

Displaying Intangible Heritage Using ICT. Roman Everyday Life on the Frontier: Vindolanda.

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Abstract

Virtual reconstructions are increasingly been employed in archaeological museums and sites, principally to improve the comprehension of structures no longer visible or clearly identifiable. They can become tools to explore ancient environments and enhance their understanding. However, can information technology also be employed in the process of displaying intangible heritage, such as reconstructing every day life in the past, through the interpretation of tangible evidence? If so, how is it possible? This project aims to answer those two questions through the case study of Vindolanda, a Roman auxiliary fort located just south of Hadrian's Wall in northern England. Like most Roman forts, Vindolanda followed several phases of construction: one of the most interesting is the so-called Period III timber fort (ca. AD 100-105). This Pre-Hadrianic phase is particularly relevant since more than 1000 writing tablets have been found at the corner of the commander's house. The Vindolanda writing tablets provide interesting information about one community on the edge of the Roman world, offering a fascinating insight into the life of specific people, such as the prefect of the fort and his family. The life of the people in Vindolanda at the beginning of the second century AD will be displayed within a 3D virtual environment - the Period III fort itself; hence the first phase of the project focuses on such reconstruction. This paper will address the issues related to the 3D reconstruction of Vindolanda Period III timber fort - using the evidence regarding buildings, size, orientation, and layout - and the relevance of the accuracy of such model as a setting for the storytelling.

Categories and Subject Descriptors (according to ACM CCS): I.3.7 [Virtual reality]:

1. Introduction

Virtual reconstructions of archaeological sites can help visitors acquire information not easily or clearly accessible, enhancing the understanding of ancient environments and, in some cases, offering the possibility to explore them. Usually archaeologists and Information and Communication Technology (ICT) researchers rely upon evidence such as buildings (or, more frequently, their foundations) and material finds to produce these 3D virtual reconstructions. In some cases, historical literary sources can help widen the knowledge of a particular site bringing to light information regarding the inhabitants and the life within it. In particular, 'first hand' information, such as written documents, provides significant insight on everyday life of people who actually lived and occupied the site. Nonetheless, this type of information is very rare to have.

The final aim of the project is to employ ICT for displaying intangible heritage through the interpretation of tangible evidence. For this, Vindolanda has been chosen as it represents one of those special cases where we do have 'first hand' historical material. Therefore we can propose a reconstruction of the fort with its 'original' inhabitants and show their everyday life. The aim is to produce an application that will allow the users to navigate and explore the 3D virtual Vindolanda Period III fort, following the life of the prefect and his family. Thus, the first phase of the project focuses on the 3D reconstruction of the fort as it might have been between AD 100 and AD 105.

This paper is organised as follows. Section 2 illustrates the relevance and the peculiarity of the case study, Vindolanda Period III timber fort, and its archaeological evidence. Section 3 outlines the different phases of the project and the

process to produce the 3D model of the fort, along with the relative approach used to overcome the issues raised during the modelling. Finally, future work and conclusions are discussed in Section 4 and 5 respectively.

2. The relevance of Vindolanda Period III timber fort and its evidence

Vindolanda is a Roman auxiliary fort located south of Hadrian's Wall in northern England. Like most Roman forts, it had several phases of construction: at least five different timber forts were built before the construction of Hadrian's Wall started in AD 122. Afterward, three stone forts were constructed on the site, which remained under Roman military occupation until the fifth century AD [Bir05]. Because of this, the remains of the earliest forts lay several metres below the modern ground level. More importantly, the Roman army custom of covering the demolished previous structures with turf or clay before new reconstructions, sealed the layers creating anaerobic conditions which have led to the survival of a huge amount of organic evidence (leather, wooden structures and objects, textiles, etc) [Bir06]. Among them, over 1300 writing tablets have been found in various deposits mainly in the commander's house. The majority of them related to the so-called Period III timber fort (ca. AD 100-105).

The Vindolanda writing tablets are made from thinly cut slivers of wood between 1 and 3 mm thick and about the size of a modern postcard, on which the correspondent wrote in ink before folding the leaf in half and writing the address on the back. In some cases, longer documents have been created by punching holes in the corner and tying several tablets together (see figure 1). They provide interesting information about the life in one community on the edge of the Roman world. Written by and for soldiers, merchants, women, and slaves, they bring to light the life of specific people, such as Flavius Cerialis, the prefect of the Ninth Cohort of Batavians garrisoned at Vindolanda during Period III [Bir05]. Sufficient material related to this man has been recovered to reconstruct aspects of his everyday life: such as his daily activities as prefect; his relationship with the governor and the prefects of other forts along the frontier and his family life (some letters sent and received from his wife have been recovered, as well as evidence of the presence of his children).

Alongside the 'private' correspondence, military reports and accounts have been found, as it would have been expected in a military context. They offer important insight on the routine bureaucracy of the Roman army and, in some cases, have led to relevant discoveries about the actual situation of the British frontier before the construction of Hadrian's Wall, inducing scholars to re-write few chapters of the history of Roman Britain.



