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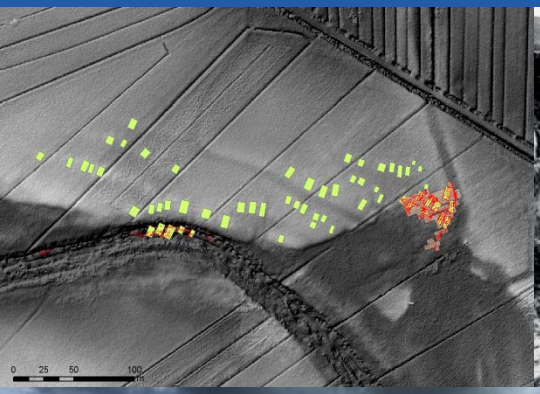
VirtualArch

TRAINING CURRICULUM

Transnational recommendations for archaeologists and heritage managers to approach stakeholders using our VR/AR technologiy tools for economic development and managing spatial usage conflicts



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VirtualArch

Visualize to Valorise – For a better utilisation of hidden archaeological heritage in Central Europe

O.T2.3. Transnational Training Curriculum

Edited by Dr. Dimitrij Mlekuž, Institute for the protection of the cultural heritage of Slovenia

Project

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	6. Autonomous Province of Trento, Cultural Heritage Department, Trento, Italy (IT)
	7. Institute for the Protection of Cultural Heritage of Slovenia, Centre for Preventive Archaeology, Ljubljana, Slovenia (SI)
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	10. City of Zadar (HR)

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This deliverable contains original unpublished work except where clearly indicated otherwise. Acknowledgement of previously published material and of the work of others has been made through appropriate citation, quotation or both.

Contents

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Deliverable introduction

This manual is a “transnational” curriculum which provides training material for archaeologists and heritage managers to approach stakeholders using our VR/AR technologies.

Developing of the training curriculum is based on good practices developed within the VirtualArch project for training of local and regional stakeholders on presenting and using visualization tools for economic development and as a tool for managing spatial usage conflicts.

The main target group for this manual are archaeologist and heritage specialist who need to disseminate their knowledge and communicate with different stakeholders, such representatives of public local and regional administration from the field of regional development and tourism, schoolchildren, local population etc.

Introduction

Hidden archaeological heritage forms a significant part of humanity shared heritage. Hidden underground, covered by modern development or lying in the depths of seas, lakes and rivers are numerous archaeological sites and traces of the past; ruins, mine shafts, settlements, harbours, shipwrecks and other traces of the past, each containing precious historical information that bears testimony to the past life. For centuries, this heritage has remained well-preserved and to some extent protected by the medium that covered it. In recent decades, however, urban development, construction of infrastructure, intensive agriculture and forestry and tourism have rendered these archaeological sites more vulnerable to destruction. Natural disasters, due to global warming and developments can sweep away all traces of what once existed, often before they are even discovered. The increasing threats to this fragile archaeological resource led to the development of the VirtualArch project that aims to make hidden and forgotten archaeological heritage visible again, using state-of-the-art visualisation methods.

Objectives of the VirtualArch project

The main objective of the VirtualArch project is a sustainable use and protection of non-visible and hidden archaeological heritage using innovative ICT and VR approaches. Using these tools will allow archaeologists and heritage professionals to better manage archaeological heritage, better represent heritage in the democratic process and spatial planning, but will also benefit regional identity, cultural participation and local economy.

Main goals of the VirtualArch projects are to visualise, present and disseminate non-visible archaeological heritage using creative visualization tools i.e., mainly virtual and augmented reality tools.

These tools are designed to make heritage more tangible, visible and better represented for local and regional stakeholders being responsible or just interested in either economic development, sustainable spatial planning, avoidance of conflicts, long-term protection or raising awareness of hidden archaeological heritage.

Thus VirtualProject partners will develop and implement target group-oriented, specially designed visualizations and presentations to increase their level of awareness and acknowledgement of archaeological heritage.

This will allow better utilisation of less known heritage in local and regional tourism developments or in the field of creative and media industries. Those tools will increase cultural awareness and contribute to the building of regional cultural identity and cultural participation.

Ten partners from 8 central European countries have elaborated elaborate a transnational strategy for visualisation and dissemination of hidden archaeological heritage. Therefore, eight selected pilot sites were researched, digitized and then visualized and results were presented to the stakeholders through guided field tours and information points. The pilot sites are consisting of special heritage sites like prehistoric and medieval mines, roman and medieval harbours as well as cultural landscapes with prehistoric pile dwellings or urban archaeology with huge and complex stratigraphies. This means that project tackled not only different time periods but also different areas, environments, different types of heritage, with their own threats and opportunities and different audiences. Thus the project partners have developed an in-depth knowledge of hidden archaeological heritage, ways of digitising it, knowledge of building and developing visualisations of heritage and ways of communicating the knowledge to different stakeholders and audiences. This curriculum thus develops a structured approach to other experts on how to share their own knowledge, based on experiences from project partners.

