developments of the open hardware ArcheoROV, with its ROS (Robot Operating System) based open source SLAM implementation.

References:

1. http://arc-team-open-research.blogspot.it/2016/10/archeorov-open-hardware-rov.html
2. http://arc-team-open-research.blogspot.it/2016/12/the-devils-boat.html

Figure:



Benjamin GEHMLICH | Marco BLOCK-BERLITZ | Dennis WITTCHEN | Benjamin DUCKE, Germany

ARCHAEO-BASE: A benchmark collection for computer vision and 3d reconstruction of real underwater scenarios

Keywords: 3d reconstruction, computer vision, underwater archaeology, videogrammetry, benchmark

Abstract:

Often, the drivers of scientific research are improvements to existing technical solutions, rather than new solutions. On the one hand, the use of acknowledged benchmark tests with high diversity are necessary to fairly compare current and new approaches. On the other hand, only open access benchmark databases can open up the research field to more people.

Existing ground truth datasets for trajectory or two-view disparity estimation focused on real-time 3d reconstruction are available (Tsukaba [1], TUM RGB-D [2], KITTI [3] or NYU Dataset [4]) and widely used, e.g. to compare different SLAM (simultaneous localization and mapping) algorithms. In case of 3d reconstruction in underwater scenarios, no benchmark database for academic research is freely available. The Archaeoteam of HTW Dresden, in cooperation with Freie Universität Berlin and the German Archaeological Institute, wants to fill this gap with ARCHAEO-BASE and collects useful datasets (photo sets as well as videos) from several campaigns with high diversity in camera systems used, recorded structures and quality of water. To be oriented towards real-world scenarios, the benchmark represents a broad range of perfect to really challenging image sets. The benchmark allows researchers to test and compare algorithms under realistic and reproducible conditions. The main aspects are repeatability, independency, and unambiguity.

Beside original videos and photo sets, the benchmark database ARCHAEO-BASE includes results of our own solutions for undistortion, keyframe selection, image enhancement, feature extraction and 3d reconstruction. This allows to open up the field of research and supports the improvement of current solutions. We still work on a synthetic image and video database (like VaFRIC [5] for evaluation of

visual odometry, 3D reconstruction and SLAM algorithms) including noise and physical interaction (absorption and reflection) between particles and light sources. For evaluating the accuracy of a 3d reconstructions framework, the free software CloudCompare [6] can be used to align the given ground truth model with the reconstructed model. ARCHAEO-BASE is freely available at the project webpage [7].

Relevance conference / Relevance session:

Archaeo-Base is a novum for underwater archaeology.

Innovation:

No benchmark for computer vision and 3d reconstruction for underwater scenarios is available.

References:

1. Peris M., Martull S., Maki A., Ohkawa Y., Fukui K.: “Towards a simulation driven stereo vision system”, Pattern Recognition (ICPR 2012), 21st International Conference on, pp. 1038–1042, IEEE, 2012
2. Sturm J., Engelhard N., Endres F., Burgard W., Cremers D.: “A benchmark for RGB-D SLAM evaluation”, Proceedings of the IEEE/RSJ Conference on Intelligent Robots and Systems (IROS), 2012
3. Geiger A., Lenz P., Urtasun R.: “Are we ready for autonomous driving? the KITTI vision benchmark suite”, Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition (CVPR), pp. 3354–3361, IEEE, 2012
4. Silberman N., Hoiem D., Kohli P., Fergus R.: “Indoor segmentation and support inference from RGBD images”, Computer Vision (ECCV 2012), 2012
5. Handa A., Whelan T., McDonald J., Davison A.J.: “A Benchmark for RGB-D Visual Odometry, 3D Reconstruction and SLAM”, IEEE Intl. Conf. on Robotics and Automation, ICRA, 2014
6. http://www.danielgm.net/cc/
7. http://www.archaeonautic.de

Figure:

Session – Cultural Heritage and Armed Conflicts

(Organisers: Benjamin DUCKE| Ralph BODENSTEIN, DAI | Archaeological Heritage Network, Germany)

As a response to the situation in countries such as Syria, the Iraq, Yemen and Afghanistan, this session will bring together experts from the fields of cultural heritage management and safeguarding, as well as researchers and professionals from related disciplines such as architecture and urban planning. In addition, we wish to give representatives from current regions of armed conflict a voice and support them in becoming part of the international heritage network. We understand that effective and sustainable curation of the world's cultural heritage is a complex task that also needs to take into account (among others) social, economical, political and educational aspects, and must include stakeholders from all strata of society. This session is intended as an open and initial forum, which we hope will pave the way for regular commitment by CHNT and its supporters.

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We invite you to join us in shaping it.

This session is organised and supported by the Archaeological Heritage Network (archernet.org).

Ralph BODENSTEIN | Felicia MEYNERSEN Germany

The Archaeological Heritage Network: a German network and its joint project "Stunde Null – A Future after the Crisis"

Keywords: post-conflict recovery, capacity building, Syria, Iraq

Abstract:

The Archaeological Heritage Network (ArcHerNet) is a network of German institutions that aims at pooling their wide range of expertise in the protection and conservation of cultural heritage conservation, and at building a platform for collaboration and exchange. Officially founded in April 2016, supported by the German Foreign Office, and coordinated at the German Archaeological Institute, it was created in order to make these competences better accessible internationally, and to help develop the synergies and collaborative solutions that are needed to rise up to the growing challenges in the preservation of cultural heritage worldwide. In response to the ongoing crisis in Syria and neighboring countries in the region, the first joint project of the ArcHerNet is "Stunde Null – A Future after the Crisis". It consists of a broad range of measures including training courses, capacity building, awareness raising, as well as building data bases, digital inventories, and information systems that are needed for the documentation, conservation and restoration of cultural heritage. The aim is to support heritage specialists, students, craftsmen and future decision-makers in these countries with the knowledge and skills needed in order to enable them to preserve their heritage and plan their country's future after the crisis.

This presentation will present the network, its project „Stunde Null" and provide an introductory backdrop to the range of activities presented in this special session.

Franziska BLOCH, Germany

The „Syrian Heritage Archive Project“ of the German Archaeological Institute and the Museum of Islamic Art, Berlin: A digital register of sites and monuments for Syria

Keywords: Syria, heritage preservation, digital record

Abstract:

Syria counts among the world's outstanding cultural landscapes. Since the outbreak of the current civil war, however, the dense distribution of monuments in Syria and the unusually good state of preservation of many sites is acutely threatened or already lost. It is against this backdrop that the German Archaeological Institute (DAI), in cooperation with the Museum of Islamic Art in Berlin (SMB-SPK), has been pursuing the "Syrian Heritage Archive Project" (SHAP) since 2013. It is supported by Germany's Federal Foreign Office as part a cultural preservation programme.

With the creation of a digital record of Syrian cultural assets, the project aims to digitize and preserve primary research data for long-term access, and is gradually generating the basis for future work in the area of heritage preservation. The Syrian Heritage Archive Project is carried out within and provides an indispensable basis for the broader project "Stunde Null – A Future for the Time after the Crisis", under the umbrella of ArcHerNet.

Since 2013, extensive archival records and museums holdings have been digitised and systematically captured in the databases of the DAI. More than 120,000 datasets have thus far been integrated into the DAI's digital research environment (iDAI.world) and administered according to a standardised methodology. It is precisely the information generated by the DAI's longstanding research activity in Syria that is documenting the cultural heritage of the region in a substantial way. Numerous images and plans of historic monuments and archaeological artefacts from almost all key periods of Syrian history provide valuable data to those working on the urgent problems of preservation in Syria and contribute to international efforts for the protection of cultural heritage.

Issam BALLOUZ | Karin PÜTT | Rania ABDELLATIF | Alaa HADDAD, Germany

Damage Assessment in the framework of the Syrian Heritage Archive Project

Keywords: Syrian Heritage, Archive, Damage Assessment

Abstract:

From archive to as-is-condition

After the Syrian Heritage Archive Project (SHAP), a joint initiative by the German Archaeological Institute (DAI) and the Museum for Islamic Art in Berlin, has started with its archival efforts, a growing disaster with severe destruction on Syrian sites and monuments demanded another scope of interest in parallel: to document those damages. Therefore, we have designed a database for digital documentation of built heritage in Syria. This new module should connect between historical – archaeological research and conservation practice. Main aspects of this work were a unified methodology, accessibility for different contributors and devices and a multi-level documentation from rapid to detailed. Goal is to prepare files with an element documentation and assessment, summarized with a recommendation class for best practice first measurements, in preparation of a further

rehabilitation. The transfer of methods and producing building documentation files are of same value in this regard.

A strong commitment to Syrians, colleagues and public, shall be a way to ensure the effectiveness of SHAP's approach.

Hot spots of data & micro projects

In the present phase of SHAP (2017), implementation solutions of its data, along with knowledge sharing and capacity building became more important.

New headlines are just started projects, like the spin out project for Aleppo and the cooperation with UNITAR, or are already running like the safeguarding of Syrian photographic collections with UNESCO, and merging of inventories with ASOR (Boston). Micro projects, planned in direct collaboration with Syrian colleagues, will be a good tool to fulfill project goals in data production, knowledge transfer and capacity building at once.

The "Aleppo Built Heritage Documentation Project" has two main focal tasks, as to produce documentation files for chosen monuments in preparation of rehabilitation, and an art-historical evaluation of their importance. The scope of project activities from a Syrian team, trained on the job in Berlin, along with internships of Syrian multipliers, training workshops, and in situ documentation with Syrian partners, shall ensure the highest grade of sustainability.

Relevance conference:

SHAP's software & method can be useful in other regions than Syria, and for a civil society driven heritage management.

Relevance session:

After armed conflicts, a lack of professional capacity, can be substituted by greater involvement of professionals and civil society.

Innovation:

Multi-level, multi devices, standardized, and collaborative for built heritage

Syrian Heritage Archive Project مشروع توثيق الإرث الحضاري السوري

Ulrike SIEGEL, Germany

Iraqi-German Expert Forum on Cultural Heritage

Keywords: capacity building, cultural heritage, emergency heritage management, Iraq

Abstract:

Exchanging scientific approaches on Conservation of Archaeological and Historical Heritage

The Iraqi-German Expert Forum on Cultural Heritage responds to the growing destruction of archaeological and historical monuments in Iraq. It is an initiative that sets its focus on the preservation, conservation and restoration of archaeological and historical building remains in Iraq as well as on modern techniques for the documentation and processing of archaeological and mainly immovable structures of excavations.

The expert forum is intended for archaeologists and architects of the State Board of Antiquities and

Heritage (SBAH) and attached institutions in Iraq. By proposing a capacity building programme, it seeks to foster as well as to intensify dialogue and exchange on recent technical developments in the fields of building archaeology and heritage conservation.
The Iraqi-German Expert Forum on Cultural Heritage is an initiative of the German Archaeological Institute and its Baghdad Branch. It is generously funded by the Migration Fund at the Federal Foreign Office and supported by the German Federal Parliament. It is part of the project “Stunde Null: A Future for the Time after the Crisis” initiated by the Archaeological Heritage Network in Germany and supported by the German Foreign Office.
This paper presents the structure and implementation of the expert forum and focuses on its goal to find the balance between capacity building in basic tools and in modern techniques.

Jonathan N. TUBB, UK

Preparing for the Aftermath: The British Museum’s Iraq Emergency Heritage Management Training Scheme

Keywords: British Museum, Iraq, Training, Emergency Heritage Management

Abstract:
In 2015, in response to the appalling destruction by Daesh of heritage sites in Iraq and Syria, the British Museum developed a scheme which, in the face of frustration and outrage, could offer something positive and constructive. Called the ‘Iraq Emergency Heritage Management Training Scheme’, or simply ‘Iraq Scheme’ for short, the programme, which is funded by the UK Government, is designed to build capacity in the Iraq State Board of Antiquities and Heritage by training 50 of its staff in a wide variety of sophisticated techniques of documentation, geomatics and retrieval and rescue archaeology methodologies. The four-year programme prepares the State Board for the aftermath of destruction – the day when areas of the country, currently occupied by so-called Islamic State, are returned to secure governmental control. The training, undertaken both in the UK and on specially selected archaeological sites in safe areas of Iraq (Tello, ancient Girsu in southern Iraq and Darband-i Rania in Iraqi Kurdistan), is intended to provide participants with the expertise and skills they need to face the challenges of documenting and stabilising severely disrupted and damaged heritage sites in preparation for potential reconstruction.
This paper reports on the progress and impact of the scheme, now in its second year.

Relevance conference:
This is an invited paper for the Special Session “Cultural Heritage and Armed Conflict”.

Reza SHARIFI, Germany

Challenges of Risk Preparedness in a War-Damaged Cultural Heritage, the case of Bamiyan in Afghanistan

Keywords: Heritage, Armed Conflict, Risk Preparedness, Bamiyan

Abstract:
The damage which is caused by the armed conflict affected enormously the cultural property of

Afghanistan. Since 2001, the risk arising from this anthropogenic agent was declining, but the current situation of the country especially after 2012, proved that armed conflict is still a main potential threat to the heritage site.

I will study the notion of the Risk in the World Heritage Site of Bamiyan and will look closely at the phenomenon of heritage destruction during the armed conflict on the site and the motives leading to the destruction of Buddha Statues in 2001. Also, I will sketch some of the conventional approaches to the theme of risk assessment. I have designed my underlying assumption that: the demolition of Buddha Statues was the result of accumulated risks over time and caused substantial damages, and now the same sources of hazard still exist in the fragile security situation in Afghanistan.

Primarily, I shall limit myself in understanding the risk to cultural heritage in the geographical area of Afghanistan and generalise the case of Bamiyan to other historical sites with a similar situation in the Country. Thus, it will provide a better perspective for the heritage managers to look at the risk assessment on this Site.

Relevance conference / Relevance session:

Afghanistan's heritage is the prominent victim of the long-lasting armed conflict, and this particular session focuses on heritage preservation in conflict zones.

References:

1. Stovel, Herb (1998):Risk preparedness. Rome: ICCROM.
2. The ABC method a risk management approach to the preservation of cultural heritage (2016). Ottawa

Figure:

Noura ALSALEH, Germany

The deliberate targeting of cultural heritage in armed conflicts

Keywords: conflict, cultural genocide, reconstruction, collective memory, identity, legal framework

Abstract:

The reconstruction of cities and cultural heritage sites destroyed in conflicts has a significant role for post-conflict recovery of societies. In this context it is not about the simple reconstruction of physical structures but the safeguarding of socio-cultural identity, which is constructed through the individual and collective memory of people and their interaction with the built environment. This paper summarizes the concept of cultural heritage values and their impact on identity and formation of peoples collective memory. Further the topic of deliberate destruction of cultural heritage in armed conflicts is presented under following questions: Why cultural heritage and in its turn the identity of opponents are targeted in the times of conflict? What effects are caused by this? The paper briefly introduces the development of the term 'cultural genocide' and presents a summary of the legal framework set by the international conventions answering the question: What are the legislations to protect the cultural heritage during armed conflict?

Relevance conference / Relevance session:

Before 3D-modelling or physical reconstruction process for a damaged/destroyed cultural property can be conducted, a deep understanding of the place and its urban identity should be developed.

Innovation:

Cultural heritage is often targeted during armed conflicts and is still being used as a tool for destruction, this damage goes beyond the physical structures and involves destroying people's identity

References:

1. Bevan, R. 2006: The Destruction of Memory: Architecture at War.
2. UNESCO, 1954: Convention for the Protection of Cultural Property in the Event of Armed Conflict.

Alessandra ALVISI, Italy

Conserving built heritage damaged by armed conflicts in the age of technological innovation

Keywords: cultural heritage, armed conflict, technological innovation, digital reconfiguration, 3D printing

Abstract:

On January 20th 2017 the Tetrapylon and parts of the Theatre proscenium in the ancient city of Palmyra, Syria, have been destroyed. This is only the last of a series of dreadful actions recently accomplished by ISIS. After the destruction of the Palmyra's Triumphal Arch at the end of 2015, the monument symbol of the Syrian archaeological site has been digitally reconstructed and then replicated using 3D printing technology. The exposition of the artifact, made in Carrara, took place in London and in New York, receiving a warmhearted welcome by people.

The contribution focuses on one of the critical topics that the international scientific community has to face: the incessant threat that afflicts Syria and Iraq (just to mention the most recent events) is causing

the damage and loss of significant and unique ancient buildings and artifacts of the local culture. International and worldwide institutions are already moving for the prevention from the attacks and the protection of cultural heritage of the sites considered endangered. Unfortunately, many monuments are already damaged and other have been completely burned to the ground: the Buddhas of Bamiyan, Afghanistan, dynamited in March 2001 by the Taliban; the mud Shrines of Timbuktu, Mali, vandalized by Islamist fighters in 2012; the Assyrian Ziggurat at Nimrud, Iraq, ravaged by ISIS in 2016.
Therefore the problem arises on how to deal with the situation, with which criteria restore the ruins and especially if to undertake the reconstruction and how deep push it. Recent experiences show an interesting potential in the use of new technologies to digitally reconfigure the lost monuments: a conscious approach must guide their application, outlining clearly the aims.
The contribution intends to analyze the theme on a theoretical level and consider with a critical approach the opportunities offered by the innovative technologies that today scientific progress makes available. The purpose is to outline how to tackle this challenge with an aware use of technologies in the transmission of cultural heritage values to the future.

Relevance conference / Relevance session:

The contribution intends to analyze the opportunities offered by innovative technologies in the field of cultural heritage from a theoretical point of view.

Innovation:

The purpose is to analyze how to tackle the challenge with an aware use of technologies in the transmission of CH values to the future through a process first theoretical and than technical.

References:

1. ALVISI, Lacuna architettonica e innovazione tecnologica. Aspetti teorici e metodologici, PhD in Urban Recovery and Regeneration dissertation, defended on 9 January 2015, Sapienza Università di Roma
2. Exhibition “Reborn from destruction. Ebla, Nimrud, Palmyra” (Colosseum, Rome 7 October-11 December 2016)

Mada SALEH, Germany

Divided cities: Case study of Erbil

Keywords: Erbil, Heritage, Conflict, State-building, Identity

Abstract:

Civil Wars have dominated the late twentieth-century leaving many cities vulnerable. Since World War II there has been a marked shift in global warfare trends from interstate to intrastate conflict, and the clashes are mainly concentrated in the big urban centers. In such cases (Intrastate armed conflict) the battle-related death is highly from urban civilians same goes to destruction apart from infrastructure. Armed conflicts in the middle east did not stop since World War II (Palestine-Israel, Lebanon Civil War, Syrian Conflict), leaving the basic urban centers almost totally destroyed, where in a place like the middle east, most of the big cities evolved around a still existing historical core. The worst part is that sometimes, executed plans of rehabilitation and rebuilding, causes a greater damage than the battle-related destruction itself.

This paper aims to give a short review about the armed conflict in the Middle East, and the divided cities as a side effect. Based on the study case of Erbil in northern Iraq, it gives an overview of the main obstacles in defining the strategies of rehabilitation. The second part is devoted to showing the methods followed in my PhD research “Strategies of rehabilitation in the old city of Erbil” and its results. The last part brings to discussion the final question of identity, and the role of architectural monuments as a tool for the state building.

Relevance conference / Relevance session:

It is relevant for the conference as an update for an ongoing project, with similar and different methodologies of mapping

Innovation:

My project is in the field of building archaeology, concentrating on building arcaheology in a city context.

References:

1. Divided Cities: Belfast, Beirut, Jerusalem, Mostar, and Nicosia (City in the Twenty-First Century)
2. Entwicklung und Struktur einer orientalisch-islamischen Stadt, Damaszener Forschungen 1, Mainz 1989.

Zoya MASOUD, Germany

Rebuilding the Suqs of Aleppo

Keywords: Aleppo, rebuilding, map

Abstract:

Aleppo is one of the oldest continuously inhabited cities in the world. Due to the on-going war, followed by unmanaged reconstruction procedures, Aleppo suffers from systematic destruction within its historic center, which is listed as a UNESCO world heritage site. Despite the continuing armed conflict in other Syrian territories, reconstruction plans for Aleppo are under intensive discussion. It is anticipated that such plans could bring about a second wave of destruction and demographic change. The research intends to examine the variables influencing the re-building process from urban planning aspects. To this end, three layers of maps will be produced: different values of the Suqs before the civil war, their destruction after 2017 and a memory map of Aleppians inside and outside Aleppo in order to evaluate losses the city had and still suffers from. The dissertation intends to provide a thorough examination through deep qualitative questionnaires with various categories of actors and stakeholders (Aleppians: visitors or shop tenants/owners in the Bazaar, academics, actors and institutional representatives … etc), the social context of the Bazaar before the war, the interests in rebuilding the Suq and the potential role such heavily charged and shared historic site can play in the national social reconciliation through urban planning.

Relevance conference / Relevance session:

Rebuilding the Bazaar in post-conflict Aleppo have to responce to the needs of Aleppo and at the 21st century.

Innovation:

Investigating the potential role such heavily charged and shared historic site can play in the national social reconciliation through urban planning.

References:

1. Mansel, Philip, 2016. “Aleppo, the rise and fall of Syrian’s great merchant city.
2. Meier, Patrik.”People of the suq : identity, practice and place-making in Aleppo’s Old City market”

Anita GACH, Austria

International Art Theft

Abstract:

It is not obvious that plundered antiques are returned to the states of origin. Usually they are sold to foreign countries. All kinds of artefacts, including archaeological items, are wanted in the art trade. But where do works of art and antiques in the art trade come from? There do not exist legal provisions to prove the provenance of an object. Provenances often are given as “family property” which might be true or not.

When a stolen or illegally excavated object is sold in an auction house or in an antiques shop it is white washed. That means that the buyer has a good title and the stolen object has a new owner. The problem: How can one know that an object has been stolen or illegally excavated? How can one know where an object comes from? It is crucial that victims inform Police and experts as soon as possible and provide good photographs and descriptions of the stolen objects (standard of Object-ID). Plundered objects should be registered in the Interpol Stolen Works of Art database. This international database is available in all 190 member states of Interpol and can be used free of charge by everybody. Especially Police, customs and the art trade use it in regular terms when antiques are offered or found.

Session – New Approaches to Medieval Structures and Space

(Chair: Meredith COHEN, USA)

In recent years, new technologies have been applied with increasing frequency to spaces and structures from the European Middle Ages. Yet many question whether such technologies really yield new information that enriches history or whether they are just gadgets that mimic the same approaches which have long defined research in architectural history. How have new technologies *changed* the study of architectural history and/or generated knowledge that cannot be obtained otherwise? This panel will showcase these new approaches and insights found through meticulous applications of new technologies to historical data, driving and defining the future of the study of medieval architecture and the urban environment.

We invite papers that have made new insights in architectural or urban history based on:

- 3D reconstructions based on historical data of lost monuments, parts of monuments, or fragments

- ground penetrating radar to uncover lost monuments in built environments
- laser scans of extant monuments as a tool for historical and structural analysis
- augmented reality and the experience of medieval architecture and urban spaces
- digital mapping tools
- recreations of sonic environments
- databases that generate new information about extant or lost structures or spaces

Caroline BRUZELIUS | Lucas GILES | Leopoldo REPOLLA | Emanuela DE FEO | Andrea BASSO | Elisa CASTAGNA, USA

Reconstructing the Choir Screen of S. Chiara in Naples

Keywords: ground-penetrating radar, cloud point scan, 3D model, historic architecture

Abstract:

Choir screens were a common feature of church interiors, separating lay public from clergy, and restricting access to the high altar by creating differentiated sacred zones. By the end of the thirteenth century they sometimes conditioned both the design and construction process of a church, forming an "interior façade" as well as a place to pause construction. They were markers of the spiritual and social topography of church interiors, containing multiple altars for lay patrons whose tombs and votive images often clustered near the relics of patron saints. As indexes of social and spiritual activity, they once articulated important aspects of the liturgy and function of sacred space. Yet studies of choir screens have been handicapped by their almost complete elimination after the Counter-Reformation. In Italy they were mostly dismantled by the late sixteenth century; their altarpieces, sculpted decoration, and tombs were destroyed or dispersed.

This case study is based on geo-radar and cloud-point scans to identify the location of and reconstruct the choir screen at S. Chiara. As in most digital projects, the 3D model represents a collaboration between multiple. Our work indicates that the screen was an integral feature of the design and construction of this massive Neapolitan church. It probably contained altars dedicated to the order's two major saints, Francis (on the left), and Clare (on the right), locations that explain the anomalous presence of their side chapels dedicated to them in the middle of long rows of lateral chapels on either side. In addition, a sculpted relief of the life of St. Catherine, formerly positioned against the west wall of the church, fits perfectly above the arches of the reconstructed screen.

Relevance conference / session:

New technologies enable us to reconstruct important elements of religious architecture that had both a liturgical and social function, such as choir screens in churches.

Innovation:

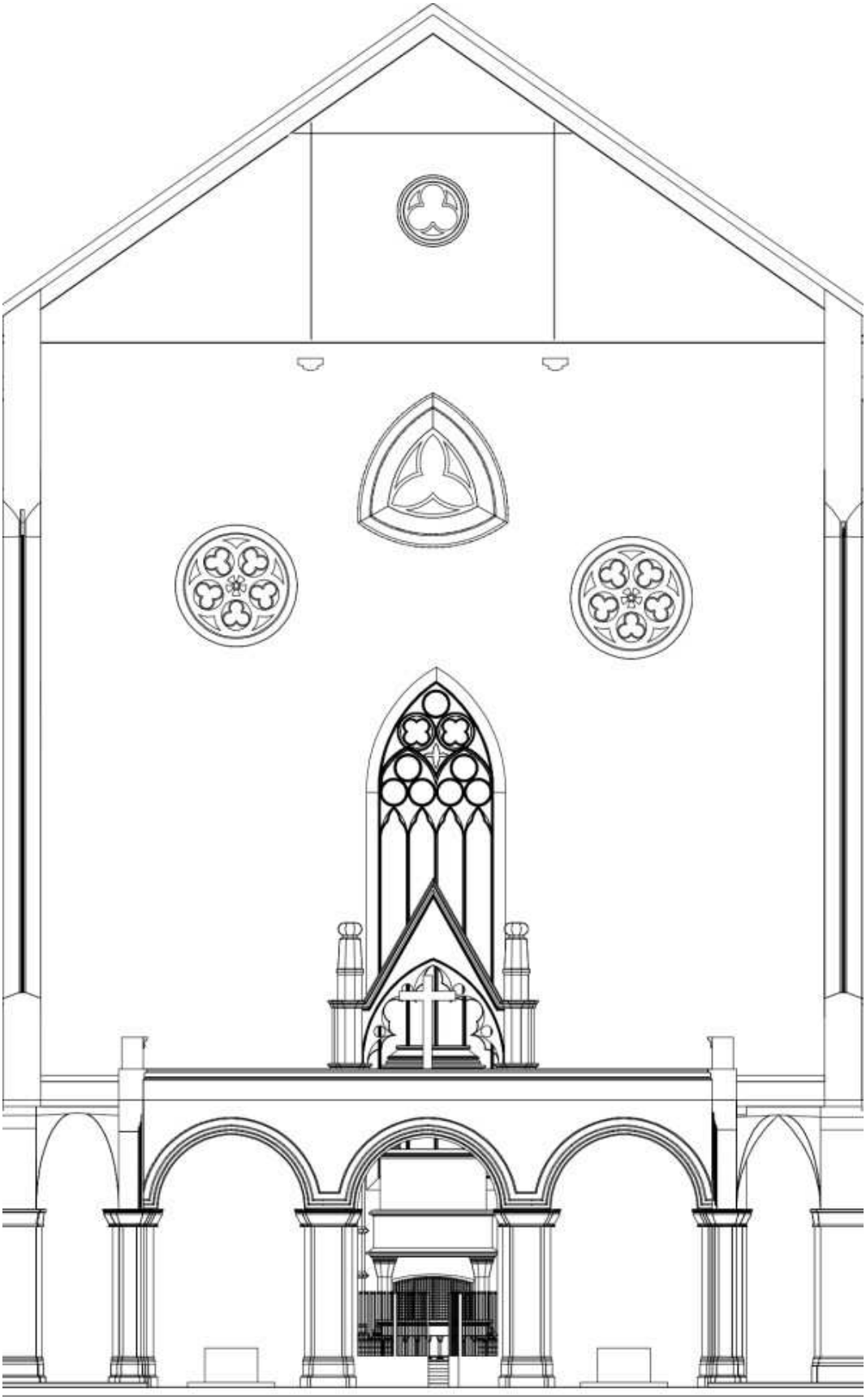
The combination of GPR, cloud point scans, and 3D modeling to reconstruct an important feature of interior space.

