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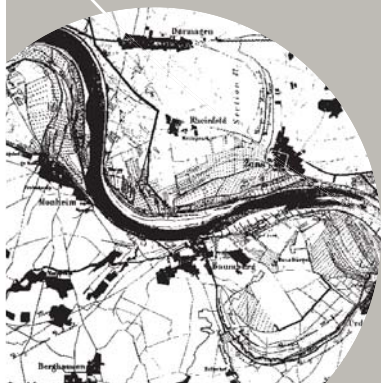
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Editor: Halina Gottlieb
The Interactive Institute

Interactive Landscapes

How to read and understand
historical landscapes





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An aerial photograph of a historical landscape, featuring a large, multi-story building complex with a central courtyard, surrounded by fields and smaller structures. The image is partially obscured by a large, semi-transparent circular graphic.

Interactive Landscapes

How to read and understand
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Editor: Halina Gottlieb
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Discovering the evolution of our landscapes

The human influence in our European landscapes is quite significant. A dynamic and explorative interface, which allows users to discover the landscape evolution in an interactive way, can help explain how our current landscapes were shaped.

In other words, a well-designed interactive interface can be a powerful tool for the user to read the landscape and understand the historical processes that influenced it. From historical data on a landscape, we can make visualisations for several time periods. However, to understand how those changes occurred and to unravel the processes that have shaped the landscape through time, those historical landscapes need to be set in relation to the landscape

of today. Besides presenting an innovative user interface, this KNOWHOW booklet describes the methodology and techniques required to make an interactive visualisation of the current landscape in a cost-efficient way, and to relate this landscape to reconstructed landscapes of the past.

Why do we need interactive landscapes?

Nearly all of our European landscapes have been shaped by man, leaving very few landscapes in Europe in a pristine state. It is in our best interest to *understand* how we have influenced those landscapes and how we can *preserve* and *maintain* them in optimal combination with inhabiting, visiting and using those landscapes.

The *evolution of historical landscapes* is not

always easy to show on site. Many features of landscapes need a bird's eye view to see, appreciate and understand. It is also difficult to put the appropriate means on site to show and explain the evolution of the landscape and the processes that drive this evolution. In many cases, on-site presentation means are limited to panels, which are not the most appropriate presentation form to show the evolution and the processes that drive it.

As *interactivity* is beneficial to understanding, learning and enjoying, it is a key element to turn our knowledge about the evolution of a landscape and the driving forces behind that evolution into an interactive application that visualises this knowledge in a simple, intuitive way and stimulates exploration of the virtual and the real landscape.

With this goal in mind, new kinds of *visualisation technology* allow for the creation of explorative interfaces, where the user's interest and curiosity drive the search for the information that is "hidden" in the interactive landscape. This information can

be text, images, video, stories or interactive elements (for example a Flash animation of how a landscape feature was built).

Understanding how landscapes evolve into what they are today, and *enjoying* how they were in the past, will create more respect for the value of those landscapes, reveal their hidden stories and hopefully yield a better preservation by, and integration in, the current society.

What is an interactive landscape?

There are several options to create an interactive landscape. In this KNOWHOW booklet, games technologies are briefly explored, while image-based methods are described in more detail. For the latter technology, we present a case study from Ename, Belgium, where an interactive landscape application has been implemented in the Provincial Archaeological Museum.

Using a *3D approach*, 3D models of ancient landscapes are created, and the virtual environment is made accessible interactively through computer *games*

technology. Through the use of an authoring environment of a game, and the power of typical graphics cards that are used to display games, an interactive environment - not a game - is created. This virtual, ancient landscape, that has been modelled and visualised based upon all available archaeological, geological and historical information (see the KNOWHOW booklet on "How to make sustainable visualisations of the past"), can be explored freely and information on landscape features, including elements that are still visible



Digital Songlines: interactive visualisation of an Australian landscape through computer game technology

today, can be found while walking through it (see for example the projects of the Virtual Landscape Centre [VLC] in Scotland or the Digital Songlines [DSL] in Australia).

This approach is based upon modelling tools that can simulate very realistically all kinds of plants and trees, as the structure of most plants follows mathematical rules. Such tools are called *procedural* as they create 3D models through a computer programme that only needs a few parameters, such as the species of the plant, the age and the season, and some extra information or factors that limit or stimulate growth (water, grazing, other plants or trees, etc.).