Pilot site 5

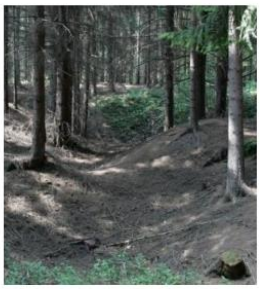
Medieval Mining remains around Municipality of Civezzano (IT)

Pilot site 6

surrounding waters City of Zadar, submerged roman harbour of Sukošan (HR)

Pilot site 7

submerged Medieval harbour, Town of Puck (PL)

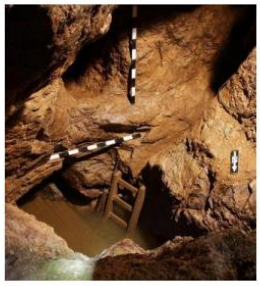


Pilot site 8

medieval mining settlement in Utín (CZ)

Pilot site 1

Prehistoric Salt Mines of Hallstatt (AT), UNESCO world heritage



Pilot site 2

Medieval Mining remains in Dippoldiswalde as part of planned UNESCO heritage site

Pilot site 3

Pile dwellings in Ljubljansko barje as part of UNESCO heritage site

Pilot site 4

Medieval urban settlement area with hidden remains within the City area of Nitra (SK)

VirtualArch project pilot sites.

Training curriculum

This international curriculum aims to develop the ways people involved in heritage protection and management can approach the stakeholders from different backgrounds and varying experience in cultural heritage about the way hidden heritage can be communicated and presented using state-of-the-art visualisations. The goal is to a common level of understanding of the knowledge about the hidden heritage.

The curriculum was designed to be very flexible and to be done mostly on-field, therefore during the visits to the hidden heritage. The curriculum involves the use of visualisations and other tools.

Through informal lectures, practical sessions and fieldwork, stakeholders are introduced to the basics of the cultural heritage protection, archaeological fieldwork and knowledge production, hidden archaeological heritage in their own regional context, use of visualisation technologies and exploration of hidden heritage using visualisation tools.

It is designed to build upon existing knowledge and understanding of the area where hidden heritage is located and develops knowledge through dialogue, exchange of ideas and free exploration. It is based on visual resources in order to foster a deeper understanding of the invisible heritage aspects of their lived environment.

Stakeholders are involved in the planning, implementation and evaluation of visualisation tools. Workshops and guided field trips are offered to them to learn more about the existing heritage and raising their awareness, especially in case of heritage threats and protection conflicts. Besides, workshops and conferences about related topics – archaeology and tourism, public archaeology, archaeology and agriculture or usage of archaeological data in the media sector – bolster the knowledge of all partners and capitalize good practises.

This curriculum is a tool for both formal and non-formal education, promoting communication and establishing connections between heritage specialists and stakeholders, through activities that promote the creation of dialogue and communication between heritage professionals and stakeholders.

This manual encourages the stakeholders to carry out an evidence-based and critical intervention in the heritage management, use and enjoyment of cultural heritage and value the importance of cultural heritage as a resource for a sustainable activity, which can contribute to the development of both urban and rural areas of Europe.

The curriculum and training units have evolved over time. The curriculum started to be developed through guided tours partners have organised on their pilot sites for targeted stakeholders.

The initial concern was to design a curriculum that aimed to train people involved in heritage management to communicate with stakeholders, from different backgrounds and levels of professional experience and to bring them to a common understanding of the complex nature of hidden archaeological heritage, complex methods needed to research this heritage, ways of visualising the heritage using modern technologies and disseminate this knowledge to the stakeholders. This entailed the identification and selection of topics according to their relative importance. Given the diverse backgrounds of the stakeholders, it was decided that all aspects of hidden heritage need to be presented, starting from general knowledge and understanding (what is archaeological heritage, what is its nature, how we research it, how do we know something about the past) and then develop towards the more local and particular knowledge about the local hidden heritage, using developed visualisations.

Feedback from the stakeholders was evaluated and used to improve the guided tours, visualisations themselves and finally the curriculum courses. The delivery of training units was dictated by the logical order of topics, with each topic building upon the knowledge gained from the previous ones.

Some, especially more general, topics were developed through International stakeholders conferences. VirtualArch project partners have organised five such conferences, addressing different aspects of interactions with stakeholders, such as, “Best practices in visualisation and virtual reconstruction of hidden heritage” in Dresden in November 2017, “Archaeology and Tourism” in May 2018 in Zadar, “Public archaeology” in October 2018 in Nitra, “Archaeology, agriculture and forestry” in Ljubljana in March 2019 and “Using digital archaeological heritage” in September 2019 in Trento. In addition, an international Summer School was organised in Torun in June 2019, targeted mainly at students and focused on the technological aspects of digital heritage.

