Abstract:
This paper aims to be a contribution towards a deeper understanding of archaeological virtual reconstruction, using the Rome Reborn project as a case study. Embedded in the use of virtual reconstruction methods as well as the technologies and software algorithms are cultural/historical conventions. Consequently a virtual reconstruction – as a simulation – may be regarded as accurately representing the past in the form of imitation, it may also be comprehended as a simulacrum constituting a hyperreality. These two viewpoints are regarded as two ends of a continuum in which the comprehension of a simulation oscillates due to the embedded conventions of realism. While not arguing for a fixed position – subjected to conventions the understanding of realism is therefore never fixed – this paper argues that above all a simulation should be comprehended as real in itself. A simulation will never be able to fully imitate and at the same has real consequences that do not remain silence in a separate virtual world but concern the ‘real’ world in which we actually live and the virtual is most definitely part of.

Keywords: simulation, representation, archaeology, virtual reconstruction, realism

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“Losing an illusion makes you wiser than finding a truth”

Ludwig Borne
Introduction

In its glory days the borders of the Roman Empire encompassed the whole of the Mediterranean and stretched from the Northern of England to the Euphrates in Syria; and from the flat lands of Europe to the rich plains of the North African coast and the Nile valley in Egypt. At the center of this enormous ancient Roman Empire was the city of Rome. The history of ancient Rome makes the city of Rome nowadays one of the most interesting sites to research for archaeologists.¹ Professor Bernard Frischer — founder of the Virtual World Heritage Laboratory of the University of Virginia and director of the ‘Rome Reborn’ project — is one of those archaeologists.² The goal of Rome Reborn (RR) is to create scientific 3D digital models (virtual reconstruction) that illustrate the development of the city of Rome from the first settlement in the late Bronze Ages to the dramatic depopulation of the city in the early middle Ages — ca. 552 AD (Frischer, 2008, p.2). However the project team started modeling at the moment of 320 AD because at that time Rome is considered to be at the height of its urban development (Dylla, Frischer, Mueller, Ulmer & Haegler, 2010, p. 62).³

Since 2007 the project team of Rome Reborn (RR Team) releases and disseminates images and videos of the virtual reconstruction on the internet for public viewing (Dylla et al., 2010). After all — next to excavating and interpreting ancient remains — one of the archaeological tasks is the dissemination and presentation of these interpretations (Frankland & Earl, 2011, p.62). According to Frischer the videos — fly-through presentations (fly-throughs) — present the current stage of the virtual reconstruction of ancient Rome’s urban development in 320 AD (Dylla et al., 2010). The fly-throughs mainly show the architectural buildings although the most recent fly-through – Rome Reborn 2.2 – for the first time incorporates animations.⁴

Every time a new fly-through is disseminated it results in many — mainly positive — reactions from the public outside the project, such as; “This is how beautiful Rome once looked!”⁵ and “Just Amazing!!! Rome looked incredible and beautiful!”⁶ Based on such

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³ Since 1997, the Virtual World Heritage Laboratory of the University of Virginia (VWHL), the UCLA Experiential Technology Center (ETC), the Reverse Engineering (INDACO) Lab at the Politecnico di Milano, the Ausonius Institute of the CNRS and the University of Bordeaux-3, and the University of Caen have collaborated on a project to create a digital model of ancient Rome as it appeared in late antiquity. The notional date of the model is June 21, 320 A.D." The project team consists out of 25 scientific advisors, 17 hand modelers, 12 experts on 3D data capture and modeling, 8 software developers for user interfaces and the advisory committee consists of 4 scholars from different disciplines. Retrieved from: [http://www.romereborn.virginia.edu/people.php](http://www.romereborn.virginia.edu/people.php)
⁴ Civilians are walking through the presentation and there are two gladiators fighting in the Coliseum (The Flavian Amphitheater). See: [http://vimeo.com/32038695](http://vimeo.com/32038695)
⁶ Comments on the web site: [http://vimeo.com/32038695](http://vimeo.com/32038695)
reactions I observe that people are mostly concerned with the imitational or representational qualities and characteristics of the fly-throughs and consider the content to be representations of ancient Rome – understood in terms of imitation (Lister, Dovey, Giddings, Grant & Kelly, 2009, p.129). They are concerned with the correctness and accuracy of the representation and thus about how the city once looked. However one could also argue that since the ancient city of Rome does not exist anymore and the preserved artifacts are by no means in the same state as they were back then, the 3D virtual reconstruction model and fly-throughs cannot exist merely as objects that represent the ancient city of Rome but also exists as simulations which are real things in themselves instead of merely as representations (Lister et al., 2009, p.127).