Figure 1: Writing tablet number 343, the longest and most complete ever found. ©Vindolanda Trust.

3. Phases of the project

One of the final goals of the project is to build an interactive application to display the life of the people in Vindolanda between AD 100 and AD 105. This will be achieved by creating a 3D virtual reconstruction of the fort itself and by producing episodes about the everyday routine activities of Flavius Cerialis, the prefect, and his family. Whilst navigating the model and following Cerialis' daily life, the user will also be able to access a database to acquire in-depth information about the tablets and their content, the artefacts recovered and the importance of their depositional condition. Thus, the first phase of the project focuses on the 3D reconstruction of the Period III timber fort, as it might have been at the beginning of the second century AD.

The archaeological data related to the structures of Period III are relatively limited: they consist of the western wing of the praetorium (the commanding officer's house), the posts of the south gate, the bath house, the latrine and fragmentary traces of other buildings [Bir94]. Despite their sparsity, these structural elements provide information about the orientation of the fort and its position, which differs from the late stone forts. By combining these data with the records of the writing tablets it has been possible to estimate the size of the garrison (see figure 2).

The second phase of the project will regard the design and implementation of a database containing all the documents that the user would eventually be able to access as well as the user interfaces to access and navigate the 3D environment. For this, it will be crucial to evaluate data related to Vindolanda's visitors to produce a valid and fulfilling experience [EP06], which can highlight the relationship between the items in the museum and their 'lost' environment as well as making a link between the Cerialis' story and the tablets (currently displayed in the British Museum).

The third phase of the project will focus on the creation of the episodes of the life of Flavius Cerialis and his family.

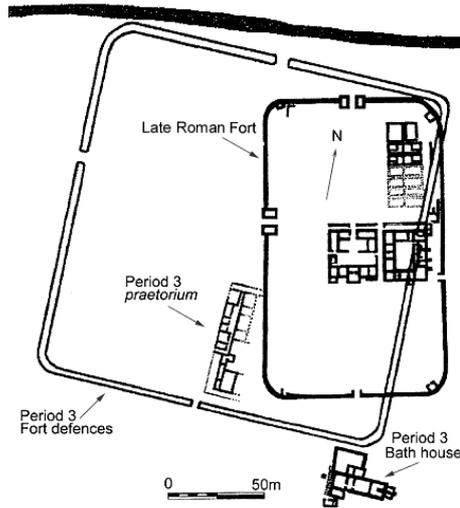


Figure 2: The Period III fort, in relation to the overlying stone fort. ©Vindolanda Trust.

The best approach is still being discussed in collaboration with the Vindolanda Trust, who currently runs the site. Similarly, the final interactive application will be deployed in agreement with the Trust.

3.1. Phase 1: the 3D 'realistic' model of Vindolanda Period III timber fort

As already underlined, the archaeological evidence regarding the buildings of the Period III fort is relatively limited; they include [Bir94]:

- part of the commander officer's house;
- the pots of the adjacent south gate;
- fragmentary traces of buildings to the West and North West of this area;
- outside the walls of the fort: the bath house and the annex latrine (see figure 3).

These constructions were made using local timber; apart from the bath house and the latrine, which were built in stone for obvious reasons of maintenance and use.

Despite the limited number of structural remains, it is possible to recover more information about the fort thanks to the writing tablets, which mention different buildings and, more importantly, the strength of the cohort there stationed. Combining all these data it is possible to establish dimension and orientation of the fort. Another important element to consider in the 3D reconstruction is the similarity between Vindolanda and other Roman forts: the military architecture adopted by Romans was standardized across the Empire, so that it is possible to recognise similar layouts and 'fill' information gaps. The basic playing card shape was adopted in

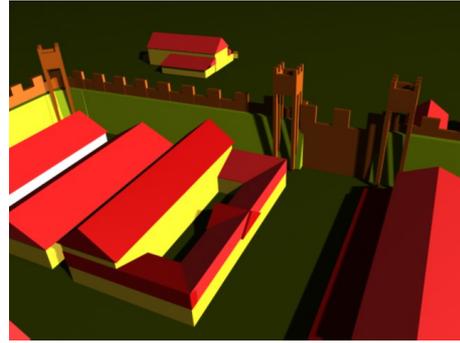


Figure 3: Detail of the 3D model of the praetorium, the south gate and the bath house before texturing.

Britain from the beginning of the conquest: initially the forts were built using local wood, eventually replaced with more durable stone material later in the second century AD. As well as the general design of the forts, specific buildings are usually identified: headquarters, commander officer's house, hospital, granaries and barracks inside the wall, while facilities such as the bath house, the latrines and various shops would have been kept outside the fortress [Bir04].