International stakeholders conference "Agriculture and Forrestry", March 2019 in Ljubljana.

International stakeholders conferences allow the main issues to crystalise and offered an ample opportunity to talk and discuss with stakeholders from different environments and backgrounds. Allowed partners to discuss their own experiences in communicating the visualisation to stakeholders.

Objective and depth

This manual aims to provide a consistent curriculum for communicating knowledge about hidden heritage using visualisations and a high standard of delivery of the training units. It also provides future trainers with a framework that enables them to create personalized presentations, practical sessions and assessments. The curriculum is organised into five modules.

The main objective of this transnational curriculum is to empower stakeholders with knowledge about invisible heritage. The goal is to provide stakeholders with knowledge and understanding of the hidden heritage, not just about its existence but also complex issues: what is archaeological heritage? how it is made or discovered? Why it is important? What do we know about it (and what we don't)? These questions will be addressed with the help of visualisations developed in the VirtualArch project.

The core idea of the curriculum is how to approach different stakeholders using the tools developed in the VirtualArch project. However, visualisations as such are not enough. They need to be deployed within a wider narrative which involves not only archaeological heritage but also other uses of the. The stakeholders – their knowledge, role, interests – thus play a key role in the execution of activities in the curriculum.

Rationale and organisation

The manual is divided into five modules, one module for each topic covered. The contents of each module are:

- Core knowledge of the module
- Introduction
- Module core
- Module summary
- Suggested reading and
- Additional information

The topics described in the curriculum have emerged as key issues when communicating with stakeholders either during conferences or through guided visits to the pilot sites. In order to successfully communicate knowledge about the invisible heritage, first, a common language and understanding should be established.

Therefore, first modules develop fundamental issues, related to the archaeological heritage itself and nature of archaeological knowledge production. When discussing heritage, and especially archaeological heritage, it first had to be addressed what heritage is, in what forms it appears, why is hidden and why it is important (addressed by Module 1). This allows stakeholders to understand our concerns and point of view.

The second issue that often emerged through communication with stakeholders is, how do we know what we know? How to establish veracity and authority of models and reconstructions? What is the factual basis of our reconstructions? Those are questions that are implicitly or explicitly addressed when presenting visualisations of invisible heritage. The main goal is not to establish an authoritative discourse, but base our visualisations arguments on existing evidence. By demonstrating the process the knowledge about the past is constructed, the procedures and data that was used, gives much more weight to the models and visualisations, understanding the work of archaeologist and heritage professionals (addressed by Module 2).

While the first two issues are general in nature, do not differ significantly between countries and stakeholders and should be communicated to all stakeholders, the next three issues relate to the specific, local heritage.

The main aim is to familiarise stakeholders to the hidden heritage in their landscape (addressed in Module 3).

Fourth topic issue of visualisations developed in a project. Visualizations should be conceptualized as "boundary objects", carriers of different meanings in different social contexts, but simultaneously maintaining a sufficiently coherent structure to be recognizable across different communities. As such, they provide a point of interpretation and translation among those communities, between archaeologists and heritage managers and the stakeholders.

In this way, they provide a common ground to understand productive dialogue with stakeholders. The main issue is how to use visualisations as a boundary object in order to allow stakeholders to be able to autonomously explore the hidden heritage using visualisations and applications (addressed by Module 4)

The last topic, addressed in Module 5 allows stakeholders to present their own view of heritage. Based on their knowledge, developed through first four modules and use of visualisations, stakeholders should be able to articulate their own understanding of the ways heritage impacts their own use of space and develop a dialogue that can address threats and opportunities, provided by the heritage.

Rationale and organisation

Archaeological traces are, by definition, often fragmented, buried and invisible. They require specialised tools and approaches to detect, record and imagine past landscapes.

Information technology has been of increasing importance in recent times for data manipulation, mapping, and analysis. The use of spatial technologies in archaeological research has enhanced our ability to collect, store, analyse and imagine archaeological data. Remote sensing has helped us detect archaeological remains systematically over large areas. Remotely sensed images of the Earth's surface have increased in quality, availability, and potential for being integrated with a GIS environment. New technologies such as lidar (light detection and ranging) or ALS (airborne laser scanning), create remarkably detailed models of ground topography, which can be used for archaeological prospection. Advances in GIS and remote sensing have resulted in the development of spatial databases, which now regularly include thousands of individual features extending over the broadest areas of study.

Spatial technology has had an immense impact on our ability to create, manage to analyse data sets and share our results with other professionals and the stakeholders. They play a key role in the development of preventive (or development led) archaeology, where archaeological remains are seen as a limited resource that has to be managed in a sustainable way, and this mainly through spatial planning.