Therefore I argue for a ‘deeper’ understanding of visualizations such as the project of RR. To better understand such visualizations this paper points towards the directions for developing a visual literacy. According to Luc Pauwels – Professor of Visual Culture at the University of Antwerp – this may seem quite paradoxically since we live in such an image saturated world and images are often regarded as ‘universally understandable’, however living in a society inundated with images does not make one necessarily visual literate (Pauwels, 2008, p.79) just as listening to an iPod does not teach one to critically analyze or to create music (Felten, 2008 p.60). Visual literacy encompasses learning to look more consciously at visual manifestations of reality, learning to understand various forms of images and visual representations and areas of application, being able to place images and visual representations in a broader context of production and consumption, and becoming aware of the personal and cultural coloring in visual reflection and action (Pauwels, 2008, p.80).7

This paper aims to do just that and wants to contribute in better understanding the visualization of RR regarding both the viewing audience and the experts involved in the RR team. Therefore the following aspects of the project of RR will be analyzed thoroughly; the production context; the visual object or phenomenon itself and the utilization context (Pauwels, 2008, p.83). This paper is structured in two parts corresponding to the main competencies of the archaeological discipline. The first part focuses on virtual reconstruction as a visualization method within the excavation and interpretation process of RR as a central case. The second part is aimed at the way virtual reconstructions are presented and disseminated by the RR team. Before starting with both parts of the analysis,

7 Such as cultural and historic conventions embedded in computer generated imagery (Jones, 1989, p.31) which RR is.
the archaeological discipline and the functioning of (visual) models will be clarified to understand better the role of archaeological visualization in general.

After this clarification the first part focuses on the virtual reconstruction of RR as part of excavating and interpreting using several archaeological papers to get a grasp at the process. The text of Beverly Jones’ (1989) text *Computer Imagery: Imitation and Representation of Realities* and Pauwels’ visual literacy approach serve as a theoretical framework. Jones points to the embedment of previous aesthetic theories and reality constructs in computer generated imagery (Jones, 1989, p.31) such as the virtual reconstruction of RR. The second part builds forth on the first part of the analysis and is aimed at the presentation and dissemination of virtual reconstructions and the way this is done by the RR team.

Finally this paper tries to clarify the implications that come along with some of the viewpoints regarding the comprehension of RR. Whilst I will not argue for a fixed position in comprehending the simulation of RR, I do argue that RR as a simulation should be comprehended as real in itself. RR will never be able to fully imitate ancient Rome but at the same has real consequences that do not remain silence in a separate virtual world but concern the ‘real’ world in which we actually live and the virtual is most definitely part of.

1 ARCHAEOLOGICAL VISUALIZATION

Before ‘excavating’ the embedment of aesthetic theories and reality constructs in the form, content and practice (Jones, 1989, p.37) of archaeological virtual reconstruction, I will first explain a bit more about the discipline itself and the role of visualization.

VISUAL MODELS IN ARCHAEOLOGY

According to archeologist Juan Anton Barceló in *Virtual Reality for Archaeological Explanation* archaeologists are in general concerned with those processes that caused our present (Barceló, 2001, p.224) and as such strive to “make visible the invisible” (Frankland & Earl, 2011, p.62). Furthermore Tom Frankland and Graeme Earl make clear – in *Authority and Authenticity in Future Archaeological Visualisation* – next to archaeologists’ task of excavating the remains and to interpret their meaning, it is also their task to make the

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8 Papers from the project will be analyzed including several more general texts of Professor Frischer to get a grasp at his personal vision which percolates through the Rome Reborn project.

