Along the Appian Way. Storytelling and Memory across Time and Space in Mobile Augmented Reality

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Abstract. In this indirect augmented reality system we have reconstructed about 1 km of the Via Appia Antica with three time periods represented: 320 CE, 71 BCE, and 49 BCE. This situated simulation explores the notion of narrative movement and travel across space and time in a cultural heritage context. The transitions between the temporal phases are triggered by the users active repositioning on location. Included in the system is also a quiz consisting of verbal and image–based alternatives to a variety of questions related to the information provided in the virtual environments. We describe the main elements of the simulation, its technical solution and production, as well as the feedback from real users testing on location. We close with a reflection on the multimodal quiz and how it relates to memory and learning.

Keywords: Mobile Augmented Reality, Indirect Augmented Reality, Via Appia, The Appian Way, storytelling, visualisation, situated simulation, sitsim.

1 Introduction

The Appian Way is known as the *Via Appia Regina Viarium* – "the Queen of all Roads" by the Roman poet Statius [1]. It has been written that "to travel the Appia today is to step in the tracks of countless ghosts. No road in Europe has been so heavily traveled, by so many different people, with so many different aims, over so many generations" [2]. It is also a road of memories, stored and displayed by means of the many burial monuments and inscriptions [3]. The Appian Way is what we may call a palimpsestic place [4], or rather an elongated palimpsestic place, a stretch, a route, a journey. A venue like this is also a site of stories. Stories acted out, taking place and told across space and over time. The Appian Way marks a phenomenon where the road, travel and journey as central metaphors for stories and narratives come close to the real.

In the Via Appia situated simulation introduced here we have tried to represent and tell the stories of some of the historical actions and events that once took place on this ancient Roman road. The user area of the simulation covers about 1 km of the Via Appia, from just before the Mausoleum of Romulus to a bit beyond the third milestone. Three time segments, or moments in time, have been reconstructed: the culmination of ancient Rome just before Christianity was introduced, ca 320 CE; the end of

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Spartacus' slave revolt in 71 BCE; and 49 BCE, as Julius Caesar was heading back to Rome after his brief confrontation with Pompey and the Optimates in Brindisium.

This Mobile Augmented Reality system explores the notion of narrative travel across space and time, the transition between the time modes is triggered by the users physical movement traversing the Appian Way on foot. We also included a questionnaire – a quiz – in the system. It contains both written and image–based alternatives to a series of questions related to the information provided along the way. In the following we first describe the technological platform in relation to other mobile augmented reality solutions, then we present the main constituents and structure of the simulation, as well as a brief account for the background and production process, before we proceed to how it was tested and evaluated with real users *in situ* on the Via Appia Antica. Finally, based on the feedback received, we discuss some effects and functions of the multimodal quiz and how it relates to and may further remembrance and learning.

2 The SitSim Platform

The Via Appia simulation was developed using the sitsim (situated simulation) platform for smartphones and tablets. The application is based on Unity3D and exported to both iOS and Android OS. However, all the experimental design and development takes place on iOS. Unlike most other Mobile Augmented Reality systems the SitSim solution does not employ mixed screen. Instead the whole screen/display is allocated for the graphics environment. Thus the phone or tablet is turned into a window for visual and auditive access to an alternative or parallel version of the environment that the user is physically in. As the the user moves herself and the phone in real space the information on the device is updated accordingly [5,6]. The SitSim platform has been using the sensor fusion approach [7] since the first working prototype was developed in 2008 [8]. Among the many taxonomies and the growing nomenclature for mobile augmented reality variants [9,10,11] the sitsim solution is probably best identified as a type of Indirect Augmented Reality as suggested by Wither, Tsai and Azuma [12].

3 The Via Appia SitSim

In the case of the Via Appia situated simulation the alternative environments are past interpretations of the physical place, representing different moments in time of a particular stretch of the Via Appia Antica. In addition to the environment itself the sitsim includes hypertext links for access to supplementary information (writing, audio and/or images) stored in the app or accessed online and displayed in the built-in web browser or .pdf–viewer. There is also a global menu for general functions like 'snapshot' (images combining photos from both the real and the virtual camera, thus creating a '*now & then'* collage), as well as various so–called views (situations where the perspective displayed by the virtual camera deliberately is no longer congruent with the real perspective of the user, such as 'zoom', 'bird's view', etc.) [13].