References:

1. Bruzelius, Caroline, "The Architecture of the Mendicant Orders. A Review of Recent Literature," Perspective. La revue de l'INHA, pp. 95-116.

2. Bruzelius, Caroline, The Stones of Naples: Church Building in the Angevin Kingdom, 1266-1343, Yale University Press, London, 2004 ; Italian ed: Le Pietre di Napoli, Rome, Viella, 2005

Figure:



Nicola CAMERLENGHI, USA

The Virtual Basilica of St. Paul, Rome

Keywords: CAD, Photogrammetry, Historical Reconstruction, Diachronic

Abstract:

Until recently, scholars have employed conventional modes of representation and analysis—think plans, sections or elevations—which generally isolate a building at a single moment in time, rather than consider it across its history. Such representations have their value, but they also curtail a deeper understanding unleashed by today's digital representations, which enable us to "know what was where when" in three dimensions and across time with uncanny precision. Digital drawings help to unleash the diachronic realities of architecture and to foster the visualization and analysis of overlapping sequences of buildings, which is to conceptually approach architecture as ever-evolving process, rather than finished product. This is a profound paradigm shift toward a more spatiotemporal understanding of cultural processes.

My talk will illustrate the theoretical implications of this innovative approach with concrete examples drawn from over a decade of now completed work on the Basilica of St. Paul in Rome. Our ability to understand that site's long, complex history has been hindered by a devastating fire in 1823. The absence of the original is offset only by a smattering of physical remnants, a vast corpus of historical images and a handful of archeological excavations. Extant fragments such as column capitals were digitized and virtually reconstructed using photogrammetry. Similarly, historical imagery was tapped to reconstruct the building's decoration and liturgical furnishings. And, finally, reports of archeological excavations scattered about the building were reconciled into a coherent 4D model. All told, by interpreting the structure, its decoration and furnishings in three dimensions and across time, I offer myriad visualizations, new working hypotheses and novel understandings of the long history of this major monument of medieval Christendom.

Relevance conference / Relevance session:

This recently completed project showcases a decade of innovative problem solving that addresses how best to employ extant evidence to vicariously study a building that no longer exists.

Innovation:

The innovations presented here include using diverse modeling software to create a coherent, analyzable and interactive compilation of architectural evidence from disparate sources.

Timothy SENIOR | Edward TRIPLETT, USA

Reconstructing St Katharinen: Archival Archaeology in Action

Keywords: Digital Reconstruction, Archival Archaeology, 3D GIS

Abstract:

Lying near the heart of Bremen, the St. Katharinen district is bounded by two of the city's principal medieval, and now modern, streets. As one of the earliest documented structures on the site, the Dominican monastery of St. Katharinen (founded 1225) has come to define much of the urban fabric of the district. A substantial building complex, it served a variety of scholarly, commercial, military and

domestic roles following the Reformation, not least housing the city Armoury, State library and the city's first university. Subject to periods of extensive redevelopment, much of the complex was finally lost to the bombing raids of the Second World War and a traffic-widening scheme of the 1970s. Only a fragment now remains of the original claustral buildings, a multi-story car park erected on piloti rising overhead.
During its redevelopment, the site was cleared without archaeological investigation. Further, little scholarly research been conducted on the site to date. As such, any attempt to reconstruct the appearance of St Katharinen is now an act of inference: a process of archival archaeology. As part of ongoing work, we will present a new understanding of St Katharinen and the site's urban transformation across the centuries, one that draws together laser scanning and Lidar data with the most extensive body of construction, land registry, visual and textual data yet assembled.
3D GIS makes it possible for a variety of 2D and 3D data formats emerging from such work to be oriented within a single coordinate system, an important part of conjectural reconstruction activities. Such work, however, remains largely bound to desktop environments. The authors will propose how web-streaming 3D GIS tools such as Cesium may enable new forms of dissemination that can open research to a wider audience and capture the decisions lying behind reconstruction work.
Innovation:
In its use of diverse data sources, the project creates a platform to test 3D GIS dissemination tools that are only now beginning to emerge commercially.

Aurelia LUREAU | Herbert MASCHNER | Victor Manuel LOPEZ-MENCHERO BENDICHO | Jeffrey DU VERNAY | James MCLEOD | Vincent MATTHEW, France
Using and combining remote-sensing technologies to document the Castillo de Consuegra in Castilla-La Mancha, Spain
Keywords: remote-sensing, castle, lasergrammetry, photogrammetry, documentation

Abstract:
The Castillo de La Muela in Consuegra, Castilla-La Mancha, Spain, is a medieval castle that has a long history starting from the Xth century. It is now one of the most well preserved castles of the region and it has undergone a lot of restoration campaigns.
A lot of questions are still not answered about this castle: it's the state of preservation and the various restoration campaigns need to be assessed and documented, the castle needs to be presented with new technics to the public in order to attract new visitors, and the surroundings of the castle and its lost outer surrounding walls have yet to be entirely found and documented.
In order to answer as many questions as possible, the castle was surveyed with remote-sensing technics by the CVAST from USF, Tampa, in collaboration with the Universities of Castilla-La Mancha and the Université Paris1 Panthéon-Sorbonne. The team used a lot of remote-sensing technologies to survey the castle and its surroundings: terrestrial laser scanning was used to document the exterior and interior of the castle; aerial photogrammetry by drone was used to document the upper parts of the castle and the whole hill on which it sits; terrestrial photogrammetry was used to document the inner parts of the castle, and 360 panoramas were made in order to create a virtual tour for the

visitors.
This survey will be included in a larger campaign using other remote-sensing technologies such as geophysics and aerial surveys using thermal imaging, but also well-known methods such as GIS and cartography will complete the new documentation in order to present all the new data to the public and contemplate an excavation campaign.

Relevance conference / Relevance session:

The survey campaign is about documenting Cultural Heritage in a remote area of Spain with new technologies, and how combining those to obtain the best of each would provide the best documentation.

Innovation:

Remote-sensing has been used before to document medieval structures, but rarely on a building this size and possibly never to that extent of precision and completion that the three surveys provided.

References:

1. Landes, P.Grussenmeyer, et all. Combination of terrestrial Recording Techniques for 3D Object Modelling regarding topographic constraints. Example of the Castle of Haut-Andlau, Alsace, France. XXIth CIPA International Symposium, 2007.
2. Guidi, F.Remondino, et all. A multi-resolution methodology for the 3D modelling of large and complex archaeological areas. Int. J. Architect. Comput. 2009.

Aaron PATTEE | Hubert MARA, Germany

CITADEL—Computational Investigation of the Topographical and Architectural Designs in an Evolving Landscape

Keywords: Photogrammetry, Laserscanning, Maps, GIS

Abstract:

This interdisciplinary project spanning art history, archaeology, anthropology, history, computer science, remote sensing, and geoinformatics explores the implementation of multi-sensor data fusion integrating photogrammetry, laserscanning, GIS (Geographical Information Systems), and historical documents to establish a more holistic understanding of the effect of the landscape on medieval fortress design in the area of Kaiserslautern, Germany during the Middle Ages. The primary objective of the project is to derive the strategic and geopolitical reasoning for the construction of six defensive sites.

Throughout the known history of the Pfalz, the region has been consistently ravaged by war, suffering intense periods of scorched-earth tactics, depopulation, deforestation, industrialization and subsequent pollution. The project is using computational methods to determine the effect that the medieval landscape had on the design, position, and strategy of the test sites chosen at the Institut für Europäische Kunstgeschichte with assistance from the Insitut für Pfälzische Geschichte und Volkskunde. All of the sites will be modeled using photogrammetric and laserscanning techniques and linked into a digital landscape model based upon aerial laserscan (ALS) data with assistance from the GIScience research group. Contextual information derived from historical documents and maps with support from the HeiMAP project will create a more complete depiction of the medieval territory once

controlled by these prominent structures. Integral invariant filters, non-maximum suppression, and other mesh-processing algorithms will be applied to the digital landscape model using FCGL's GigaMesh software framework.
Essentially, information regarding the depiction of the landscape has been hidden over the past 800 years by the destruction of the sites, the extreme alteration of the landscape, and the loss of archival material. CITADEL will overcome these obstacles, by establishing a methodology to open a portal into the past.

Relevance conference / Relevance session:

The project focuses upon the recording of historical/archaeological sites that are in dire need of preservation.

Innovation:

It is using 3D modeling techniques in addition to medieval texts and maps.

References:

1. Sapirstein, „Accurate Measurement with Photogrammetry at Large Sites," Journal of Archaeological Science, Bd. 66, pp. 137-145, 2016.
2. Richards-Rissetto und K. Landau, „Movement as a means of (re)production: using GIS to measure social integration across urban landscapes," Journal of Archaeological Science, Bd. 41, pp. 365-375, 2014.

Meredith COHEN, USA

Digital Gothic: Reverse Engineering the Monuments of Medieval Paris

Keywords: reconstruction, augmented reality, cultural heritage, mapping, architecture

Abstract:

Too much of what is known about Parisian Gothic architecture is based on too few extant monuments; of some fifty-five buildings constructed in Paris in the period from about 1150-1300, only five are extant in fragmented form today. However, ample information stemming from archaeology, graphic, and written documentation allow us to reconstruct a number of the now-lost monuments with varying degrees of accuracy. In this talk, I will discuss my approach to and aims in resurrecting the lost monuments of Gothic Paris through digital reconstruction in a collaborative web-based project I initiated at UCLA entitled Paris Past and Present.
Working within a rapidly expanding area of research, our team has developed methodological strategies to address some of the problematic issues that arise with 3D reconstructions of lost monuments, such as reconciling inconsistencies within the source materials, illustrating true results in contrast to hypotheses, as well as means of public presentation. At the same time, the insights we have made on Gothic architecture in the course of constructing some twelve buildings for Paris Past and Present have been numerous and unexpected. Some of these will be detailed as they relate to our reconstruction of the magnificent thirteenth-century Lady Chapel at Saint Germain des Prés, attributed to the Parisian "doctor lathomorum," Pierre de Montreuil, in an effort to demonstrate how technology can further academic discourse in ways not previously possible.

Relevance conference / Relevance session:

This project incorporates 3D reconstruction and augmented reality to extend our knowledge of Gothic architecture and the Urban Space, by making use of underused archival and archaeological sources.

Innovation:

This significantly broadens our data for the understanding of Gothic architecture and urban space.

References:

1. Meredith Cohen, “Louis’ later patronage in Paris,” in The Sainte-Chapelle and the Construction of Sacral Monarchy: Royal Architecture in Thirteenth-Century Paris (New York: Cambridge University Press, 2015).
2. Christ, Y., Églises parisiennes actuelles et disparues (Paris: Éditions Tel, 1947)

Martina POLIG | Despina PAPACHARALAMBOUS | Nikolas BAKIRTZIS | Sorin HERMON, Cyprus

A 3D-GIS approach to the iconographic program of the cathedral of St. John the Theologian in Nicosia, Cyprus

Keywords: 3D-GIS, 3D-models, iconography, byzantine

Abstract:

This paper proposes the use of an innovative 3D-GIS methodology to facilitate and enhance art historical research. Specifically, the use of the above-mentioned approach will help to explore aspects of the organization, reception and interpretation of decorative iconographic programs in the medieval and early modern churches of Cyprus. The 17th century church of St. John the Theologian in Nicosia, Cyprus will be the paper’s primary case study. The unassuming building has a single nave with a barrel vault and is richly decorated with wall paintings and portable icons resting on the lavish wood-carved iconostasis scenes spread all around the church’s surfaces. Having served as the seat of the Archbishop of Cyprus since 1730, the church’s painted decoration provides a key iconographic narrative full with political and ideological meaning. A major art historical question regards the planning and reception of such iconographic programs in their diachronic socio-political context. Moreover, the issue of the program’s narrative and its intended audience provides additional levels of inquiry.

The paper describes a 3D-GIS based approach as a first step towards elucidating the above-mentioned questions. The interior and the exterior architectural components of the church were 3D documented (laser scanning and photogrammetry) and high-resolution images of the iconographic program were taken. A GIS environment was created based on this material, which was further separated in different layers and structured according to themes and elements of interest. Through attribute tables connected to the different layers of painted decoration, additional information was attached and queried at will. These characterizations where used to investigate how the positioning and the sequence of entire scenes, single figures or the direction of faces and eyes engaged the church’s audience.

Michael KLEIN | Heike KRAUSE | Paul MITCHELL, Austria

The Making of the Film "Vienna in the Middle Ages"

Keywords: Vienna, history, animation, film

Abstract:

A prominent part of the new Museum of the Middle Ages in St. Virgil's Chapel at St. Stephen's Square in Vienna is a 06:12 minute long film about the development of the city – "Vienna in the Middle Ages". Beginning with the abandonment of the legionary fort, it follows the emergence of the city up to the construction of the town wall in the thirteenth century, afterwards examining major parts of the late medieval cityscape including the market district, the castle and the cathedral. The authors prepared the film for Wien Museum and were also members of the team which put together the exhibition at St. Virgil's Chapel (curator Michaela Kronberger). The film combines the very latest archaeological data with thorough knowledge of the written and pictorial sources. It incorporates results based on georeferencing historical maps and also data from 3D scanning. The film unites parts of many other films and visualisations – from past projects of the Jewish Museum Vienna, the Academy of Sciences, the Stadtarchäologie Wien, Wien Museum and elsewhere – with new reconstructions of the urban topography and of prominent buildings in the story of medieval Vienna. The making of the film is a good example of the collaboration between archaeologists/historians and visualisation specialists.

Relevance conference/ session:

Combines animation with archaeological/ historical data. Interesting for all conference participants

Stefaan VAN LIEFFERINGE, USA

New Technologies to Use Sources for the Study of Medieval Architecture

Keywords: artificial intelligence, knowledge representation, document analysis

Abstract:

This paper presents an innovative approach to the analysis and reconstitution of medieval architecture. Computing technologies from Artificial Intelligence used in conjunction with 3D modeling software provide new means to visualize lost or never built architecture. Natural Language Processing makes it possible to translate descriptions of architecture in a format that can be processed by a computer; Knowledge Representation enables a computer to reason about a described structure. These methods from computer science offer new possibilities for the analysis of architecture. For example, through studying how knowledge is embedded in documents describing architecture these technologies can serve to reconstitute and reason about the verbally depicted structures. Biblical glosses in which medieval patrons envisioned ideal – though never built – architecture can be analyzed with the assistance of a computer, providing us with new means to enter into the architectural mindset of medieval people. These technologies also can further our current knowledge on actual architecture. Archeological descriptions can be computationally analyzed to check their accuracy with regard to extant structures. The method has the potential of determining the modifications that modern restorations introduced into the original medieval architecture. Finally, computers could provide assistance when analyzing written accounts to recreate lost buildings.

Focusing on Gothic cathedral architecture and on Biblical archetypes, this paper will introduce these new technologies and present a computational method that utilizes Knowledge Representation for the study of medieval architecture. The paper will present the challenges that a computer system faces when analyzing descriptions of Gothic architecture, show how formal logic provides answers to these challenges, and introduce the core of an actual working implementation of a Knowledge Representation for Gothic cathedrals.

Relevance conference / Relevance session:

This paper demonstrates innovative technological research for the study of cultural heritage in general.

Innovation:

The use of Artificial Intelligence to create a computational model of historic architecture is new.

References:

1. http://ieeexplore.ieee.org/document/6295877/
2. https://www.researchgate.net/publication/266286949_Application_of_Defeasible_Domain-Specific_Knowledge_to_the_Description_of_Gothic_Cathedrals_in_the_ARC_Project

Kristine TANTON, USA

Reconstructing the Romanesque east end at Sainte-Marie Madeleine de Vézelay

Keywords: Romanesque, 3D reconstruction, France

Abstract:

Located along the pilgrimage route to Santiago de Compostela, the abbey of Sainte-Marie-Madeleine de Vézelay and the surrounding town was at its apogee in the twelfth century. The abbey and the surrounding town was a major pilgrimage center and played host to many of the most important figures of the period. The Second Crusade was launched there, Thomas Becket vehemently protested Henry II from Vézelay, and Richard the Lionheart and Philip Augustus held a summit there on route to the Third Crusade. As the town and abbey thrived, the monks embarked on an extensive building program. Yet this was not a period of accord. Textual sources, such as charters and the Vézelay Chronicle, attest to mounting tensions among the bishops of Autun, the counts of Nevers, the townspeople of Vézelay, and the monks of Sainte-Marie-Madeleine. Violence boiled over in 1106 when the townspeople murdered the Abbot Artaud.

Although the textual sources document the prosperity and violent conflict at Vézelay, an examination of the material evidence from the period—namely the basilica—may tell us more. However, the twelfth-century fabric of the basilica was drastically altered in the thirteenth century when the basilica's east end was rebuilt in the Gothic style. In this paper, I will propose a digital reconstruction of the twelfth-century east end based on archaeological evidence, the basilica's surviving fabric and sculpture, and the site's topography. In doing so, we can better consider the ritual and political uses of the basilica during the monastery's conflict with local ecclesiastical and noble powers as well as its role as a center of pilgrimage and the crusades. Furthermore, it will allow us to interrogate the textual sources and reconstruct the material processes of monastic building projects in relation to twelfth-century monastic and papal reforms in Burgundy.

Relevance conference / Relevance session:

This paper not only considers how a 3D reconstructions contribute to cultural heritage but also provide a virtual environment to consider ritual and social uses of the space.

Innovation:

In addition to presenting my 3D model, I will propose standards for annotating the model to document all data and project workflow.

The paper addresses medieval structures and spaces and 3D reconstructions based on historical data for lost parts of a monument.

Rebecca SMITH, USA

Lost in the Labyrinth: The Unified Plan of Reims Cathedral

Keywords: Gothic geometry, laser mapping, Reims

Abstract:

Reims Cathedral ranks as one of the most important churches in Europe in terms of history and art history, but controversy continues to swirl around the history of its design, with many scholars attempting to sort out the roles played by the four architects memorialized in its famed labyrinth. In an effort to better understand Reims, Robert Bork and I undertook a new survey using a handheld laser that allowed us to produce a modern, comprehensive plan of the cathedral. Using the Vectorworks CAD system, we then explored the underlying geometry governing its design. On this basis we have concluded that the plan of the whole cathedral was already established by its first architect.

The development of this new plan of Reims Cathedral was made possible by our using the LEICA S910 laser. The S910, while being compact and affordable, allowed us to collect data from the extremes of the cathedral and get high precision measurements on areas inaccessible to hand tools. It is especially useful for geometric studies because it allows for a selection of data points across long distances. This enabled us to add the exterior and nave zones to Nancy Wu's foundational geometry study, which was limited to the Reims chevet interior. As a result, we can distinguish between and explain two kinds of anomalies in the cathedral plan: on the one hand, buttress rotations and chapel displacements that appear to have resulted from errors in layout of the building; and on the other hand, peculiarities such as the different bay lengths in the choir and nave that can be shown to result naturally from an elegantly unified geometrical scheme. Our paper thus offers a new lens through which Reims Cathedral might be studied by utilizing cutting-edge tools to augment traditional methods for studying medieval structures.

Relevance conference / Relevance session:

This project uses an interdisciplinary point of view combining archeology, architectural history, and geometry using a new laser measuring device in conjunction with traditional measuring methods.

Innovation:

It marks one of the first scholarly combinations of laser scanning and Vectorworks to determine a building's plan using a brand new hand-held laser.

References:

1. Bork, Robert. “Changing Geometries in the North Transept of Reims Cathedral.” In The North Transept of Reims Cathedral: Design, Construction, and Visual Programs, edited by Jennifer Feltman. 65-84. Abingdon and New York: Routledge, 2016.
2. Villes, Alain. La Cathédrale Notre-Dame de Reims: chronologie et campagnes de travaux… Joue les Tours: La simarre Editions, 2009.

Michael DAVIS, USA

A Puzzle of Pieces: Rebuilding the Franciscan Convent in Paris

Keywords: Franciscan convent, Paris, reconstruction, digital model

Abstract:

The Franciscan convent in Paris, begun shortly after 1240 and dedicated in 1263, was one of the most significant architectural projects undertaken during the reign of Louis IX. Severely damaged by fire in 1580 and demolished in the 1790s, the church has been called unknowable, its reconstructed plan dismissed as imaginary, and its importance in the city’s built environment erased. However, a robust dossier of graphic and written records can be assembled that document the church of Sainte-Marie-Madeleine and its cloister. So why bother with a 3-D reconstruction?

The visual evidence available for the Franciscan convent is partial, contradictory, and often misleading. Painted views of the ruined church portray an interior of extreme width and the east end of the building is completely omitted. A suite of archaeological drawings of the chapter house offers four versions of the entrance piers. It is only through the process of digital rebuilding that graphic fragments can be linked, discrepancies resolved and the buildings reassembled as credible structures.

Technology enables the Franciscan convent’s return from exile and its re-entry into the monumental history of medieval Paris. Reconstruction highlights its studied simplicity and formal economy to offer a bracing counterpoint to the opulence of the contemporary Sainte-Chapelle or transepts of Notre-Dame that compose the current picture of the capital’s architecture and the canonic narrative of the Gothic.

Relevance conference/session:

This paper offers a case study of the use of digital technology as a tool that facilitates the integration of varied and discordant evidence as the basis of a credible architectural reconstruction.

Innovation:

This paper, incorporating unpublished visual documents, presents an original reconstruction of the church of the Franciscans in Paris and its cloister.

References:

1. “La cathédrale de Narbonne et les édifices nobles et magnifiques du royaume de France,” Actes du 3eme colloque d’histoire de l’art méridional au Moyen-Age, Narbonne, 1994: 27-38.
2. “‘Fitting to the Requirements of the Place’: The Franciscan Church of Saint-Marie-Madeleine in Paris,” in Architecture, Liturgy, and Identity, ed. Z. Opacic and A. Timmerman, (Brepols: Turnhout, 2011), pp. 247-261.

Figure:

Session – New Realities 3: Virtual, augmented reality and ALL other techniques in Cultural and historical Heritage for the general public
(Chairs: Willem BEEX, The Netherlands | Giorgio VERDIANI, Italy)

This session will focus on case studies and experiences concerning Virtual Reality (VR), Augmented Reality (AR) and ALL other techniques, covering the range from the virtual visit to in-world re-enactments. The implementation of the digital world in the real one is commonplace today. There are digitally born studies, and people born with smart phones in their cradles will be soon the typical users of cultural and historical heritage. The task to bring valuable information to scholars as well as to enhance the knowledge of the general public is an important part of the mission of everyone actively involved in developing digital applications for the field of cultural and historical heritage.
Reconstructed models, imaginary places, characters from another age, historical game play, enhancing the perception of the historical value of a place, are just a few of the terms in vogue today that show how museum and site presentations are being transformed by digital technology. Little by little our spaces dedicated to cultural activities and with them our cities are receiving a new virtual layer.
This session welcomes reports on the application of AR, VR, and ALL other technologies to the study and dissemination of cultural and historical heritage. But the main subject will be the relationship of our cultural and historical heritage to education and dissemination supported by digital technologies. Papers should focus not only on technical issues, but also on strategies of communication to raise the general public's awareness and appreciation of written sources and cultural heritage.

As occurred since its first edition in 2015, this session will have a format different from what one commonly experiences at CHNT. Participants will have a strict limit of six minutes and six slides in which to present their reports. This limit will free up the bulk of the time at our disposal for discussion and debate among the presenters and attendees.
Each presentation should consist of the following slides:

- Summary of the project: the cultural/historical heritage; the intended audience of the application, the general operational environment
- Technical solution (short and clear, stressing the innovations, if any)
- How the technical solution contributes toward reaching the project's goal
- Results: success, failure, something in between?
- Lessons to be learned from the project
- Where do we go from here?

And please, do not use one slide in PowerPoint with many images and a lot of text that keeps floating in. This is what we call cheating!
Discussion will be a significant part of the session. All the participants are expected to actively contribute.

Effie ATHANASSOPOULOS | Aaron PATTEE | Cole JUCKETTE | Amy NEUMANN | Catherine ELLIOTT | Erik SCHULZ | Kami AHRENS, USA | Germany

UNL Campus Archaeology: Building a Digital Resource

Keywords: Photogrammetry, GIS, Maps

Abstract:
UNL Campus Archaeology is a team project led by faculty, students, and alumni focused upon the analysis and reassessment of historic collections from excavations carried out on the University of Nebraska-Lincoln campus. The project is using 3D modeling techniques, non-rigid registrations of historical maps in GIS (Geographical Information Systems), and interactive online platforms to explore Lincoln's early urban development. The goal is to develop an interactive online portal for public outreach and education incorporating state of the art methods of recording cultural heritage.
The case study for this presentation is a former domestic cistern that had been excavated in 1997 prior to the construction of the university Student Union. This diverse archaeological collection is in excellent condition, including glass bottles, faunal remains, and ceramics. The artifacts are representative of late nineteenth and early twentieth-century Lincoln homes before the area was redeveloped by the university. This archaeological collection offers insight into the social structure, domestic life, and trade patterns at the turn of the century.
The project resources consist of 3D photogrammetric models and photographs of artifacts, historical maps, and archival databases. The dissemination of this information requires an intuitive and interactive online portal emphasizing public accessibility. A central website will be made with WordPress incorporating Leaflet for the visualization of the historical map registrations as well as links to the previously constructed online exhibit hosted by Scalar, and the Omeka-based online repository. Scalar is designed for a broader audience, consisting of a non-lineal narrative, incorporating the 3D

models of the artifacts. Omeka provides an organized solution for the variety of file types, allowing visitors to explore the data more in-depth. The project serves as an online portal for public outreach and education, making archaeology an integral part of Lincoln's early history and the broader Great Plains region.

Relevance conference / Relevance session:

This project is concerned with public outreach and education regarding the historical urban landscape of Lincoln, Nebraska.

Innovation:

It is combining database management, 3D modeling, and interactive website to assist in education.