9 A second important text is Realism in Virtual Reality applications for Cultural Heritage written by Laia Pujol (2011). Pujol examines Virtual Reality (VR) as an (objective) attempt to replace the world by simulating our perception of it and traced a conventional way of representation in VR (also virtual reconstructions) that comes forth from the western pictorial tradition.
interpretations accessible for a broader public through the dissemination and presentation of their excavations (Frankland & Earl, 2011, p.62).

Archaeology’s goals are not merely aimed at documenting ancient sites and objects but at studying the dynamics of society (Barceló, 2001, p.226) and thus “reconstructing human history and daily life from cultural remains and their natural context” (Hermon, 2008a, p. 36). To understand and analyze the complexities of the real world – such as the just mentioned social dynamics – people draw pictures or build models/abstract descriptions (Ibid.) i.e. to understand how specific regularities of artifacts relate with the production, use and discard of artifacts through time, archaeologists create archaeological models, often a visual model (Barceló, 2001, p.225).

Building a model is done to learn more about a particular system, some aspect of reality where one is “concerned with space-time effects and causal relationships among parts of the system” (Ibid., p.221). “The purpose of any archaeological model should be to allow the understanding of the causal dynamics of social actions” because the goal is to understand why the described entities have specific visual features and not just to describe the visual features (Ibid., p.226). In other words as Stella Sylaiou and Petros Patias (2004) emphasize in Virtual Reconstructions in Archaeology and some Issues for Consideration – like Felice Frankel (2004) did in The power of the ‘pretty picture’ – it is not about creating ‘pretty pictures’ but it is about essential benefits to archaeological research.

However visualizing the archaeological data into visual models, these models are – what Latour (1986) termed – immutable mobiles: easily reproducible images and inscriptions that can widely travel (Dyke, 2006, p.371; Hermon, 2008a, p.36). Immutable mobiles are never merely innocent representations of the past, although they may appear objective and neutral – through their optical consistency – they encourage some perspectives and interpretations while obscuring others (Van Dyke, 2006, p.371). Therefore it is important that it should be made evident in the visual model how one gets from the perceived reality to the explanatory model (Barceló, 2001, p.242).

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10 The archaeological discipline can roughly divided into two main ‘tasks’: first in tasks related with the excavation and interpretation and second the tasks related to the communication and presentation of the interpretations and excavations.

11 Therefore an archaeologist should treat objects not as objects but as events, e.g. a particular texture of a vase is the result of some event. A social action produced a specific transition from a previous state (mass of clay) to a next state (the vase) giving as a result an artifact with specific characteristics, shape and texture properties (Barceló, 2001, p.226).

12 As Sybille Lammes (2011) explains in The map as playground: Location based games as cartographical practices Bruno Latour coined the term immutable mobile to explain the social production and status of techno-science artefacts. “Immutable mobiles don’t lose their fixed shape when used in different locations and situations” (Lammes, 2011, p.3). Latour uses the map as an example. E.g. when a map of an island is drawn in the sand at the beach of the island, the map is mutable and immobile because the tide will eventually wash out the map; when the map is on a computer it is immutable and mobile. The point here though is that through the map the concept of comprehending the land as an island is accelerated while this does not mean that the information is exact. This can be compared to the virtual reconstruction of RR (especially the fly-throughs), as immutable mobiles they accelerate the comprehending of ancient Rome vastly.
COMPUTER GRAPHIC PROGRAMS

Visualization – in the form of visual representations – is integral to the production of knowledge and scholarly authority in archaeology (Dyke, 2006, p.370). The recent developments of computer graphic programs offer archaeologists powerful tools for building visual models. Hence many archaeologists consider the application of computer reconstructions a good opportunity to visualize and reconstruct elements of the often unclear and difficult to understand archaeological data. Computer graphic programs are increasingly being used to build virtual reconstructions and serve as models to gain knowledge about the past (Sylaiou & Patias, 2004). However there are issues for consideration regarding such virtual reconstructions and in effect also in presenting them to the public, the power of graphic programs can hide dangers (Sylaiou & Patias, 2004).