The big advantage of this approach is that the virtual landscape can be visualised in the same way as you would walk through a normal landscape, so one can appreciate the virtual landscape and all its details while comparing the differences or similarities to the landscapes we know today. While exploring the virtual landscape, you can encounter objects, places, animals or plants that are linked with stories.

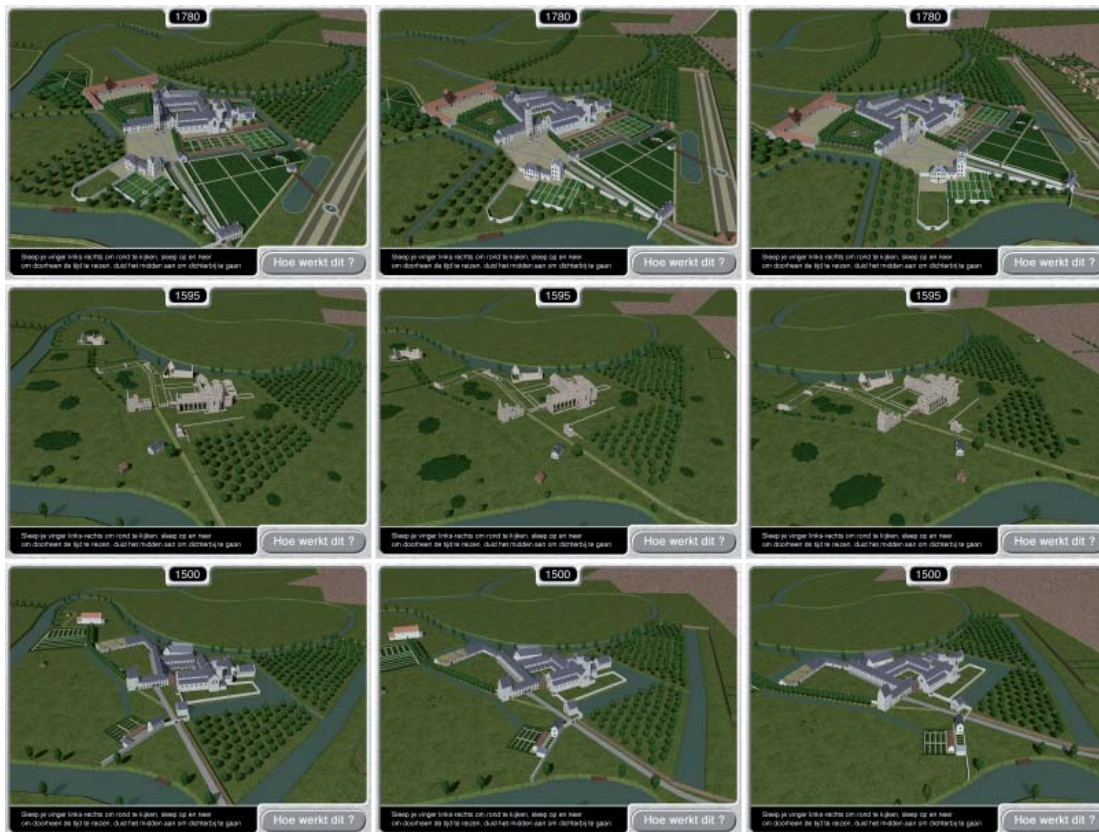
In the Digital Songlines example, the landscape and its content becomes a key to the aboriginal culture, which is completely story-based, as aboriginals don't have a written language. The image is a north-facing view looking up towards the head of the Maranoa River in South West Queensland. About half a kilometre north along that river is a fish trap and river crossing. To the east about 500 metres is a camp near a billabong, a traditional camping site which later became a fringe camp on the outskirts of the township of Mitchell. The application is called Irene's World, as most stories come from Irene Ryder, one of the responsible persons for this country as a traditional owner and Gunggari woman.

In such a virtual environment, you can use a higher viewpoint to see more general landscape structures. All visualisation environments based upon computer games technology offer different methods of moving around, such as walking and flying.

When using *image-based methods*, interactive landscapes can be implemented as an *interactive object*. This paradigm is based upon interactive visualisation of a matrix of images, allowing two degrees of freedom. In this KNOWHOW booklet, the horizontal axis is used to move around the object while the vertical axis is used to move through time. This paradigm has been implemented for the first time in the **QuickTime VR** software [QTVR] but other equivalent implementations are available today (for example **Flash** programming).