The productive engagement with information systems in archaeology opens new paradigms and research venues. Spatial technologies have been conceived as useful tools, which can be applied to the working processes in archaeology that are already well established. But information systems are not only representation tools, but they also allow for a productive engagement with the past. The construction and analysis of digital models of past landscapes is not only a way of reproducing the real world but also a new framework of reference for approaching and exploring it in novel ways, while also identifying new conceptual and theoretical problems.

The present-day landscape can be seen as a historical artefact and the main object of study is focused on how the past survives and makes the present landscape. The modern landscape is understood as a heritage, a cultural asset and a resource. However, the past in the modern landscape is often hidden, difficult to understand, buried, incorporated or covered. The goal of these approaches is to provide structured understanding to inform planning and management decisions across a wide range of options that affect the landscape.

These approaches were developed to provide an understanding of the historical dimension of the modern landscape and to uncover its hidden dimension. It provides a context for appreciating how archaeological sites fit into the modern landscape. It focuses on the time-depth of the landscape, treating landscape as a matter of history rather than geography.

Heritage visualizations as products designed to stabilize and consolidate archaeological knowledge. They are not mere illustrations of texts, but important actors in the process of knowledge production. Visualizations can shed light on open questions, help us develop arguments and offer new interpretations. Thus visualizations play an important role in the "real" archaeology, they are instrumental in the interpretation of the past. Making visualizations is in no way different from other, more usual tasks of archaeologists. Making visualizations is knowledge production, in the same way as producing reports, writing articles or creating exhibitions. Visualizations thus become actants in the process of knowledge production about the past and can be mobilized to significantly support our interpretations. The assemblage that produces a visualization (including people, tools, machines), the visualization itself, the number of inscriptions mobilized into a visualization, parallels, generalizations, discussions, the line of reasoning etc. are in a constant process of interaction and mutually constitute each other, aligning themselves along with the general arguments and ideas of the visualization, making new alignments and changing the direction of interpretation. Through this process of "translation', new knowledge and insights are gained. Knowledge is thus not fixed, but mouldable and is constituted through this process. Visualization is therefore not the product or reflection of knowledge, but is made during the process and becomes fixed and stable by itself. When completed, visualization looks like a coherent, solid entity, a black box. But if we open this box, visualization reveals itself as a heterogeneous network of different actants. In this way, the line dividing "data" and "interpretation", "familiar" and "new", "fact" and "hypothesis" becomes blurred and irrelevant. Visualizations are carriers of complex knowledge, communicating this knowledge using the visual language. This makes them very suitable tools for communicating complex knowledge to the wider public.

Visualizations can thus be conceptualized as "boundary objects", carriers of different meanings in different social contexts, but simultaneously maintaining a sufficiently coherent structure to be recognizable across different communities. As such, they provide a point of interpretation and translation among those communities, for example between archaeologists and the public. But therein lies the danger: the visual sophistication of the visualization can be a mere facade of empty or misleading content. These "hyper-real" images do not communicate ideas but serve only to make the past more inspiring, beautiful or interesting than it really was. In order to document and maintain the credibility of visualizations, we stress the importance of "paradata", the record of the subjective discussions and decisions made in the process of building visualizations.

Stakeholders

Stakeholders are individuals or institutions that are either interested in the aims or VirtualArch project or are somehow involved or with the invisible heritage – either as users, managers, or just interested public. They can get involved in many different ways. Curriculum affects them either directly – like the ones involved in the activities – or indirectly, as promoters and users about the hidden heritage. Stakeholders are not mere recipients of this curriculum, they are the very reason a curriculum is developed and they should be seen as active agents in promoting the hidden archaeological heritage.

Stakeholders, identified during the VirtualArch project include mainly:

- public administration
- tourism workers
- forestry and agriculture workers
- educators
- students
- other interested public

Stakeholders are not *tabulae rase*. They possess their own knowledge, understanding and perception of the landscape they live in and work with. Thus this curriculum does not promote one-way transmission of knowledge but strives to a more dialogical approach, where our aim is to build mutual understanding in relation to heritage and presence, form and importance of hidden heritage. This curriculum is designed to promote dialogue, communication and mutual understanding between stakeholders and heritage managers, based on visualisations of hidden archaeological heritage.

Besides, the curriculum aims to establish a connection with the stakeholder and induce the urge to conserve cultural heritage. Archaeological heritage should be interpreted in a way that it somehow relates to the visitor or viewer.

Discussion with stekeholders in Dippoldiswalde, Germany.

Trainers

The selection of trainers is essential in ensuring a high standard of delivery of training activities. During the project, trainers were mainly project employees, actively involved with either pilot heritage, recording and digitising or development of the visualisations. This proved to be the best case, as deeply involved trainers they possess the deep knowledge and understanding of the topics they are teaching. In some cases, more than one trainer can be used, as some trainers are more specialised, either in heritage aspect or visualisations and digital technology. When training new trainers, it proved best to involve them in modules as passive listeners, preferably with as many different stakeholders groups as possible.