An important factor regarding this matter is our perception of realism which is not fixed but subject to change dependent on cultural/ historical conventions that are also embedded in technologies used (Jones, 1989). These conventions affect our understanding of virtual reconstructions, i.e. they are perceived by the viewing audience (and creators) to accurately mimicking historical or archaeological reality or parts of it (as a form of objective realism) while from a postmodern position they are perceived to constitute a (hyper)reality; a simulacrum (Ibid., p.36-7). We will therefore look at the different perspectives for understanding the virtual reconstruction of RR and subsequently present considerations with some of the viewpoints as food for thought which will be brought together at the end in the conclusion/discussion.

13 These dangers will come back in the analysis. One danger according to Sylaiou and Patias for example involves “the sense of misleading accuracy” through the advanced graphics and therefore understanding the image as true. It has become too realistic (2004) which points towards the construction of “a hyperreality where the artificial is experienced as real” (Lister et al., 2009, p.40).

14 With simulacrum this paper points to Baudrillard’s identification of simulation that coincides with his understanding of hyperreality. According to Baudrillard the signs within a simulation and that to which the signs refer (reality) are merged in such a way it will be impossible to distinguish between the reality and the sign. Therefore Baudrillard understands these signs as simulacra “that cannot be exchanged with ‘real’ elements outside a given system of other signs, but only with signs within it” (Lister et al., 2009, p.38). However these sign-for-sign exchanges have the same functionality and effectiveness as real objects, therefore they are hyper-real instead of hyper-fictional. According to Baudrillard any reality though innocent of signs disappears into a network of simulation and therefore reality is replaced by a hyperreality (Ibid., p.38-39). “Never again will the real have the chance to produce itself—such is the vital function of the model in a system of death, or rather of anticipated resurrection, that no longer even gives the event of death a chance. A hyperreal henceforth sheltered from the imaginary, and from any distinction between the real and the imaginary, leaving room only for the orbital recurrence of models and for the simulated generation of differences” (Baudrillard, 1997, p.2-3).

This paper will not go as far as Baudrillard who understands a simulation as an all-encompassing hyperreality (Lister et al., 2009, p. 40-2), the notion of simulacrum will though be useful to address some implications concerning the virtual reconstruction of RR.
2 VIRTUALLY RECONSTRUCTING ROME

The use of computer reconstructions in archaeology dates back to the early eighties (Sylaiou & Patias, 2004) with the computer graphic programs becoming more powerful archaeologists increasingly use virtual reconstruction as a method to visualize the archeological data (Hermon, 2008b; Frankland & Earl, 2011). First we will look at how virtual reconstruction is used for excavating and interpreting – with the RR project as a central case – and more importantly we will look at the conventions behind these views and technologies used for the project.  

EXCAVATING AND INTERPRETING ROME REBORN

In The Importance of Scientific Authentication and a Formal Visual Language in Virtual Models of Archeological Sites Bernard Frischer and Philip Stinson make clear that the concepts of model or simulation which are implied by the term virtual reconstruction are by no means universal and need to be spelled out. Frischer and Stinson distinguish between four kinds of models; (1) an original model, (2) a state model, (3) a restoration model and (4) a reconstruction model.

The original model shows the bits of ancient material that survive intact. The state model shows the site as how it exists today, e.g. the surviving bits supplemented by added later restorations. The restoration model is based on the original model and shows everything that has been destroyed over time. It may show any or all phases in time. And fourth the reconstruction model is used when there are so few original surviving pieces that it requires a large amount of hypothesizing to fill in the missing elements. Therefore a reconstruction model is seldom based on the original model since so little remains that there seems no reason to even build an original model (Frischer & Stinson, 2007, p.51-2). Considering the virtual reconstruction of RR this obviously consists out of several restorations and reconstructions. During the course of the analysis it will become clear how this discrepancy can cause some problematic issues for example when they are both integrated in the virtual reconstruction and form one simulation.