Fig. 1. The Via Appia Sitsim in use *in situ*. In the real background one can see the base of Cecelia Metella's Tomb, built around 30 BCE. On the screen the simulation in March 49 BCE mode and Julius Caesar and his entourage are heading towards Rome on the same part of the Appia.

In the development of the Via Appia sitsim we focused particularly on how to combine and relate time periods, and also how the user should be able to move between them. The users were advised to start the simulation just North of Romulus Mausoleum and then enter the 320 CE moment in time with reconstructions of the same Mausoleum, Circus Maxentius and a number of burial monuments on each side of the road. They can also access actions/functions via the spatially distributed hypertext links and activate visits inside buildings with the fly–in function (using the virtual camera to access physical position not possible in the real environment). When the user has passed Circus Maxentius on the Eastern side of the road the systems asks

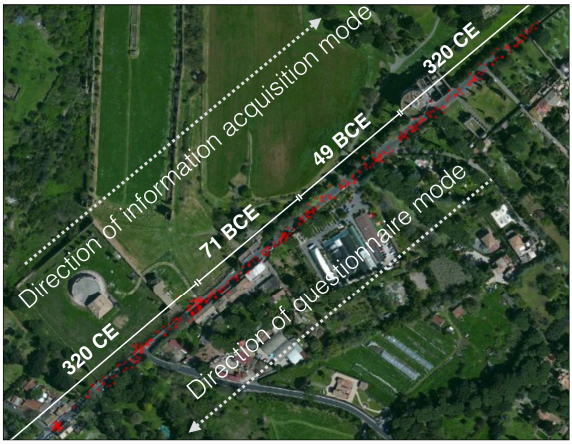

Fig. 2. Satellite photo showing the tracking of the user activity during the test. Distribution of red dots marks the Via Appia Antica and indicates where the links are (more spots and deeper red colour). The extension and order of the various temporal sections can also be seen. In the system the user first walked away from Rome, towards the South–East activating the hypertext links and acquiring relevant information. The upper left corner of the illustration marks the turning point where the quiz is activated before the user returns and answers the questionnaire on her way back. Tracking app developed by Tomas Stenarson, CodeGrind AB.

Fig. 3. 320 CE: Links for information acquisition next to Circus Maxentius (top). 71 BCE: Spartacus' soldiers crucified by Marcus Crassus along the Appia (middle). 49 BCE: Julius Caesar on his white horse and his retinue passing by the user on the Appian Way (bottom).

if he or she wants to switch to the 71 BCE segment. If yes, the whole environment changes and both sides of the Appia is now lined with a row of crucified soldiers from Spartacus' rebel army. Here the user may, as in the previous section, access information

about various relevant topics, such as: the Third Serville War or Spartacus in popular culture. After about 150 meter the scene can again be switched and now the time of the reconstruction is about twenty years later, 49 BCE and the beginning of the Civil War. In a letter to Atticus on the 29th of March in 49 BCE (A IX, 18) Cicero writes that Caesar has just visited him at his villa in Formiae, and that Caesar then headed to Rome for a meeting with what was left of the Senate on the 1st of April [14]. The shortest route from Formiae to Rome is the Appian Way. It is thus probable that in late March 49BCE Julius Caesar and his retinue passed by on this stretch of the Via Appia. The scene also includes spatial hypertext links to audio narration and online material on topics such as the civil war, Julius Caesar's life and career and more. The next time switch is located just before Cecelia Metella's Tomb and sends the user back to 320 CE as she ascends the rise towards the third milestone. At the end of this second 320 CE section there is a single hypertext link named 'Quiz'. Upon activation the user is informed to turn around and answer the question as good as he or she can. The questions are easily identified as balloon–like yellow hypertext links with a question mark. In this return 'questionnaire mode' (see Figure 2) all the other hypertext links from the 'information acquisition mode', before the quiz was activated, are no longer available. The answers to the questions are related to the knowledge provided in the information links for the same tempo–spatial area.

Fig. 4. Screen shot of balloon links with question marks along the Appian Way in the 320 CE time segment of the simulation

As the user walks up to the link and touch the round yellow hot spot a question and four alternative answers are displayed on the screen against an opaque 'page'. To maintain the feeling of still being inside the environment we have made the question page narrower than the full screen format. The user can easily observe that the virtual environment is still active behind and outside the question page. The information provided by the hypertext links in the information mode is not specialised but at a popular level and aimed at the general tourist visitor. Thus the questions are likewise undemanding and oriented toward simple facts, at least in the written alternatives.

