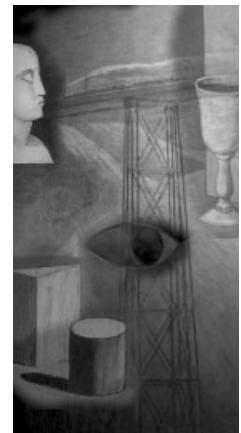


# Heritage presentation through interactive storytelling: a new multimedia database approach

By Daniel Pletinckx\*, Neil Silberman and Dirk Callebaut



*This paper discusses the rationale for—and describes the methodology of—a new system of interactive storytelling being developed by the Ename Centre for Public Archaeology Heritage Presentation in Belgium. Based on 5 years' experience with multimedia heritage presentation systems, both on-site and in museum contexts, this approach to the presentation of history and archaeology enables visitors to create their own 'stories' as they explore the information contained in a database. The collaborative virtual environment in this case is the visitor's exploration of a historical monument through a series of interactive panoramas and navigation options that allow the visitor to weave archaeological facts and historical information to larger narratives. Because the visitor can follow a number of different trajectories (of time, space and theme) through the monument, and can freely switch trajectories, hundreds of different narratives are possible. The creation of these interactive stories has a larger educational purpose. It has proved to be a uniquely flexible medium for the communication of personalized, interest-oriented, and user-driven heritage information for the general public. Copyright © 2003 John Wiley & Sons, Ltd.*

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## On-site Presentations for Monuments and Sites

In their attempts to improve communication with the public, regional governments, municipalities, tourist authorities and heritage organizations are increasingly investing in expensive and technologically advanced presentation systems at archaeological and historical sites (see Figure 1).<sup>1</sup> Almost always, these on-site presentations require substantial investment both of public funds and the time and expertise of already overburdened heritage organizations and scientific institutes. Yet the final quality of these projects varies widely, from very simple to very advanced technology, from very basic data to elaborate and innovative multimedia programs. Some are oriented entirely to attracting tourists, some to the local community. And the skilfulness of

their communication techniques varies as widely as the depth or reliability of their scientific contents.

There are also some fundamental and practical problems with current on-site presentations.<sup>2</sup> Because of the need to reach the widest possible audience of potential site visitors, most presentation systems offer contents that are sufficiently general to be understood by everyone from a school child to a senior citizen; from a specialist to a layman. Of necessity, this kind of heritage 'broadcasting' must seek to address the common cultural interests and knowledge levels of all these groups—almost by necessity yielding a simple and fairly shallow (or overly factual)—presentation. To solve this problem, an effective on-site heritage presentation needs to offer a high degree of interactivity and personalization, providing the form, depth and context of information appropriate to visitors, both as groups and as individuals.

Related to this problem is the question of attention span. While indoor museum exhibits and Internet websites can offer users more time to assimilate and a higher degree of concentration to absorb the sometimes

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Figure 1. An outdoor TimeScope system (Stevensweert, Netherlands).

complex archaeological and historical material, on-site heritage presentation systems are in (often crowded and sometimes noisy) public spaces. In some places, environmental conditions such as heat, strong sun, dust or rain create additional distractions. Visits to a heritage site in the fairly regimented framework of a large guided tour or excursion further restrict individual viewing time at a particular spot. Many current presentations do not take this time and attention factor into account when they are based on extensive sequential narratives in the form of introductory films or videos or in a long series of descriptive panels arranged around the site.

A better approach may be to offer the visitor a higher degree of interactivity and a presentation that must not necessarily be viewed or read in its entirety to convey the basic concepts of the site. In terms of the *effectiveness* of two-way communication between the heritage presenters and the visitor audience at an on-site presentation, this last possibility would be the ideal.

Finally, the design of on-site presentations must take into account the different modalities by which people visit historical sites: coach tours with guide; small unguided groups of friends or family; and as individuals. Each visitor group type has different requirements with regard to visibility of screens, desired level of interactivity and personalization—from the more passive (large guided groups) to the highly interactive (individuals). An effective on-site application must therefore be flexible enough to communicate effectively with audiences ranging from highly interested, non-guided individuals to large guided tours.