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15 Unfortunately during the research for this paper I did not have access to the actual virtual reconstruction and the programs the Rome Reborn project is working with. The only way to gain knowledge about the virtual reconstruction – that is behind the fly-through presentations – was through reading the papers (written from and about the Rome Reborn project) and examining the project website and websites from associate companies and institutions. Due to these limitations I was not able to fully comprehend (if this were at all possible) the process that is behind the virtual reconstruction, however I was able to get a general knowledge about techniques being used and some conceptions behind the project and presentations.

16 As such the virtual reconstruction of a site can consist of both reconstruction and restoration models e.g. the Forum Romanum in which the Arch of Septimius Severus would be subject to restoration whereas the Basilica Julia would be subject to reconstruction (Frischer & Stinson, 2007).
**TECHNIQUES AND REALISM**

For the virtual reconstruction of RR\(^1\) several techniques and software programs have been used however the model can roughly be divided in two types of elements which incorporate a different use of technique. Dylla et al. (2010) distinguish between the Class I elements and Class II elements.

*Class I elements*

Class I elements are those sites whose position, identification and design are known with great accuracy. 250 elements fall in this category of which they modeled – back then – thirty. They are modeled “using commercial 3D database authoring software such as 3D Studio Max and Multigen Creator” and mostly include important monuments such as the Circus Maximus (see fig. 1) or Coliseum (Dylla et al., 2010, p.62).

![Figure 1. The class I element Circus Maximus with the Class II elements as filler content (Dylla et al., 2010, p.62)](image)

In virtually reconstructing the Class I elements, the goal is to do this as accurately as possible through the intense collaboration of archaeologists, computer experts and architects because at the same time the RR team strives for scientific authentication. The main points in scientific authentication are; “authorship by qualified experts; transparency of metadata; and a clear understanding of the typology of virtual reconstructions” (Frischer & Stinson, 2007, p.55-57).

According to Jones’ (1989) this aim for accuracy could probably be compared to Sir Joshua Reynolds’ view, who claims that an artist should derive his ideal of beauty from the physical world through direct observation. Emphasizing on the exactness and precision in representation, Reynolds further advocates a method of instruction that requires students to draw exactly from the appearance of the model before them. Both Frischer’s and

\(^1\) The current version is 2.2 however the most recent paper is about the 2.0 version
Reynolds’ views coincide with the scientific realist’s orientation\textsuperscript{18} to imitation, a view of the world that derives information from scientific research (Western Europe) to make the most perfect representation of the world based upon the best information to date.\textsuperscript{19}

Frischer thinks of a virtual reconstruction as being a representation of a certain kind of monument, be it contemporary or historically. He thus considers it to be an isomorphic representation of reality (Jones, 1989, p.34-5). A belief that such a representation may form an objective one-to-one, value free correspondence to reality (Ibid., p.34) and thus enables the ‘actual’ (or past) monuments to be studied in their absence from the virtual reconstruction (Pujol, 2011, p.42). That is why Frischer understands visualization – with the aid of computer graphic programs – as a powerful tool for understanding and discovery through which it is possible to “become aware of features always present but never apparent to the naked eye or unaided mind” (Frischer, 2008, p.3). We already learned that a virtual reconstruction – as an immutable mobile – is never innocent and value free, therefore Frischer’s viewpoint may cause some implications which we will discuss right after the next section.

\textit{Class II elements}

Class II elements include around 6750 buildings and monuments about which the RR team lacks detailed information and were therefore procedurally modeled. Based on two late-antique catalogues of the building stock of the city they used \textit{procedural modeling} techniques to create visually compelling and detailed models of the Class II buildings.\textsuperscript{20} By using procedural modeling techniques the aesthetic discrepancy between the Class I elements and Class II elements – which was visible in the former version – now almost diminished, see \textbf{fig. 2} (Dylla et al., 2010, p. 62-63). Most of the Class II elements can be regarded as reconstruction models whereas the Class I elements can be regarded as restoration models.