References:

1. Christopher M. Schoen and Peter Bleed. 1993. The Archaeology of the Lincoln Pottery Works. Central Plains Archaeology, vol. 3 (1): 1-240.
2. http://archiv.ub.uni-heidelberg.de/propylaeumdok/volltexte/2016/3217

Tadas ZIZIUNAS | Rimvydas LAUZIKAS | Albinas KUNCEVICIUS | Renaldas AUGISTINAVICIUS | Ramunas SMIGELSKAS, Lithuania

3D technologies for cultural heritage

Keywords: 3D scanning, AR, monitoring, museums

Abstract:

Recently our department started new campaign where 3D laser scanning (lidar) and augmented reality was used as tools to reach some new possibilities in measuring our UNESCO heritage and making museum experience more immerse. At first case we (with lidar technologies) had focused on how large heritage areas can be monitored and secondly, how these 3D data sets could be used for automatic identification of illegal actions in old town Vilnius. With augmented reality technologies we implemented some mobile applications in not so popular museums to reach more interest concerning X and Y generations and their expectations. Secondly we made one additional mobile augmented reality application for historical book where content was augmented with various media (3D reconstructions (VR), audio guides, 2D data, etc.) on the book pages. This particular case showed great interest in buying such book and augmented reality factor clearly helped this to happen.

Relevance conference / Relevance session:

I will focus on advanced technologies: AR, VR, and 3D capturing (Lidar) which was used particularly for heritage field.

Innovation:

Lidar technologies for monitoring urban heritage could be main tool for governments across the globe to monitor, plan and maintain valuable assets in old towns.

References:

1. Tadas Žižiūnas, Išmanusis kultūros paveldas: genius loci ir papildytoji realybė// Vietos dvasios beieškant, 2014 m., p. 156-183, Vilnius. Translation: Tadas Žižiūnas, Smart cultural heritage: genius loci and augmented reality// Searching for genius loci, 2014 m., p. 156-183, Vilnius.

2. Laužikienė, Anželika, Laužikas, Rimvydas, ŽIŽIŪNAS, Tadas. Erelio vaikai: mokomoji interaktyvi knyga ir mobilioji programėlė. Vilnius, 2017. Translation: Laužikienė Anželika, Laužikas Rimvydas, ŽIŽIŪNAS Tadas. Children of an eagle: interactive book with augmented reality app, Vilnius, 2017.

Colin WALLACE | Ladislav DEDÍK | Jana MINAROVIECH | Dorina MOULLOU, Canada | Slovakia

3D Modeling and Virtual Access of Omega House in the Athenian Agora, Greece

Keywords: photogrammetry, Athens, 3d modeling, virtual reality

Abstract:

This paper presents a project conducted in the Athenian Agora, Greece which was realized through the cooperation of participants from Canada, Greece, Slovakia and the United States. It documents and presents results from surveying, photographing and photogrammetric modeling of Omega House as well as comparative retrospective 3D modeling using archival photographs.

Omega house is a 30 room structure in the Athenian Agora dating from the fourth to sixth centuries A.D. and it is considered to be one of the last philosophical schools of the ancient world. It was excavated between 1969 and 1971 by John Camp and is currently inaccessible to the public and in need of preservation and restoration.

The project's purpose is to provide accurate three dimensional modeling of Omega house as it was when first excavated and as it is now in order to achieve two goals. firstly, to provide the Greek Ministry of Culture and Sports with data which can be used for the preservation and restoration of the site. Secondly, to create a virtual environment which will allow the public to experience the site in its current form, its post-excavation form and in a recreation of its original form. The virtual environment will accommodate visitors on site while the monument is undergoing conservation and restoration.

In order to achieve accurate photogrammetric results using archival photographs, an accurate site survey of features that remain intact since the time of excavation was done with those coordinates being applied to the retrospective model. Additionally, elements of the contemporary modeling were employed in the construction of the archival model with only archival photographs used as texture.

It is our view that the successful use of these methods will be applicable to other inaccessible sites allowing the public to a have a broader experience of monuments and sites while visiting.

Relevance conference / Relevance session:

Our work involves using the latest technologies to record material culture for the purpose of preservation, restoration and presentation.

Innovation:

Our innovation will be to model the site based on the original excavation photos and, with accurate surveying reach an accuracy that allows comparison with our new site modeling.

References:

1. Bruno et al., From 3D reconstruction to virtual reality: A complete methodology for digital archaeological exhibition. Journal of Cultural Heritage

2. Rua, P Alvito Living the past: 3D models, virtual reality and game engines as tools for supporting archaeology and the reconstruction of cultural heritage, Journal of Archaeological Science

Giada CERRI | Giacomo PIRAZZOLI | Marco TANGANELLI | Giorgio VERDIANI | Stefania VITI, Italy

Role of the new technologies on the artefacts seismic vulnerability

Keywords: artefacts vulnerability, artefacts 3d modeling, Juno Fountain analysis

Abstract:

In these decades the seismic vulnerability of buildings have been widely investigated, and many different approaches have been developed for their preservation. Museums' collections, instead, achieved interest from research communities only in the very last years. Artifacts can easily be both valuable and seismic vulnerable, since they can present irregular shape – not easy to be numerically represented – and fragile material. The need to check the seismic vulnerability of artifacts has induced the developments of new techniques aimed at representing their shape and mass distribution through not-invasive approaches, and at simulating their seismic response by means of numerical analyses. In this work a laser scanner analysis has been applied to create a three dimensional digital model of the Bartolomeo Ammannati's "Fontana di Sala Grande", currently located under the vaults of the National Museum of Bargello court, in Florence. The set of data produced can be visualized in interactive modes, creating a sort of "new reality" showing the possible events according to earthquake phenomena, a kind of reality no one want to see getting real, but at the time useful to know for taking countermeasures. Furthermore, the 3D model has been adopted to perform a structural analysis aimed at checking the seismic response of the sculpture complex. The seismic input assumed in the analysis has been found by implementing the seismic hazard of the area, according to the current Code classification, through a proper soil modeling of Florence, defined after the amplification factor distribution. The research, developed by joining different knowledges and fields, is an example of the importance of a multidisciplinary approach for preserving artifacts and museums' collections.

Relevance conference / Relevance session:

The research involves different research areas and methods of analysis in the field of artefacts preservation.

Innovation:

The research provides original information about the seismic vulnerability of an International masterpiece, by adopting an innovative approach.

References:

1. Verdiani, G. Pirazzoli and G. Cerri (2012). "The reconstruction of the "Fontana di Sala Grande": And some hypothesis about its original layout," Proc. 18th Int. Conf. on Virtual Systems and Multimedia, Milan, 2012, pp. 383-390.
2. Jerry Podany (2015). An Overview of Seismic Damage Mitigation for Museums. Inte. Symposium on Advances of Protection Devices for Museum Exhibits, Beijing and Shanghai.

Giorgio VERDIANI | Barbara GUASTINI, Italy

Virtual Museum as a new reality: the case of the "Paper Architectures" rebuild

Keywords: Virtual Museum; Augmented reality; Visionary Architecture; Digital Heritage

Abstract:

The will of experiment the architectural design process on a virtual space, is the main feature of this project; in this case, has been adopted the typology of museum to investigate del potential of virtual reality on architectural visualization.

Its specific structure allows to host a multitude of different collections (3d digital arts, 3d model reconstructions, etc…) and each one of them can be modified in time thank to the flexibility and dynamic state of the museum. It could be a "never-ending" project, or a "continuously growing" museum.

In this contribution, it will be presented a first collection prototype, created from the 3d reconstruction of some of -as they're called- visionary architectures: a selection of works, from the 19th century to today, born "on paper" and never built. Such a collection can be, in general, considered as a bridge between "intangible" and "built" Heritage, but overall an important part of the architectural culture.

The aim of the project is to experiment a different approach in the field of historical "paper architectures", trying to increase their value and their suggestive nature and sharing it through the museum structure.

Basically, the project gives to these (art)works the possibility of spatial perception and through virtual and augmented reality, based on online and site specific platforms, allows them to be explored as a real building inside a virtual world in which they don't have to deal with technical and physical issues. A world where creativity can take place as defined by the will of the original authors.

Relevance conference / Relevance session:

A case study on historical architectural drawings;

Innovation:

A try to applied augmented reality to architectural design and to renew historical architectural works' visualization;

References:

1. Bertol D., Designing Digital Space: An Architect's Guide to Virtual Reality, Wiley,1997
2. Genovese P., Dalla Decostruzione alla Cyber-Architettura e oltre, Liguori Editore, 2005

Adele MAGNELLI | Carla PIRAINO, Italy

The Ara as it was – A multi-medial tale in which history and technology come together to create a fully immersive and multi-sensorial experience

Keywords: Ara Pacis, AR- VR for archaeological heritage, real-time 3D tracking system

Abstract:

The "L'Ara com'era" (The Ara As It Was) project, promoted by the City of Rome (Roma Capitale), Department of Cultural Growth – Capitolina Superintendency of Cultural Heritage, was organised by Zètema Culture Project and assigned to ETT SpA.

This is the first time a work of art has been systematically enhanced using Augmented and Virtual Reality. The subject is one of the most important Roman monuments, Ara Pacis, built by Augustus between 13 and 9 BC.

Samsung GearVR viewers bring the Ara reliefs to life, regaining their original splendour right before visitors' eyes.

ETT utilised a 3D tracking system on this project, making use of the most advanced computer vision algorithms. The entire AR system recognises three-dimensional bas-reliefs and carries out real-time tracking. This recognition system "anchors" the overlay to the real surface, increasing the effectiveness of this immersive experience. This technology lets users see the monument in its original colours, as established by the Superintendency. The voices of Luca Ward and Manuela Mandracchia accompany visitors on the tour of reliefs depicting the sacrifice of Aeneas and the birth of Romulus and Remus, with characters, gestures and deities illustrating the origins of Rome and the lineage of Augustus.

In the three-month period following the opening, there were more than 11,000 visitors, even though it was only open on Friday and Saturday evenings. This result permitted additional investment, with the addition of another two Virtual Reality points of interest. Starting on January 18, the combination of live filming, 3D reconstructions and computer graphics take visitors in the northern part of ancient Campus Martius, where they can watch the first VR reconstruction of a Roman sacrifice.

Feedback is enthusiastic, encouraging us to continue in the use of cutting-edge technologies to enhance our cultural heritage.

Relevance conference / Relevance session:

The project is an important example of how the results of artistic research can effectively reach the audience through the use of cutting-edge technologies, gaining enthusiastic feedback from users.

Innovation:

The entire AR system recognises three-dimensional bas-reliefs and carries out real-time tracking to show the visitors the original colors of the Ara Pacis.

References:

1. http://www.bbc.com/news/av/world-europe-37719897/museum-brings-emperor-back-to-life
2. http://www.artribune.com/progettazione/new-media/2017/03/ara-com-era-ara-pacis-realta-virtuale-aumentata-roma/
3. https://www.archeomatica.it/musei/ara-com-era-un-racconto-in-realta-aumentata-del-museo-dell-ara-pacis

Figure:

Davide PANTILE | Francesco PELLEGRINI, Italy

Consentia Itinera: an interactive and immersive story of the identity of the city of Cosenza

Keywords: Storytelling, Immersive Experience, Virtual reality

Abstract:

The Multimedia Museum Consentia Itinera was born by the will of the Fondazione Attilio and Elena Giuliani Onlus and tells the story, archaeology, events, symbols, landscape, artistic heritage and personalities that have characterized the history of Cosenza (southern Italy), part of the ancient Magna Graecia, and its "crossroads" with Great History.

The museum will be located in the austere and elegant Villa Rendano, built in 1887 by Domenico Rendano, totally restored and will be inaugurated in November 2017.

The layout offers an interactive path that winds through the entire second floor of the Villa, focusing on specific episodes and people and set up with immersive and multimedia tools including virtual reality and wall, circular and holographic projections used to tell the story of Cosenza from the dawn to reach our days.

These solutions combine original images, virtual reconstructions, texts, and voices into a storytelling experience accessible to all visitors where classical authors such as Pliny, Euripides and Ovid and virtual reality travels with bird's eye views or walks in the alleys of the city are connected. The project also includes a mobile app to visit the city at its best.

Among the episodes are the story about the sack of Rome and the treasure of Alarico, that according to a legend is buried in Cosenza, the transformations of the city caused by earthquakes, epidemics and invasions, the Renaissance, the Risorgimento and the unity of Italy.

The story of the twentieth century will be narrated in an environment reproducing a cinema of the early years of the century but equipped with chairs and virtual reality devices. Visitors will enjoy an immersive experience through vintage images to contemporary ones with changing perspectives and themes.

A unique project to enhance stories, images and events of different ages, implemented in a building of remarkable historical-artistic interest.

Relevance for the conference:

Consentia Itinera is a comprehensive project that includes a range of technological tools used to create a multimedia layout within a historical building and a mobile application for the enhancement of the historical-cultural heritage of an entire city.

Relevance for the session:

Consentia Itinera project uses digital technologies such as virtual reality, 3D reconstructions, mobile apps and projections to create a totally new storytelling experience based on the creation of different environments combining virtual and real world.

Innovation:

Consentia Itinera is an example of the use of various digital tools to make accessible thousands of years of history to different kinds of visitors and create an interactive journey to be enjoyed inside and outside the museum and able to engage and communicate according to the principles of edutainment.

References:

1. https://www.youtube.com/watch?v=KDYfBwcpvjo
2. http://www.corrieredellacalabria.it/societ%C3%A0/item/57834-a-cosenza-nasce-un-museo-multimediale

Figure:

Erik DOBAT | Christof FLÜGEL | Patricia WEEKS | Lyn WILSON, Austria | Germany | UK

Advanced Limes Applications for smartphones

Keywords: AR, 3D content, Roman Archaeology, Location Based Services

Abstract:

In 2016 the ALAPP project was granted funding from Creative Europe to develop cutting-edge technology to enhance visitor experience at the Antonine Wall in Central Scotland and on the Limes in Lower Bavaria.

Based on earlier developments of smartphone applications in Bavaria, created for archaeological monuments and museums, the ALAPP project is using the existing technological framework to develop a smartphone platform for the Frontiers of the Roman Empire World Heritage Site. In the future, ALAPP may be used by other cultural and archaeological sites to provide visitors with the latest technology.

Modern smartphones are powerful computer devices and can display any kind of information. The existing platform, based on the applications from Bavaria, already displays a wide variety of content such as video, audio and texts with pictures. Furthermore, GPS navigation provided by smartphones will alert the user when approaching a Point of Interest (POI) in the landscape. The application will display content offline, so an internet connection is not mandatory. This is especially important for remote regions and also for users visiting from different countries.

The ALAPP project is now aiming to enhance the capabilities of the existing platform. For users, new types of content will be introduced:

- rotatable 3D objects
- 360 degree views
- Augmented reality

For content providers, the platform will feature a content management system (CMS) that enables information to be kept up-to-date without the need to upload a new version of the application to the app stores every time.

The archaeology of the Frontiers of the Roman Empire WHS is an ideal monument to install and test the possibilities of modern technology. The ALAPP platform will be available for Android and iOS. The Creative Europe project started in 2016 and will be finished in 2019.

Relevance conference / Relevance session:

The creative Europe project ALApp is aiming to create a smartphone platform for the WHS Frontiers of the Roman Empire trying to present archaeology with the latest technology to a public audience.

Innovation:

The application can display all forms of content currently available linked to a database enabling live updates of the content in the application.

References:

1. http://www.antoninewall.org/visiting-the-wall/download-the-app
2. https://itunes.apple.com/de/app/limes-mittelfranken-mobil/id610299032?mt=8

Figure:

Tiziana CASABURI, Italy

The Archaeological Area of Rome rediscovered with the visual arts

Keywords: Archaeological Area, visual arts, new realities

Abstract:

My research forms part of the current debate on the development of the archaeological landscape in an urban context.

I start by looking at the relevance of our “archaeological heritage” in the modern world and at how the way in which we are exposed to our heritage has developed. From being the preserve of elite to it becoming a base resource for mass tourism.

In the past, the presentation and layout of the archeological sites in Rome were structured in a way that limited access to scholars.

Today mass tourism has opened up our archaeological heritage to a mixed audience.

How can one inform the tourist, packaging the information in a way that is readily accessible without debasing that information?

In coming up with a solution to the problems of presentation, various bodies within Rome opted for an approach using a digital media such as AR “augmented reality” A live but indirect view of archeological sites augmented by computer generated sensory input such as video, graphics and sound in order to convey information in an entertaining way.

Augmented reality has been experimented with, as a guide to various sites such as: The Roman Domus of Palazzo Valentini, Cesare’s Forum, and the projections of the great fire of AD64 during the

reign of Nero at Augusto's Foro and at Domus Aurea.

Using digital technology is one way of opening up and giving the public a key to understanding Rome's archaeological heritage.

Augmented reality can add to the experience of both those that are familiar with the historical layout of the archaeological sites as well as those that are coming anew.

With all that the computer generated sensory input can impart, such as video, graphics and sound, the fundamental and perhaps the most important experience remains that of being there. Being on site and seeing with one's own eyes.

Relevance conference/ Relevance session:

New methods to promote the archaeological landscape in an urban context.

Innovation:

New approach using a digital media such as AR "augmented reality" in Rome's Archaeological Area

References:

1. Domus of Palazzo Valentini
2. Caesar and Augusto's Forum in the Augmented Reality experience of "Viaggio nei Fori"

Figure:

Francesco GABELLONE | Maria CHIFFI | Donatella CAMPANILE | Marisa CORRENTE | Massimiliano PASSARELLI | Francesco FRULLINI, Italy

The Battle of Canne: towards a model of immersive visit with the use of massive character animation

Keywords: Character Animation, Canne, Stereoscopic

Abstract:

The Battle of Canne, near the Ofanto River in Puglia, was the biggest war event in the Second Punic War. As a consequence of events related to this war, Rome could be transformed into an imperial republic of the known world, the ecumene, or forever surrender to the rule of Carthage. At the dawn of 2 August 216 BC, Hannibal brought a devastating victory, but the ultimate outcome of the war, as well known, ended definitively with the victory of the Romans under the guidance of Publius Cornelio Scipione in Zama (202 BC).

Rome gained the control of the entire Mediterranean basin, with decisive political, social and economic repercussions not only for the future of the empire, but determinant for the destiny of the peoples who faced Mare Nostrum.

The Battle of Canne is known as the “battle of excellence”, studied by the military of all times. The war strategy has made school, but is described with many considerable differences of views. Thus, within a renewed antiquarium, the direct study of sources is conjugated with the use of technologies for communication and massive character animation, to offer the opportunity to shows those events, together with all protagonists, within political and social context in the years of punic wars. With the new set-up, the museum opens up to a more dynamic and participative audience, proposing to become a cultural attraction capable of virtuous processes of knowledge transfer, thanks to the potential of new digital languages. The development of self-explaining immersive content, coupled with touch-screen apps, provides a diversified proposal for a heterogeneous target, where, a simplified user-experience was used in conjunction with the most innovative museum communication technologies.

Relevance conference / Relevance session:

Stereoscopic narratives with the use of massive character animation

Innovation:

Stereoscopic view with dual active projectors and different techniques for crowd animation.

References:

1. Brizzi, Canne. La sconfitta che fece vincere Roma, il Mulino, Roma 2016;
2. Ilya Baran, Jovan Popovic, Automatic Rigging and Animation of 3D Characters, ACM 2007 SIGGRAPH conference proceedings

Figure:

Maria Emanuela ALBERTI | Anna Margherita JASINK, Italy

How to dismantle the myth and build it again: Greek mythology vs Bronze Age Agean archaeology

Keywords: Archaeology, Mythology, Augmented Reality, 3D reconstructions

Abstract:

Since its very beginning, the archaeology of Bronze Age Aegean has been variously and erroneously connected to the Greek mythology. The confusion is still present nowadays in publications for the wider public and for school pupils. The aim of the present project is to unravel the various elements clustering around the most famous mythological sagas, separating clearly ancient literary sources from Bronze Age remains. The pupils of primary school are the main intended audience, while other types of public are not excluded. The final aim is to raise in the audience a critical consciousness about the use of mythology and history. The prospective operational environment are then primary school classes, through workshops involving, along with pupils, some specialised operators and their teachers. A typical case study is the saga of the Atreides, conflating a long series of myths and the important remains of Late Bronze Age Mycenae. For archaeologists, it is presently clear that there is no point in seeking in one of the historical phases of the town the 'town of Agamemnon'.

The chosen technical solution are various tales presented through multi-media graphics (hand-drawing, vector images, virtual reconstructions and others), 2D and 3D reconstructions. The main characters are two modern children who read ancient stories, visit Museums and archaeological sites. In their dreams they meet children of Minoan Crete or of Mycenaean Greece, who illustrate the actual situation in ancient times. The plurality of the adopted techniques allows to see in parallel and in combination the various levels of tale, the mythological sources/literature and the archaeological remains. A somehow similar experience made in primary schools (Montelupo Fiorentino, 2014-2017) through the Interactive Museum (MUSINT) was very successful.

Relevance conference / Relevance session:

An example of how new technologies can be used in primary schools to develop a critical approach to culture heritage, especially archaeology and mythology

Innovation:

Innovation is more on contents, i.e. a critical contrast between Aegean Archaeology and mythology, to clearly separate historical reconstruction and mythological narration

References:

1. Jasink, A.M., Tucci, G., Bombardieri, L. (eds): MUSINT. Museo interattivo delle Collezioni egee e cipriote in Toscana. Ricerche ed esperienze di museologia Periploi 3. Firenze University Press, Firenze (2011).
2. Jasink, A.M., Dionisio, G. (eds.): MUSINT 2. Nuove esperienze di ricerca e didattica nella museologia interattiva. Periploi 8. Firenze University Press, Firenze (2016).

Figure:

Anna Margherita JASINK | Cristiana BARANDONI | Isabella VALINOTI, Italy

New Fruition of Aegean Archaeology: a board-game on Minoan Crete

Keywords: Virtual museum, games, education

Abstract:

MUSINT and MUSINT II are part of a long-term project on Aegean and Cypriot collections from Italian Museums. MUSINT contains findings from the Archaeological Museum of Florence and other institutions in Tuscany. MUSINT II concerns the sealings from Haghia Triada (Crete) stored in the Museum of Florence and in the “Luigi Pigorini” National Museum in Rome. One of the main aims of the project is to reach a wider public: in MUSINT a small section was devoted to children and MUSINT II has been recently implemented with a special section entirely dedicated to games.

This essay focuses on the use of games preeminently inside -but also outside- classrooms as a new kind of educational resource. It turns out that games can be a valuable method in teaching Aegean archaeology. Different kinds of games (printed or digital) allow virtual visitors to get more deeply engaged and satisfied. At the same time the general needs of a better fruition of Aegean

archaeological heritage will be achieved.
Although games can be found in many websites, so far they have never been concerned with Aegean archaeology. Indeed, this is a difficult and peculiar subject which needs specific games objectives. MUSINT may be the ideal platform to start with promoting the culture of games based activities in this educational sector.
This contribution will focus on how dedicated board games can maximize the positive perception of archaeology. On the basis of the materials and games of MUSINT II, we are working to the creation of board games on Cnossos and Crete. Crete will be transformed into a platform where, acting and surveying, exploring and playing with archaeological sites, a new relationship between ancient findings and modern engagement is established.

Relevance conference / Relevance session:

The use of new methodologies in the teaching of archaeology

Innovation:

A board game in Aegean archaeology

References:

1. MUSINT 2.Nuove esperienze di ricerca e didattica nella museologia interattiva (A.M.Jasink e G.Dionisio eds)Firenze University Press, Firenze 2016
2. M. Jasink, G. Dionisio “Teaching new technological methodologies applied to ancient history: the profitable example of the Municipal Archaeological Museum and the Primary School of Montelupo Fiorentino, Italy” in CHNT 20, Wien 2015

Session – Reflections and research on archaeological practices in the digital era

(Chairs: Suvi DEBENJAK, Austria | Isto HUVILA, Sweden | Peter TÓTH, Slovakia)

The use of digital methods and tools in archaeology and heritage, whether for documentation, prospection, analysis, visualization and presentation purposes, has increased tremendously during the last decade. There is an increasing emphasis on interdisciplinary cooperation with digital data standing in the centre of research. However, in contrast to the amount of practical and scholarly work that has been devoted to developing and appropriating techniques and methods, there is relatively little research on how digital information, tools and infrastructures are used and what is their impact on research and practice in archaeology and heritage field. Important questions that need to be answered are how digital data is used for assessing the archaeological record or for statistical analysis. It is vital to reflect on the methods with which the historical data is being used and on the impact that these methods have on the archaeological work. A better understanding of these archaeological and heritage practices both through empirical and theoretical research on on-going and past projects, and accounts and methods for assessing and reflecting on practical work is a key to a sustainable development and use of new, innovative and useful digital approaches in the heritage field.
The session brings together papers studying and highlighting archaeological and heritage practices, interdisciplinarity, knowledge production and use, and their impact on digital scholarship and practices in the cultural heritage sector. Papers can focus on the study of methods in digital work in a broad range of contexts from archaeological fieldwork and collections-based research and stewardship of

archaeological and heritage data to scholarship, and archaeological and heritage practices involving local knowledge and global communities. This session invites contributions from both researchers and practitioners conducting theoretical and empirical research and practical projects that provide new knowledge and perspectives to the topic.

The session is organised by the COST Action "Archaeological practices and knowledge work in the digital environment" (http://www.cost.eu/COST_Actions/ca/CA15201).

Suvi DEBENJAK, Austria | Isto HUVILA, Sweden | Peter TÓTH, Slovakia

Reflections and research on archaeological practices in the digital era – introduction

Keywords: archaeology, knowledge production, knowledge work, practices

Abstract:

Archaeology and cultural heritage have often enjoyed a particular status and captured the public imagination. They have become the focus for the expression and negotiation of cultural identities from European to intra-national level. Currently, nations and the European community are making huge efforts in creating technologies, infrastructures and standards for digitization, preservation and dissemination of archaeological knowledge. However, in contrast to the amount of practical and scholarly work that has been devoted to developing and appropriating techniques and methods, and to case studies to demonstrate their viability, there is relatively little research on how digital information, tools and infrastructures are used and what their impact on research and practice in archaeology and heritage field is.

Therefore the aim of the presentation will be to introduce the ongoing COST action "Archaeological practices and knowledge work in the digital environment" (ARKWORK) CA15201, which is targeted at a better understanding of archaeological and heritage practices and the creation of a transdisciplinary network that brings together the work of researchers and their projects. The project aims are implemented through four working groups which closely cooperate within and between themselves. Working groups cover interrelated topics, such as archaeological fieldwork, museum collections and data repositories, relation to global communities as well as archaeological scholarly practices.

Such a transdiciplinary community will strengthen and consolidate the current state-of-the-art, as represented in leading research in the field and will provide a guidance to diverse stakeholders responsible for making, regulating, preserving, managing and using archaeological knowledge.

Innovation:

building transdiciplinary network of researchers on European level

References:

1. Huvila, Perspectives to Archaeological Information in the Digital Society. Uppsala: Department of ALM, Uppsala University, 2014.
2. Vatanen, "The Archaeologist Files: An approach to the digital contextualization of archaeological finds in user adaptive information systems", in Archaeological Informatics: Pushing the Envelope CAA 2001. Computer Applications and Quantitative methods in Archaeology. Proceedings of the 29th Conference, Gotland, April 2001, 2002.

Takehiko NAGAKURA | Rachelle VILLALON | Wenzhe PENG | Diego Cornejo BARRA, USA

Capturing with Community: An Online Collaboration Approach for Cultural Heritage Practice

Keywords: Digital Heritage, Architecture, Collaboration Tool, Data Base, Photogrammetric Modeling

Abstract:

This paper introduces an online collaboration platform as means to facilitate a new type of cultural heritage practice. Over the past decade, capturing a 3D form and its texture has become easily attainable by anyone with an inexpensive device such as a smart phone. This has been made possible by photogrammetric modeling software, and its consumer use now offers an opportunity for heritage documentation projects. These projects can collect a large amount of 3D captured data sampled on site through the help of untrained novices, rather than skilled professionals utilizing special scanning or measurement equipment. However, unorganized 3D captures by novices are just fragments representing parts of the site in varied qualities from different times. Taking advantage of them requires placing them properly in the spatial context of the site and having them related to each other.