Typically this interactivity is realised by putting visualisations of the landscape from certain time periods in horizontal rows of the object matrix, in such a way that every column of the matrix represents the same viewpoint of the landscape but for different, chronological periods. This is very simple if realised from a 3D modelling programme, where one set of virtual cameras can be applied to the 3D models of each period. The creation of images from a 3D model is called 3D rendering.

This set of cameras should produce a smooth, continuous movement so that the interactive visualisation of the landscape creates the



Part of the image matrix
of an interactive object

feeling of flying around above the landscape. Typically, a circle with equally spaced camera positions is used, but any closed, smooth path with more or less equally spaced camera positions will do. Typically 30 to 40 viewpoints are sufficient for a closed path.

In some cases a variable viewpoint is not needed in order to visualise the evolution of a landscape. Sometimes it is not possible to use multiple viewpoints, as the area for which historical data exists can be too limited. With this in mind, a single viewpoint interactive object can be made from a single row matrix of images, with each image visualising another period in the evolution of the landscape.

There are, on the other hand, scenarios in which we can or want to visualise only one period. This can also be done as a single row matrix of images, with each image representing another viewpoint on the landscape.

Using an image-based approach has major advantages. As images are the sole material, such an approach allows for the

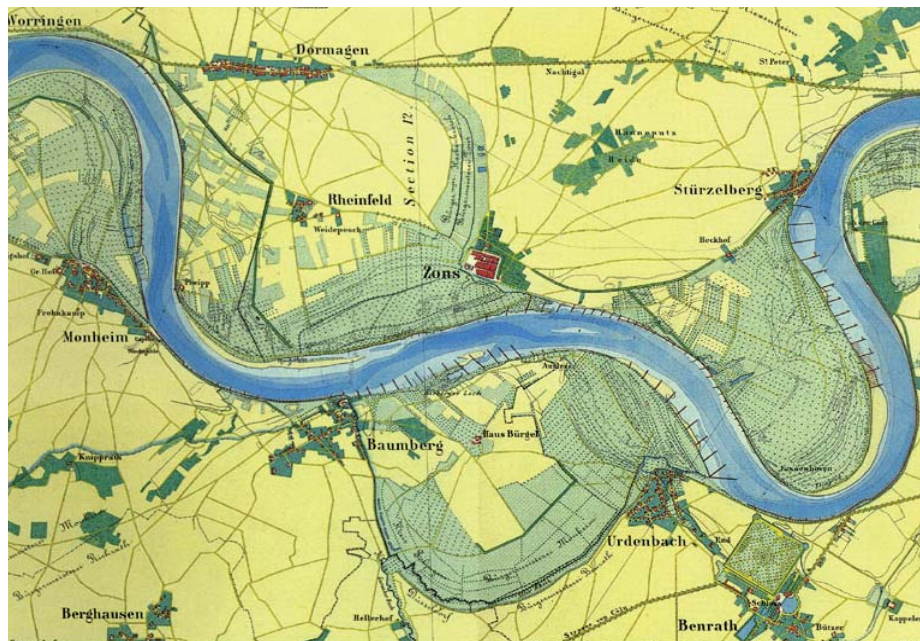
use of other visualisation techniques than 3D rendering. This is especially useful for landscape visualisation as it can take major efforts and costs to realistically and correctly visualise all landscape elements such as terrain, vegetation, water, etc. Watercolour drawings for example can be a cost effective solution when using single viewpoint objects (as the creation of multiple viewpoints raises the cost proportionally). As cities and villages have expanded in the last 200 years, the creation of industry zones and new living areas has destroyed a lot of the historical landscape structures. *Old maps* can be very useful to show landscape evolution, as they still show many elements that refer to earlier phases.

Another approach is to combine *aerial photography* with 3D rendered images or drawings, and in this way, easily create a link between the current and the historical landscapes. There are even methods (see below) to combine 3D visualisations of historical buildings or structures with such aerial photographs, hence creating “augmented reality” images that

combine the present and the past in one visualisation.

Let’s illustrate this with two examples, one of a single viewpoint interactive object and one of a full-blown landscape visualisation including 3D visualisation and aerial photography.

The first example takes us to the city of Zons, Germany, which is situated between Köln and Düsseldorf at the borders of the river Rhine. It was founded in the 14th century as toll city by the archbishop of Köln. Before that, it was part of the Roman limes and later on an important property of the archbishop of Köln. The river Rhine and its changing appearance and course played an important role in this historical development, therefore, it was decided to produce an interactive application which shows the evolution of the river in relation to the historical developments. The application was embedded in a larger public presentation system and installed in the Tourist Information Office in Zons. To help plot the changing course of the river, a detailed map made in 1872 was used.