\textsuperscript{18} This view contrasts sharply with the imitation of ideals as well as the imitation of essences which attempted portrayal of perfect models with no counterpart in the phenomenal world (Jones, 1989, p.34-5).

\textsuperscript{19} From the objective realist view “...it is assumed that the relationships of objects depicted on a three dimensional grid can depict areal view of phenomena” and “it is assumed that this structure exists as \textit{real in itself, independent of human understanding.}” In order to portray reality the correct way, one should utilize the conventions common to Western Europe because these are assumed to be based upon the best scientific knowledge of that time (Jones, 1989, p.34).

\textsuperscript{20} In the former version – rome reborn 1.0 – the Class II elements were modeled and textured by hand. Their positions were derived from a laser scan of Gismondi’s Plastico di Roma Antica – the large scale physical model of ancient Rome – and implemented by a team of engineers from the Politecnico di Milano led by Professor Gabriele Guidi (Guidi, Frischer & Lucenti, 2007; Dylla et al., 2010). The Class II models were very schematic though and their architectural detailing came from textures and not geometry. This caused an aesthetic discrepancy with the detailed Class I models. In Rome Reborn 2.0 the project team solved this aesthetic discrepancy through the use of procedural methods (Dylla et al., 2010, p.63).
“Procedural modelling makes use of a set of rules and functions input by the user in order to generate a 3D model”\(^{21}\) (Frankland & Earl, 2011, p.65). Now the archaeologists can reconstruct a structure based on architectural rules derived from similar buildings at other sites of the same period. Compared to traditional modeling tools procedural modeling is much more efficient and cheaper without aesthetically having to compromise, unlike when using other techniques such as non-photorealistic rendering. Procedural modeling requires the archaeologist (or 3D designer) to script their visualization through a *shape grammar* – a structural and semantic description of the architecture (Ibid., p.64-66). In RR the shape grammar rules\(^{22}\) were developed under careful guidance of archaeological consultants who provided extensive images, floor plans, statistics, and useful data (Dylla et al., 2010, p.63). Frankland & Earl argue that this records and makes explicit the interpretive process the archaeologist undergoes which in turn will make it harder for an archaeologist’s interpretation to overlook any gaps in the data (2011, p.65).

Furthermore procedural modeling uses *stochastic variation* to generate 3D content. This makes it easier to create different models based on the same archaeological evidence. With these stochastic rules different kinds of visualizations can be created which respect the different levels of certainty ascribed to interpretations of the archaeological data, using procedural modeling (Frankland & Earl, 2011, p.64-5).

At first procedural modeling seems to link with a view similar to an *imitation of essences* (Aristotle). According to Aristotle, works of art should not be literal copies rather they should express the essence of the subject portrayed (Jones, 1989, p.33). This seems to fit because procedural modeling is based upon underlying geometric forms of similar buildings through a shape grammar and is not based on exact imitations of actual reality. However the stochastic randomness\(^{23}\) and the development of the shape grammar under careful guidance of archaeologists reveal the view of a scientific realist’s orientation (Jones,

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\(^{21}\) This is the exact citation. They used UK spelling whereas I am using US spelling.

\(^{22}\) The RR team used the CityEngine software from Procedural Inc. which employs a shape-grammar-based geometry generation system called CGA shape.

\(^{23}\) That serves the interpretive practice of archaeology (Frankland & Earl, 2011, p.66).
1989, p.34-5). The ‘need’ to add small irregularities and details (Ibid., p.35) through the provision of; extensive images, floor plans and statistics, relates to the aim for scientific authentication. “Just because a reconstruction is virtual does not mean that it can be done shoddily, quickly, or unprofessionally” (Frischer & Stinson, 2007, p.56) coincides with the aim to make the ‘overall picture’ look more naturally real, visually compelling, aesthetically in accordance with the Class I elements.