Assessement

The assessments on the goals of each module have been relatively informal and may take various forms, such as verbal discussions to determine to what extent the ideas are assimilated by the

stakeholders. The main goal is that stakeholders understand what heritage is, what kinds of heritage are in their environment and be able to use visualisations to actively explore it by themselves. Assessments are needed to provide a basis for future trainers to improve the structure of their presentations and expanding and improving the topics and issues addressed by this curriculum. thereby further enhancing the modules and future courses.

Module 1: Invisible heritage

Introduction

This module is intended as a general introduction in the idea of heritage. It strives to make familiar unfamiliar, or in other words, to point to the hidden heritage in a familiar context (for stakeholders).

The main aim is to present the stakeholders with the concept of heritage and the status of archaeological heritage, which is – by definition – hidden, fragmented and buried.

In the end, stakeholders should have a clear understanding of the nature of archaeological heritage, not as some valuable items, stuff, but as a source for understanding the past of a particular region.

On the completion of this module, stakeholders will:

- have a basic understanding of what is heritage, what it consists of, why it is important and what values (scientific, cultural) does it have.

Module core

Archaeological heritage triple meaning; it can mean physical remnants of the past, typically artefacts, buildings etc. but also traces of past human and natural activities (such as pollen, bones, or footprints). It can also mean subject and result of archaeological research and legally protected archaeological site.

The “archaeological heritage” is that part of the material heritage in respect of which archaeological methods provide primary information. It comprises all vestiges of human existence and consists of places relating to all manifestations of human activity, abandoned structures, and remains of all kinds (including subterranean and underwater sites), together with all the portable cultural material associated with them.

Archaeological traces are, by definition, hidden; often fragmented, buried and invisible. They require specialised tools and approaches to detect, record and imagine past remnants.

Archaeological heritage is detected, recorded, interpreted and disseminated through the process of research. This research often involves modern technologies (See Module 2, 3D Visualisation of archaeological data).

This module can be combined and executed in conjunction with Module 3 (Pilot region heritage), which can serve as a case study and as an example of heritage.

Hidden archaeological heritage: remains of prehistoric pile dwellings on Ljubljansko barje.

Resources

- ICOMOS charter for the protection and management of the archaeological heritage (1990). https://www.icomos.org/en/practical-information/179-articles-en-francais/ressources/charters-and-standards/160-charter-for-the-protection-and-management-of-the-archaeological-heritage

Module 2: 3D visualisations of archaeological data

Introduction

This module intends to demonstrate to stakeholders very basic principles of knowledge construction in archaeology. It basically answers the question of “how do we know" something about the past.

The main aim is to demonstrate the stakeholders how the visualisations of archaeological heritage are made. It should present stakeholders the research methods (geophysics, remote sensing, excavation) used in the construction of visualisations, but also on the process of reconstruction and visualisation building. It should clearly address what we know and what we don't know.

On the completion of this module, stakeholders will:

- have a clear understanding how archaeologist makes visualisations of hidden archaeological heritage, how do we know about the past, what information is used in the visualisation, and how did we "fill the gaps" in the knowledge.

Module core

Among different kinds of presentation of tangible and intangible heritage, the virtual reconstruction and visualisation are gaining influence and importance since the early 90s of the 20th century and led to the establishment of the fields of virtual archaeology and virtual cultural heritage. Typically, the field of virtual archaeology is comprehended as a cross-section between archaeology and technology.

The main element of effective visualisations is adequate data acquisition. This field made a huge leap forward in all working processes and greatly improved the level of documentation and presentation quality with the development of modern technologies (e.g. digital photography, laser 3D scanning, and photogrammetry).

The methodological impacts of these technologies can be seen in both in research as well as archaeology heritage management. Results include not only the discovery and protection of new sites and the complete survey of known sites, but also the promotion of an ethic on nondestructive, or minimally destructive field archaeology and incorporation of archaeological data in spatial planning.

Spatial technology has had an immense impact on our ability to create, manage, analyze and especially visualise and image data sets and share our findings with other professionals and the public. Especially Geographic information systems (GIS) have gradually become the platform that should be used to manage spatial large sets of information. GIS allows to integrate heterogeneous data from different sources, ranging from archival information, remote sensing data, geophysics and other fieldwork into a georeferenced database, that can be analysed and integrated with readily available data (such as topographic maps, digital elevation models, cadastral data, land use datasets, etc).

The data acquisition is followed by the computer-aided visualisation that has to, besides being scientifically evaluated, achieve effective communication with the audience, also. The objective in

question is, how we can achieve such communication with the use of the modern computer-aided visualisation.