## TimeScope 3: Presenting the Saint Laurentius Church in Ename, Belgium

These, then, are the challenges. This paper will discuss the rationale for—and describe the methodology of—a new system of touchscreen-based interactive storytelling being developed by the Ename Centre for Public Archaeology Heritage Presentation in Belgium that addresses the major drawbacks of traditional heritage presentation systems. Based on 5 years of experimentation with multimedia heritage presentation systems, both on-site and in museum contexts,<sup>3</sup> this approach to the presentation of history and archaeology enables visitors to create their own 'stories' as they explore the information contained in a database. The visitor (or group guided by a tour leader) explores a historical monument through a series of interactive panoramas and navigation options that allow them to weave self-selected archaeological facts and historical information into larger, self-produced narratives.

These narratives consist of a series of user-chosen facts connected by standard story links. Because the visitor can follow a number of different trajectories (through time, space and/or by theme) through the monument, and can freely switch trajectories, hundreds of different narratives are possible. In addition to its potential usefulness for public cultural heritage presentations, the creation of these interactive stories has a larger educational purpose. It has proved to be a uniquely flexible medium for the communication of personalized, interest-oriented and user-driven heritage information for heritage programs in the schools.

The prototype system is called TimeScope 3 and was installed in the Saint Laurentius Church in Ename, Belgium, in September 2002. It tells the story of this unique thousand-year old church, which has been studied in detail, excavated and restored in the last 12 years (see Figure 2).<sup>4</sup>

It is based on the use of a database of information collected by the team of archaeologists, historians and architects who have intensively studied the church. Their information has been broken down to a database of 'nuggets', consisting of visuals and text, which together present a single archaeological or historical fact about the church, its architecture, or its wider historical and geographical background. These nuggets are the irreducible units of information from which the interactive stories are built. Through the use of variable



Figure 2. The St Laurentius Church around 1020.

transition devices between nuggets, any sequence of user-selected nuggets forms a story with a basic beginning, middle and end. The number of distinct stories (and therefore distinct interpretations about the meaning and significance of the monument) that the visitor can access is limited only by the number of nuggets and their possible combinations. Mathematically, the possible random number of stories based on a visitor's choices increases with the length of time that the visitor spends at the application screen. In the case of Time-Scope 3, an admittedly modest first prototype, the database contains 114 nuggets. Even the most basic four-step stories have 63 possible trajectories.

These combinations are not random. The sequence of nuggets is produced by the personal choice of the visitor, motivated by curiosity or personal interest, and following various navigational options. By clicking on a hot spot in an interactive panorama from several viewpoints within the church, or on theme-related menus, the visitor selects a particular nugget to begin the creation of a story, proceeding further through personal choice. Each nugget is a part of a primary story, comprising a number of thematically linked nuggets. They can be visualized as a ring, with the nuggets marking the points around the circle like pearls on a string. A primary function of this circular arrangement (rather than a sequential presentation) is as an on-site presentation. Visitors come and go freely, without always waiting to the end of a presentation, often merely taking up where the last visitor left off. By designing the basic stories as narrative loops, a story 'sense' is preserved wherever the visitor enters the story and wherever he or she leaves it.

This approach utilizes techniques similar to those in the work on interactive storytelling of Kurt Fendt<sup>5</sup> and Glorianna Davenport<sup>6</sup> at MIT.

In our prototype, the primary story 'rings' are spatial ('Exploring the Church'), archaeological ('The Story of Discovery') and historical ('The Story of the St Laurentius Church'). In other words, these primary story rings represent multiple points of view or informational 'flavours' on the heritage of the monument. Hence, the individual nuggets also come in one or more flavours, and tell—in the case of our prototype—a specific piece of the story in an archaeological, historical or object-related way. The spatial stories start from interactive panoramas, the historical stories span the entire life of the church, the archaeological stories tell about the discoveries made during the excavations inside the church (see Figure 3). At any point in the presentation, the default (and easiest) choice for the visitor is to continue the story of which the chosen nugget is a part.

Yet because the nuggets of a particular story are also relationally linked to other nuggets of different stories, the visitor is free to change 'flavours' and thereby begin to create a personalized story that weaves together elements from several of the predefined themes. For example, if the visitor clicks on a hot spot where a field pattern was found in the deepest layers of the excavations in the church, he or she receives information about what exactly has been found (spatial-object information) but can also learn about why the archaeologists *think* this is a Roman wheat field (archaeological information); or how this fits with the historical fact that Flanders was a Roman province in the first and second centuries AD, mainly involved in agricultural production to feed cities and armies (historical information).