**IMPLICATIONS**

In the modeling of both the two different elements and put together in the virtual reconstruction, the scientific realist’s view is utterly present. Although the techniques differ and are based on more or less detailed information the intention stays the same. For Frischer sees a virtual reconstruction of a monument as a representation of this monument (Frischer & Stinson, 2007, p.56) and it serves as a representation of their current knowledge. This indicates his attempt of an isomorphic representation of reality because according to him a model serves not merely as an illustration of what already was known. It also has the potential of revealing new knowledge that was always lurking below the surface of the facts but it needed to be visualized in 3D to emerge and grasped (Frischer, 2008, p.3-4).

Frischer’s approach although understandable also presents some implications. Both Sylaiou and Patias (2004) as well as Colleen Morgan (2009, p.481) in (Re)Building Çatalhöyük: Changing Virtual Reality in Archaeology address that the main problem with the graphics becoming more advanced is that the virtual reconstructions may become too realistic. For example when an item has a lot of missing elements and the archaeologist has to use a lot of imagination the image still may look good though the image is far more subjective. The very good picture – or ‘pretty picture’ as I prefer in this case – could give the impression that the archaeologist knows more than he actually does, after all the computer reconstruction seems accurate and therefore seems scientifically accurate (Sylaiou & Patias, 2004). Such visualizations are able to make fantasies seem very real. Therefore not only non-specialists but also specialists may have difficulties understanding that the model is

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24 Class I & II elements.

25 According to the Rome Reborn website: “the model is thus a representation of the state of our knowledge (and, implicitly, of our ignorance) about the urban topography of ancient Rome at various periods of time.” Retrieved 22nd of November 2012: http://www.romereborn.virginia.edu/about.php

26 For instance when models are placed on a Digital Terrain Model (DTM) – acquired from a digital map – reconstructions can reveal symbolisms or an explanatory view to settlement patterns through which they can examine the relationships between the buildings of an architectural complex and test theoretical issues such as ‘impressiveness’ (Sylaiou & Patias, 2004).

27 Reasoning from his viewpoint in reconstructing the city as accurately as possible; when there is data missing, the reconstructions at least have to be based on grammar shape rules that are characteristic for that period or site of which they do possess the knowledge, in this case the more imaginative buildings are still based on scientific ‘knowledge’.
only a hypothetical reconstruction that may be based on weak evidence. Also highly problematic according to many researchers is the tendency for archaeological computer reconstructions to show the capabilities in terms of graphical realism rather than serving archaeological aims (Ibid). Sylaiou and Patias are therefore skeptically towards the contribution of large computer firms such as IBM in their sponsoring of archaeological computer projects – just as in the case of RR where IBM is also involved.29 With the advent of the latest photorealistic renderings it is easy to create confusion between the (photo) realism of a reconstruction and the archaeological reality (Ibid.).

The fear for these reconstructions becoming too realistic coincides with the postmodernist’s view of the constitution of a hyperreality where the artificial is experienced as real which is synonymous to Jean Baudrillard’s understanding of simulation as simulacra (Lister et al., 2009, p.38-40). In attempting an isomorphic representation of reality through techniques which enhance the photorealism of the simulation as a whole (also the elements of which they have less data) the RR team commits the ‘perfect crime’ so to speak in Baudrillard’s terminology. This entails not a destruction of reality itself but rather the destruction of an illusory reality beyond the technologies that make it work. The effect is not a loss of reality but the consolidation of a reality without an alternative (Lister et al., 2009, p.39).

I still am not arguing that RR should be comprehended as a simulacrum but through pointing to such an understanding I would like to address the crux of the problem with regards to the visualization of RR which is isomorphism. Pujol (2011) brilliantly addresses and situates the problem in her investigation if; virtual reality is a natural, objective and universal way to represent and analyze the world (p.41). In her comparison of Eastern and Egyptian art she demonstrates that the concept of realism does not have an absolute value linked to the visible reality, but rather it depends on each cultural and historical context. Our representation of the world is therefore a construction that depends on three variables: “the sensorial perception of the world; the processing of this experience from a visual and intellectual point of view; and its preservation through memory” (Pujol, 2011, p.44). And such processes happen within a particular cultural environment that instills its forms of representation through education and daily contact (Ibid.). This makes all representations realistic from the point of view of the society that creates them since they

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28 Think of the procedurally modeled Class II elements. A lot of data is missing but the buildings seem very accurate and aesthetically fit perfectly with the Class I elements in one reconstruction.