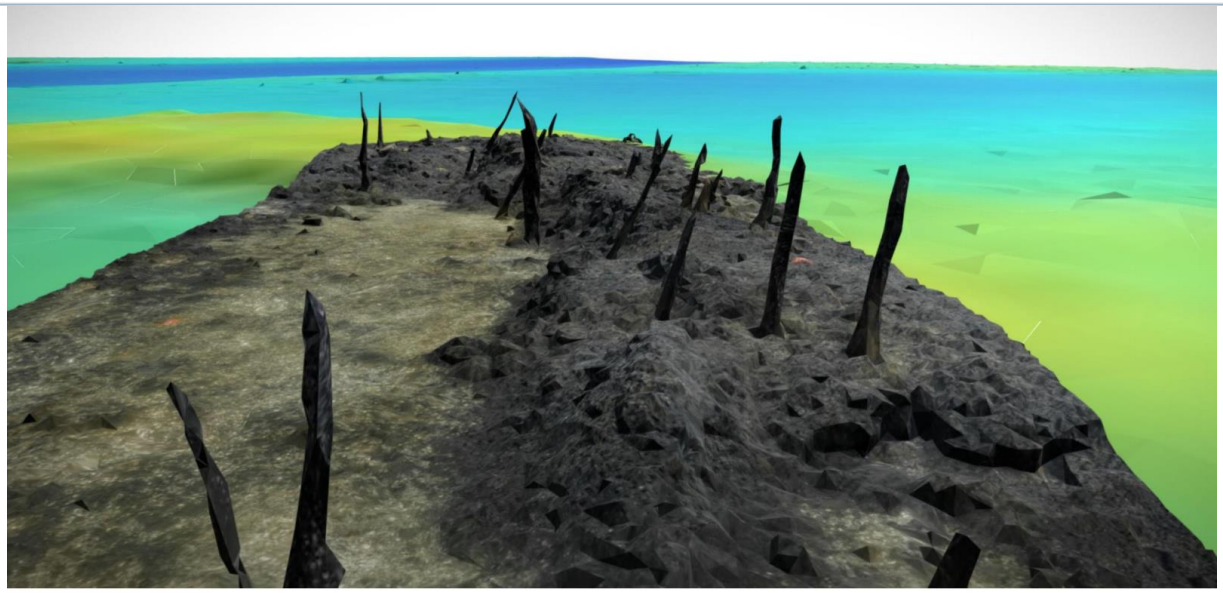
Other concerns were mainly aimed at the fact that these visualisations may convey the knowledge with misleading authority and are not transparent on their accuracy. Consequently, in recent years, dedicated heritage representation guidelines dedicated to the use of virtual tools for cultural heritage were constructed like *London Charter* and *Principles of Seville*.

The London Charter states that a computer-based visualisation method should be used when it is identified as the most appropriate for the selected heritage and purpose only. Research sources and the visualisation process should be documented, and a sustainable archive, preferably one that supports digital 3D data should be implemented. The visualisation should bring vast outreach to the presented heritage.

The Principles of Seville urge that computer-based visualisation should be an interdisciplinary effort that is only a complementary heritage management tool. It should express clearly its purpose, strive or historical rigour, authenticity, scientific transparency, efficiency, and it should also have specific training and evaluation programmes.

Moreover, visualisation of archaeological heritage requires an enormous responsibility as interpretation must convey the right information, touch the audience on a personal level and at the same time remain objective and ethical. Subsequently, visualisation workflow, from data acquisition, interpretation and communication, requires careful documentation of the process.

To accomplish the visualisation corresponding to the guidelines and the desired outcome, we must look at the construction process from all the angles. Namely, archaeologists must create models of the past to transfer the gathered knowledge to a broader public. Therefore, besides the already quite well-defined guidelines for a scientifically based virtual 3D model and the carefully studied archaeological data collection methods, the communication and the manifold heritage interpretation approaches are additional aspects to consider. Successful communication techniques are crucial when conveying any kind of messages. This includes the choice of the right communication tools in mediated communication as well as a construction of the most possibly clear message, which is not affected by communication noise. Consequently, goal-oriented communication that uses specific communication tools needs a specific form of virtual visualisation.



Visualisation of data collected in submerged medievaL harbour in the Puck bay, Poland.

Visualisation of medieval mineshaft from Dippoldiswalde, Germany.

Resources

- Principles of Seville. International Principles of Virtual Archeology. http://sevilleprinciples.com/
- The London Charter for the computer-based visualisation of cultural heritage. http://www.londoncharter.org/fileadmin/templates/main/docs/london_charter_2_1_en.pdf

Module 3: Pilot region heritage

Introduction

Stakeholders have personal knowledge about the landscape and region they live in and work. We should build on this and expand their knowledge and understanding by pointing to the hidden and buried aspects of the area, showing the time depth or complexity of the landscape and site they know.

On the completion of this module, stakeholders will:

- have a comprehensive overview of the archaeological heritage in the pilot region. Understand the role of heritage in the formation of present landscape or site, but also it's status and threats.

Module core

Existing archaeological heritage communication focuses on educating the public by emphasising scientific knowledge from the perspectives of experts (e.g. archaeologists), often sidelining the perspectives of the local community. Nevertheless, the local community's perspective is equally important in providing humanistic insights and in connecting the past to the present context.