Historical map of Zons in 1872

This map shows many ancient landscape elements referring to ancient riverbeds, wetlands and higher places, as well as roads and settlements. Based on historical and

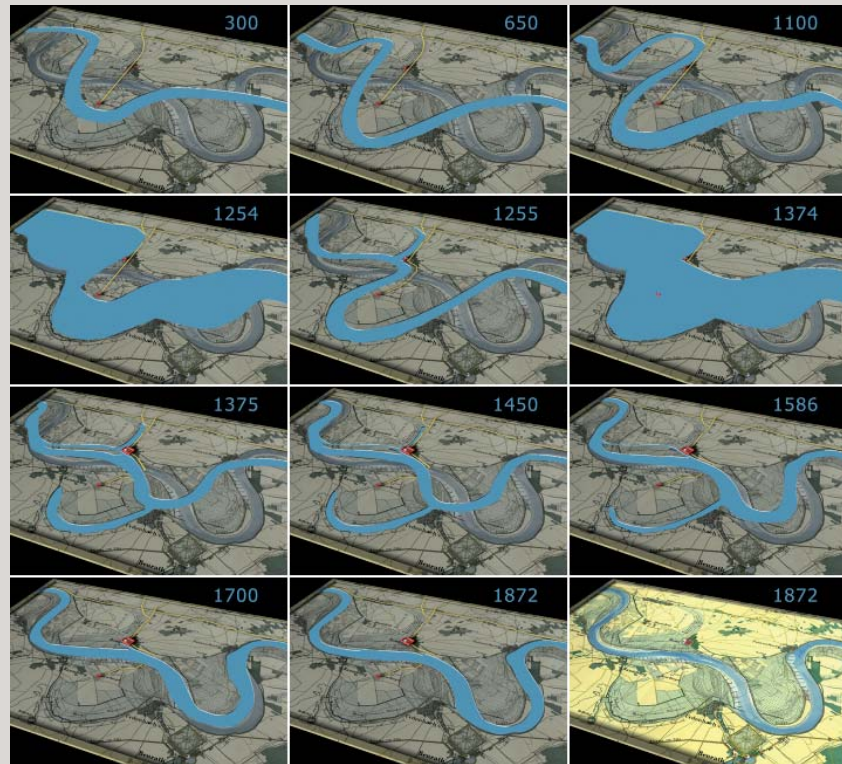
hydrographic studies, the probable course of the river Rhine could be defined, from the 3rd century AD until the end of the 19th century, when the river was enclosed in

Based on the scholarly studies and the landscape elements in the map, the changing course of the river Rhine was visualised as a simple 3D element on the map for eleven points in time, and arranged using these images – together with the original map – into an interactive object. The points in time were chosen to show historical events that had a relation with the changing course of the river.

Important historical events for the river Rhine:

- About 300: Creation of a Roman castellum as part of the Rhine Limes.
- About 650: Creation of a major farm belonging to the archbishop.
- About 1100: The farm is enlarged and fortified.
- 1254: a first major flood changes the course significantly, leaving the fortified farm enclosed by water on two sides

- 1374: Two years after the foundation of the city Zons was erected around the fortified farm, another major flood changes the course again.
- About 1450: The city is thriving, but the river moves away from the city and a channel is kept open by the citizens to bring the ships by the city walls and make them pay toll.
- 1586: Franz Hogenberg produces the first detailed map of the city and its environment.
- About 1700: The channel is finally given up and the city loses its power to collect toll and starts to decline.
- About 1872: The city council wants to take down the walls and toll tower, but the city is in such an impoverished state that these works cannot be commissioned, so the city is preserved today in its original state, drawing about 1 million visitors per year.



Evolution of the river Rhine from 300 AD until today

major dikes (which means that the course of the river hasn't changed since).

Through a simple drag gesture on the touch screen of the application, the visitor can explore the evolution of the river, and at each stage in the evolution learn



Interactive kiosk in the Tourist Information Office in Zons, Germany

about the events that happened at that stage by clicking the info symbol. This action produces a screen that explains and illustrates the event and links it to the evolution of the river. In this way, the visitor can discover the interaction between the river and the history of the town.