Design Heritage is an online platform for posting, assembling and sharing 3D captures, and is under development at MIT. Similar to 3D GIS software, it is a database and 3D visualization tool, with a toolset tailored to help individual participants share a communal project and to integrate various data collected by professionals and novices alike. This paper discusses the design requirements for this system and deployment to various community scenarios such as a private class, public workshop, or community event with open participation. Topics include handling of massive and heterogeneous captures, a permission and moderation scheme for sharing and editing, communication among participants, automation of annotations, data sorting and querying, and delivery with multiple levels of detail.

Examples are illustrated by recent cultural heritage practices in Singapore and Machu Picchu. They demonstrate use cases of this collaborative platform and the possibilities for forming a unique community of participatory practice around an effort to digitally preserve an important heritage site.

Relevance conference:

This paper illustrates a strategy to integrate massive and heterogeneous 3D captures collected by experts of different fields and novices alike through the use of an online platform.

Relevance session:

A communal approach to cultural heritage practice is discussed, and location cases demonstrate use of an online platform with database and visualization tools for collaborating participants.

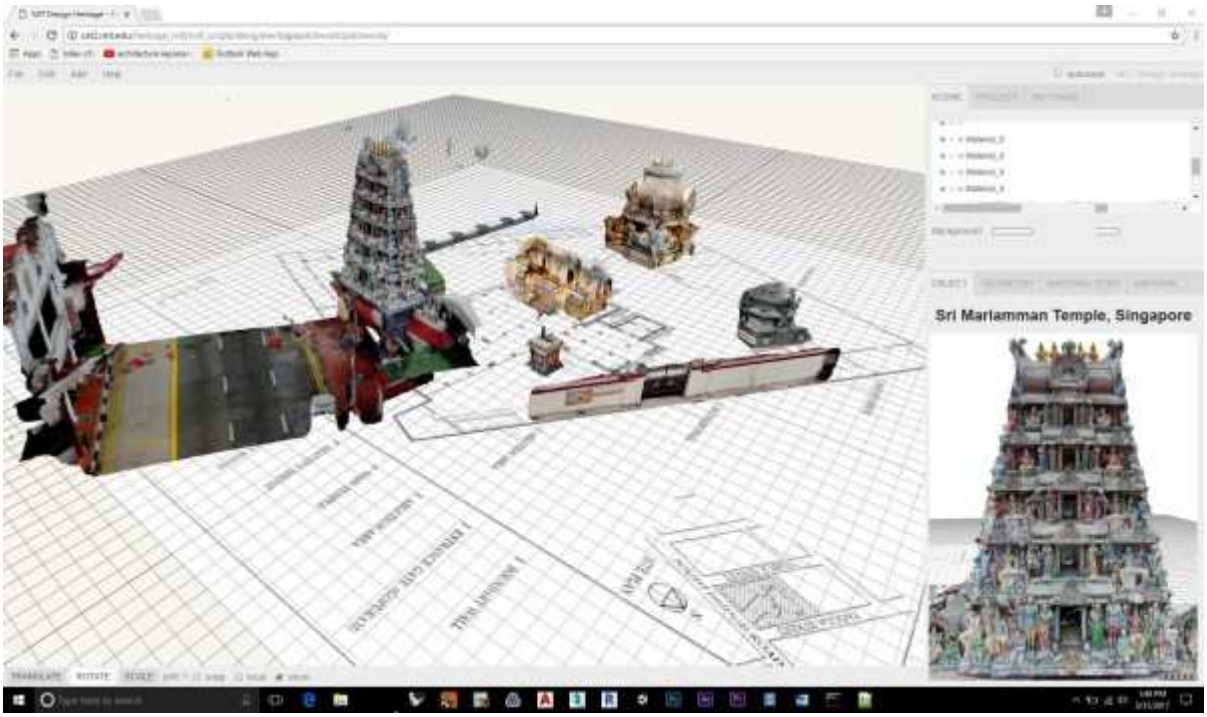
Innovation:

An online platform for posting, assembling and sharing 3D captures is introduced with its toolset tailored to facilitate collaboration of individuals in a cultural heritage project.

References:

1. Agarwal S., Furukawa Y., Snavely N., Simon I., Curless B., Seitz S. and Szeliski S. “Building Rome in a Day”, Communications of the ACM, Vol. 54, No. 10, Pages 105-112, October 2011.
2. Nagakura T., Tsai D., Choi J. “Capturing History Bit by Bit – Architectural Database of Photogrammetric Model and Panoramic Video”, eCAADe, September, 2015

Figure:



Sander MÜNSTER, Germany

A community on digital cultural heritage

Keywords: survey, cultural heritage, community

Abstract:

The proposed contribution is about topics and research approaches of relevance within a community of practice on digital cultural heritage and – closely related – digital archaeologies. It includes results from an online survey involving around 4500 participants which contributed to major conferences in the mentioned field during the past 15 years. Nearly 1000 responses could be collected. What are findings of relevance from this investigation? Most of the researchers are Europeans and especially located in Italy. With regards to their disciplinary background, one third of them are humanists and in particular archaeologists. Other fields of importance are engineering, geosciences and computing. Even if there is a wide scope of topics addressed by a community, most of these topics are around data in terms of data acquisition and management, visualization or analysis. With regards to publication bodies of relevance, especially conference series as CAA or Digital Heritage seem of great importance for scholarly communication. While many single projects were named in the online survey as influencing, only a few projects, primarily funded by the EU were mentioned by multiple researchers. Similarly, there is probably no single institution or method explicitly mentioned as “standard” – maybe due to the diverse nature of approaches to cope with Digital Heritage.

Relevance conference: / Relevance session:

Disciplinary and national backgrounds, topics, methods, podia and projects of relevance for digital heritage were examined via a survey with nearly 1000 participants.

Innovation:

As far as I know it's the survey on that field with most participants.

References:

1. Münster, S. and M. Ioannides, The scientific community of digital heritage in time and space, in 2nd International Congress on Digital Heritage 2015, G. Guidi, et al., Editors. 2015: Granada.
2. Münster, S. Employing bibliometric methods to identify a community, topics and protagonists of digital 3D reconstruction in the humanities. in iConference 2017. 2017. Wuhan.

Martina POLIG | S.C. PHILLIPS | S. MODAFFERI | S. HERMON | L. DORST | M. SPAGNUOLO | C.E. CATALANO | D. OLDMANN | D. TANASE | A. TAL, I. SHIMSHONI, Cyprus

GRAVITATE – a platform for the re-unification, re-association and re-assembly of Cultural Heritage artefacts

Keywords: Semantic, 3D models, similarity, reassociation, reunification, reassembly

Abstract:

The overall aim of GRAVITATE is to provide a digital solution to main challenges in archaeology and cultural heritage, represented by three Rs: Re-Unification, Re-Association and Re-Assembly. This means bringing together fragments of objects now stored in different museum and collections, assembling fragments and artefacts once belonging to a same object or group and virtual restoration of broken artefacts in a digital environment. This will be achieved by creating an innovative research platform integrating 3D geometry analysis with semantic descriptions, 2D/3D puzzling (shapes and colour), natural language processing and advanced visualisation methods. Such a platform will serve the archaeological research community, as well as museum curators and archaeologists in the public sector dealing with curated artefacts. Moreover, it will offer an innovative solution to search for objects of similar criteria and bring them together (digitally) for a comprehensive interpretation through their digital surrogates. Finally, while being a stand-alone platform, GRAVITATE aims to integrate its digital solutions with major large-scale research initiatives, virtual research environments and research infrastructures, such as RESEARCH SPACE, E-RIHS or ARIADNE.

In this paper the functionalities of GRAVITATE that will be offered to the end-user will be briefly introduced, followed by a discussion on issues that were encountered in the project. The structure and codification of metadata and the heterogeneity in terminology and classification within the cultural heritage sector will be addressed, as well as the quality of 3D models and the requirements they have to meet that allow a use beyond mere documentation and visualization. These issues are pertinent to the ongoing digitization of the cultural heritage in Europe and around the world and GRAVITATE aims at contributing to the discussion arising around these efforts. It is hoped that the project illustrates a novel approach for geometrically and semantically exploring, comparing and associating objects in large datasets.

Mieke PFARR-HARFST | Marc GRELLERT | Marco SILVESTRI | Eva-Maria SENG, Germany

Digital 2D and 3D visualisation technologies as research and dissemination tool in Cultural Heritage

Keywords: Cultural Heritage, Research Tool, Visualisation

Abstract:

The interdisciplinary project “Wesersandstein as a global cultural asset – innovation in the construction industry in pre-industrial times (WeSa)” was a cooperation between University of Paderborn and Technische Universität Darmstadt. Founded by Federal Ministry of Education and Research (BMBF), Germany, it was successfully completed in 2017. Intention was to examine prefabrication of buildings in preindustrial age in close interdisciplinary cooperation between history of art and economics, architecture and computer science. Through this interdisciplinary approach, this research project combined different disciplinary perspectives, which have hitherto been studied separately, in a high complex research process.

Different digital 2D and 3D visualization techniques have been used as research tool as well as medium of dissemination. By means of these visualizations it was possible to combine heterogeneous digital and analogue data, documents and further sources to the respective objects in three-dimensionality, thus establishing links and investigating them.

In order to analyze and investigate sandstone facades of different buildings 3D visualization technologies and especially photogrammetry and SFM were used. It was possible to find out similarities of the formats of sandstone and some principles of prefabrication. Furthermore, by means of 3D visualizations different types of ships and their load capacities were investigated. Against this background historical resources such as loading lists or invoices could be verified.

In this context 3D visualizations were also used to find out and classify spatial relationships between topography and loading conditions of sandstone in pre-industrial times.

A further purpose was to visualize historical transport routes of Weser-Sandstone. Therefore, 2D animated maps as well as 3D reconstructions of ships, vehicles as well as transport instruments were used as a tool of dissemination.

Based on the project WeSa the potentials of 2D and 3D visualization types as research, documentation and dissemination tool in Cultural Heritage should be pointed out and defined.

Relevance conference / Relevance session:

This paper is representing digital 2D and 3D visualisation technologies as a future research tool in Cultural Heritage.

Innovation:

The combination of different 2D and 3D visualisation technologies as research tool.

References:

1. Münster, S., Köhler, T., Hoppe, S. (2015): 3D modeling technologies as tools for the reconstruction and visualization of historic items in humanities. A literature-based survey. Perth, 25-28 March 2013.
2. Pfarr-Harfst, M. (2016): General workflows, documentation approaches and principles of 3D reconstructions. Springer, Berlin

Damien VURPILLOT | Matthieu THIVET | Quentin VERRIEZ, France

Aspectus: a flexible collaboration tool for multimodal and multiscalar 3D data exploitation

Keywords: Collaboration tool, Web-based application, 3D data, Open-source, Remote expert solution

Abstract:

High density remote survey technologies (TLS, ALS, Photogrammetry, etc.) have become widespread practices. In recent years, we have seen a tenfold increase in volume of digital data acquired. Beyond this sheer amount of data, multimodal three-dimensional data exploitation has become another common challenge for specialists, whether it be computer scientists or ordinary users.

The Aspectus project aims to ease the access to complex three-dimensional data and to promote collaborative work and remote expert assessment. Thus, we can get past the problem of distance and availability of the "object of expertise", ranging from cultural heritage sites to artefacts. By extension, it enables us to circumvent the ever-present problem of destruction, be it as a result of the excavation itself or as a consequence of natural events or human activities.

From a technical point of view, Aspectus takes advantage of available open source solutions (A-Frame, Potree, 3DHop, Humhub, etc.) to produce a flexible web-based team collaboration tool. It works with commonly used browsers which means no additional installation is required.

With such dynamic and flexible solutions, we can make available innovative visualization and interaction interfaces such as: desktop VR headsets or smartphone VR headsets and Vive/Touch or LeapMotion controllers. We acknowledge the fact that those technologies have added value but remain of circumstantial use and may not be widely available at the moment.

Our top priority is to enhance available collaborative tools by allowing users to easily annotate and share hypothesis and interpretive materials. By extension, we also aim to give the ability to record and share digital assessment sessions (viewpoint and gesture).

Relevance conference / Relevance session:

Our tool relies on innovative open source solutions to ease the process of accessing and assessing complex multimodal 3D data related to cultural heritage.

Innovation:

The innovation lies in our ability to blend high quality multimodal and multiscalar 3D data and access it through a web-based collaboration tool.

References:

1. HESS, Michael, PETROVIC, Vid, MEYER, Dominique, et al. Fusion of multimodal three-dimensional data for comprehensive digital documentation of cultural heritage sites. In : Digital Heritage, 2015. IEEE, 2015. p. 595-602.
2. MARTINEZ-RUBI, Oscar, DE KLEIJN, Maurice, VERHOEVEN, Stefan, et al. Using modular 3D digital earth applications based on point clouds for the study of complex sites.

Pamela JORDAN, Germany

Binaural recording in archaeological site research – a case study

Keywords: Acoustics, binaural, sanctuary, site planning, soundscape

Abstract:

This paper discusses recent acoustics fieldwork conducted at Mt. Lykaion, an ancient Greek sanctuary and games complex dedicated to Zeus. Active for hundreds of years with an ash altar and hippodrome, the complex was monumentally developed around 425BCE with limestone structures including a stoa, bathhouse, administrative building, and various natural fountain houses—all of which lay in complete ruin today. Little is known about the original functions of the site in antiquity, from possible rationality in its physical layout to patterns of use during ritual athletic competitions. Yet despite the physical deterioration, contemporary visitors can experience distinct 'sound-lines' throughout the site, where, in certain locations, unamplified conversations can be held across distances of fifty or one hundred meters. Contemporaneous open-air theaters demonstrate the ancient Greek command of acoustics, suggesting sound could have played a primary role at other sites of public spectacle as well, such as sanctuaries and ritual spaces like Mt. Lykaion.

Concurrent with outside archaeological investigations, digital acoustic explorations are attempting to identify patterns of aural anomalies across the site to help determine whether sound was an intentional driver in the ancient sanctuary's layout and design. A modified impulse response test has been developed and is employed between prominent site locations based on recent architectural and archaeological findings (e.g. building entrances, promontories, unusual seating features). The fidelity and qualities of the surviving signal are recorded at specific points using binaural microphones. Subsequent digital analysis employs the latest acoustic and psychoacoustic metrics (e.g. perceived loudness) to compare recordings and determine whether unusual characteristics align with ancient built features.

Field-testing and evaluation methodologies will be presented in detail. Audio recording results demonstrate how sonic relationships may be traced in open-air settings, using the remains of their underlying, unrecognized acoustics to ask how sites may have functioned in antiquity.

Relevance conference / Relevance session:

This research adds to the collection of digital tools being discussed by proposing binaural sound recording and analysis as a new digital tool for archaeology and heritage investigation.

Innovation:

The methodology proposed in this paper details a new experiential approach to site research by conceiving sound as artifact and digitally tracing the acoustic remnants of the ancient soundscape.

References:

1. Jordan P. Soundscapes in Historic Settings – A Case Study from Ancient Greece. In: Proceedings of InterNoise 2016: August 21-24, 2016, Hamburg: 4783–94.
2. Lubman, D. Is There Really A Whispering Gallery At The Great Ballcourt At Chichen Itza, Mexico? The Journal of the Acoustical Society of America, 2013; 133(5): 3439-3439.

Rowin VAN LANEN | Bert GROENEWOUDT, The Netherlands

Travelling through the centuries. Roman and early-medieval long-distance transport routes as an indication for the potential of large-scale multi-proxy approaches

Keywords: Long-distance transport, Roman period, Early Middle Ages, multiple proxies, daily-life goods

Abstract:

The transition from the Roman period to the Early Middle Ages in many parts of northwestern Europe coincided with a clear economic decline and strongly decreasing population numbers. In many regions, socio-economic conditions changed considerably (e.g. the collapse of markets, surplus-distribution networks) and existing trade routes collapsed. To what extent long-distance transport routes changed from Roman to early-medieval periods is generally unknown. Only few historical sources are available for this transition period, and the archaeological record is complex. Moreover, traditional research on the long-distance exchanges of goods mainly has been focused on the spatial analyses of archaeologically recognisable goods such as jewellery and religious artefacts. Although greatly improving our understanding of long-distance trade, these endeavours in themselves probably do not represent the full spectrum of common exchange networks and transport routes.

In this contribution we present a newly-developed high-resolution reconstruction of first-millennium long-distance transport routes in the Netherlands. By integrating multiple large-scale heritage datasets, for the first time we were able to develop detailed spatiotemporal frameworks regarding long-distance transport based on quantitative data. Using a transdisciplinary approach we modelled changes in the long-distance transport of oak (a common good) for each individual Roman and early-medieval period. By combing the provenance of exogenous timbers with data on modelled first-millennium route networks in GIS we were able to reconstruct: (1) Roman and early-medieval trade networks in structural timbers, (2) changes in long-distance transport, and (3) model core sections (i.e. frequent-travel zones) within the modelled route networks. To validate these reconstructed patterns, the findings were compared with import patterns of other daily-life commodities: pottery and stone household goods. The presented results underline the importance and potential of large-scale transdisciplinary research approaches in archaeological studies, but equally demonstrate the necessity of data validation through comparisons.

Relevance conference / Relevance session:

This contribution shows the potential of data integration for the reconstruction of past transport networks, which were crucial for past urban development.

Innovation:

By applying the presented approach, for the first time a quantitative approach towards reconstructing the spatial and chronological boundary conditions of transport networks was possible.

References:

1. Jansma, E., Haneca, K., Kosian, M.C. (2014) A dendrochronological reassessment of three Roman boats from Utrecht (the Netherlands). Journal of Archaeological Science 50, pp. 484-496

2. Orengo, H.A., Livarda, A. (2015) The seeds of commerce: A network analysis-based approach to the Romano- British transport system, Journal of Archaeological Science, 66, pp. 21 – 35

Filippo DIARA, Italy

State of conservation analysis using remote sensing post processing techniques: the example of early medieval low relief in SS. Assunta e S. Bartolomeo church in Badia Prataglia, Tuscany

Keywords: Badia Prataglia, conservation, low relief, remote sensing, DEM

Abstract:

This work will focus on the state of conservation of low relief in SS. Assunta e S. Bartolomeo church in Badia Prataglia (Poppi) in Tuscany. This sculpture, dated to IX-X sec. A.D., is located into the early medieval crypt of the church, in an epistyle above a little alcove. In this place over the years the rising damp degraded the epistyle decoration and also capitals, getting close to lose the low relief depth. This project of analysis started in 2012, from another photogrammetric project of this church, and after we found an old picture of this sculpture in an article of Alberto Fatucchi, one of the most important scholar of history of Casentino and Tuscany in general. From this old picture (1977) we noticed the different state of conservation of low relief and we decided to plan another photogrammetric survey, in 2016, to understand the low relief changes over the time. Remote sensing techniques, especially post processing methods like digital elevation model (DEM), helped us to know the rising damp action over four years. In addition to the post processing analysis we studied and measured the instruments signs on low relief in order to compare these results with DEM and to organize another analytic survey and an intervention plan.

Julian BOGDANI, Italy

PAThs: putting together Digital Humanities and Archaeology to reconstruct Late Antique and Early Medieval Egyptian landscape

Keywords: Coptic Literature, Egypt, GIS, landscape archaeology, data-mining

Abstract:

“PAThs” Tracking Papyrus and Parchment Paths. An Archaeological Atlas of Coptic Literature is an ERC funded project (Advanced programme) committed to create an open access online Archaeological Atlas of Coptic Literature, i.e. an online GIS platform buttressed by a relational database system apt to accommodate data derived from quite different sources.

Archaeology has a long tradition in integrating heterogeneous information, particularly data obtained by methodologies and techniques borrowed from the hard sciences. Yet, information produced by akin disciplines such as philology, literature, social and religious history—fields of studies that are familiar since long time to digital technologies—has rarely been taken into account.

It is tempting, thus, to consider the digital environment as the new methodological common ground able to put again together disciplines that share goals and objectives, but that has walked along different paths. It is not a matter to over-simplify what has been done so far, but to try to provide digital information systems and networks tools able to establish new connections and hopefully new

knowledge.

Late Antique and Early Medieval Egypt provides a formidable and extremely rich context, both from the archaeological and literary production and dissemination point of view, particularly suitable for such an experimentation. Indeed, the Atlas is meant to supply a thorough description of the physical and cultural landscape of Egypt between the 3rd and 11th centuries, by illustrating in details the archeological landscape where the Coptic literature was born, circulated and propagated, and—in a second step—by integrating the archaeological data with precious information that manuscripts and text provide. In order to do this it is necessary to further bend and adapt well-known tools like GIS and databases to meet new needs, pointing out and trying to resolve new methodological challenges.

Relevance conference / Relevance session:

Digital techniques are the backbone of a project that interlaces archaeology and philological/literary studies to obtain an original contribution for the reconstruction of the late Egyptian landscape.

Innovation:

The Atlas will be a precious tool for the knowledge of Coptic Egypt, not only for the dynamic archaeological maps, but also for describing the cultural landscape that gave birth to Coptic literature.

References:

1. Buzi, P, J. Bogdani, N. Carlig, M.C. Giorda, and A. Soldati. 2017. "'Tracking Papyrus and Parchment Paths: An Archaeological Atlas of Coptic Literature. Literary Texts in Their Geographical Context. Production, Copying, Usage, Dissem…" in Bolletino Del Museo Egizio 1, forthcoming
2. Buzi, P. 2016 "Early Christianity in the Fayyum: the new contribution of Archaeology", in VO XIX, pp. 85-96

Baya BENNOUI LADRAA | Youcef CHENNAOUI, Algeria

Use of photogrammetry for Digital Surveying, documentation and communication of the cultural heritage: Example regarding virtual reconstruction of the ruins of a temple in Tipasa

Keywords: photogrammetry, Digital Surveying, virtual reconstruction

Abstract:

The rangefinder, the theodolite, and more recently photogrammetry and lasergrammetry techniques allow not only the archiving and preservation of data but also virtual reproductions for the transmission and communication of the cultural heritage. However, with the fast evolution of survey techniques arises the question of which are the most conducive to the clearest results.To support this claim, the authors present the approach for the survey of the ruins of the nameless temple located in the Western Park of Tipasa's archaeological site in Algeria, and has been part of UNESCO's World Heritage List since 1982. The method applied for the survey of the temple varies from a simple acquisition by using a theodolite for the big measurements to the photogrammetry for the survey of details. This method has proven very effective if not indispensable for the representation of complex morphologies such as capitals and moulded fragments. This allowed the elaboration of a corpus of different architectural elements of the nameless temple necessary for the recognition and identification of the elements that constitute the type and order of the construction. Additionally, the creation of an

appreciable database in 2D and 3D will allow for new directions of research on different thematics relating to the places of worship of ancient times in North Africa in general and Algeria in particular.

Relevance conference / Relevance session:

Provide an important database for the inventory and research programs relating to the places of worship of ancient times in North Africa in general and Algeria in particular

Innovation:

creation of an appreciable database in 2D and 3D will be necessary for the inventory and research programmes relating to the places of worship of ancient times in North Africa in general and Algeria i

References:

1. Georgopoulos A. (2014). 3D virtual reconstruction of archaeological monuments.Mediterranean Archaeology and Archaeometry, 14(4), 155–164.
2. Gsell, S. (1894). Tipasa, ville de la Maurétanie Césarienne. In Mélanges d'archéologie et d'histoire T. 14. Paris: l'école française de Rome.

Davide TANASI | F.M. MILOTTA | I. GRADANTE | F. STANCO | H. KAPLAN, USA

3D digital imaging for study and semi-automatic matching of ancient Sicilian bronze seals

Keywords: seals, epigraphy, 3D, digital imaging

Abstract:

In the last decade the epigraphists have grown a new interest in signacula, a class of artifacts for a long time neglected. This has brought numerous contributions devoted to the different regional contexts, along with reflections on methodological questions, not to mention the momentum towards the digitizing of a corpus which counts at least 3,500 pieces, confirming the great potential of these artifacts in providing information related not only to the economy and to the administration of the res, both in public and private sphere, but also about the profile of the signacula holders. In this scenario, a specific research question has been inspired by the Sicilian seals – about 60 signacula and a dozen impressions left by seals on mortar in burial contexts –: it is possible to identify unequivocally a signaculum through its impression? Given for granted that the use of 3D documentation will bring along effective results in terms of improved readability of signacula and seals, the aim of this contribute is to establish a protocol for a semi-automatic matching between 3D models of seals and 3D models of impressions. As part of a preliminary scanning campaign of Late Roman impressions on mortars and metal seals from the catacombs of Siracusa, a bronze metal was digitized with a NextEngine 3D triangulation laser scanner and subsequently 3D printed with liquid resin with a Formlabs Form 2 SLA high resolution printer. The cast obtained, was experimentally used to create a set of impressions on mortar using different degrees and angles of pressure, in order to create similar but still different stamps. During the next step, the impressions were 3D scanned and used as ground truth for the outlined semi-automatic procedure of matching with the seal. In Meshlab environment, the 3d model of the seal and that of the impression were manually aligned and then the distance between two sets of 3D points was measured using the filter Hausdorff distance in order to validate a matching. This successful exercise could open the way to the proposal of creating a virtual edition of signacula

with 3D models metadata. Furthermore, a research agenda may include the design of a machine learning algorithm for matching of 3D meshes.

Sandro PARRINELLO | Daniele BURSICH, Italy

3D Documentation for the study of the UNESCO site of Masada: methodologies and applied research for the analysis of Roman fields

Keywords: 3D scanner, photogrammetric survey, archaeology, roman camp, roman tent

Abstract:

The Masada Research Project – MRP is an inter-university project launched in 2013 and developed within international agreements among the University of Pavia, the University of Florence and the Department of Interior Building and Environment Design – Shenkar College of Israel, for the development of documentation methods of the archaeological area of Masada through digital technologies.

MRP saw numerous campaigns conducted on site to detect the entire plateau and surrounding roman camps. The aim of the project is to define experimental methodologies and test reliability by combining and integrating different data acquisition techniques, for the construction of reliable models and for managing cultural heritage.

An international multidisciplinary team was coordinated to document the site by using 3D laser scanner and photogrammetric survey or SFM techniques; The data collected and systematized into a digital archive, formed a database of photos and drawings useful for digital and virtual reconstruction, which illustrates site conditions at the various evolutionary stages of Masada.

In particular, during the third documentation campaign (2015), it's been completed the relief of the buildings present on the plateau and some Roman camps, especially the H camp and the main legionnaire (F2) the so called "Silva Camp". An analysis of the findings of the latter, thanks to an in-depth archaeological study it was possible to make some interesting proposals for architectural reconstruction of some military buildings, connected with the historical picture of the site.

Session – PhD / Master Session

(Chairs: Martina POLIG, Sweden | Benjamin STANGL, Austria)

A crucial aspect of the conference „Cultural Heritage and New Technologies" is that it brings together researchers from different fields and backgrounds, creating a platform that enables and promotes the exchange of ideas. A discussion that can only benefit from the input and perspectives of the young scientific generation. Their participation will enrich the scientific ambient with their fresh views as well as give them the opportunity to confront themselves with their peers in the context of an international conference. Therefore, we invite students and recent graduates to present their ongoing or finished Master or PhD thesis at the conference. New ideas, new ways of thinking, clever solutions, workarounds and critical thoughts are especially welcome.

The topic of the presentation should be within the scope of cultural heritage and new technologies. However, presentations that are within this year's main topic "Urban Archaeology and Integration.