We should assess the level of knowledge and familiarity with the study region and build upon that. Our experience from the VirtualArch project clearly shows that most of the stakeholders possess only a vague idea about the archaeological heritage of the area, mostly about iconic sites (such as UNSECO pile-dwellings). However, they lack contextual information and understanding of the wider historical and environmental context. Thus best examples proved to be guided tours with an experienced trainer, who can describe and point to the hidden heritage and discuss it with stakeholders. In our experience, this is best achieved through storytelling, discussion and questions and answers sessions.

This module can be combined with Module 4 (Using visualisations in promotion of the hidden heritage).

Field trip on Ljubljansko barje.

Resources

- Pilot region catalogue with relevant literature
- The main tool is visualisation and apps developed in a project

Module 4: Using visualisations in promotion of the hidden heritage

Introduction

This is the key module of the curriculum. It builds upon the first three modules and empowers stakeholders to creatively use visualisation understand hidden aspects of their landscape or site.

On the completion of this module, stakeholders will:

- understand how the visualisations can be used, what informations does it show, and independently use it to explore their own site or landscape. Stakeholders should embrace

visualisations as tools that they can use to explore hidden aspects of the landscapes they know, live in and work in.

Module core

The visualisations themselves are not enough, they have to be part of a wider narrative. Thus the way users and stakeholders experience and use visualizations, videos and interactive maps are important and directly addresses the aims of the project – to make invisible heritage tangible. We want users to be able to explore an invisible heritage by themselves and be able to see how the known area looked like in the past. Augmented reality (AR) application combines all the visualizations developed above into a comprehensive whole. Special "areas of interest" allows users to see location-specific views and information, for example, how was pile-dwelling visible on a horizon, where it was located with the modern landscape, how were settlements organized. It allows them to explore the known area by themselves to experience the invisible heritage.

To understand what it was like to live in the past, you have to experience it for yourself. Although the past is inaccessible, visualisation methods can help us approach it. The main aim of landscape visualisation is to make hidden heritage more tangible and visible.

Visualisations change our interactions with information and knowledge about the past. Most people are confronted with the usual media in our repositories of knowledge: text, photographs, video, and audio. While these media convey interpretations and descriptions of their subject matter, they rarely can stand as accurate representations of sites and objects. The potential that three-dimensional imaging brings to human interaction with information can be enormous. Hidden, buried, destroyed, covered, inaccessible heritage, limited to a particular geographical area could be made accessible to others, leading to progress in understanding and awareness. Using these visualisations can lead to highly effective ways of comprehending information about heritage.

Virtual reality (VR) has been applied to many projects relating to the virtual reconstruction or imagining of archaeological heritage.

VR (with purely imagined or virtual landscapes) is not the only option. AR makes it possible to incorporate virtual elements directly into the real world. This form "allows a user to work in a real-world environment while visually receiving additional computer-generated or modelled information to support the task at hand". This normally involves putting virtual objects onto live video feed from a mobile device. The importance of AR is that it makes possible the juxtaposition of reconstructed elements of heritage on the modern, well-known landscape.

It has become relatively simple and cheap to create an immersive three-dimensional AR or VR maps with a combination of game engines, software development kits for streaming and rendering geospatial data and affordable hardware. However, most examples of VR in archaeology capitalize on their ability to render realistic scenes of the past. Many are aimed at the heritage industry and production of imagery for public consumption. This is not the full potential of VR tools.

The ability to render alternative versions of the past landscapes can be instrumental in providing new insights and raising new questions. They are tools to discover and make intelligible data that otherwise would be impossible to grasp.

The dissemination approaches are dependent upon the communication plan and intended audience. When using the visualisation products, it is essential to plan for the intended audience (stakeholders). It depends where, how and who is going to share the content. Consequently, in practice, the appropriate communication tools are selected. In the case of visualisations, this means either image, videos, augmented reality applications, virtual reality applications or immersive virtual reality applications can be chosen and used, depending on the context. Each of these dissemination products calls for a specific form of the virtual model and its adjustments.

Nonetheless, the visualisations of archaeological heritage are rapidly evolving, and with it, the vast potential they hold. Indeed, several shown examples of good practice only came to be in the last couple of years. For methodical application, the computer-aided visualisation has to be planned in the project conception already. For it to succeed, the project must employ the right techniques, as well as the right experts, must be on the team.

This module is the core as it brings together knowledge about the heritage (Module 1), ways archaeologist create these visualisations (Module 2), it allows direct exploration and of local hidden heritage (Module 2) and thus serves as a foundation to discuss the threats and opportunities of local heritage (Module 5).

User testing the VirtualArch application on Ljubljansko barje, Slovenia.

Resources

- The main tools are visualisations and applications developed in a project.