The nature and the quality of all this information have raised some issues regarding the transparency requirements eventually needed in the modelling process of the virtual fort. As underlined by the London Charter, whether there are uncertainties about a proposed 3D reconstruction, transparency information should be clearly provided [BDN06]. However, those requirements could differ depending on the aim and characteristics of the project itself, as long as the relevant documentation is made available [LC]. These issues are indeed relevant in all virtual reconstructions of archaeological sites, because they are inevitably imperfect, due to the characteristics of the data themselves, and, in the majority of the cases, liable to more than one reasonable interpretation. Therefore, 3D visualisations are speculative and have to deal with the incompleteness of the archaeological data. Nevertheless, they ought to have also a certain degree of reliability; otherwise they become just speculative experiments. Different approaches to this problem have been suggested: from applying concepts of fuzzy logic in order to quantify reliability and uncertainty of a proposed virtual reconstruction [HNP06], to using the Possibility Theory to represent uncertainty in visualisation [SJW*06] [SMWW06]. These approaches seek to propose methodologies to tackle the issues of uncertainty and incompleteness in archaeological reconstructions, in the sense that 3D models of sites, buildings and ancient environments should provide visual information about different layers of interpretation and degrees of reliability.

The importance of the above mentioned theories is undoubtedly crucial for this project. From the evidence de-

scribed above, it immediately became clear that several approaches could be eventually used to propose plausible models of the praetorium, the bath house and the latrine, the only three buildings with sufficient remains to allow any 'scientific' reconstruction. However, as the primary aim of the project is to display the life of the people that lived in Vindolanda at the very beginning of the second century AD, the focus was instead on 'translating' the writing tablets into a virtual experience for the visitors of the site. In other words, this project seeks to animate the written documents: the Vindolanda tablets have given an incredible opportunity to understand how life really was at the furthest north edge of the Roman Empire. They have also provided detailed information about specific people, which could therefore be brought to life. Consequently, it has been considered important to produce a model of the fort 'realistic' enough for this story to be told.

The reconstruction of the fort has then been carried out taking into account different layers of information, integrating the archaeological evidence with the writing documents, to provide a virtual environment for the future storytelling. The presence, position and size of each building have been evaluated confronting structures from the later levels of occupation and other forts along Hadrian's Wall. A general plan of the site has been drawn by Dr Robin Birley - archaeologist and former Director of the Vindolanda Trust - and consequently transformed into a 3D model using 3D Studio Max 8 (see figure 4). The texturing of the model will be done combining pictures of the archaeological remains - such as the wooden floors, walls and other structural elements - with images of the plastered 'finished' look that the building would have had. The resulting reconstruction of the Period III fort can therefore be considered a reliable and 'realistic' background for the episodes of the life of Cerialis and his family.

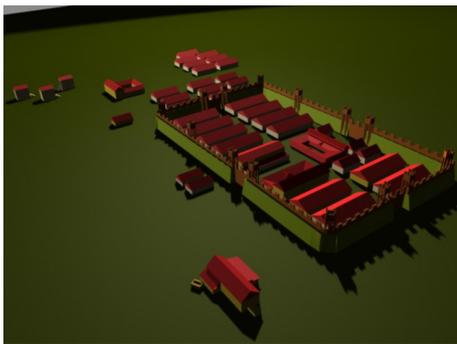


Figure 4: 3D model of Vindolanda Period III timber fort before texturing.

4. Future work

The future steps of the project comprehend the creation of the database linked with the final interactive application; the definition of the plot of Cerialis' life and its consequently animation. The design of the final application has not yet been defined, as it would have to take into account various issues related to the display form and the target users.

As already mentioned, the interactive final application will enable the exploration of the virtual environment whilst learning about the life within the fort. The story itself will animate the writing tablets, transforming their content into a visual, interactive experience. It is also important to underline that the information provided by these particular documents represents the core of data upon which the virtual reconstruction relies, as underlined in section 3. Furthermore, the 3D model of the fort shown in the final application will be a unique opportunity to visualise an archaeological layer not currently visible.

These premises are important in order to understand the peculiar issues related to the further phases of the project. It will be certainly important to carry out a survey on the typology of future users: recent studies [FPP06] [PE06] have underlined the importance of cultural and social interaction (with the museum's exhibits and other visitors), along with the potential problems arisen by ICT application in museum contexts (usability, accessibility, interactivity, etc.). Consequently, the phase regarding the design of the interface will take into account usability studies in order to produce an application user-friendly in its layout and useful in spreading content. As for the management of the content, [DRE07] has emphasised the importance of integrating different media with a 'challenging' approach (namely, a learn/challenge/reward system like a game) and underlined the significance of interactivity in a museum environment, especially when targeting children for educational purposes.

The definition of the technique to be deployed into the application will take into account all these premises and try to test different techniques among the various resources currently available (multimedia, avatars, blue-screen technology, etc.).

5. Conclusions

In this paper we have described the initial phases of a project aiming to employ ICT for displaying intangible heritage through the interpretation of tangible evidence for the Vindolanda site. It has also highlighted the importance of clarifying priorities when modelling 3D virtual environments according to the project's final aim. In particular, we produced a 3D reconstruction of Vindolanda Period III fort combining all the data available, evidence of buildings and writing tablets, with the intention to create a suitable setting for storytelling. This reconstruction will be used for the final goal of the project - to display the life within the fort.

6. Acknowledgments

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