Combining archaeology, history, and new technologies" will be given preference. The session wants to encourage young scientists to present for their first time at an international conference.
Only presenters, who have not yet given a presentation at this conference will be accepted for this session. To facilitate and encourage the participation the conference organizers agreed that every presenter will get free admission to the conference.

Niklaas GÖRSCH, Germany

Ptolemy's Geography and the Tabulae modernae. A comparison using the example of the Arabian Peninsula

Keywords: Historical Geography, Digital Humanities, Recogito, QGIS

Abstract:

Klaudios Ptolemaios (c. 100 – c. 170) compiled the geographical knowledge of the 2nd century in his Geography. From a historical and geographical point of view, his collection is a unique source of investigation. In Europe, the Geography was rediscovered in the early 15th century.
This paper wants to account for questions on geographical knowledge existing in the ancient Mediterranean and in 15th century Europe about the Arabian Peninsula, the then so-called Arabia Felix. An aspect of this paper investigates what kind of toponyms in this area we preserved through the Geography and how this knowledge was received by geographers and mapmakers in their Tabulae modernae (or novae) in the 15th century.
This paper uses traditional historical methods and new technologies. On the one hand, methods from philology and historical geography are employed. On the other hand, open data methods are used to compare already known locations from historical and archaeological research and make it possible to discuss solutions to rediscover places, which are unknown in modern times but were localized and are mentioned by Ptolemy. QGIS as well as the web-based tool Recogito and its gazetteers will be applied to make similarities between the antiquity and the early modern period visible by creating a map with different layers.
The implementation of Digital Humanities in current historical research allows a collaborative workspace in which historical issues can be visualized and discussed more efficiently. In order to embed the results of this paper into the current research Linked Open Geodata will be used for comparing maps and its toponyms of certain areas of the Arabian Peninsula.

Relevance conference / Relevance session:

The geographical understanding of the world plays a crucial role in shaping the reality and the imagination of any culture.

Innovation:

The paper compares geographical knowledge from different periods of time about the Arabian Peninsula by employing traditional historical methods and tools from the Digital Humanities.

Fabian RIEBSCHLÄGER, Germany

Exploratory and comparative Analysis of Archaeological Excavation Databases

Keywords: data mining, databases, archaeological reasoning, spatio-temporal patterns

Abstract:

Excavations are arguably one of the most important sources for archaeological data. Since the information gained from this data plays a significant role in the process of archaeological reasoning it was long argued, that the data itself should be accessible to evaluate the claims which were made based upon it. Although the development and use of databases as part of the excavation recording strategies has a long tradition in archaeological research, only in recent times, with an advancement in technology and more accessible database systems more excavations store their data as digital records in databases in a way that access to them could be provided easily. By the means of integration, it is now theoretically possible to compare different excavations at the level of its records. To achieve this, in my PhD Thesis, working with excavation data stored in iDAI.field, I study an exploratory and comparative approach to analyse the content of archaeological excavation databases. This approach is based on methods from data mining (in most cases in R and Python) with the goal to identify relevant, nontrivial patterns for the interpretation. Because of the evasive and incomplete nature of the archaeological record and the resulting uncertainty, the interaction between the archaeologist and the mostly exploratory algorithms like clustering, frequent pattern mining or outlier detection is considered essential. Avoiding blackboxing, identifying metadata which could be used for "Quellenkritik", data visualization and the reproducibility of the achieved results are therefore an important part of this type of data analysis. My aim is, to offer an epistemological framework within which these methods could be applied.

Dominik HAGMANN, Austria

Brave New World: Digital Archaeology at Molino San Vincenzo/Tuscany (ITA)

Keywords: digital archaeology, roman archaeology, excavation, master thesis

Abstract:

The presented thesis deals with the topic of digitalization in the humanities and has a clear focus on digital archaeology. Within this methodological and theoretical framework and as a case study, the implementation of various digital archaeological methods is tested in course of a modern archaeological research and training excavation at "Molino San Vincenzo" in Tuscany/Italy. The site is located on farmland in the Pesa valley near Florence and Empoli in the municipality of Montespertoli and has been seriously damaged by modern plowing. However, various archaeological structures were clearly identified by different invasive and non-invasive investigations. The material culture can be interpreted as remnants of an ancient medium-sized settlement. Since 2012, the Department of Classical Archaeology at the University of Vienna studies the site archaeologically.

Digital archaeology at the site of Molino San Vincenzo is mainly based on the intense use and combination of different methods, like (nearly) fully digitized and GIS-based excavation workflows, enhanced metadata recording of the excavation process using video documentation, and a science to

science/public data dissemination concept considering social media, open access, and long term data archiving. These diverse concepts of gathering, managing, and presenting digital archaeological data are critically evaluated in course of the thesis. Therefore, the lecture tries to question the relevance and (dis)advantages of integrating digital archaeology in today's field research in practice and theory. The talk takes the significant quantitative (and qualitative?) increase of digital data into account and considers special aspects like the usefulness of paperless fieldwork, time- and cost-efficiency of digital documentation tools, storage space requirements, and archaeological information quality.
All in all, the lecture wants to evaluate the possibilities as well as the limits of state-of-the-art computing in archaeology and the role it plays in gaining archaeological knowledge.

Relevance conference / Relevance session:

The presented thesis deals with the integration of digital archaeology into an archaeological research and training excavation.

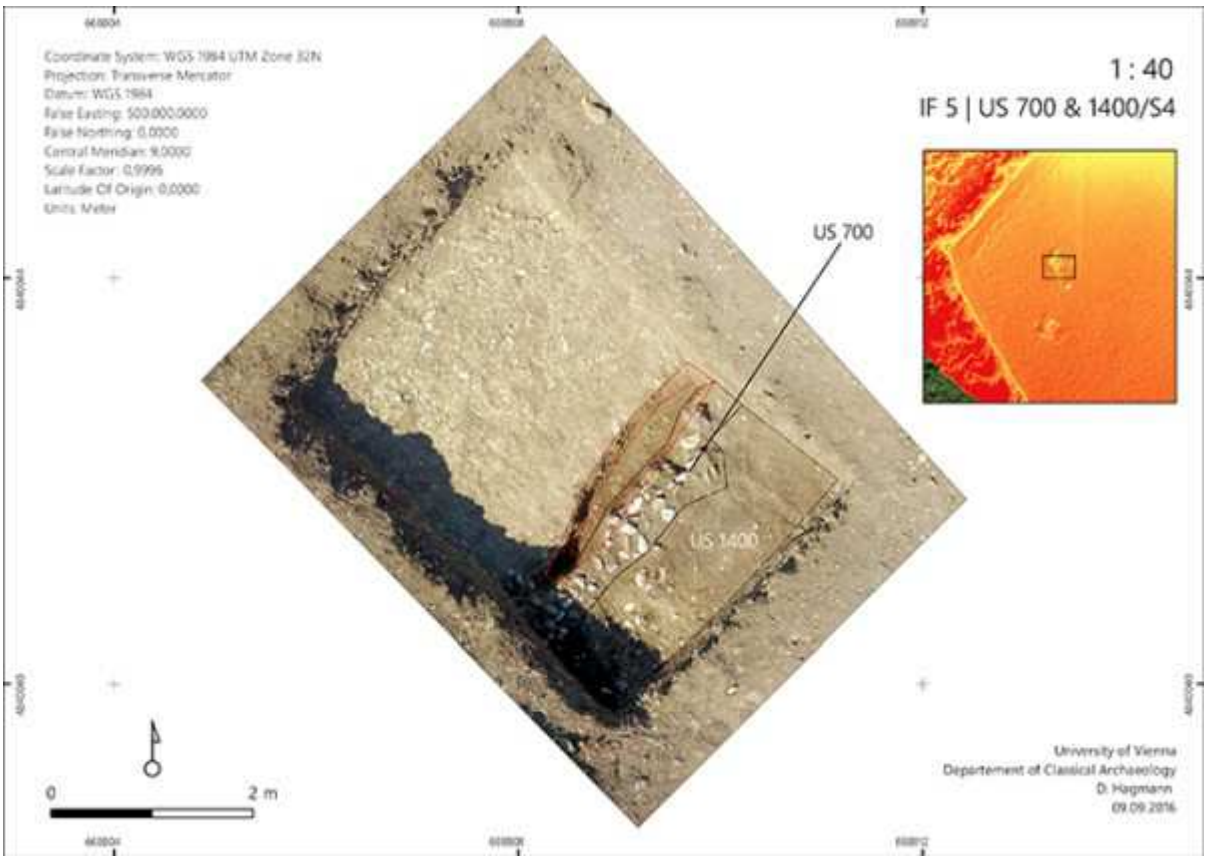
Innovation:

Several different state-of-the-art digital-archaeological methods are combined and critically evaluated at an archaeological excavation.

References:

1. C. H. Roosevelt, P. Cobb, E. Moss, B. R. Olson & S. Ünlüsoy, Excavation is (Destruction) Digitization: Advances in Archaeological Practice, Journal Of Field Archaeology 40/3, 2015, http://dx.doi.org/10.1179/2042458215Y.0000000004
2. G. Schörner, D. Hagmann & V. Schreck, Die site Molino San Vincenzo, Archäologie Österreichs 26/2, 2015, 56-59, http://phaidra.univie.ac.at/o:471843

Figure:



Harmilyanti SULISTYANI, The Netherlands

Reading a Railway Station Photograph: A Story of a Java Railway Station Architecture in the Colonial Age

Keywords: railway architecture, a biographical approach, 3D-methods, heritage

Abstract:

The presence of the Dutch as a colonial power on Java introduces railway system and its architecture for a Javanese in the middle of 19th century. The railways were a part of a colonial system, which facilitated the exploitation of natural resources of the island. It is an instrument of the colonizing power, which generated an economic space. The Java railway stations were a material culture in an urban setting, which formed as a tool and result of the state formation in Dutch colonial age.

This research started with scrutinizes an image as an artifact that is a photograph. Although it is a two-dimensional, however, an image in the photograph can give framing information that text cannot support. The visual evidence was used to identify the typology and morphology architecture. A series railways station presented from a synchronic and diachronic perspective related to its establishment. The history behind the station development will be reconstructed by departing from its architectural appearance using information from a photograph which transformed into a 3D model and walkthrough animation. This new role technology will provide a simulation of the station realistic condition since it was built 150 years ago until now. A complete visual information of the building since it was developed, used and a present condition can take a look through a virtual animation. In the next phase, the architectural context of the selection will be explained by studying the forming of the railway companies, railway constitution, and concession negotiations between the colonial government, private company and local rulers.

The general aim of the research is to provide a thorough understanding of the lifecycle of the railway station on Java, which showed the process of technology transfer in architecture that involved the transformation of culture. A reconstruction story through a biographical approach can help establish both the intellectual framework and the visual background for the repair and/or transformation of old stations that are conceived as cultural heritage.

Relevance conference / Relevance session:

The corpus of the research is a chronological catalogue of the railway stations in Java, which in terms of heritage it will become a data to conserve the old ones.

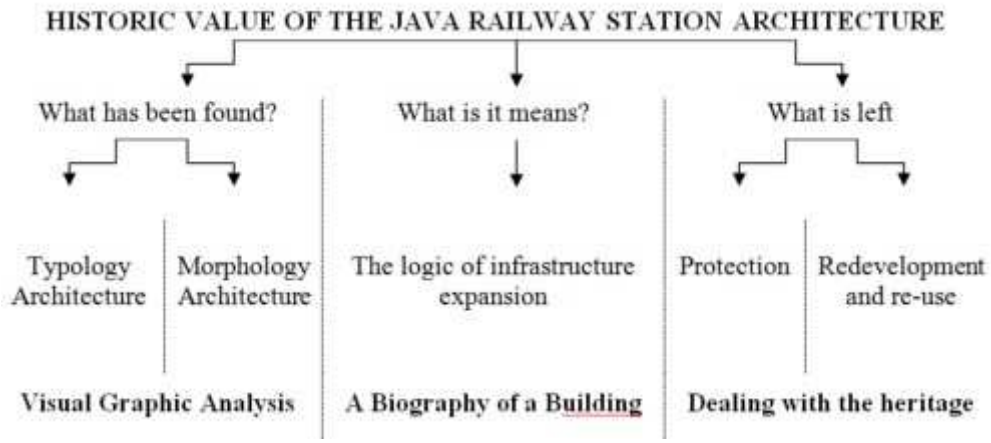
Innovation:

The biographical approach can help to explain the circulation of things and to see how one object related to another.

References:

1. Burman, Peter and Stratton, Michael (Eds), Conserving The Railway Heritage, Routledge (London), 1997
2. Revesteijn, Wim and Kop, Jan, For Profit and Prosperity: The Contribution made by Dutch Engineers to Public Works in Indonesia (1800-2000), Zaltbommel (Aprilis) 2008

Figure:



Farnaz MOHSENI, Germany

Successes and Failures of Visual Impact Assessment (VIA): Recommendations on Integrating VIA in the Urban Planning Process in Iran

Keywords: Visual Impact Assessment, Integration in urban development plan, Historic Urban Landscape, Cultural Heritage, conflicts

Abstract:

In the past few years the Visual Impact Assessment (VIA) is being widely applied by experts as a methodology of safeguarding the visual significance of cultural heritage in the natural and built environments. Nevertheless, implementing VIA in urban settlements faces more critical challenges, influenced by conflicting concepts of urban development and heritage conservation. The fact that VIA is a predictive tool which foresees the visual impact of individual developments on the limited number of viewpoints, makes it a case-by-case solution lacking the financial advantage, especially in developing countries. Not only is the precise 3D visualization of city districts a remarkable financial burden for municipal organizations, the VIA is also a late-stage explication for developers. Leading to the waste of money and time, VIA suggests major changes in the structure of development in almost final steps of architectural design. As a consequence, this can set the stage for conflicts between stakeholders and developers. Suffice to say that the method is expert-oriented and does not consider residents opinion in safeguarding Historic Urban Landscapes. This papers, aims to investigate the merits and demerits of VIA and to propose its integration in the urban planning process in a way to advantage the privileges of this method and curtail its drawbacks. It is believed that VIA should be a complimentary part of urban development plans. In addition, the development plans should be revised in accordance with visual preferences of residents.

Relevance conference / Relevance session:

The paper is mainly concerned with the subjects of Visual Impact Assessment (A 3D visualization tool) and urban heritage which are both highly connected to the aims and topic of the conference.

Innovation:

Applying the VIA as a complimentary stage of urban development plans.

References:

1. Ripp, M., & Rodwell, D. (2016). The governance of urban heritage. The Historic Environment: Policy & Practice, 7(1), 81-108.
2. Albert, M-T. (2015). Perceptions of Sustainability in Heritage Studies: De Gruyter

Alison MCCANDLISH, UK

Revealing hidden cultural heritage through digital cultural asset mapping

Keywords: culture, heritage, digital technology, mapping

Abstract:

New technologies have the potential to widen the audience for heritage and cultural activities, as well as contributing to policy goals relating to growth throughout Europe. This evolution of communication and presentation methods provides ways to explore and capture tangible and intangible heritage, forming an interactive, discursive archive.

The discipline of cultural asset mapping has the potential to inform policy; this research investigates the development of a digital cultural asset map as a method of revealing a picture of the breadth and spread of cultural activity in Renfrewshire, Scotland using creative techniques to work with groups that traditionally find participation difficult, helping to give them a greater voice within the context of activity around the bid for UK City of Culture status.

There are four types of hidden cultural heritage, unseen unknown undervalued and untold; creative approaches to working with communities can reveal these hidden assets. In this PhD a combination of participatory geographical information systems (GIS), cognitive mapping and digital storytelling approaches are utilised in order to reveal and celebrate hidden stories of community creativity and heritage, referencing the title of the adopted local heritage asset strategy 'Paisley the Untold Story'.

The work will result in knowledge exchange events between the University of the West of Scotland, Renfrewshire Council and the Creative Renfrewshire Network and the results of the research will feed into the DCMS bid for UK City of Culture 2021; contributing to this national competition and to the cultural mapping, participatory arts and community heritage engagement fields.

Relevance conference / Relevance session:

ArcGIS Story Maps are an emerging form of computerised mapping; my PhD examines the creative potential of this tool to explore the location, distribution and meaning of cultural assets.

Innovation:

My research is situated within a live project context (bidding for UK City of Culture); it a unique and time limited opportunity for a researcher with the potential to stimulate debate around culture

References:

1. Arnstein, S. R. (1969) A Ladder Of Citizen Participation. Journal of the American Institute of Planners. Vol.35 (4), pp.216–224
2. Lee, D. and Gilmore, A. (2012) Mapping cultural assets and evaluating significance: theory, methodology and practice. Cultural Trends. Vol.21 (February 2015), pp.3–28.

Session – 3D digital reconstruction and related documentation sources

(Chairs: Fabrizio I. APOLLONIO, Italy | Krzysztof KOSZEWSKI, Poland | Piotr KUROCZYŃSKI, Germany)

Over the last few years the broad application and rapid technological development of 2D / 3D digitalization open toward new scenarios and new challenges from big data to semantic web technologies, and to the exponential growth in data accessible via digital libraries.
Urban historians, archeologist, architecture and art historians, as well as common people widely use the 3D Digital Reconstruction in many research projects, as well as they benefit through popular publications, multimedia products, or using digital applications in museums and different kind of exhibitions.
Within the broad field of the 3D Digital Reconstruction, the session would like to deepen the application of effective 3D-methods for the reconstruction of buildings or artefacts, able to increase our ability to understand the past. The 3D Digital Reconstruction process regularly draws heterogeneous sources, integrating evidence and/or archaeological excavation data with historical sources including texts and images, and furthermore filling the lacunas proposing interpretative hypotheses or reconstructive conjectures. Therefore, we should be able to analyze and evaluate the right contribution of those different sources to achieve the final outcome.
The purpose of the session is to concentrate on some still not solved questions related to digital documentation of the reconstructive process and re-contextualization of the results, mainly focusing on the following topics:

- the critical analysis of the written sources and of the different kind of images documentations (drawings, sketches, paintings, engravings, photos, etc.)
- the metadata related to documentary sources
- the knowledge representation and visualization standards
- the interoperability and data access related to the digital hypothetical 3D Digital Reconstruction.
- the methodology of using 3D Digital Reconstructions as research tools in multi-professional (or interdisciplinary) environments
- the reliability of 3D Digital Reconstructions as research tools in terms of scientific regimes.

Richard KURDIOVSKY | Julia FORSTER | Christoph HOFFMANN | Elmar SCHMIDINGER | Andreas VOIGT | Herbert WITTINE | Gabriel WURZER, Austria

Using the 3D-modell of the Vienna Hofburg to store written and pictorial historical sources from collections and archives

Keywords: Three-dimensional archive, spatial presentation of digitized historical documents, cross-border tool for the humanities, re-use of 3D-models

Abstract:
A 3D-modell of the Vienna Hofburg consisting of twelve stages from the 13th century until 1835 was built to make the construction and planning process of this palace easily comprehensible. The basis

for this reconstruction was formed by archaeological findings and by the analysis of handwritten and printed historical sources including pictorial sources like architectural drawings. Questions of sustainability of digital models and the responsibility of publicly funded research projects have lead us to believe that 3D-models and the large number of digitized data have the potential for future use. We are aiming at constructing an online-prototype which locates the written and the pictorial sources according to time and space within the 3D-model as a three dimensional archive which allows to analyse the building and the respective sources both synchronically and diachronically.
Our paper will focus on the challenges we face both on the side of IT-technology (e. g. the structure of storing and correlating data, the divergent quality of digitized objects) and on the side of the visualization of a big amount of heterogeneous data within a three-dimensional frame (e. g. the complex situation of written sources which can simultaneously contain a range of information on different topics and dates of diverse character or the problem of visualising uncertainties of text-based data for a spatial context). This new visualisation of data can offer new contextual visions of a built structure and new ways of looking at source materials for different scientific disciplines transcending architectural history towards other text-based disciplines to help interpreting written sources which deal with a spatial situation.

Relevance conference / Relevance session:

Making use of a 3D-reconstruction as a three-dimensional digital archive for written and pictorial sources creates a link for an interdisciplinary approach towards and a transdisciplinary use of digit

Innovation:

The innovative potential of our three-dimensional archive lies in the planned online-based retrieval of historical sources within a spatial context.

Emanuel DEMETRESCU | Marilena COZZOLINO | Daniele FERDANI | Vincenzo GENTILE | Tatjana KOPRIVICA, Italy

Integrating photogrammetric, geophysical, and virtual reconstruction methodologies in archaeology: the Roman Baths at Doclea

Keywords: Geophysics, Photogrammetry, Virtual Reconstruction, Extended Matrix

Abstract:

The contribution presents the integration of geophisical and photogrammetric methodologies aimed at the interpretation and virtual reconstruction of the Roman Thermae at Doclea (Montenegro). The town is the most important site of the Roman period in Montenegro and has been investigated by the CNR-ITABC and the University of Podgoritza since 2016.
Given that, the research started with the aim of detetcting buried architectures and to reconstruct the overall urban layout integrating geophisical survey and 3d image-based modeling. The researches started from the Thermal Bath of the forum. Only a small part of the Roman Bath was excavated while the rest of the structures remain buried.
Geophysical survey allowed the physical parameters of the subsoil to be mapped providing useful information on the depth and shape of possible regular structures belonging to the thermal bath. The high resistivity data, were visualised as image and georeferenced togheter with aerial photos and 3d

models of the extant structures excavated in 1962 and surveyed using photogrammetic approach. The integration of this kind of data allowed the arrangment of this city's sector to be interpreted. Basing on this, a volumetric recontruction was performed. The recostruction of the missing part was mostly based on comparisons with similar structure from other archaeological contexts and using data coming from existent building and archaeological studies performed on the city. The reconstructive record has been recorded and managed using the Extended Matrix. Workflow and integration procedures of different techniques will be deepened step by step in the article highlithing adavantages and possible developments.

Relevance conference:

The contribution integrates new technologies with the aim to enhance the scientific interpretation and hypothesis making of an ancient archaeological context.

Relevance session:

The contribution integrates new technologies with the aim to enhance the scientific interpretation and hypothesis making of an ancient archaeological context.

Innovation:

The innovation of the paper is in the evaluation of methods able to combine the geophysical and photogrammetric techniques into a virtual reconstruction hypothesis.

References:

1. Koch, J., L. Kühne, R. Linck, and J.W.E. Fassbinder (2013), 3D-reconstruction of Roman sites in Bavaria based on geophysical results, in Virtual Archaeology, edited by State Hermitage Museum St. Petersburg, pp. 94-102
2. Gaffney, C. (2008), Detecting trends in the prediction of the buried past: a review of geophysical techniques in archaeology. Archaeometry 50(2). pp: 313–336

Alessandro VECCHIONE | Marco CALLIERI, Italy

Claudian Aqueduct in Rome, from the 3D survey to the virtual reconstruction according to archaeological records

Keywords: Aqueduct , Rome , virtual reconstruction

Abstract:

This paper presents a possible way to manage a virtual reconstruction of the Roman aqueduct Aqua Claudia in Rome, in particular, the section between Tor Fiscale and Porta Furba. The aqueduct is a peculiar monument, because it spans multiple scales: it has an architectural scale, as a building, but also a landscape scale, as a part of the local geography, and also a detail scale, considering each section as a single entity, with traces and carachteristics worth to be investigated.

Furthermore the modern urban illegal development and the fragmentary conservation status of the aqueduct due to a wide middle-age mining phase, resulted in the monument being split in several chunks, each one, now, an object on its own.

These considerations had a great influence on the methodology and on the data recording technique we had to choose: a classical total station survey was paired with a photogrammetric campaign, to cope with the different scales of the monument to be documented.

For the second step, that is the organization and visualization of the collected data, we chose to work with 3DHOP (3D Heritage Online Presenter), an open-source software package for the creation of interactive Web presentations of high-resolution 3D models. Using this tool, we have built a “3D hub” that, at different scales, can link together the 3D geoemtry, the data from the ground surveys and the classical archaeological records, providing a more immediate and structured access to the available information.

Thus, we have split the visualization into two differents layer: the first one, at a landscape scale, let us to have a complete view of the section; the second layer is focused on the single chunks of the monument, especially on their structure, to better understand the ancient building techniques and its evolution in time. The surveyed data will be also enriched with a modeling of the original shape of the aqueduct, and of its modifications.

Relevance conference / Relevance session:

The paper is focused in integrating archeological data in the framework of the ancient and modern cityscape, integrating different media using 3D as a spatial organization substrate.

Innovation:

We use the 3D data to provide a more natural access to the gathered information, exploiting the geometry space to spatially organize the data, and following the multi-scale nature of the monument.

References:

1. Ministero per i beni culturali\Istituto Nazionale per la Grafica – I.W.S.A. – A.C.E.A., “Il trionfo dell’acqua. Immagini e forme dell’acqua nelle arti figurative”. Ernesto Paleani Editore, Roma, 1986
2. 3DHOP: 3D Heritage Online Presenter
   Marco Potenziani, , Marco Callieri, Matteo Dellepiane, Massimiliano Corsini, Federico Ponchio, Roberto Scopigno, Visual Computing Lab, ISTI CNR, Pisa, Italy

Figure:

Anne MOLLENHAUER | Martina MÜLLER-WIENER | Dietmar KURAPKAT | Tutku TOPAL | Mayssoun ISSA | Zoya MASOUD | Martin FLEISCHMANN | Franz AUßERSTORFER, Germany

3D-model as a basis for the discussion on the reconstruction of the Aleppo bazaar

Keywords: 3D-model, reconstruction, postwar rehabilitation, Aleppo, bazaar

Abstract:

In 1989 the old city of Aleppo was declared world heritage. Since 2011 the city became one of the hotspots of the armed conflict in Syria and a great number of historical buildings were damaged or destroyed. The project presented by this paper is one of the “Stunde Null” projects. Designed as cooperation between the German Archaeological Institute, the OTH Regensburg and a group of free researchers, the project aims at creating a scientifically based 3D model of the bazaar in its condition before the destructions since 2012. The model will be delivered to the very heterogeneous groups of actors involved in decision-making and planning of rehabilitation measures as an instrument that illustrates the historical monuments of the bazaar and conveys the complexity of its structures.

The construction of the virtual 3D model is carried out in a number of successive working steps. After dividing the bazaar into sectors, a pilot area was chosen.

First, a survey on available data was carried out. The most important data sources are the Syrian Heritage Archive Project (SHAP) and the University of Aleppo. Plans (ground plans, sections and facades), photographs (historical and current) and scientific research on the buildings of the bazaar were collected, evaluated, sorted and integrated in a systematic folder structure, that allows fast and easy access to the data.

The hand-made hard surface 3D model is developed on the basis of the plans and photos collected from several sources, using ArchiCAD, SketchUP and 3ds Max. Appearing differences are equalized manually.

Using virtual reality will simplify the rendering of the 3D model on different output devices. The model will contain several levels of details depending on the distance of viewer position and knowledge about the single buildings. The provided metadata will include descriptive textual information but also architectural background information.

Relevance conference:

Presenting an example for the application of new technologies to
document, understand, visualize and safeguard cultural heritage.

Relevance session:

Using 3D-methods for the virtual reconstruction of war-damaged historical area, to increase our understanding of its past in order to prepare for future rehabilitation plans.

Innovation:

The model serves as a tool for visualizing and documenting, yet its development process enables an exact verification of the available data on the buildings and the reliability of its reconstruction.