The second example takes us to the village of Ename in Belgium. This site was a major, growing city in the period from 974 to 1033, when it was destroyed and turned into an important abbey site. Besides major excavations at the abbey site, in-depth multidisciplinary studies of the landscape have been undertaken [BVV], ranging from historical study or pollen analysis to hydrography. The site received the Flemish Monument Award in 2002, as the first Flemish landscape to receive this prestigious award. As this landscape has been studied in great detail and enough information is available about its evolution, a link could be established between the real landscape and visualisations of the historical landscape. In the Provincial Archaeological Museum



Augmented reality visualisation of the Ename abbey buildings from around 1780 superimposed on the current landscape

(pam) Ename, an interactive object was realised in the TimeLine room to make this research accessible to the public, integrating bird's-eye images of the landscape, taken from a helicopter.

The TimeLine interactive object contains three major components. First of all, it is based upon the 3D visualisation of 12 periods of the Ename landscape, from 1020 to 1780, which was constructed based upon all available excavation and research results. Secondly, it contains the current landscape through photographs taken



Timeline screens showing the village in the 1780 period, the AR view and the village in 2004

from a helicopter, which were aligned with the existing 3D visualisations via a special technique (image-based rendering). Thirdly, it shows the current landscape in AR (augmented reality) form with the abbey buildings of 1780 superimposed.

In this way, the AR images act as a transition between the 3D visualisations and the current landscape, and intuitively show, for example, where all of the archaeological

remains are situated on the terrain, especially those that are not excavated.

The interactive Timeline object is used for example by guides who explain the landscape evolution by browsing through the different time periods visualised in the object, and going with their group to the site to experience the landscape, showing the different historical layers in the landscape on the terrain itself.

The implementation of interactive landscapes

Previous experiences

The first version of the Timeline interactive object was made for the opening of the Provincial Archaeological Museum in 1998, and contained an augmented reality visualisation of Ename through a panoramic view on the village.



First version of the TimeLine in 1998

A second version in 2000 used an interactive object approach to show the evolution of the whole village from 1020 to 1780, and to integrate the archaeological objects that are on display in the TimeLine room. For this

purpose, several interactive objects were linked together to show a wide view on the village, a detailed view of the abbey and images of the museum objects. For some museum objects, such as the ivory object described in the Virtex KNOWHOW booklet, interactive objects were implemented.

Although this application provided a much better visualisation of the evolution of the village and a much wider offering of information, people were missing the link with the current landscape and the village of today. So, an upgrade was made in

summer 2004 that showed Ename at that time, perfectly aligned with the existing 3D visualisations of the village in the past, complemented with an augmented reality version that superimposed the abbey buildings of 1780 on the 2004 landscape.

How interactive landscapes support stakeholders

Interactive landscapes provide a totally different approach in presenting and understanding landscape evolution. The interactive landscape typically will be used in an indoor museum or visitor centre



Timeline interactive landscape with location of archaeological objects

setting, and supports a visit to the landscape itself. This has implications for several groups of stakeholders.

For *museum curators*, an interactive landscape application can convey much more information in a visual, interactive form about evolution or typical features than an on-site panel. This means that a wider range of information can be provided, including the link with museum objects or displays, with historical characters or iconography. An interactive object allows an appealing story to be told in an explorative way, and this rich content can be linked to the real landscape in an on-site visit after the museum visit.

For *guides*, an image-based interactive landscape is an ideal support for the story they want to tell. Their story not only becomes illustrated through a wide range of images, such as 3D visualisations, iconography and objects, but the interactive landscape application also provides a wide range of material to answer questions from the group, including a very visual presentation of the evolution of the



A guide using the TimeLine to explain the Ename history and landscape

landscape, the buildings and the roads. It is important to point out that, due to the ability to change viewpoint (horizontal movement) and time period (vertical movement) at the same time, any view in any period can be reached within seconds, which helps the guide to quickly move to the information that answers the question or supports the story. To do so, a touch screen in combination with large screen projection provides a simple but very effective setup to support the guide while telling the story.

A guide could also use a 3D-based interactive landscape in a TimeLine-like setup to take a group through the landscape, using the attached information while explaining and making a virtual stroll with the group. Afterwards, the guide can take the group through the real landscape of today and highlight the links between the current and the historical landscape.

Both approaches are based on explorative interfaces that provide guides with powerful and flexible tools to support their storytelling and to provide visual material that helps them answer questions or elaborate on subjects specifically of interest to their group. An additional advantage for guides of such an explorative interface is that most information is available within seconds, so that they can easily change or expand their story based upon the reactions and interest of the group members.