## Interactive Storytelling

The interactive storytelling comes through the visitor's response to visual and verbal cues. In the above-mentioned example, the visitor who clicks on the object description of the field pattern has three choices of trajectory. He or she can continue exploring the monument, go on to the next hot spot in the panorama and receive another object description (i.e. continuing with the spatial story). He or she can also switch flavour, i.e. look upon the information in a archaeological or historical way (see Figure 4). Thus, after seeing the field pattern, the visitor is asked if he or she wants to find out *how* we know this is a field pattern, or, alternatively if he or she wants to learn about the field pattern's wider historical context. The first alternative gives the story

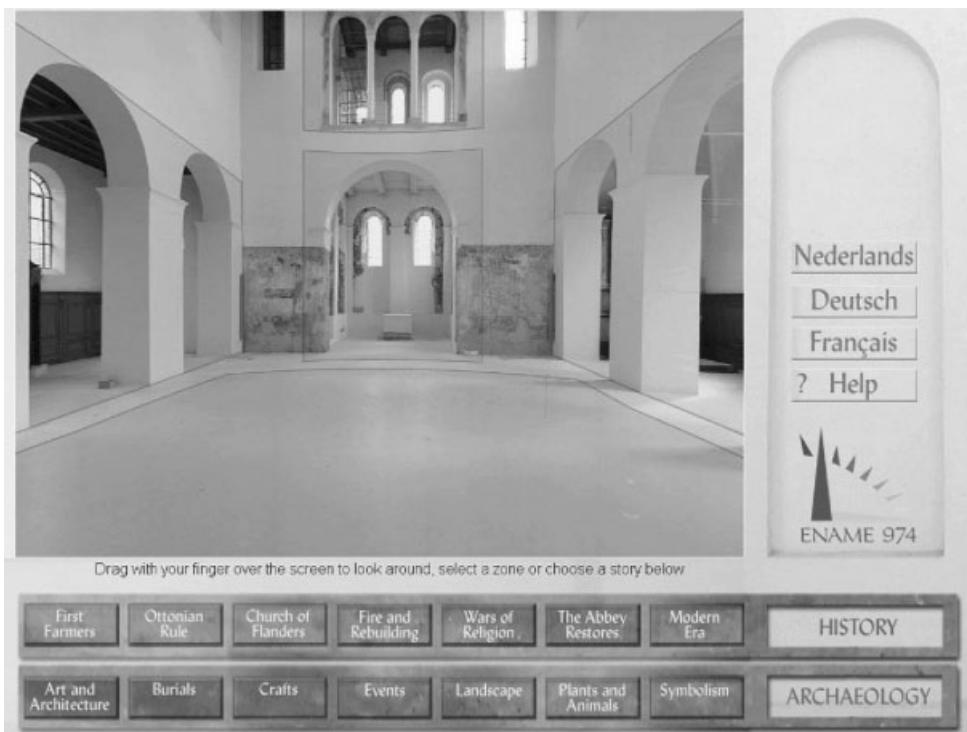


Figure 3. The startup screen of TimeScope 3.