Marc GRELLERT | Mieke PFARR-HARFST | Jochen SCHMID, Germany

Documentation for Virtual Reconstructions One Year R-A-M – Reconstruction-Argumentation-Method – A Report of First Experiences

Keywords: virtual reconstruction, documentation, standards

Abstract:

A year ago the documentation method for virtual reconstructions, "R-A-M", (Reconstruction-Argumentation-Method), developed in Darmstadt, was introduced to the international community. This project was presented at the Euromed in Nicosia and at the CHNT in Vienna and in the meantime has been developed into an online tool in the status of a prototype and has been used by various projects (www.sciedoc.org). Based on the fact that it was common that no documentation was made for virtual reconstructions, due in part because the client did not request this, lack of established standards and, as a rule, insufficient human and financial resources, in 2016 the Digital Design Unit of the Technical University of Darmstadt developed a proposal for a minimal standard. This concept stemmed from the consideration that one needed to reduce the hindrances for documentation and instead choose a practical approach that was extremely user friendly and very easy to understand.

The paper reports about the actual status of the development, about the use as a communication tool (Cloister Altenberg, Archaeological Zone Cologne) as well as the experience gathered with the belated documentation of projects (Tell Halaf, scientific advise Vorderasiatisches Museum Berlin). Already now the use of the tool shows that the work procedure for a reconstruction was able to be systemized and in perspective also be standardized without bypassing individual work methods. The question is whether systematization can be so effectively developed that in the end through the use of such a tool as a communication platform a documentation of fundamental principles, processes and results of the reconstruction can be achieved that satisfy the requirements of a scientific publication. The goal is to come to an agreement with as many national and international parties as to how virtual reconstructions are to be documented in the future.

Relevance conference / Relevance session:

Documentation is an important and basic question in the field of scientific research

Innovation:

Proposal for a new standard of documentation in the field of reconstruction and first experiences.

References:

1. Pfarr-Harfst, M. / Grellert, M.: The Reconstruction – Argumentation Method: Proposal for a Minimum Standards of Documentation in the Context of Virtual Reconstructions, in: Ioanides, M. / u.a. (Hg.), Digital Heritage. Progress in Cultural Heritage, Heidelberg, Berlin 2016, S. 39-49
2. Pfarr, M.: Dokumentationssystem für digitale Rekonstruktionen am Beispiel der Grabanlage Zhaoling, Provinz Shaanxi, China. TUprints, Darmstadt (2010). http://tuprints.ulb.tu-darmstadt.de/2302/

Jonas BRUSCHKE | Ferdinand MAIWALD | Florian NIEBLING | Sander MÜNSTER, Germany

Browsing and Experiencing Repositories of Spatially Oriented Historic Photographic Images

Keywords: image repositories, 4D browser, 3D web, architecture

Abstract:

A substantial number of institutions archive historical images of architecture in urban areas and make them available to scholars and the general public through online platforms. Users can explore these usually huge repositories by faceted browsing or keyword-based searching. Metadata that enable these kinds of investigations however are often incomplete, imprecise, or even wrong. Thus, retrieving images of interest can be a cumbersome task for users as art and architectural historians trying to answer their research questions.

Many of these images, often containing historic buildings and landscapes, can be oriented spatially using automatic methods such as structure from motion (SfM). Providing spatially and temporally oriented images of urban architecture, in combination with advanced searching and exploration techniques, offers new potentials in supporting historians in their research. We are developing a 3D web environment usable to historians enabling them to search and access historic photographic images in a spatial context. Where related projects make use of 2D maps, showing only a planar view of the current urban situation, we create interactive views of 4D city models, i.e. 3D spatial models that are changing over time, to provide a better understanding of the urban building situation regarding the photographer's position and surroundings. A major feature of the application is to make both, 3D reconstructed models and photogrammetric digitized models from historical photographs corresponding. At the same time, this mixed methods approach is used for validation of the 3D reconstructions. Moreover, we examined both, users and related research practices and strategies by surveys and observations to identify most relevant scenarios to support.

Relevance conference / Relevance session:

Our research creates new ways for historians to access digitized information available through online media repositories to pursue their research questions.

Innovation:

We combine spatially oriented photographs of historic buildings with 4D city models to provide context of the urban situation at the time the photograph was taken.

References:

1. Bruschke et al. 2017. Towards browsing repositories of spatially oriented historic photographic images in 3D web environments. In Proceedings of the 22nd International Conference on 3D Web Technology (Web3D '17).
2. Niebling et al. 2017. Zugänglichkeit und dauerhafte Nutzbarkeit historischer Bildrepositorien für Forschung und Vermittlung. In Digital Humanities im deutschsprachigen Raum (DHd).

Session – Adding life to written sources by studying the dead

(Chairs: David BIBBY, Germany | Ann DEGRAEVE, Belgium | Raphael PANHUYSEN, The Netherlands | Karin WILTSCKE-SCHROTTA, Austria)

Over recent years the "Burial Archaeology/Archaeology/History of Death" theme has established itself as an interdisciplinary forum where archaeologists, anthropologists, forensic specialists, historians and emergency workers can profit from a wide variety of viewpoints on human and animal remains. The exchange of methods, ideas and experiences has repeatedly proved fruitful. We are therefore pleased to announce the continuation of the theme in 2017. This year we especially welcome papers combining written and pictorial sources with archaeological and bioarchaeological data. Papers juxtaposing historical concepts on demography, mobility, living conditions and identity with finds from archaeological excavations and the results of funerary studies are cordially invited. Similarly, papers focusing on the identification of human remains from known persons in an historical or forensic context are/may be eligible for presentation.

Traditionally this session highlights interdisciplinary approaches focusing both on archaeological and historical studies and on new technologies such as DNA, isotope and chemical analysis. How can archaeologists, historians, forensic specialists and natural scientists learn more about life in the past by studying funerary customs and human remains?

Raphaël PANHUYSEN, The Netherlands

The feasibility of sex and age determination of human remains in the field. Comparing field observations with laboratory determinations from Oldenzaal, The Netherlands

Keywords: sex and age, determination, historical demography

Abstract:

Cemeteries around churches represent an important source from which developments in demography and health in historical times may be studied. The excavation of large cemeteries in and around churches in urban centres in the Netherlands is not always followed by osteoarchaeological laboratory studies of all human remains. Only small sections of the excavation are analysed and generally a small sample of circa 10 per cent of the human remains is selected for osteoarchaeological studies. During the excavations of a cemetery around the Plechelmus church in Oldenzaal 2750 graves were documented. Since it was evident from the start that not all graves and human remains were going to be studied in detail, a protocol and a digital form were developed to record burial and skeletal data in the field. This database included variables related to age sex and stature of the skeletal remains.

In order to evaluate these data collected in the field, the available field data were analysed and when possible compared with data from laboratory studies comprising of standard physical anthropological examinations and aDNA analysis. The general impression is that collecting data on sex and age in the field is less reliable and not suitable for historical demographic studies. Possible causes for the differences in results will be discussed.

Relevance conference:

The paper seeks to validate a recent trend in Dutch archaeology that seeks to collect demographic data in the field without a full examination of excavated human remains.

Relevance session:
The paper evaluates ways to rapidly collect historical demographical information in the field by comparing sex and age determination in the field with laboratory determinations.

Zabihollah BAKHTIARI | Mina RASTEGARFARD, Iran
The Function of biological anthropology in archaeology, with a focus on study of late bronze age and early iron age in the east of central Iranian plateau
Keywords: Archaeology, natural science, interdisciplinary sciences, physical anthropology, DNA

Abstract:
In today's societies, transition of archaeology from classic and traditional archaeology phase to apply and natural sciences is unavoidable. This transition and movement, requires interaction and relationship Between Archaeology and natural science and employment of novel technique and tools. Archaeological studies and analyses physical remains of the past societies. Accessing data beyond those achieved with tools, requires a holistic approach and utilization of interdisciplinary methods in the field of archaeology. In this study, remains of human skeletons found in Gazvar Cemetery and some other cemeteries in the eastern parts of central Iranian plateau in semnan province, have been analyzed and studied using experimental science in the area of physical anthropology. Extracting DNA from human skeleton remains for the purpose of genealogy and determining relations between races, pathology of human skeleton remains with the aim of studying illnesses, type of nutrition, role of climate and geography on anatomical and genetic structure of human and determining cause and time of death, are among results of this research. Using new techniques and taking advantage of experimental sciences in archaeology could provide us with more information than those achieved through studies and description of physical material. This procedure is the only proper path of transition for archaeology from a classic and descriptive knowledge towards becoming an applied science.

Letty TEN HARKEL, UK
Who was who in the enigmatic early medieval emporium and ringfort near Domburg, SW Netherlands? New results from the multidisciplinary analysis of human remains
Keywords: Human remains, early medieval, Low Countries, multidisciplinary approaches

Abstract:
Situated in the estuary of the river Scheldt, the former island of Walcheren has a rich early medieval history. Evidence includes the remains of the enigmatic trading site of Walichrum, comparable in wealth to the better-known site of Dorestad but now entirely destroyed by the sea, and the remains of no less than 3 ringforts, the densest concentration of early medieval fortified sites from the Netherlands. One of these – Domburg – was located in the direct vicinity of the emporium, raising questions about the relationship between the two sites. Who, for example, were the people who lived here, and what was their relationship with regions further afield? Documentary sources have been studied extensively but direct references to early medieval Walcheren are few and difficult to interpret.

The archaeological study of the locality is no less problematic. Extensive cemeteries associated with the trading site were discovered at various times during the 17th, 18th, 19th and earlier 20th centuries, but skeletal material was generally not retained for future study. Only 5 (partial) skeletons have survived until the present day, and it is these that stand central to this talk. Although few in number, there is nevertheless a wealth of information about the individuals' health, lifestyles and long-distance contacts that can be retrieved through the innovative combination of interdisciplinary technologies. Presenting the results of the collaborative project Investigating the Dead in Early Medieval Domburg, the talk will discuss the combined implications of radiocarbon dating, stable isotope analysis, physical anthropological study, dendrochronology and typological analysis of coffin wood, and 'digital excavation' of an in-situ burial through CT and structured light scanning, taking an important step towards unravelling the enigmatic early medieval history of the Domburg area.

Relevance conference /Relevance session:

This talk demonstrates how the innovative combination of new and old technologies to investigate cultural heritage can yield important results even if the evidence base is at first sight very slight.

Innovation:

The innovation of the Investigating the Dead in Early Medieval Domburg lies in the exhaustive combination of all available technologies to gain new insights in the settlement history of a region.

References:

1. Ten Harkel 2013. A Viking Age landscape of defence in the Netherlands?. In Baker, Brookes and Reynolds (eds), Landscapes of Defence in Early Medieval Europe, 223-59, Brepols.
2. Ten Harkel et al. in prep., Investigating the dead in early medieval Domburg, the Netherlands: an interdisciplinary approach (for Antiquity).

Nikita DOBROTIN | Romas JAROCKIS | Dainius MICHELEVIČIUS | Saulius SARCEVIČIUS | Oksana VAILIONIENĖ, Lithuania

New technologies for Holocaust archaeology – combining geophisical prospection and 3-D terrain scanning data to historical aerial photos and maps in the case of Paneriai mass killing site

Keywords: Holocaust archaeology, historical aerial photos and maps, geophysical survey, 3D terrain scanning

Abstract:

With the appearance of new technologies a significant change occurred in our understanding of mass killing sites of WW II in Europe. According Dr. Caroline Sturdy Colls, a British archaeologist, "People haven't even put the Holocaust and archaeology in the same sentence until the last few years".

The aim of this presentation is to analyze the results of the field survey which was carried out in Paneriai (Ponary) – the biggest the Holocaust site in the territory of present day Lithuania. Non invasive methods such as LiDAR, ground penetrating radar, electrical resistance survey and 3-D terrain scanning were applied in the last couple of years.

The new data which has derived from geophysical survey and intensive digital mapping of the terrain of the area of some 50 ha was applied to historical aerial images and maps. All together it has become

a basis for archaeological landscape analysis of the mass killing site which was in operation more than 3 years since 1941. The total number of victims by July of 1944 was between 70,000 and 100,000. By combining of different kind of research data it has allow the partial reconstruction of the relief of landscape in forested area. Remnants of once existed infrastructure: buildings, a walkway of the victims, places of gates to the fenced territory, and other workings which for a long time remain hidden among trees and bushes. Detailed study of possible archaeological features allow to indicate the location of several new killing pits which features up till present day were unknown and uncatalogued.

Session – **The Employment of Mobile Applications for Survey, Documentation and Information** ***(Chair: Claudiu Silvestru, Austria)***

The wide access to smart mobile devices as well as the easiness of mobile application distribution through several webstores have led to an inflation of apps. A major factor for the high popularity is the permanent availability and intuitive use through user owned – i.e. already well known – handheld devices of everyday life.

From gaming to text editing and training to navigation, mobile applications are common in all imaginable fields – including building and urban history and addressing often at the same time professionals and the general public. Apps are employed in presentation and interpretation strategies by e.g. museums as well as research like urban archaeology and building survey.

The rapid development in the field of apps leads to several issues to be addressed especially when using them for information, education and research purposes, such as:

- **Origin of data and information:** where does it come from? Is it validated and traceable? Is it the product of first hand historical research? Especially considering the openness of app stores and the inflation of apps its becoming increasingly difficult to sort out solid third party apps for infotainment.
- **Copyright and pricing:** how much does using an app cost? The two original basic price models – free apps and apps with costs – have been extended lately by a marketing strategy providing free light versions of apps with a full version with costs. This pricing model as well as copyright issues due to the light version / full version differences affect research projects especially if the target is to use free – or even open source – software only.
- **Retail:** is a research app a service to be sold? Regarding app development difficulties of promoting project results as a product raise due to the financing mechanisms. Public funding generally requires not for profit projects which don't generate additional income. Apps– and especially validated research, database or information software – need to be updated periodically in order to meet the requirements of new smart mobile devices as well as to implement new research findings. Research partnerships with the private sector might create opportunities for long term maintenance of content and technology.

This session's aim is to discuss the challenges and promises of the current and future development and implementation of mobile apps in urban archaeology, building survey and urban history research. To this end, we invite papers that contribute with insightful and controversial aspects regarding the employment of mobile apps, including but not limited to:

- innovative mobile apps for survey and documentation purposes,
- mobile apps as a means to public information and awareness,
- linking infotainment apps to research databases,
- funding and retail strategies for the development of research apps.

Sebastian CUY | Philipp GERTH | Daniel DE OLIVERA | Thomas KLEINKE | Jan WIENERS, Germany

iDAIfield 2.0: Modern approach to distributed fieldwork documentation

Keywords: database, GIS, documentation, field recording

Abstract:

An archaeological field research database that can be used for different projects poses an advanced technical problem. It does not only have to deal with different needs by a variety of disciplines and methods like excavation and survey but also be useable for architectural or object studies. Therefore, a generic data model is required, that can deal with most circumstances while also trying to maintain standardisation where possible. Another requirement is the ability to support distributed work and data entry in the field even in areas with no internet coverage. This creates the need for a very hardened synchronization between the various clients and to the server. As the use of GIS is still gaining importance in archaeological fieldwork, an additional focus lies on the integration of spatial data and descriptive documentation.

This paper presents iDAI.field 2.0, the field research documentation system by the German Archaeological Institute, which is currently being developed. This solution will be published as an Open Source software product that also relies heavily on OSS and web technologies. It makes use of CouchDB/PouchDB for data storage and synchronisation. The cross platform client application is realised with the Electron and Angular frameworks using TypeScript as the main programming language. The client also provides an open interface for import and export. This allows the integration of other fieldwork software like for example QGIS, iDIG and Survey2GIS into the toolchain.

Relevance conference / Relevance session:

Documentation systems are the fundamental basis for nearly any digital research. Therefore creating a robust software for field recording is the absolute basement!

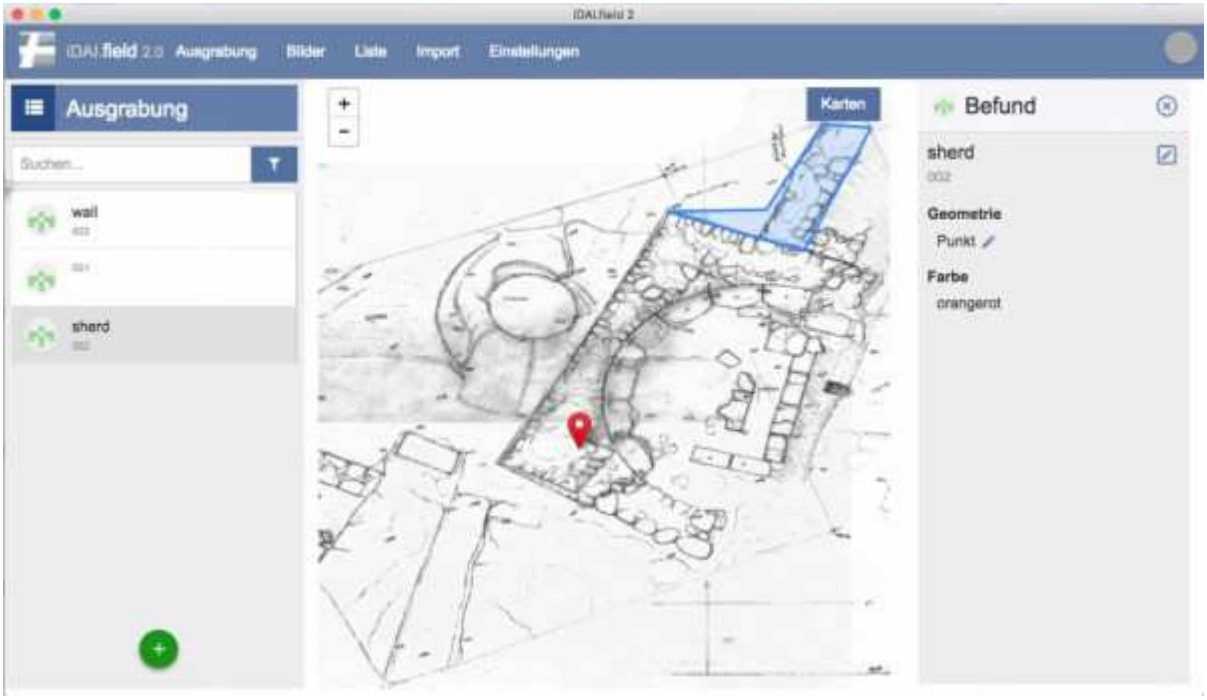
Innovation:

To find the balance between schemaless data storage and standardization, beside komplex syncronization is pretty innovative for archaeology.

References:

1. https://github.com/dainst/idai-field-client
2. https://prezi.com/mqdj5eafaabo/idaifield-20/

Figure:



Hans VON SEGGERN, Germany

Museum 4.0: On the use and abuse of mobile digital devices in museums and archaeological sites

Abstract:

Do museums nowadays necessarily have to keep in store mobile digital devices (aka audio guides) in order to inform and educate their visitors? Or are they better off offering mobile applications via the App Store and other online forums? To BYOD, or not to BYOD – that is the question! In my paper I will focus on experiences with educational efforts of museums and archaeological sites in the age of the Museum 4.0. Illustrated audio tours can indeed draw the attention of visitors to details of objects shown or to objects not on display. They can also serve as a means of navigation inside complex architectural structures. In this way multi media guides make sense, and can serve to communicate complex educational concepts. Mobile applications for forums like the App Store as well as social media like Facebook and Twitter can encompass the educational effort. I will present case studies as examples of how to improve educational efforts of archaeological exhibitions with the help of mobile digital devices and the gathering of big data. I will conlude in a comparison of the economic feasibility of audio & multimedia guides and mobile apps today. The audience is invited to share their experience subsequently.

Relevance conference / Relevance session:

The subject hits the core of one of the substantial topics the conference is about.

Innovation:

The paper includes case studies of very recent projects, which are worthwhile to be shared with the conference participants.

References:

1. Das Museum von Babel, Frankfurt, M. 2014
2. Conference of the Canadian Museum Association, Toronto 2014
3. Museums & the Web, Chicago 2015
4. Bundesakademie für Kulturelle Bildung, Wolfenbüttel 2016
5. Expo Heritage, Istanbul 2017

Category: New Technologies
(Chair: Peter DORNINGER, Austria)

Stefano MARZIALI | Eleonora MARZIALI, Italy

The Focus-stacking technique in macro photogrammetry

Keywords: Photogrammetry, Structure from Motion, Macro, Focus Stacking

Abstract:
Small objects are an essential part of archaeological collections. While is getting more and more common the SfM scanning of Cultural Heritage architectures and collections, the small objects are often omitted for the technical difficulties the digitalization process of such objects impose. This research focuses on the most common issue in macro-photogrammetry: the depth of field, that is the distance in a scene between the nearest and farthest objects that appear acceptably sharp in an image. At a high magnification levels, the small depth of field can compromise the picture alignment or create noisy point cloud. Moreover, it can significantly reduce the quality of the texture, creating blurred patches during the picture projection phase. The proposed solution is the focus-stacking technique, a digital image processing technique which combines multiple macro-images taken at different focus distances to give a resulting image with a greater depth of field than any of the individual source images. The whole procedure can be realized with commercial software and a low-budget setup. The poster starts with a critical analysis of the existing literature on the technique and propose an optimized workflow for acquisition (focus stacking with turn table), pre-production (color balance, Wallis filter, green2gray) and reconstruction process (Agisoft Photoscan).

Relevance conference / Relevance session:
The photogrammetric technique is applied to very small size archaeological artifacts.

Innovation:
A lesser-known photographic technique, the focus stacking, is applied to the SfM survey of very small size archaeological artifacts.

References:

1. Gallo, Muzzupappa, Bruno (2014). 3D reconstruction of small sized objects from a sequence of multi-focused images. Journal of Cultural Heritage 15
2. Brecko, Mathys, Dekoninck, Leponce, VandenSpiegel, Semal (2014) Focus stacking: Comparing commercial top-end set-ups with a semi-automatic low budget approach. A possible solution for mass digitization of type

Martin OCZIPKA | Manuel SCHNEIDER, Germany

Photogrammetric strategies in 3D reconstruction of Bismarckturm Dresden

Keywords: Photogrammetry, accuracy assessment, geometric resolution

Abstract:

Since the beginning of photography in the 1830s, the documentation of historical buildings and archaeological finding spots has been an important part of archaeology, architecture and many other sciences. Excavation destroy the finding spots irretrievable, buildings were destroyed or in a state of continuous decay or damaged or destroyed by warlike operations. Since that time, a wide range of technologic developments was archived. With high-resolution digital images, digital photogrammetry including the algorithms of computer vision as well as powerful computers equipped with high performance graphic cards, 3D modelling became an important tool for the documentation of all kinds of cultural heritage for many scientists.

In this example, terrestrial and airborne photos of a Bismarckturm in Dresden/Saxony were taken with a Canon 5D Mark3 and a Sony Alpha 6000 and processed to a high accuracy 3D model. The archived geometric resolution is 2.4mm; the radiometric resolution is 12bit and an accuracy of 1.2mm or half a pixel.

Digital terrestrial and aerial photography, Unmanned Aerial Systems and digital photogrammetry offer a bench of tools not only for experts, but also for non-professionals. Still, most of the products are not reliable. The leak of knowledge concerning cameras, interior and exterior orientation, algorithms and accuracy assessment cause main problems, while accuracy assessment make a 3D survey complete. Therefore, the resulting 3D models are often more or less similar models in an unknown accuracy of the actual object ignoring:

- camera accuracy and images quality,
- other photogrammetric principles,
- low cost technology is applied in a wrong way,
- reconstructed geometry might be wrong,
- image artefacts might be misinterpreted
- generally inaccurate or wrong positons on the earth’s surface

The benefit of these models is problematic.

This poster shows how to increase the quality and accuracy of models by applying generic rules of:

- Photogrammetric principles
- Proper use of cameras
- Self-calibration and camera parameters
- Flight and recording strategies
- Optimized processing

Relevance conference / Relevance session:

Many 3D-model in archaeology are of an unknown accuracy and have a more or less similarity to the real object.

Innovation:

The innovation is the sophisticated simplicity of photogrammetric processing.

References:

1. https://www.htw-dresden.de/fakultaet-geoinformation/fakultaet/personal/prof-dr-rer-nat-oczipka/veroeffentlichungen.html

Figure:

Panagiotis PARTHENIOS | Androulaki THEANO, Greece

Integrating Structure from Motion photogrammetry with Augmented Reality tools as a novel technique for digitally reconstructing an archaic column

Keywords: structure-from-motion, digital-reconstruction, augmented-reality

Abstract:

This poster describes the research conducted at the Digital Media Lab, Technical University of Crete, in coordination with the Ministry of Culture of Greece, via Ephorate of Antiquities of Chania, for the digital reconstruction of an archaic column. The 3d models of five very heavy parts of an archaic column (constructed ca 540 BC) were used for studying and reconstructing the complete column. The column was part of an archaic temple unique in size and in type for the area of Chania, in West Crete, Greece. The five stone drums found in a salvage excavation in the town. Now they are exposed in the

yard of the old Archaeological Museum and the plan is that they get reconstructed in order to be properly exhibited in the New Archaeological Museum of Chania. The 3D models of the items were produced using SfM. Afisoft Photoscan software was combined with fast, easy and low cost equipment. The five 3D detailed models of the very heavy objects will be useful to archaeologist and researchers for their study since they can work in their office away from the museum. Furthermore, a digital reconstruction of the column and as a result the reconstruction of the ancient temple can be exhibited in a number of ways taking advantage of contemporary digital media such as Virtual, Augmented or Immersive Reality tools. Our research team is currently investigating ways to utilize augmented reality for the reconstruction of the archaic column. The 3D models that were produced with the Structure from Motion techniques, are being uploaded as .obj files into Google Tilt Brush. The user can then experiment by moving, rotating and scaling the individual 3D parts in a 3D environment in real time, thus drastically simplifying the digital reconstruction process for similar projects.

Relevance conference:

Integrating archaeology, architecture and innovative new technologies such as SfM and Augmented Reality, in order to digitally reconstruct an archaic column.

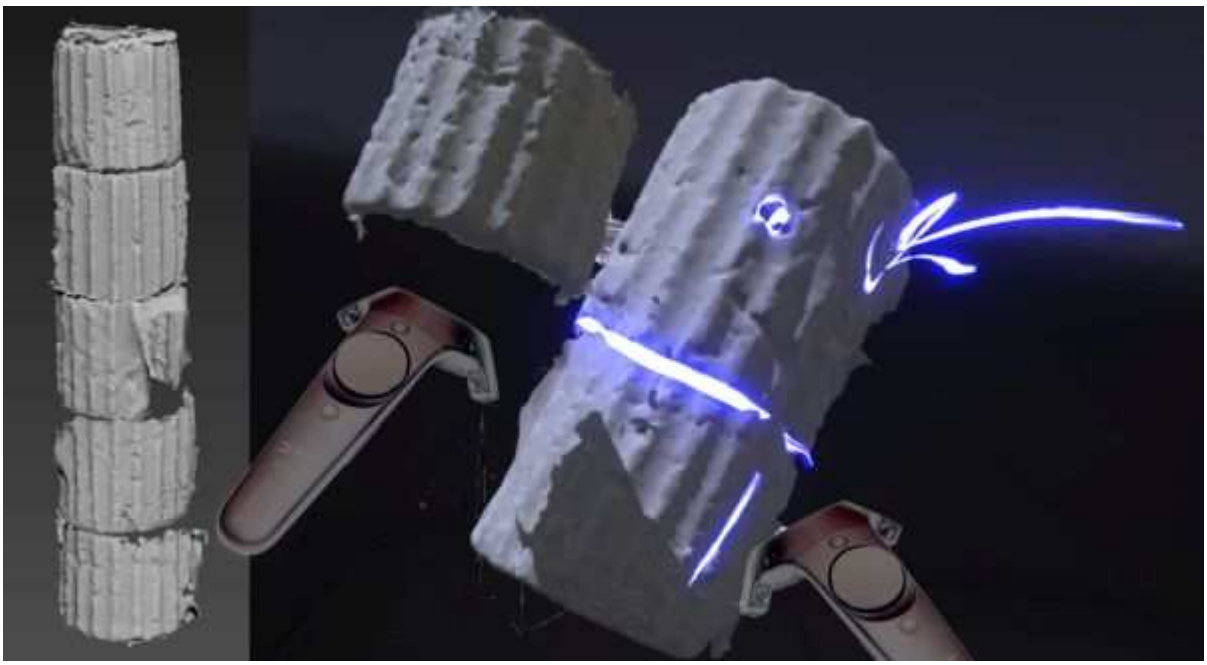
Innovation:

Combining Structure from Motion techniques with Augmented reality tools in order to digitally reconstruct an archaic column.