For *visitors*, an interactive landscape provides them with a wealth of information that they can explore at own pace, following their own interests. An image-based interactive landscape provides them

with a bird's-eye view or an interactive visualisation of the landscape evolution. A 3D-based interactive landscape rather provides a personal walking experience that lets them enjoy the historical landscape in different periods in time and find the elements that can still be discovered in the current landscape.

It is a major advantage for the *museum management* that an indoor installation can visualise and present outdoor landscapes, as it would be much more expensive and difficult to organise as an outdoor setting. Outdoor presentation systems also have more limited technical possibilities and higher maintenance costs. The indoor systems presented here can be quite simple and cheap, and their content is quite easy to create.

Image-based interactive landscapes, as described in this KNOWHOW booklet, are easy to implement and can also be used in small museums and landscape visitor centres. 3D-based interactive landscapes require somewhat more skills, but remain nevertheless feasible, as most of the plant models are simple to obtain.

How to create image-based interactive landscapes

In this section, we expand on the creation of image-based interactive landscapes, both to revive old maps and to link existing landscapes to visualisations of older instances of that landscape.

As shown above in the Zons case, old maps can be augmented through 3D elements and used to visualise historical landscapes. Let's take the example of Stevensweert, Netherlands, where a 18th century map of the town was used to show the transformation of a small hamlet into a strategically placed, fortified town. In this way, several phases of the place were visualised, from 14th century to 18th century. To do this, later elements in the map were removed by photo retouching, older elements were restored through digital painting (based upon in-depth research of other sources) and the appropriate 3D elements were superimposed on the map for each period. In this way, the interactive landscape could be based upon one single map, augmented with 3D elements.

The most versatile approach to do interactive landscape visualisation and make the link with the current landscape is to use aerial photography in combination with 3D visualisation. In order to do this, we need to take a set of aerial photographs of the current landscape and visualise the reconstructed landscape from the same points of view for one or more periods. All these images are structured as a matrix with the horizontal rows showing the movement around the landscape, while vertical rows show the evolution of the landscape for a certain viewpoint. Appropriate software, such as QuickTime VR, turns this matrix of images into an interactive object as described above. Let's analyse the different steps in creating such an object.

First of all, we need to take photographs of the landscape. The best way to do this is using a helicopter of which a side door can be removed for unhindered photography. A model helicopter, carrying GPS and a remotely controlled digital camera, also can be used where allowed.



3D visualisation of Stevensweert in 1705, superimposed on old map

In the Ename case study for example, we were taking pictures from a circular path at a height of 150 metres. When shooting the pictures, one needs to aim as much as possible at a central point that can be easily

recognised, and the horizon needs to be visible in every picture. This is important for the processing of the images later on. It is also recommended to fly multiple rounds, and also to fly slightly lower and higher

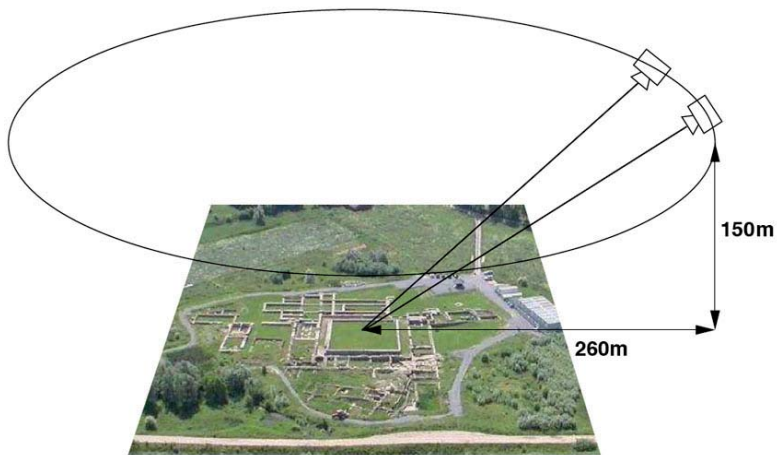


Helicopter used in the Ename case study



Remote-controlled model helicopter with camera and GPS

than the target altitude when using image-based rendering (see further). About 150 to 300 pictures will result from this photo shoot.