Module 5: Threats or opportunities: the role of heritage

Introduction

Stakeholders pose knowledge about the landscape and region they live in and work. They should be already equipped with the understanding of hidden heritage (modules 1–3) and the use of visualisation (module 4). This should provide the ground for discussions of the role of heritage in the life and work of stakeholders.

On the completion of this module, stakeholders will:

- be able to articulate their relationship to the heritage. In what ways the presence of the hidden heritage influences their life and work? What is the conflict, as they see them? What are the opportunities they see?

Module core

Threats can be divided into man-made and natural. The man-made category encompasses destruction from conflict, construction, and development. Human neglect can also be included as a potential danger to the survival of important sites.

Environmental damage caused by climate change is accelerating the destruction. Rising sea levels are predicted to have a particularly devastating impact on archaeological sites. The effect on weather patterns due to climate change, particularly the increase in severe weather events, could pose major threats to cultural heritage sites beyond normal historical weathering.

A crucial element in the protection of cultural heritage is the legal and political protection of sites.

During the VirtuaArch project and meetings with stakeholders became obvious, that the main threat to the archaeological heritage is its unknown, hidden, forgotten status. Most of the destruction is no due to the deliberate attempts to, but due to the lack of awareness, knowledge and understanding. Once there is established communication with stakeholders, stakeholders became partners in the protection of the archaeological heritage. In some cases, stakeholders are actively interested in the heritage of their landscape (especially tourist workers, local inhabitants and forestry workers) and once involved with heritage. Stakeholders should not be seen as threats.

Even if there are conflicts of interests, creative solutions can be sought if both parties are aware of the heritage, its importance and threats. For example, intensive agriculture can erode topsoil and destroy buried archaeological remains, but with the use of precision farming, the damage can be minimised.

Local communities can use the heritage to make meaning of and relate heritage to their social identity.

Builds upon the knowledge developed in the Using visualisations in promotion of the hidden heritage (Module 4) and core knowledge, developed in modules 1, 2 and 3. Stakeholders should be able to independently explore the hidden, unknown heritage, locate it in a familiar environment and discuss their relation to it.

Resources

- The main tools are visualisations and applications developed in a project.

Interactions with stakeholders using different visualisations in Hallstatt, Austria.

Conclusions

Main contributions of the VirtualArch project is cultural mediation, as one of the central tasks of archaeological heritage. By using modern IT technologies hidden or inaccessible archaeological sites and areas such as mines, harbours and settlements become accessible, visible, tangible to various stakeholders. Even complex facts and reconstructions are presented in a comprehensive way using applied VR and AR technologies, that allow approaching modern landscapes and sites. Besides this, coming from eight European countries and different institutions dealing with archaeological heritage matters, all project partners create a broad base of experience and promote the international exchange of scientific, management, legal and cultural information. As a result of the cultural mediation, the public awareness for these invisible aspects of sites and landscapes will increase; the heritage professionals will be able to reconstruct sites i.e. for stakeholder meetings (conflict management). At the end of the project, the applied VR and AR technologies explained by the guidelines will be open not only for heritage or archaeological institutions but as well for tourism offices or local museums to promote and protect their archaeological heritage in their region.

Forgotten, lost, concealed and erased traces in the landscape are made active again using visualisations; forgotten traces once again become part of the living landscape. In this way, they intertwine with the interests, work and life of stakeholders. Our scientific practices have political implications, in the sense that we represent hidden archaeological heritage in a democratic process of negotiating the future. Heritage provokes different feelings, passions, create opinions and trigger disputes, disagreement and agreement. Heritage can spur the stakeholders to live and work in them and visit them to represent them in their own work and political actions. The richer heritage is, the easier it is to represent them when it is a question of making decisions about them. Complex heritage is an assembly, parliaments that collect us together and frame new public spaces that are different from the usual understanding of the political. Complex heritage offer opportunities for concrete solutions, compromises and changes. Only a complex heritage can be truly democratic. Tools and practices developed in the VirtualArch projects are ultimately aimed at this.

This manual includes the transnational curriculum developed and taught by trainers of VirtualArch projects. The transnational curriculum has evolved during the VirtualProject duration since 2017. This manual illustrates the quality of the training under within the project and issues that emerged during the dissemination of knowledge, produced within VirtualArch projects. By using this manual, other training providers will benefit from the experience gained during the VirtualProject project. It is anticipated that this manual will continue to evolve as future trainers and courses will contribute their own experience and expertise.

More information we provide about heritage, more tangible it is, more people will become involved in its protection. This is precisely the goal of the VirtualArch project, to make hidden, fragmented and buried archaeological heritage visible and accessible to all.

Multilayered dimensions of archaeological heritage are intricately connected to contemporary society. Incorporating these wider dimensions into archaeological heritage communication will result in communication that is more socially, culturally and psychologically relevant, thus engendering greater interest and appreciation.

Reconstructed medieval mining settlement at Utin, Czech Republic.