References:

1. El-Hakim S. Et al., ‘Detailed 3D Reconstruction of Monuments using Multiple Techniques’ ISPR-CIPA Workshop, Corfu, Greece, Sept 1-2,2002.
2. F. Remondino and S. El-Hakim, ‘Image-based 3D Modelling: A Review’ The Photogrammetric Record, vol.21, no. 115, pp. 269-291, Aug. 2006.

Figure:



Giorgio VERDIANI | Stéphane GIRAUDEAU | Anna FRASCARI, Italy

The Halicarnassus Mausoleum, a digital rereading. Step 1: the statues at the British museum

Keywords: Halicarnassus, Mausoleum, Mausolo, SfM photogrammetry

Abstract:

Well known as one of the seven ancient world's wonders, the Mausoleum built by Mausolo in Halicarnassus is one of the many lost masterpieces from the past. Its architectural and artistic high quality just left a large bounce of fragments and ruins, leaving to all the scholars a rich subjects for studies and to imagine possible reconstructions. In this ongoing research, a try of collecting the single parts and make some matching with other possible references is done starting from 3d digital modeling. In the specific from the photogrammetry of a set of statues from the British Museum, with a great attention in finding correspondences with other sculptures and features (faces, dresses, details) from other artworks from the same area. The use of the SfM photogrammetry tuned out again to be a great tool for rapid and accurate digitalization, all the models were then edited, simplified and uploaded to the Sketchfab platform to be a quick reference for all the participants to the research group, but also accessible to anyone for seeing and checking these interesting pieces from the past. Such an operation, starting from the statues trays to bring on some reflections about proportions, stiles and relationship with architecture to better understand and verify possible new reconstruction choices about this long lost architectural wonder.

Vojtěch NOSEK | Ludmila KAŇÁKOVÁ HLADÍKOVÁ, Czech Republic

Contribution of 3D photogrammetry for ballistic analysis of lithic projectiles

Keywords: 3D photogrammetry ; ballistic analysis ; lithic projectiles ; archaeometry

Abstract:

We have developed new method for archaeometric analysis of lithic projectiles using 3D photogrammetry and virtual models of projectiles. Till these days ballistic analysise of these archaeological artefacts was done simple by using simple formulas with just few exact metric values so there was possibility of innacurate result. Our method use high definition 3D models of projectiles which provides much more accurate hard data which can be later used for statistical or balistic analyse. Several hundreds of lithic projectiles dated from late neolithic and early bronze age from burial sites as Mýtná Nová Ves, Holešov and several more were analysed and evaluated by our new method with very interesting results. Such number of examined artefacts provides solid base for statistical evaluation of such important complex of artefacts.

Digitization using photogrammetry and 3D scanning u provides great oportunities for studying lithic projectiles. In the first place virtual 3D models are easy to orient in virtual space so they can be non – destructive studied in detail, for example making of cross – section cuts and profiles of artefacts or just their parts. Secondly, precise virtual images are great tool for morphometric analysis using landmarks and other applications. Therefore we present our new method as combination of photogrammetric documentation of lithic projectiles and archaeometric and ballistic analyse of archaeological artefacts,

Francesco GABELLONE | I. FERRARI | F. GIURI, Italy

The Greek-Roman theater of Taormina: towards a reconstruction proposal

Keywords: Taormina, Theatre, 3D, reconstruction

Abstract:

This contribution outlines the results achieved for the reconstructive study of the Greek-Roman theater of Taromina, aimed at the realization of a GC film presented at the G7 summit (26-27 May 2017). The reconstruction is now exposed to visitors within one of the two basilicas at the entrance of the theater. The work was commissioned by the archaeological superintendence-archaeological park of Naxos-Taormina and proposes the ancient structure in its original aspect in two distinct phases. The first phase dating back to the first quarter of the II sec. When, following a first imposing renovation, the complex expanded the receptive capacity of audience with the construction of an external ambulatory and the re-construction of the entire scaenae frons. The second part of the III sec. instead, it involves changes to the stage building and the orchestra with its transformation into the arena that change the use of the building. The theatre representations was substitute with gladiatorial games. Our reconstruction uses fast 3D surveys based on drone photogrammetry and close range photogrammetry, together with the potential offered by the 3D modelling environment for interpretation and study. This approach have led to some unpublished solutions. The main goal of this work, after all, is to understand the architectural and detail features of the monument, in an overall vision that frames the original context allowing visitors to value the elements of its originality.

Relevance conference / Relevance session:

This poster presents 3D reconstruction of the important Greek-Roman theatre of Taormina.

Innovation:

The study is carried out using drone-based and close-range photogrammetry, aided from direct 3D approach.

References:

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2. Musées et monuments de Sicile, Museums and Monuments in Sicily, Istituto Geografico de Agostini, 1960, p.74

Figure:

Peter DARE | Maria PAPAIOUANNOU, Canada

Creation and analysis of a 3D representation of a church on the island of Kalymnos, Greece

Keywords: Terrestrial laser scanning, 3D model, historic church.

Abstract:

Terrestrial Laser Scanning (TLS) is a modern surveying technique that can be used to capture in three dimensions the size and shape of an object. TLS acquires spatial information regarding the object by reflecting off the object a series of laser pulses and using the returned signals to determine the size and shape of the object. This can be done to an accuracy of just a few millimetres.

In this poster we show how the technique can be used to document and analyse the remains of a historic church on the island of Kalymnos in Greece. Over a period of one week we acquired enough spatial information – subsequently processed using TLS software – to produce a three dimensional digital replica of the church. We show how we have used the initial scan of the church to identify locations where more detailed studies were justified. At these locations of the church we have carried out a rescan with a higher accuracy and level of detail. This has enabled us to study features of the church such as its dome's smoothness, and its closeness to a spherical shape.

With the assistance of a local archaeologist we have been able to gain a historic interpretation of the church and its relevance to the local community during its time of use.

Relevance conference / Relevance session:

Poster includes new technology (terrestrial laser scanning) and cultural heritage (historic church).

Innovation:

First time this historic church has been captured digitally enabling numerical analysis of its dome to take place with the addition of a historical viewpoint from a local archaeologist.

References:

1. Michael Koutellas. (2006). “Kalymnos: History, Archaeology, Culture”.
2. Donal Cooper and Jennifer Sliwka. (2015). “Virtual Florence: A Church Goes Digital”. Apollo, November.

Irmela HERZOG | Sandra SCHRÖER, Germany

Reconstruction of Roman Roads and Boundaries in Southern Germany

Keywords: Least-cost path, Thiessen polygons, Roman roads, southern Germany

Abstract:

The initial aim of this project was to reconstruct the boundaries of the Roman administration units in a large part of southern Germany based on known central locations and least-cost Thiessen polygon calculations. The boundaries derived from SRTM elevation data by applying the popular Tobler cost function roughly coincide with those of standard Thiessen polygons even in hilly regions. These results do not change significantly when assigning high costs to crossing the main rivers or when choosing a slope-dependent cost function for vehicles rather than for pedestrians. For this reason, we decided to investigate the issue more thoroughly in a small part of the study area. For this area, we mapped indicators of boundaries and some traditional road reconstructions of Roman roads. The known Roman roads allow estimating the costs of movement during Roman times in this part of Germany, i.e. for several cost models, least-cost paths (LCP) were compared with the routes of the known Roman roads. Based on the best performing cost model, accessibility maps were created. Some evidence is presented that most Roman boundary sections can be found in areas of either very low or very high accessibility suggesting that natural boundaries are more important than the equal distances principle motivating the Thiessen polygon approach. Some issues detected in the course of this research will be discussed, e.g. the difficulties of attributing appropriate costs for crossing the rivers and creeks based on the available data on modern water bodies.

Ralf HESSE, Germany

Adaptive histogram matching for improved readability of aerial images

Keywords: aerial photography, archaeological prospection, image enhancement

Abstract:

Contrast or histogram stretch is a common method of image processing. In aerial archaeology, it is used to enhance the visibility of crop or soil marks in aerial photographs. In practice, the applicability and usefulness of this method is often compromised by the very inhomogeneous nature of many agricultural landscapes. The application of a single, overall contrast stretch for an aerial photograph or orthophoto commonly containing a mosaic of fields with different crops, grassland, forest and built-up areas often leads to unsatisfactory results. Readability of the image may even be reduced rather than improved. Therefore, aerial photographs are segmented by field parcel using cadastral data, and contrast stretch is applied to each field parcel. To further increase interpreter control over the image processing, histogram matching rather than simple contrast stretch is applied, resulting in similar

histograms for all field parcels and a homogeneous, contrast-rich appearance of the resulting image. Tests of this approach indicate that it can be successfully applied for large-area analysis of aerial photography, in particular orthophotos, in agricultural landscapes. They do, however, also reveal some limitations, including for example non-correspondence between cadastral maps and actual crop parcels.

Tobias DUCZEK | Samantha SEITHE | Dina JÄGER | Susanne SCHUMACHER, Germany
Up! The opportunities of aerial archaeology in university
Keywords: aerial archaeology, flying-documentation, opportunities

Abstract:
Up!
This is just one word which makes you dream. But in case of archaeological studies this is a word full of opportunities. The challenge for most archaeologists is not the flying itself, it's to see things on the ground and in the fields, except from the crop circles which we all know from some bored farmers. However, there are, as far as I know, two teachers at university for aerial archaeology in Europe. So just in Bochum and Vienna you can take a look into this airy subject. And because this is so rare we want to show you how Dr. Song from the Ruhr-University of Bochum is teaching his students.
We will show the theoretical part of archaeology and flying-documentation and the practical part in which both theoretical things will be combined to an airy journey through the full spectrum of time periods; from the stone age to the modern era. And especially here it is all about knowing the things you are searching for. If you don't know them, you will not see or find them.
And in this case, we are proud to be taught by Dr. Song, a pupil of one of Germany's pioneers in aerial archaeology, Otto Braasch. So we have the best conditions to get up in the air.

Category: New Technologies
(Chair: Peter DORNINGER, Austria)

Athanasios ARGYRIOU | Aris KIDONAKIS | Apostolos SARRIS | Daphne LAPPA, Greece
Nicosia in the 20th century: the story of a shared and contested city
Keywords: Nicosia, historical overview, ethnic communities, census, GIS

Abstract:
The Cyprus two main ethno-religious communities are the Muslim Turkish-Cypriots and Orthodox Greek-Cypriots. Despite that, other ethnical communities existed in the island during the past centuries. This study addresses the issue of the fragmented collective memory within the concrete context of the city of Nicosia, while due to the city's physical division since 1974 it also addresses its fragmented visual and conceptual perception. Exploring and highlighting the diversity of all the city's communities, including the Armenian, Maronite and Latin during the period 1878-1974 can provide important information regarding the historical overview of Nicosia. Various historical maps were

georeferenced with the city's boundaries delineation through the years and the major landmarks being determined respectively. The examination of the city's diverse religions, the ethnic communities' population distribution through the years, the identification of the city's urban growth and the communities' residential allocation is highlighted in this study by using various geoinformatic approaches. The visual and conceptual fragmentation of the city is addressed through the series of graphically powerful historical GIS maps. These maps offer a visual narrative of Nicosia's urban and social life before and after the 1974 separation. Such derived information offers to decision makers an educational tool regarding the city and its history, while it conceptually restores Nicosia's unity and cultivates the sense of a common city.

The project was materialized under the 'Home for Cooperation' (H4C) project funded by Norway Grants 2009-2014 and the Council of Europe, through the collaboration of the Laboratory of Geophysical-Satellite Remote Sensing & Arhaeo-environment of FORTH and the Association For Historical Dialogue and Research (AHDR).

Ayşegül ALTINÖRS ÇIRAK | Akın ERSOY | Emine DUYGU KAHRAMAN, Turkey

Searching the Continuity of Street Pattern in the Historical City Center of İzmir by Using Digital Methods

Keywords: Street Pattern, Archaeology, Turkey

Abstract:

Historic city center of Izmir has been inhabited continuously since the 3rd century BC. The city center is located on the same area during the Hellenistic, Roman, Byzantine, Beyliks and Ottoman periods, over 2000 years, and after the Republican period this area continued to maintain its central character. Today, archaeological excavations are being conducted in the public and monumental buildings of ancient era including Smyrna Agora and its surroundings, Kadifekale (Acropolis of Smyrna) and Smyrna theatre by Ancient Smyrna Town Excavation Presidency. Surface surveys and excavations in the region represent the traces of the grid plan that the city had in the Roman period. It is envisaged by researchers that Ancient period grid street pattern was protected in general terms and sustained in the following historical periods since the antiquity. In the context of this forecast this work aims to investigate the possibility of being continuous of grid street pattern in the historical city center of Izmir that is seen today since antiquity. Similarity with antiquity of the existing grid street and city plan will be revealed from the archaeological and historical maps by using digital technologies such as ARCGIS and CAD programs. Existing street widths and urban blocks sizes will be compared with the estimated Antique period form and sizes determined in archaeological studies. This study was planned to make analysis and synthesis to discuss the continuity of the street pattern in the city centre in Izmir since the antiquity in the context of street widths, urban blocks sizes and land use.

Sandra UIJLENBROEK | Karen JENESON, The Netherlands

Urban Heritage – Roman Quarter Heerlen

Keywords: urban heritage, making heritage visible in the city, heritage as urban identity

Abstract:

The Roman heritage of Heerlen is unique and special. We intend making it visible in the city's Roman Quarter. The Roman baths, a national monument, are the major showpiece of Heerlen's Roman collection. The restoration that is currently underway will allow us to preserve this unique monument for future generations. But there is much more of the city's Roman past to view: the Roman collection, markers in public areas, and remains underground. New archaeological investigations are providing additional insights into the history of our city. With these new excavations, we are literally digging down into our past. But we don't only want to make the story of Roman Heerlen visible – above all we want to enable people to experience it. When you walk through this part of Heerlen in 2020, you'll really feel the city's Roman past. It's urban heritage that Heerlen can be proud of!

In the project 'Roman Quarter' we are looking for new ways to present our heritage. A 3D shooting of our Roman Bathshas been made and we're now exploring good ways for using it in restoration and presentations for visitors of the museum.

Carmela CRESCENZI | Francesco TIOLI | Stefano NARDONI, Italy

Multimedia for an archaeological rocky landscape

Keywords: Virtual museum, CHNT, archaeological rupestrian settlement Göreme

Abstract:

The interactive poster shows the results of the research on the rocky archaeological habitat in the northwest of the Open Air Museum of Göreme in Cappadocia. The rocky habitat of Cappadocia is one of the most characteristic human and natural landscapes in the world, and was listed on the UNESCO World Heritage List in 1985. The research area is an urban rock settlement detected from 2012 to 2014.For its particular geological structure, the cultural and monumental witnesses kept there will be lost due to natural and anthropic causes For an entire century, the interest of scholars for the expression of pictorial art prevailed over the architectural and social one of living in the cave. Furthermore, the evolution of the urban settlements made by additional building has led to the lost of the ancient constructive knowledge by subtraction and with this the cultural heritage of the rocky settlement. This heritage is difficult to visit and make known both for the rough paths, the danger of collapsing and because some monuments are closed to the public or are private property. The multimedia poster will show the processing of data captured in the relevant campaigns. The research was focused on detection, in particular on a digital survey carried out with3D laser scanners for architecture and the natural stone structure of the village. In this way, the first complete and detailed documentation of this sector was created, enabling the first studies on the urban character of this archaeological site. The poster will present a digital approach to the virtual visit of the investigated area. Two-dimensional, three-dimensional, and static video editions will illustrate the rocky interiors of the plan volumetric.

Paolo FORMAGLINI | Filippo GIANSANTI | Stephane GIRAUDEAU | Alessandro GIACOMELLI, Italy

The Adriatic coast: the case study of Albani and Clementina towers

Keywords: Coastline towers, Adriatic Sea, military architecture, Papacy, photogrammetry survey

Abstract:

Along the Mediterranean coast, the fortification system of towers has always the function to prevent and defend the coast from all the attacks, often of pirates. This kind of system is a planned and wellorganized network also in the Adriatic sea, where during the XIII century the Papacy and the Republic of Venice militarily controlled the sea. The choice of the case study, the Torre di Albani in Montignano, near Senigallia (AN), built in the XIII century, has served for the analysis of the historical and technological aspects that characterized the towers in this part of Adriatic sea in the Modern Age. Interesting is also the comparison with the Torre Clementina in Portonovo (AN) built in 1716 by Pope Clement XI, 30 km far from Montignano, tower of a different period, but with the same relationship between the tower and the territory. It appeared immediately evident the need to have exact metric references since it is a strong offset towards the sea side. In order to process a photogrammetric survey, photographs were taken around the tower, which allowed to select 183 photos that were used during 3D alignment using the Agisoft Photoscan. The dense point cloud resulting from alignment has a high quality, with over 23millions points. After appropriate point cleaning with the 3D System Geomagic software, the resulting mesh model of 20 million polygons maintains the right relationship between data quality and data management ease. At the end, a rebuilding of the UV map has allowed to get a high-resolution texture map (16384 px).

This work aims to document and show all aspects of the tower, the construction type, the materials and the building model and to be able to analyze the different characteristics of the towers in order to better interpret the defensive system of the Adriatic Sea.

Alessia PANELLA | Andrea Innocenzo VOLPE, Italy

The ancient walls of L'Aquila, from the earthquake destruction to new reuse possibilities: a case study on "Porta Leone"

Keywords: digital survey, earthquake, city walls, L'Aquila, Italy

Abstract:

L'Aquila is an important town in central Italy: in time it has been a significant crossover of passages and the place to manage and control a large and complex sector of country. Besides, since ever, it was subject to strong and destructive earthquakes, that often caused the reshaping of the urban pattern. The last one, happened in 2009, caused large destruction on both contemporary and ancient buildings.

This study exploits the earthquake as an opportunity to free the area of the city walls around "Porta Leone" (Lion Gate), which has been saturated in the late fifties by buildings of social housing, precluding the community from enjoying this place.

Nowadays these buildings, heavily damaged by the earthquake, are in ruins and abandoned and their full demolition is foreseen in a quite short time.

In this situation, it's possible to rethink the relationship between the town and the ancient walls.
The area was scanned using the digital survey (operated by 3D Laser Scanner and IUAV photography/video) to produce a series of models that allow to understand this part of the urban asset, rereading the town shape and developing simulations for a new settlement, less invasive than the previous one.
This study tries to give a new significance to the system walls, valorising their historical value and giving opportunity of better comprehension of the city's development, interpreting the historical phases of evolution and defining specific solutions thanks to the use of the 3D model, going beyond a simple juxtaposition of buildings, towards a clear interpretation of the ancient evidences.

Arget TOÇILA | Elisa SGHERRI | Andrea PASQUALI, Italy
The mosaics of Lin basilica, Albania; photogrammetry and musealization
Keywords: Albania, byzantine basilica, mosaics, photogrammetry, musealization

Abstract:
In Albania, as time passes, a larger part of the archeological heritage is discovered, but for many places there is still the need of a deeper exploration and a better musealization. This project studies a single link from the chain of monuments distributed through Via Egnatia, the antique pathway that connected Western with Eastern Roman Empire; beginning from Dyrrahu (Durrës, Albania) and ending in Constantinople (Istanbul, Turkey). The focus of this research is on the medieval basilica of Lin, which is located on the top of a rocky appendix over the Ohër lake, Albania. The basilica features a composition of multilayer constructions from different periods, it reached its climax in the VI century under the Byzantine Empire. Because of its entire pavement covered in mosaics and its rare chapel typology, the basilica deserved further examination. Today the site lacks a protection from the weather and a structure that could make possible the access on the mosaics. This research initially consisted on the survey of the area, including the hill that creates a unique landscape on the lakeshore. The gathered data consist in more than 500 high quality photos captured manually, from several photos (with GPS data) and video shots taken from a UAV unit and a set of video shots in 360°. From this photogrammetric survey, a virtual 3D model has been built. This data provides a meaningful document for the preservation of the heritage and the base for further steps of the research. The project also encompasses the design of a pavilion that operates as a protective structure, which allows a musealization space for the heritage and includes recreational activities to broaden its fruition.

Morten V. RASMUSSEN, Denmark
The Castle that never was
Keywords: Moleology, 3d, Castle

Abstract:
In the area just south of Viborg in the central part of Jutland, Denmark, an impressive number of earthworks or remnants thereof can be seen. These earthworks collectively called Hald I-V were built from the 13th century and up to the 18th century.

As a part of a project to create an increased availability to the area for the public and to make these areas better known, the archaeologist of Viborg Museum was allowed to open up new trenches to investigate some of the five Hald's. This poster focusses on the earthwork Hald II, either known as Niels Bugges Hald (The Hald belonging to Niels Bugge), Gammel Hald (Old Hald) or just simply Hald II, and how the investigations there, thoroughly disproves the connection between Niels Bugge and the specific earthwork. A connection otherwise completely accepted and set in stone, with even a nearby inn bearing the name, Niels Bugges Kro (Niels Bugges Inn).
The investigation consisted of several trenches, based partially on non-destructive survey and molehills. All trenches was registered either via 2d photogrammetry or "structure from motion" 3d documentation, this including an oven and its surrounding area.
A combination of the results in the trenches, OSL dating samples (Optically Stimulated Luminiscense) and C14 dating, not only reveal an incomplete rampart, that was never fully constructed and later demolished, but also reveals that chronologically, there was never a connection between Niels Bugge, and the earthwork that is credited to his name.

Peter TÓTH | Jana MELLNEROVÁ ŠUTEKOVÁ, Slovakia

Field survey results in Domadice (SW Slovakia)

Keywords: SW Slovakia, Neolithic, field survey, geomagnetics, GIS

Abstract:

Vicinity of Domadice and especially Santovka (both distr. Levice, SW Slovakia) are well-known in archaeological literature for finds from the Neolithic and Bronze Age. Very important is Lengyel culture settlement (probably with rondel architecture) excavated in late 70s of the 20th century. The impulse for the new research activities in Domadice was given by a stray find – fragment of an anthropomorphic figurine from the Middle Neolithic (cca 5300 cal BC) – without any parallels in Middle Danube region. Therefore it was decided a systematic field survey was needed in the vicinity of this important find withing the "Domadice project" conducted by the Department of Archaeology, Faculty of Arts, Comenius University in Bratislava. The goal of this project is to identify and reconstruct Neolithic settlement areas and to outline the settlement dynamics in the region.
Field survey in a raster method (side of the sector measured 20 m) and geomagnetical measurements were conducted in March and September 2017. In order to compare the research results approximately 20-25 minutes were reserved for each square. Collected were each finds from every archaeological period. Archaeological material was processed in an MS Access database with the focus on its dating and weight. This approach with the use of GIS enabled us to precisely interpolate spatial concentration of finds in the top soil thus documenting the preservation status of archaeological features lying underground. These findings were consequently compared with the geomagnetics. The spatial distribution of archaeological finds in plough layer enabled us to reconstruct the development of the settlement area in various periods of the Neolithic with regards to the prehistoric landscape use.

András SIMON | Endre FÜLÖP, Hungary

'Qulto Connect' for Museums: An information hub for metadata and full text information coming from various systems in a cloud based semantic network. A case study for Szekszárd Municipal and County Museum (Tolna county, Hungary)

Keywords: deep web, semantic network, collection management system, integrated system

Abstract:

Though the amount of digitalized information is constantly growing, most of it is hidden in the "deep web", which means that users might find it difficult to trace.

A professional solution for this problem is a cloud based Integrated System, a semantic network of identified, qualified and tagged metadata and full text or visual information, originating from databases and repositories of archeology, digital inventories and catalogues, making browsing, search and displaying the linked data on the Web possible.

Data is coming from databases of several types created for various purposes. It is prepared by local experts as data masters, and linked by the managers of the collection management and knowledge organisation systems. Such data cannot be regarded as database records anymore, but rather statements acting as nodes and links of a semantic network.

Units of the system:

- items of inventories and catalogues of heritage institutions,
- descriptions of restoration and conservation events in museums,
- information about archeological sites and objects,
- articles from knowledge organisation systems and full text databases,
- vocabulary items,
- data from namespaces of persons, corporations, geographical locations, animal and plant species
- text (indexed for search), image, audio, video and 3D files

Linking all kinds of data nodes with each other, the system becomes the network of semantic statements, classifying the nodes and the link joining them as well. The innovation of this system is the integration of statements of various data masters, making possible the reuse of recorded metadata. The system prepares the search indexes, synchronises the elements of various data sources, cares for the protection of non-public data, and displays the relevant information on the web interface.

Luciano RICCIARDI, Italy

Could virtual restoration substitute actual restoration? A method proposal

Keywords: Virtual restoration, new technologies, photo retouching, non-invasive interventions

Abstract:

The aim of the research presented is to investigate the opportunity of replacing, where possible, the restoration of a work of art by means of virtual intervention. This for a number of reasons: to virtually re-integrate missing areas in a work of art on the basis of proper historical and diagnostic examinations; to avoid tampering with original parts –something that inevitably occurs during an actual

restoration; and to limit the number of works which are restored not for conservation purposes, but mainly for aesthetical upgrade.
More specifically, this research proposes a method for virtually reintegrating the figurative text of works of arts, where readability is damaged due to the presence of numerous or extensive areas of loss.
The method has been developed taking as case study two panel paintings of the XIV century, sited in the Galleria Nazionale delle Marche (Urbino): the Madonna dell'Umiltà, attributed to "Maestro dell'incoronazione di Bellpuig" and the Annunciazione by Olivuccio di Ceccarello.
Both representations have been considerably damaged during their conservative history and have incurred extensive loss of authentic pictorial film, even in key sectors, such as characters' anatomical details. These areas of loss have been filled with neutral colors during restoration interventions carried out around 1970, since judged as not interpretable, according to criteria set by Italian Theory of Restoration.
Starting with a high-resolution photograph of mentioned paintings, it has been proposed to redefine the missing form and color with AutoCAD and Photoshop, so as to render the paintings virtually intact. In order to recreate the drawing, the research compares graphic surveys taken from other works of the same artist. Peculiarity of Medieval artistic production, indeed, is the use of silhouettes, reproducing standardised shapes.
Moreover, part of this research focuses on the theme of virtual cleaning. Here, an example of application is proposed for the Madonna dell'Umiltà, where diagnostic images have detected severely altered paint.