The alternative answers may either be written suggestions or pictorial examples. In the written version four alternative sentences are suggested to the user. To the relatively straight forward and easy question 'How did Julius Caesar die?' four written answers are suggested, all with some form of credibility and relevance to the mythical and historical person Julius Caesar.

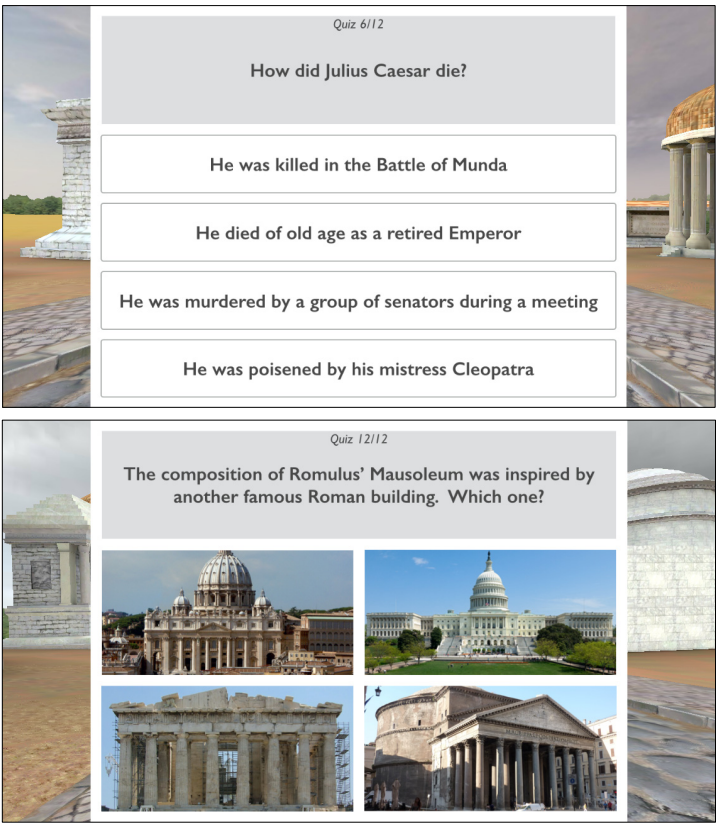

Fig. 5. Top: A 'page' of one question and four alternatives, written answers displayed on a part of the screen. The graphical environment is still present and active. Bottom: A 'page' of question and four image–based answers.

The other version of providing alternative answers to the posed question uses the same page metaphor, but displays four images and no written text except for the question itself.

When all twelve questions have been aswered a diploma is displayed on the screen. Depending on the amount of correct answers the diploma appoints the user to either slave, citizen, senator and so on. The diploma can then be shared online via mail, Twitter or Facebook.

4 Testing and Evaluating the Simulation on Location

The Via Appia sitsim was developed and produced in conjunction with a student course (MEVIT3810) given at the Department of Media and Communication, University of Oslo in the spring term of 2014. A group of nine third year BA–students contributed with 3D–models, manuscripts for audio narration, written text and images. However, the simulation was produced within the context of the Sitsim–project and used a new version of the Sitsim–publication platform developed in collaboration with CodeGrind AB and Tag of Joy.

The Via Appia sitsim was designed and assembled in February and March and tested *in situ* on the Via Appia Antica in April. A group of seven students at the Norwegian Institute in Rome tested and evaluated the application. These students attended a BA–course in The Culture of Antiquity – The Augustian Age (ANT2210). On location they were presented with a short introduction to the Via Appia simulation, including its main features and functions as well as its content and structure. Then they were each given an iPad Mini Retina with earphones and sent off to test the simulation on their own. The students taking part in the production made themselves available for assistance in the user area as long as the test lasted. When all had finished the trial, that is, walked the whole distance of the Via Appia and explored both the *information acquisition mode* moving in the South–Eastern direction away from Rome, and the *questionnaire mode* moving back in the North–Western direction, towards the city of Rome, they individually answered a paper–based questionnaire with a variety of question concerning their experience in using the application/simulation. We also had more informal Q&A sessions both during the production and after the test on location, both face to face and via e-mail.

In our context we shall look at the response to two of the questions that was asked:

1. How did you experience the difference between image–based options and written options in the quiz?

2. In this version of the quiz the questions were placed in the same location and time period on the Via Appia as the presentation of the related information/knowledge. Do you think this made it easier to remember the answers? Or do you think the positioning of the questions in time and space was irrelevant to your capacity to remember the information and context it was asked for?