Required flight path for Ename case study



Required flight path for Ename case study – top view on orthophotomap

The next step is to find out the viewpoints of all pictures taken. For this, we use the free EPOCH ARC3D software [ARC3D], not to make a 3D model of the landscape, but simply to use the calculated camera viewpoints which are a by-product of the digitalisation process (see also the

KNOWHOW booklet “ARC 3D Webservice”). Once coordinates of all pictures have been taken, they are visualised in 3D and then a selection is made from images that realise a smooth path with more or less equally spaced camera positions (graphs in polar coordinates around the central point can help in making the selection). Typically 30

to 40 camera positions are selected. The goal is to create a natural rotation of the landscape around the central point, which gives the interactive landscape the correct feeling when using it. This is obtained if those selected viewpoints create a sufficiently smooth and equally spaced path in space. If the aerial pictures

are correctly photographed, we only need to correct the selected pictures for small errors of camera tilt (horizon not perfectly horizontal) and misalignment of the central point through some rotating and cropping of the pictures. If wide-angle lenses were used, we need to correct the barrel distortion of the lens beforehand (most image processing software, such as Photoshop, has this feature readily available). In this way, we obtain a set of images of the landscape, plus their respective camera coordinates in space. If our set of images does not yield a smooth path, or if we want to obtain equally spaced camera positions on a perfect circle (like we did in the Ename case study), we can use a technique called **image-based rendering**, which allows us to calculate images for given viewpoints, provided that there are enough images close to those viewpoints. In other words, if we shoot enough pictures close enough to an ideal camera position, image-based rendering can calculate the image for that ideal camera position from the existing pictures.

Once we have selected and processed the aerial pictures (which are the top row of the image matrix of the interactive object), we can then create the 3D visualisations of the historical landscape through the different periods from the camera positions of the selected aerial pictures (each period is another row in the image matrix). Done correctly, all 3D visualisations will align very well with the aerial pictures, so that every column of the image matrix represents the different instances of the landscape through time from one single viewpoint. If we don't have 3D models of the landscape through time, and if the landscape does not contain complex buildings, we can simply draw the historical landscape based upon the aerial pictures. Below is a drawn visualisation of the landscape near Valkenburg, Netherlands, at the beginning of the 4th century AD, based upon photographs taken in 2003. While drawing in Photoshop, the artist used the real photograph as a layer under his drawing to guide him.



Goudsberg area in Valkenburg, Netherlands in 2003



Goudsberg area in Valkenburg, Netherlands around 300 AD

Of course, it is a major undertaking to draw 30 to 40 instances of a historical landscape (based upon the aerial photography) for every time period we want to visualise, but we need to recognise that this probably costs less than creating detailed 3D models

of the landscape. We can of course further reduce the effort and cost by reducing the number of viewpoints to a few, or even one. A good example of a watercolour visualisation of the Bleasdale area, Lancashire, UK shows an evolving landscape over a period of 13000 years [PLC]. Putting such a series of drawings into an interactive landscape has major advantages. It yields an interactive, explorative way of showing the evolution of that landscape and allows attaching information and stories to it. It is easy to make at a low cost, and can be used both in the museum and on the internet.

Benefits

Interactive landscapes provide a *better visualisation and understanding of natural and human-driven processes* that shape a certain landscape. Most of these processes are slow (the changing course of a river, deforestation through animal grazing, climate changes, etc.) and can be difficult to grasp or imagine. Interactive landscapes have an *explorative*

nature. Information is not presented, but “found” by the user, which has a positive influence on the learning process and engagement of the user. As the user will only “pick up” information that is considered to be interesting, the application adapts itself in a passive way to the user (in other words, the user will only see the information that fits with his or her interests, while the application doesn’t in fact change appearance or apply filters to the information).

Interactive landscapes provide a rich *interface to a wide range of information*, from text and images over video to interactive elements and stories. This 3D interface has many more possibilities than other 2D interfaces and can store more information in a natural, intuitive way. In fact, interactive objects and panoramas (the underlying technology of interactive landscapes) are an interface language that is easily and immediately understood by novice users (which is a key advantage for museum technologies) and provide multiple interfaces to different media.

Interactive landscapes are available in *different forms*, from highly interactive and engaging exploration of ancient forests through 3D visualisation to simple and cost-effective museum kiosk applications based upon drawings.

Summary

Interactive landscapes are an excellent way to learn about landscapes, about their evolution and about the processes that drive that evolution, by creating virtual landscapes in different periods of time, including today. By exploring those virtual landscapes, visitors can “pick up” information at their own pace, while enjoying the virtual landscape. Both guides with groups and individual visitors can use it to prepare a visit to the real landscape of today and to better understand the different historical layers that can be discovered onsite.

Interactive Landscapes



TECHNOLOGY/INTERACTION

Interactive indoor presentation technology for historical landscapes, ideally in combination with a visit to the real landscape of today. Uses a typical museum kiosk setup with touch screen or arrow keys to navigate, large screen projection helps to make it accessible for groups.