Yazan Abu ALHASSAN, Germany

Sodium Ferrocyanide Ions as Salt Crystallization Inhibitor for Sandstone Monuments to Prevent Damage Due to Sodium Chloride Salt and Salt Mixtures in Petra – Jordan

Keywords: Crystallization inhibitor, Sodium ferrocyanide, Salt weathering

Abstract:
The present poster addresses the application of salt crystallization inhibitor on the rock-cut monuments in Petra – Jordan; for the improvement of desalination as well as for the reduction of aggressiveness and probable damage of salt weathering. However, to date, the fundamental knowledge with respect to the interaction of such additives with salts in stone and its implications on stone deterioration processes is still lacking. Ferrocyanide decahydrate (Na4Fe(CN)6·10H2O) was proposed to use as a preventive measure against NaCl damage, since this product allows the formation of the harmless efflorescences instead of harmful subflorescences. Intensive researches have been done in the past in order to assess the salt weathering of a single salt inside stone. Although single salt are rarely present in practice and generally a salt mixtures are found in the form of efflorescences, either salt crusts or subflorescences. The highest damage potential is attributed to subflorescences. From this point of view, this study will assess the probable application of crystallization inhibitor as preventive measure against both single and mixtures salt for the first time. The overall aim of the study is to evaluate the possibility of stone treatment with inhibitor as a method for improved desalination of salt-loaded sandstones composing the famous monuments in the ancient

city of Petra. The particular aims are development of a consistent methodological approach for identification of parameters controlled the success, reliable quantification, interpretation and rating of the treatment´s success, therefore trying to assessment of optimum concentration of inhibitor which leading to maximum success.

Category: "Project Stunde Null"
(Chair: Ralph Bodenstein, Germany)

Ralph BODENSTEIN | Felicia MEYNERSEN, Germany
Archaeological Heritage Network (ArcHerNet): A Network for the Preservation of Cultural Heritage
Keywords: post-conflict recovery, capacity building, Syria, Iraq

Abstract:
The Archaeological Heritage Network (ArcHerNet) is a network of German cultural heritage institutions that aims at pooling their wide range of expertise in the protection and conservation of heritage, and at building a platform for collaboration and exchange on national and international levels. ArcHerNet was officially founded in April 2016, is supported by the German Foreign Office, and coordinated at the German Archaeological Institute. The experts' network brings together 18 founding members, including universities, museums, research institutions, professional organisations, academic foundations, the federal associations of Germany's state departments for archaeology and heritage conservation, and the national committees of international heritage organisations. ArcHerNet makes their competences better accessible internationally, and creates synergies, international co-production and collaborative solutions that are needed to rise up to the growing challenges in the preservation of cultural heritage worldwide.
By combining innovative research, sustainable education, and practical work with measures to boost economic potential and thereby foster stability in host and partner countries, ArcHerNet will also generate greater acceptance of cultural relations and education policy in the long term.
In response to the ongoing crisis in Syria and neighboring countries in the region, the first joint project of the ArcHerNet is "Stunde Null – A Future after the Crisis".

Ralph BODENSTEIN | Felicia MEYNERSEN, Germany
Stunde Null – A Future for the Time after the Crisis

Abstract:
"Stunde Null – A Future after the Crisis" is the first joint project launched by the Archaeological Heritage Network (ArcHerNet) in 2016, in response to the ongoing crisis in Syria and neighboring countries in the region. In line with the recommendations of the UNESCO Action Plan, updated during the UNESCO Expert Meeting „Emergency Safeguarding of Syria's Cultural Heritage" held in Berlin on June 2-4, 2016, the „Stunde Null" project aims at combining competences, enhancing coordination,

and amplifying concerted capacity building in support of experts and communities for the safeguard and future of cultural heritage in Syria and the region.
The project is carried out by German and international partners, with funding by the German Federal Foreign Office and the Gerda Henkel Foundation, and is coordinated by the German Archaeological Institute (DAI). The joint project is composed of complementary modules that comprise a broad range of measures. These include capacity building, specialised training courses and university programmes in partnership with local institutions in the region, awareness raising, as well as collaborative projects for building data bases, digital inventories, and information systems that are needed for the documentation, conservation and restoration of cultural heritage in Syria and other Middle Eastern countries. One central and basic component is the „Syrian Heritage Archive Project“ (SHAP), an extensive database built in collaboration between the Museum for Islamic Art in Berlin and the DAI, which serves as a basis for several further innovative digital heritage projects in the framework of „Stunde Null“.
The measures serve to support students, craftsmen, heritage specialists, and future decision-makers in the region with the knowledge and skills needed in order to enable them to preserve their heritage and plan their country’s future after the crisis.
The poster will present an overview of the „Stunde Null“ project and its major components.

Ulrike SIEGEL, Germany

Iraqi-German Expert Forum on Cultural Heritage

Keywords: capacity building, cultural heritage, emergency heritage management, Iraq

Abstract:
The Iraqi-German Expert Forum on Cultural Heritage responds to the growing destruction of archaeological and historical monuments in Iraq. It is an initiative that sets its focus on the preservation, conservation and restoration of archaeological and historical building remains in Iraq as well as on modern techniques for the documentation and processing of archaeological and mainly immovable structures of excavations.
The expert forum is intended for archaeologists and architects of the State Board of Antiquities and Heritage (SBAH) and attached institutions in Iraq. By proposing a capacity building programme, it seeks to foster as well as to intensify dialogue and exchange on recent technical developments in the fields of building archaeology and heritage conservation.
The Iraqi-German Expert Forum on Cultural Heritage is an initiative of the German Archaeological Institute and its Baghdad Branch. It is generously funded by the Migration Fund at the Federal Foreign Office and supported by the German Federal Parliament. It is part of the project “Stunde Null: A Future for the Time after the Crisis” initiated by the Archaeological Heritage Network in Germany and supported by the German Foreign Office.
This poster presents the structure and implementation of the expert forum and focuses on its goal to find the balance between capacity building in basic tools and in modern techniques.

Dörte ROKITTA-KRUMNOW | Franziska BLOCH, Germany

The „Syrian Heritage Archive Project“ of the German Archaeological Institute and the Museum of Islamic Art, Berlin: A digital register of sites and monuments for Syria

Keywords: Syria, heritage preservation, digital record

Abstract:

Syria counts among the world's outstanding cultural landscapes. Since the outbreak of the current civil war, however, the dense distribution of monuments in Syria and the unusually good state of preservation of many sites is acutely threatened or already lost. It is against this backdrop that the German Archaeological Institute (DAI), in cooperation with the Museum of Islamic Art in Berlin (SMB-SPK), has been pursuing the "Syrian Heritage Archive Project" (SHAP) since 2013. It is supported by Germany's Federal Foreign Office as part a cultural preservation programme.

With the creation of a digital record of Syrian cultural assets, the project aims to digitize and preserve primary research data for long-term access, and is gradually generating the basis for future work in the area of heritage preservation. The Syrian Heritage Archive Project is carried out within and provides an indispensable basis for the broader project "Stunde Null – A Future for the Time after the Crisis", under the umbrella of ArcHerNet.

Since 2013, extensive archival records and museums holdings have been digitised and systematically captured in the databases of the DAI. More than 120,000 datasets have thus far been integrated into the DAI's digital research environment (iDAI.world) and administered according to a standardised methodology. It is precisely the information generated by the DAI's longstanding research activity in Syria that is documenting the cultural heritage of the region in a substantial way. Numerous images and plans of historic monuments and archaeological artefacts from almost all key periods of Syrian history provide valuable data to those working on the urgent problems of preservation in Syria and contribute to international efforts for the protection of cultural heritage.

Issam BALLOUZ | Issam HAJJAR | Eva-Maria AL HABIB NMEIR | Sandra SCHAEFER | Rasha KANJARAWI | Zoya MASOUD | Karin PÜTT | Rania ABDELLATIF | Alaa HADDAD, Germany

Damage assessment method for Syrian built heritage

Keywords: Damage Assessment, Data base

Abstract:

DSDS, or Digital Spaces DataSheets:

Is a web-based database for collaborative documentation, developed by Syrian Heritage Archive Project, for the purpose of Building Documentation and Damage Assessment.

Main aspects of this work are a unified methodology, accessibility for different contributors and devices and a multi-level documentation from rapid to detailed. Goal is to prepare files with an element documentation and assessment, summarized with a recommendation class for best practice first measurements, in preparation of a further rehabilitation

This solution has in detail following objectives:

- establishing documentation files for a list of monuments by collecting all available plans and photographs
- performing a damage assessment (DA), ranging between rapid (based on UNESCO forms) and detailed, based on European standard EN 16069, with German conservation expertise.
- handing over the results to all contributing partners, as well as to Syrian authorities of concern.
- sharing methods and knowledge with Syrian experts.
- In this, we are using some main methods, as:
- using a restricted web-accessible database with collaborative workflow (multilingual)
- development and test of a mobile app for photographic documentation and data entry
- preparing documentation files in Berlin
- consulting multipliers from Syria and acknowledged experts
- performing training workshops for trainers on building documentation on one hand, and damage assessment on the other hand
- working with Syrian colleagues on building documentation in situ.
- for DA: setting a list of damages (kind, grade, consequence)
- for building documentation: setting an ontology to describe built elements.

A new approach in this project would be:

- adding the state/ condition of an element, of either built heritage or even any other kind of object, it allows us to establish a link between scientific research and subsequent conservation and management.
- by using a mobile app, It opens the way for civil society to participate in the management of cultural heritage

Mayssoun ISSA | Tutku TOPAL | Martina MÜLLER-WIENER | Anne MOLLENHAUER | Dietmar KURAPKAT | Zoya MASOUD | Martin FLEISCHMANN | Franz AUßERSTORFER, Germany

3D model as a basis for the discussion on the reconstruction of the Aleppo bazaar

Keywords: 3D model, reconstruction, postwar rehabilitation, Aleppo, bazaar

Abstract:

In 1989 the old city of Aleppo was declared world heritage. Since 2011 Aleppo became one of the hotspots of the armed conflict in Syria and a great number of historical buildings were damaged or destroyed. The project presented by this poster is one of the “Stunde Null” projects, an initative of the Archaeological Heritage Networks (ArchHerNet), a network of the German Archaeological Institutes and aims at creating a scientifically based 3D model of the bazaar in its condition before the destructions since 2012. The model will be delivered to the very heterogeneous groups of actors involved in decision-making and planning of rehabilitation measures as an instrument that illustrates the historical monuments of the bazaar and conveys the complexity of its structures.

The construction of the 3D model is carried out in a number of successive working steps. After dividing the bazaar into endowments, a pilot area was chosen to begin working on. First, a survey on available data (Plans, photographs, scientific research, etc.) was carried out. This data was collected and integrated in a systematic folder structure that allows fast and easy access to the data.

The virtual 3D model is developed on the basis of the plans and photos collected from several sources. Appearing differences are equalized manually. The 3D model is intended to serve not only as a tool for visualizing and documenting the bazaar but also as an instrument which enables through its development process an exact verification of the available data on individual building areas and the reliability of their reconstruction. Another important goal of the project is capacity building. The creation of the 3D model is combined with the training of Syrian experts and young researchers and the establishment of a network of persons and institutions working on the bazaar.

Zoya MASOUD, Germany

Rebuilding the Suqs of Aleppo

Keywords: Aleppo, memory, identity, Suq, map

Abstract:

Aleppo is one of the oldest continuously inhabitant cities in the world. Due to the on-going war, followed by unmanaged reconstruction procedures, Aleppo suffers from systematic destruction within its historic center, which is listed as a UNESCO world heritage site. Despite the continuing armed conflict in other Syrian territories, reconstruction plans for Aleppo are under intensive discussion. It is anticipated that such plans could bring about a second wave of destruction and demographic change. The research intends to examine the variables influencing the re-building process from urban planning aspects. To this end, three layers of maps will be produced: different values of the Suqs before the civil war, their destruction after 2017 and a memory map of Aleppians inside and outside Aleppo in order to evaluate losses the city had and still suffers from. The dissertation intends to provide a thorough examination through deep qualitative questionnaires with various categories of actors and stakeholders (Aleppians: visitors or shop tenants / owners in the Bazaar, academics, actors and institutional representatives … etc), the social context of the Bazaar before the war, the interests in rebuilding the Suq and the potential role such heavily charged and shared historic site can play in the national social reconciliation through urban planning.

Benjamin DUCKE | Claudia BÜHRIG | Felicia MEYNERSEN, Germany

A New Spatial Information System for Palmyra

Keywords: Palmyra, GIS, iDAI.welt

Abstract:

The UNESCO World Cultural Heritage Site of Palmyra, an ancient settlement located in an oasis in the heart of the Syrian desert, has been at the centre of recent media attention. It is an exceptionally well preserved site is a manifest of world history that is second to none in its architectural and historical importance.

The scope and diversity of academic research, surveys and excavations at Palmyra reflect the site's importance. Archaeologists from Syria and many other nations have worked here for many decades and have produced a wealth of documentation and data. Given the current situation, the long-term archival and dissemination of this data has become a matter of utmost urgency.

Together with many supporters, data donors and academic partners, The German Archaeological Institute (Deutsches Archäologisches Institut, DAI) is coordinating efforts to pool, digitize and archive research data on Palmyra and its immediate environs. The preliminary result of this initiative is a spatial database that contains GIS-based data on topography, architectural remains and excavated features, as well as per-monument, object-based documents and large image series.
The DAI's online platform, iDAI.welt, plays a key role in our efforts to attract external contributors, structure and archive data for its long-term preservation and open or (depending on needs) restricted access. This open infrastructure offers various components for online data storage and retrieval, such as a gazetteer, a GIS data repository and an object database. It uses open source software and open standards for data formats and protocols, and employs system-wide, unique identifiers to correlate datasets between the various storage backends.
Our poster presents an overview of the technology and current state of work, by the DAI and its partner organisations and researchers, in building a publicly accessible, online database and information system for Palmyra.

Felicia MEYNERSEN, Germany

Telling Stories with Data: An object biography of Athena Allat at Palmyra

Keywords: Narrative visualization, object biography, Palmyra, archaeology, digital heritage

Abstract:

Acknowledging the processual nature of material culture, its artefacts and contexts, a Syrian-German project is indebted to the novel approach of object biography. The object concerned is the Athena Allat monument at Palmyra.
It is the aim to reconstruct the monument's changing appearance and state phase by phase up to the present's day, including action taken in response to damage it suffered: a cultural biography of the monument from the original raw material to the present-day artefact. Computational archaeology, after all, is not just a matter of geo-data; it is also a matter of object-data.
Cultural heritage data concerns the identity of all forms of human organization. Whoever controls this data can possess, manipulate or destroy identities. Examples of this are many and varied. Cultural heritage data must therefore not exclude the people in host countries, but should actively include them. What is necessary therefore is a reorientation towards the specificities of cultural heritage data and towards crises. The Syrian-German case study seeks to be sensitive to these manifold conditionalities and to formulate an answer to the question of how to respond to the crisis. Making cultural data and project-related results available as parts of a network are of fundamental importance.
The DAI's online platform and data infrastructure, iDAI.welt, plays a key role in the efforts to structure and archive cultural heritage data for its long-term preservation and open access.
The case study is a international cooperation/co-production with Walid As'aad, Andreas Schmidt-Colinet et al.

Tony GERROUGE, Germany

The Annotated Atlas on the Architecture of Hauran, Syria

Keywords: Syria, Cultural Heritage, Hauran, Interactive Media

Abstract:

Among the international and regional efforts to protect and preserve the endangered cultural heritage in Syria, the project “Stunde Null: A future for the Time after the Crisis” by the German Archaeological Institute comes as one of the valuable steps to complete the Institute’s highly significant targets.

The need for documentation projects is evident, particularly for urgent regions like Palmyra and Aleppo, as World Heritage sites. Moreover, there is also a need for the documentation of other important regions like Hauran, South of Syria, to form a source of information for the restoration experts and decision makers when the crisis is over.

With the vast areas of endangered sites of cultural heritage in Syria, any given attention by organizations, initiatives and individuals seems to be very important to cover a part of those areas.

This “The Annotated Atlas on the Architecture of Hauran, Syria” is a 2-year project, as a scholarship by Gerda Henkel Foundation in Düsseldorf, Germany that aims to produce a restricted-access online database to experts and researchers, containing the available materials in the library of the Orient Department of DAI, related to the archaeology and historical architecture in Hauran, Syria.

Targets:

Due to the fertile soil in Hauran, the people of this region have had through history enough resources to build and maintain their architectural monuments.

During the 5th and 6th centuries, the region of Hauran had about 30 parishes to cover all the villages of the region, each of which has had at least 1 church.

This project has the following targets:

- Shedding light on the importance of Christian architecture of the region of Hauran in the Near East,
- Supporting researchers, restoration experts and decision makers by building an online interactive database.

ABSTRACTS – APP-AWARD

(Organiser: 7reasons Medien GmbH., Austria)

Edeltraud ASPÖCK | Seta ŠTUHEC | Ksenia ZAYTSEVA | Peter ANDORFER, Austria

DEFC app

Keywords: online database, Neolithic, Greece and Anatolia, linked open data, DEFC app

Abstract:

The open access online database called DEFC app, available on https://defc.acdh.oeaw.ac.at/, is a work in progress that stores archaeological research data on Neolithic Greek and Western Anatolian sites and finds. The Django-based web-application has been designed in the framework of the Digitizing Early Farming Cultures Project, which aims to integrate and harmonize archaeological research data (analogue and digital) on Neolithic Greece and Western Anatolia in order to provide a basis for studying archaeological phenomena collaboratively across the whole region for the first time. So far the database includes information extracted from several publications as well as unpublished work containing excavation and other archaeological reports. At the moment users can browse, filter and download information on over 800 archaeological sites. The sites with known spatial coordinates can also be visualized and filtered using an interactive map. Furthermore, the database supports additional media content such as 3D models of selected sherds from the Fritz Schachermeyr pottery collection and for registered users also an image glossary, which depicts the pottery typology of that period and region. The image glossary is a support tool for the data entry process. Moreover, the DEFC app homepage includes video content that is unlike the database content more noticeably directed also to the layman public.

Through the DEFC app archaeological legacy data concerning the topic are for the first time available in a searchable form and can be used and reused by archaeologists first and foremost but also by interested public. As the database complies with existing standards and guidelines, further work can focus on interoperability and linked open data by mapping the database to CIDOC CRM, storing the data in a triple store and enabling data querying via SPARQL endpoint.

Erik DOBAT | Patricia WEEKS | Christof FLÜGEL | Markus GSCHWIND | Lyn WILSON | Alistair RAWLINSON, Austria | UK | Germany

Antonine Wall

Keywords: Antonine, Wall, Roman, Frontiers, Limes

Abstract:

Advanced Limes Applications for smartphones:

In 2016 the ALAPP project was granted funding from Creative Europe to develop cutting-edge technology to enhance visitor experience at the Antonine Wall in Central Scotland and on the Limes in Lower Bavaria.

Based on earlier developments of smartphone applications in Bavaria, created for archaeological monuments and museums, the ALAPP project is using the existing technological framework to

develop a smartphone platform for the Frontiers of the Roman Empire World Heritage Site. In the future, ALAPP may be used by other cultural and archaeological sites to provide visitors with the latest technology.
Modern smartphones are powerful computer devices and can display any kind of information. The existing platform, based on the applications from Bavaria, already displays a wide variety of content such as video, audio and texts with pictures. Furthermore, GPS navigation provided by smartphones will alert the user when approaching a Point of Interest (POI) in the landscape. The application will display content offline, so an internet connection is not mandatory. This is especially important for remote regions and also for users visiting from different countries.
The ALAPP project is now aiming to enhance the capabilities of the existing platform. For users, new types of content will be introduced:

- rotatable 3D objects
- 360 degree views
- Augmented reality

For content providers, the platform will feature a content management system (CMS) that enables information to be kept up-to-date without the need to upload a new version of the application to the app stores every time.
The archaeology of the Frontiers of the Roman Empire WHS is an ideal monument to install and test the possibilities of modern technology. The ALAPP platform will be available for Android and iOS. The Creative Europe project started in 2016 and will be finished in 2019.

Takehiko NAGAKURA | Woongki SUNG, USA
CHNT, You've got AR Mail!

Abstract:
"You've Got AR Mail!" is a mobile application that enriches the spatial experience and social interaction for visitors at cultural heritage sites. It combines augmented reality (AR) technology, captured photogrammetric 3D models, and traditional paper media.
The digital content augmentation in the AR application includes photogrammetric 3D captures of the target site and animated human figures. The paper media is a set of architectural drawings printed on postcards that serve as trackable image targets. A plan of the entire heritage site is partitioned into several drawings, each printed on a postcard and augmented by a corresponding 3D model. When a user of the app views these postcards through the camera of the mobile device, the digital contents are superimposed over the view of the drawings.
An individual postcard is used to examine each 3D model, or all the postcards can be combined in a specific arrangement to see the entire site. The meticulously captured 3D models provide users with a scaled, realistic representation of the target. The system also provides a special scissor card that allows the user to "cut" the digital model and see the cut section at any angle for further exploration. These postcards then can be sent to a remote location to share the visitor's spatial experience with friends and family.
"You've Got AR Mail!" is designed to give users a playful and exploratory experience of a cultural

heritage site and a way to share their experience with others using the mail-friendly postcards. This is a low-cost interactive platform suitable for any tourism center or location of historic importance. Its application can be tailored to each site by adding annotations, playful graphics, and audio recordings that provide additional information to the visitor.

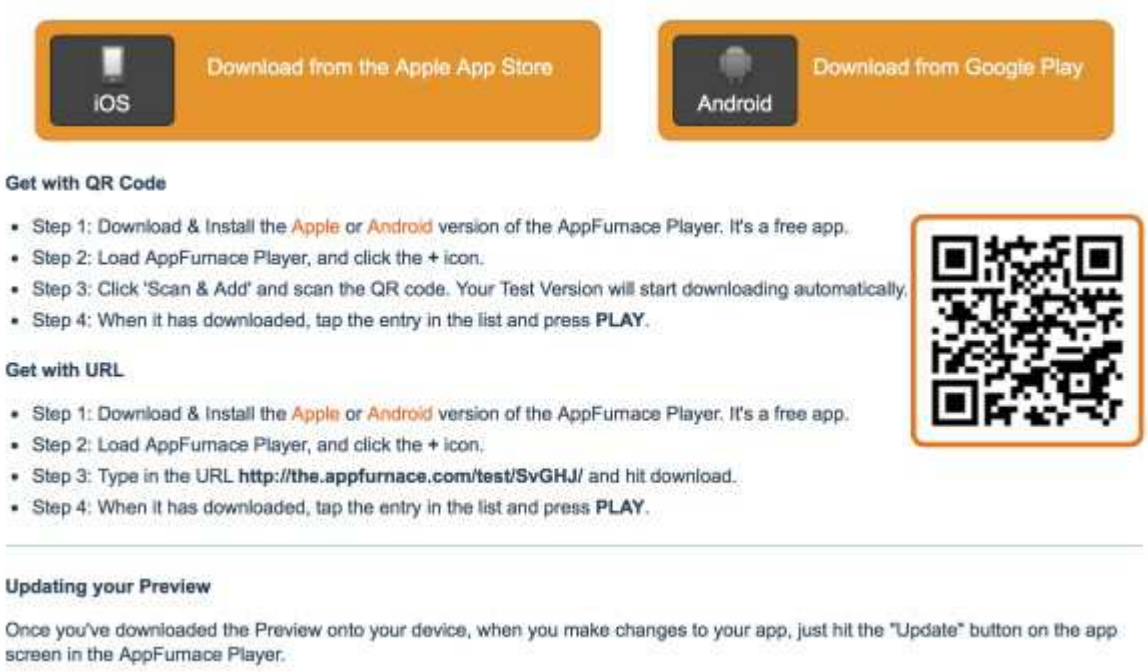
Special APP – Award: Vienna City Award for Innovative Apps in Cultural Heritage for young researchers
(This award will be sponsored by the Vienna Municipal Department of Cultural Affairs)

Cristina MOSCONI, UK

Rollright App

Keywords: site specific, stone circle, interpretation, Neolithic archaeology, outdoor archaeological site

Abstract:
For my dissertation (MA Archaeology for Screen Media, University of Bristol), I produced an app to research the potential and effectiveness of site specific mobile applications as interpretative tools for outdoor archaeological sites where it is not possible to provide standard site interpretation (i.e. display boards, visitor centre, etc.) nor access to mobile network (3G/4G) is guaranteed.
The Rollright Stones (Oxfordshire, UK) are a unique group of three monuments formed by a stone circle and two monoliths dating back to the Neolithic Age, nowadays strongly imbued with archaeological, legendary and spiritual values. Unfortunately, the remote and unguarded nature of the Stones constitute a strong deterrent to the reestablishment of permanent installations and the appointment of internet connection devices.
The site-specific Rollright App -produced using the free online platform AppFurnace (Calvium) and available for download via QR code, is not geo-located so it can be used also in a 'armchair' modality. Using a simple interface, the app provides visual and audio insights about the archaeology, history and folklore of the Stones. For each monument it includes pictures of the excavations and the finds, as well as didactic simple visual comparisons with similar monuments in the UK. Featuring also audio contents such as folktales and brief tour of the site, the app is appealing to young users and friendly for visually-impaired visitors.
With the aim of covering the broad spectrum of visitors' differing expectations, the app presents a layering approach to the contents allows different grade of engagement, which has received an enthusiastic welcome –in particular families and school groups. Being minimally intrusive and yet easily accessible, the Rollright App allows the visitors to gather information about the site in an enjoyable and personalised manner without spoiling the under-stated nature of the Stones.



Cristina CIUFFI, Italy

Perfect Picture

Keywords: Perfect Picture

Abstract:

1) PerfectPicture is an innovative App for smartphones and tablets aimed at promoting and exploiting places of cultural heritage – from famous art cities to less known tourist routes. It rouses the travellers' curiosity by enabling them, in the shortest time possible, to take their own Perfect Picture against world-famous backgrounds because it selects for them strategic places of historical, architectural or landscape interest.

2) PerfectPicture is conceived so that you can "photograph yourself" rather than just take pictures. Its original idea comes from tourists' very common demand to be photographed in the most beautiful and interesting locations they visit. Unfortunately, lack of time or a faulty organisation of their travel itinerary often prevent them from doing so. PerfectPicture is unique for it allows to photograph people and backgrounds together in one single shot with no waste of time. PerfectPicture was first released in 2014 for New York. On the occasion of Expo 2015, then, PerfectPicture – Milano was created in partnership with Canon Italia.

3) PerfectPicture exploits places of cultural heritage and makes travellers save time. By being directed to the most beautiful and interesting spots of the places they visit, tourists can photograph themselves in these spots with no waste of time. Through their pictures, then, they can tell the story of their journey in a unique way.

4) PerfectPicture is the right app for those who visit art cities and places of cultural heritage, and do not want to waste time selecting the best backgrounds to photograph themselves against. Tourists will have an organised itinerary of Perfect Pictures to hand, together with all the most useful information on the places they are photographing. The Map section of the app presents you with strategic photo

spots in which you can take your own perfect picture following the parameters given in the Prototype Picture section. You can then upload and share your photos on social networks.
www.perfectpictureapp.com
PERFECT PICTURE VIDEO: https://youtu.be/cMBr_by2hKc
For iOS devices: https://itunes.apple.com/it/app/perfectpicture/id1013969227?mt=8
For Android devices: https://play.google.com/store/apps/details?id=com.perfectpicture

SPECIAL LECTURES AND PRESENTATIONS

Stephanie RAMMEL, FFG – Austrian Research Promotion Agency, Austria
Cultural Heritage in Horizon 2020 calls for proposals (European and International Programmes (EIP)

Margareta MUSILOVA, Slovakia
Film-presentation: The Celtic hillfort on the Bratislava Castle Hill

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