Answers to the first question varied. Some did not notice any difference between written and image–based alternatives, while others found them much to easy. It was a clear tendency that they found the image–based alternatives more fun, challenging and different. Here is a typical response to the first question with an interesting comment:

"…the image-based ones gave the whole quiz an extra level and increased my attention towards the Via Appia simulation."

Answers to the second question also differ. Some did not even notice that the there were any relevance between the position of the questions and the information links in the two modes. Others noticed it, but did not think that it had any effect. More than half of the respondents, however, were clear about the effects of the relationship between the spatio–temporal positioning of information acquisition links and quiz links. Here is typical example:

"…I do think that answering the quiz in the same time period as the related information made it easier to remember the answers."

What can we learn from these responses? In the next section we will try to discuss some of the implications of the information provided by the users testing the Via Appia simulation and quiz on location.

5 Reflections on the Feedback

We agree that a quiz with multiple choice answers is not the ideal means for checking the learning potential of any information system [15]. However, in this context the purpose was to see how a quiz with multiple choice could function inside a location–based system and if the positioning itself of the questions and multimodal alternatives had any significance.

To what extent may we understand that the image–based alternatives provided the whole quiz with an "extra level". What may this extra level consist in? How is it generated? When we read the written alternatives they are experienced as just separate options. There is no connection between them. Browsing through the options you search for the right answer by elimination. Left with the singular best option you have found your answer. With the image–based alternatives we start by following the same process, but something else happens: While we examine the individual pictures for their relevance and truth value we also see them in relation to each other. We see them as related pictorial presentations: the front of the Phanteon with its pediment, architrave and columns in the lower right photo is related to and compared with the equivalent and similar architectural elements of the Eastern facade of the Parthenon in the lower left picture. At the same time we see how the rotunda of the Phanteon is repeated in different ways in both St. Peters Basilica in the Vatican and the US Capitol building in Washington. Despite these connections, having used the Via Appia simulation and accessed all the information about Romulus' Mausoleum there is no doubt in our mind that the image of the Phanteon is the correct answer. However, while we have looked at the images we have also learned something about the relationships and connections between these buildings despite their separation in both time and space; the collage of related images tells a story of architectural development. This, we might say, is adding "an extra level to the whole quiz".

What about the response to the second question? How is position relevant to memory? We do not need to search in modern research to answer that question. In his treatise *On the Ideal Orator* Cicero tells the story of the Greek poet Simonides who invented

the art of memory: Simonides was hired by Scopas, a wealthy nobleman in Thessaly to compose a panegyric to the host at a banquet. When Simonides had finished his poem Scopas offered to only pay half the honorarium since Simonides spent half the poem honouring Castor and Pollox. While they where arguing a servant came and said that there were two visitors outside asking for Simonides. Simonides went out, but found no one. Meanwhile, the roof over the banquet hall collapsed and killed all the guests including the host. When their families wanted to arrange their funeral, but could not possible distinguish them because they had been completely crushed, it was reportedly Simonides who, from his recollection of the place where each of them had been reclining at the table, identified everyone of them for burial. Cicero continues: "Prompted by this experience, he is then said to have made the discovery that order is what most brings light to our memory. And he concluded that those who would like to employ this part of their abilities should choose localities, then form mental images of the things, while the images would represent the things themselves; and we would use the localities like a wax tablet, and the representations like letters written on it." [16]

The relationship between spatial positioning and pictorial representation is well known throughout history and has been recorded in detail by Yates [17]. We also know that the art of memory is relevant to the development of the graphical user interface (GUI) as well as interaction design [18]. There are good reasons to believe that the same mechanisms are at work in the tempo–spatial relationship between information links and quiz links in the Via Appia sitsim. In a positioned information environment like the situated simulation it is plausible to understand the spatially distributed hypertext links as elements constituting a memory chamber which helps improve remembrance when using such a system. To paraphrase Cicero: At certain localities in the simulation (and accompanied by the physical environment) the link and nodes form images of topics and things and this order helps us bring "light to our memory".

In this paper we have only scratched the surface on how situated and sensory media may render new forms of information representation possible, and how such new architectures may facilitate learning. Further research related to these aspects of the sitsim–platform will focus on the possible potential of the mnemonic techniques in employing situated simulations as a learning tool.

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