IDEAS FOR IMPLEMENTATION



Interactive landscapes can be used in museums and visitor centres for presenting the evolution of nearby historical landscapes. It can also be used to create educational setups for understanding landscape evolution and exploring past and present societies that are closely linked with the landscape. Can be provided in the near future also on ruggedised tablet PCs and UMPCs (ultra mobile PCs) for use onsite.

SUMMARY

Interactive Landscapes provide a cost efficient and intuitive way to learn about landscape evolution. The explorative 3D interface can give access to a wide range of information that can be discovered in the virtual landscape.



REQUIRED COMPETENCIES

Photography, 3D landscape modelling or graphical skills, basic image processing and geography skills, basic skills for interactivity design.

RESOURCES



Man hours: starting from 100 man hours
Technology: 3000 euro
Production cost: 2000 euro



Interactive Landscapes

Project team

Involved Partners:

- ¹Visual Dimension bvba, Ename, Belgium
- ²pam (Provincial Archaeological Museum) Ename, Belgium
- ³KULeuven - ESAT, Leuven, Belgium
- ⁴DeRoDe 3D, Utrecht, Netherlands
- ⁵AB-C Media, Utrecht, Netherlands
- ⁶BIAX Consult, Zaandam, Netherlands
- ⁷Hoaxland, Oudenaarde, Belgium
- ⁸Kreisarchiv Zons, Dormagen, Germany
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- historical research: Carl Emsbach⁸, Daniel Pletinckx¹
- historical landscape visualisation: Jan De Rode⁴
- interactive application: Arjan den Boer⁵, Daniel Pletinckx¹

Stevensweert project:

- historical research: Har Rutten, Daniel Pletinckx¹
- historical landscape visualisation: Jan De Rode⁴
- interactive application: Arjan den Boer⁵, Daniel Pletinckx¹

Valkenburg landscape visualisation:

- historical landscape research: Laura Kooistra⁶
- landscape visualisation: Geert Reynaert⁷
- interactive application: Kris Förster⁹, Daniel Pletinckx¹

Ename TimeLine project:

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- curator: Marie-Claire Van der Donckt²
- aerial photography: Noel Colman, Daniel Pletinckx¹
- image-based rendering: Maarten Vergauwen³
- historical landscape visualisation: Daniel Pletinckx¹
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Proof-reading for booklet:

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Publisher: The Interactive Institute AB, Stockholm, Sweden
Editor: Halina Gottlieb
Graphical design: Rafat Sosin

References

[ARC3D] ARC 3D software
<http://www.arc3D.be/>

[BVV] G. Tack, P. Van den Brempt, M. Hermy, *Bossen van Vlaanderen, een historische ecologie*, Davidsfonds, Leuven, 1993

[DSL] Digital Songlines
<http://songlines.interactiondesign.com.au/>

[PLC] Bleasdale area reconstruction
http://www.pcl-eu.de/virt_ex/

[QTVR] QuickTime VR
<http://www.apple.com/quicktime/technologies/qtvr/>

[VLC] Virtual Landscape Centre
<http://www.virtual-landscape-centre.co.uk/>

With support by the European Commission under the Community's Sixth Framework Programme, contract no. IST-2002-507382.

The human influence in our European landscapes is quite significant. Interactive and explorative applications help us read the landscape and understand the historical processes that shaped our current landscapes.

From the historical data on a landscape, we can make visualisations for several time periods. New software developments allow us to match these visualisations with the landscape of today. In addition to presenting an innovative user interface, this KNOWHOW booklet describes the methodology and techniques required to make an interactive visualisation of the current landscape in a cost-efficient way, and to relate this landscape to reconstructed landscapes of the past.

The KNOWHOW booklets are an inspirational series cataloguing existing examples of a variety of projects which use ICT for the recording, display and interpretation of cultural heritage. These booklets highlight functional information covering the design, development and implementation of ideas and their solutions, and give thoughtful suggestions for alternative applications within the cultural heritage sector. The KNOWHOW booklets aim to support people working in the area of museums, heritage sites and monuments. The information covered within the booklets benefits managers, exhibition producers/curators, pedagogues and professionals working with digital restoration, as well as those working with communication and audiences. These booklets cover projects developed by the partners of EPOCH, and are divided into the following categories: MUSEUMS, HERITAGE SITES and MONUMENTS.

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