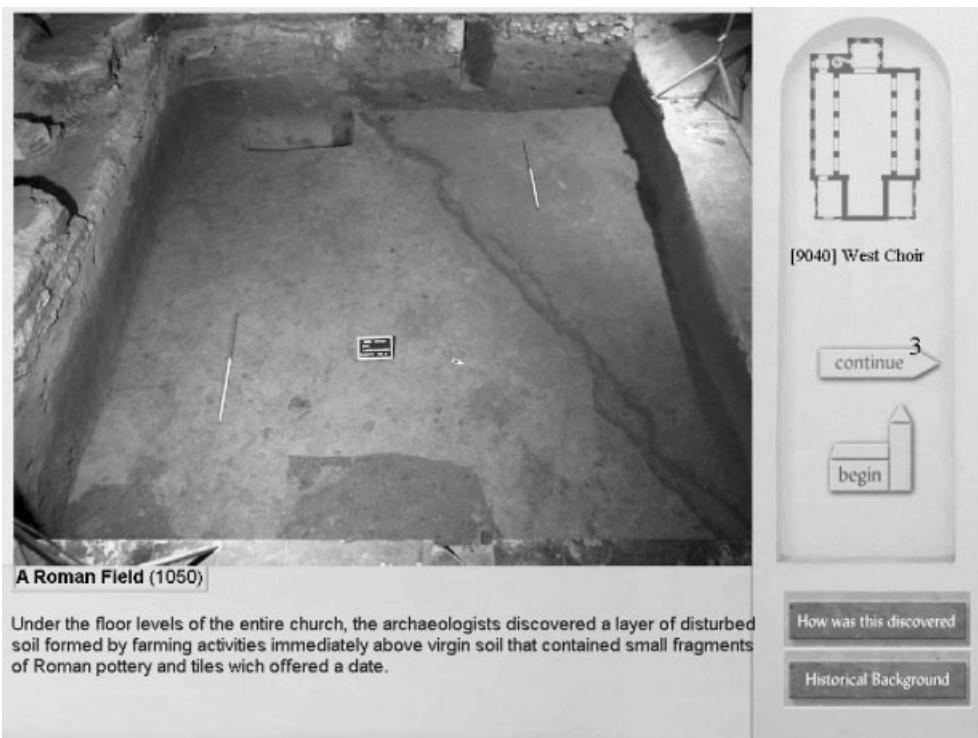


Figure 4. The Roman field pattern (in debug mode).

temporarily an archaeological flavour; the second, an historical flavour. In other words, the user can interact with the story and enrich it by answering the questions of greatest personal interest. In one respect, this way of enriching the story is very similar to a footnote in a book: you can read the footnote and have more information about what you are reading, or you can skip the footnote and continue reading the text.

But the structure of this application allows more: when, for example, the visitor sidesteps to the related archaeology 'flavoured' nugget, he or she can decide to continue on the archaeological ring, following the story of discovery in general. In navigational terms, a single sidestep is regarded as a footnote, but when the user who began in the 'Object' ring makes two consecutive choices indicating his or her interest in archaeology, the system redirects the default story from history into archaeology, while maintaining a logical flow of the presentation that results from the user actions. In this way we obtain a system of passive personalization, enabling the creation of personalized descriptive narratives.

## A New Personalization and Input Strategy

By representing the knowledge of site, monument or museum as a set of interconnected nuggets with embedded story structures, we are able to create a heritage presentation system which adapts to the interest of the user: the application dynamically expands as the user interacts more with the application. In other words, this system represents a dramatic move away from static presentation systems, containing a limited number of complete stories or informational films to a dynamic and flexible system, where the user writes his or her own story, as an exploration through an interconnected world of information.

This is because the system relies on a completely new input model. In current heritage presentation systems, information goes through a stage of data collection (by archaeologists and historians) to a stage of simplification and reformulation (by scenarists, designers, 'popular' text writers and multimedia specialists). Their collaborative product is a static, finished presentation, which is eventually viewed passively by the visitors. This three-stage process is slow, expensive and error prone and updating is an expensive and time-consuming process, requiring a complete rewrite and a

new production to materially update the contents to accommodate new historical understandings or new discoveries.

In the new TimeScope system, updating is easy and gives instant results. Information can be continually added or updated with the addition or revision of the existing database of nuggets by the researchers, under supervision and with advice of the multimedia people and scriptwriters. During development or updating, a debug mode showing extra navigational information helps the researchers to keep track of the changes and test the behaviour (see Figure 4). Nuggets are interconnected through a clear and easy-to-grasp linking scheme. The visitors ultimately benefit by having a constantly expanding and up-to-date body of information to explore in each visit to the site.

The interconnected nugget rings not only provide a medium for the dynamic presentation of available knowledge; they also represent the knowledge in a dynamic way. The motors behind this presentation system are XML and databases, and if the number of nuggets is small the database can be entirely replaced by an XML structure that can also serve as a simple database. Each nugget contains a number of standard elements such as written text, sound files, images, digital video and locator maps, which are entered as XML fields. When a certain nugget is selected, an HTML page arranged according to a predefined template (or stylesheet) is produced on the fly and displays all the elements of image, text and sound that compose a particular nugget. When the next nugget is chosen, an appropriately predetermined transitional media link is played (reflecting the narrative relationship to the previous nugget, i.e. 'before', 'after', 'close', 'far', 'similar', 'different'). The newly chosen nugget is then shown. Thus the linking of nuggets gradually begins to build a narrative.

## A New Output Strategy

This new system also allows output to multiple media without major efforts, as the database permits the storage of all information in multiple formats. For example, a kiosk system will need text as a sound file, while an Internet site will need text in a written form.

Only two major components change when casting the information to another medium: the stylesheet will be different and, through another linking scheme, the level of detail can be altered.



Figure 5. TimeScope 3 in use by a small group.

## System Set-Up

The system set-up has been designed with different target audiences in mind: single visitors, families and guided groups. The system consists of a standard but heavy-duty computer, a large plasma screen, and a touchscreen which can rotate around the vertical axis. Single visitors can look at the touchscreen and rotate it to see the presented area both in its current state and, for example, how it was before restoration. Families can enjoy the presentation on the plasma screen while one family member interacts with the system (see Figure 5). Guides can turn the touchscreen so that they face the group members who look at the plasma screen (see Figure 6).

To respect the character of the church, all audio will come through portable audioguides with headphones, which are synchronized with the system through IR.



Figure 6. TimeScope 3 in use by a guide with group.

## Future Work

A major anticipated refinement of this system will be active personalization. By identifying the user and by applying a user profile within the HTML page generation process, the selections most likely to be of interest to the visitor will be offered in descending order. Guides will be the first target group for active personalization: some guides prefer to offer their own presentations and have full control over the timing of the system; others will prefer to rely on the system's presentation, and add comments to it. By logging onto the system with his or her personal identification, the guide will obtain his personal settings to give an optimal presentation.

Another major target for active personalization is the creation of cultural heritage tours, where a number of sites are linked to each other, enabling the user to create his or her personal narrative (stored on a user-and-password accessible website) of travels along this cultural route.<sup>7</sup>

## Conclusion

This system of interactive storytelling for heritage presentation addresses one of the main weaknesses of current presentation systems. It relies on an innovative method of allowing the visitor direct and interactive access to heritage information. It is not restricted by time limitations or an overly general synthesis of the monument's features and significance. In this new presentation method, information is constantly added and updated and made accessible to the visitor, who determines the narrative trajectory. Experimentation continues to improve the user interface, navigation system and narrative structuring elements. Yet it has already demonstrated its potential as a robust, flexible and effective method for conveying heritage presentations to the general public at archaeological sites, monuments and historical landscape areas.

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established the Provincial Museum, which is directed by Marie-Claire Van der Donckt. The Institute for Archaeological Heritage (IAP) is responsible for the scientific content of the archaeological research, which is carried out by Dirk Callebaut, Koen De Groote, Nancy Lemay, Vera Ameels and Eva Roels.

The Ename Centre for Public Archaeology and Heritage Presentation is directed by Dirk Callebaut. Daniel Pletinckx and Neil Silberman are responsible for New Technologies and Heritage Interpretation respectively. The goal of the Ename Centre is to develop new technologies and standards for heritage presentation. It also coordinates heritage presentation projects and educational programmes for partner sites around the world (<http://www.enamecenter.org>).

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**Daniel Pletinckx** trained as a civil engineer, specializing in digital imaging and computer science. He gained extensive experience in system design, digital image processing, digital image synthesis, 3D and virtual reality through a career of 15 years in private industry. He is the author of several articles on computer graphics and cultural heritage presentation and has lectured at

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**Dirk Callebaut** was educated at the University of Ghent and currently serving as acting director of the Institute for the Archaeological Heritage of Flanders (IAP). Callebaut is the chief coordinator of the scientific, interpretive, and public activities of the Ename 974 Project and the Ename Center. Since initiating the Ename 974 Project in 1982, he has worked closely with the Provincial Government of East-Flanders and various international organizations to develop and expand the interface between scientific research, technology, and the general public. He is the author of numerous scientific articles and lectures widely on the finds from Ename and the subject of public interpretation of archaeology. Callebaut serves on several international committees dealing with public archaeology and medieval material culture.



**Neil Asher Silberman** is an author and historian with a special interest in history, archaeology, and public interpretation. A former Guggenheim Fellow and a graduate of Wesleyan University in the United States, he is the author of nine books on archaeological subjects. As a contributing editor for *Archaeology* magazine and frequent contributor to other archaeological and general-interest periodicals, he has special expertise in the communication of archaeological discoveries and insights to the general public. He has been on the staff of the Ename Center since 1998, working on various international projects in archaeology and heritage interpretation.