29 For these firms sponsoring such projects are good for both publicity and testing their developing technologies. Therefore Sylaiou and Patias (2004) argue that often the outcome of such efforts resulted in high-profile projects that are of little archaeological significance.
contain all the signification features necessary for their function (Ibid., p.46). 30 And as Jones pointed out, Western European cultural conventions for depicting visual reality have also influenced the development of computer algorithms and hardware that are now being used in countries all over the world (Jones, 1989, p.34).

**CONCLUSION**

So while the virtual reconstruction of RR aims to be objective and accurate through the use of scientific techniques and therefore supposedly simulating the world (as a representation) or at least simulating as we humans perceive it (in this case of representing the archaeological knowledge) this is by no means the case (Pujol, 2011, p.48). 31 According to Pujol the project of RR therefore does not simulate ancient Rome the way Archaeologists see/perceive it; it simulates ancient Rome as they represent it. “VR does not simulate the world as we see it but... as we represent it” (Ibid., p.48). 32

Although I do not fully agree with the this notion of Pujol because it implies that the simulation is a matter of human agency – i.e. it simulates the world as we represent it, and thereby ignores the complexity of a network in which many different actors are related to each other and in their relation acquire a certain agency – this does not mean that her argument is not useful. I think it addresses quite well, the ‘opaque layer’ (of intervening conventions) that is present but not directly noticeable in the simulation/ virtual reconstruction and in its aim for representing the world as how we see it. 33

Before coming to a general conclusion and discussion we will first proceed towards the analysis of the way RR is being presented and disseminated through the use of fly-throughs. This part will be a lot shorter because it will be based on the previous analysis.

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30 This coincides with Rome Reborn as an immutable mobile would, it appears to be objective but it is subject to many conventions which encourage some perspectives and obscure others.

31 “Firstly, that human perception does not always provide exact or objective information about reality, because it is the result of a cognitive process. Therefore, the depiction of retinal projections is not innate because the objects’ extrinsic features are spontaneously inaccessible to the conscience. Consequently, it is not universal but culturally acquired. And it has been established in the western world for purely historical reasons, related with the evolution of religious, architectural and philosophical-scientific concepts” (Pujol, 2011, p.48).

32 This does not mean that a virtual reconstruction is not useful in the field of archaeology, however it means that the aim for accuracy through the presentation of photorealistic renderings – and thus limited to the isomorphic reproduction of the world – can have negative influences as well on; the archaeological interpretative process, therefore in gaining new knowledge and subsequently also loses its potential as a communicational tool (e.g. as presenting different perspectives). This coincides with the view of Colleen Morgan (2009) and Sylaiou & Patias (2004)

33 Pujol’s opinion towards the isomorphic aim of so many archaeological virtual reconstructions I think is valuable for thinking about how to construct a virtual reconstruction and in making sure that it does not lose its potential as a scientific and communicational tool. She argues that in many of the cases (in cultural heritage and subsequently in archaeology) it is not necessary to make a (photo) realistically virtual reconstruction because the level of visual detail may distract and prevent users (both experts and non-experts) from focusing on the content (Pujol, 2011, p.47).
PRESENTATION AND DISSEMINATION

Now that we know more about how RR is build up; the use of several software packages, different techniques (to model class I and II elements), the RR team consisting out of archaeological, architectural and digital experts to enhance scientific authentication, we will look at how this is presented towards the public. This section builds on the previously gained knowledge and is therefore significantly shorter.

In *Truth and credibility as a double ambition: reconstruction of the built past experiences and dilemmas* Geeske Bakker, Frans Meulenberg and Jan de Rode examine the implications of building a virtual reconstruction not only from a maker’s perspective but moreover their text emphasizes on the virtual reconstruction as a means of presentation (Bakker et al., 2003, p.1). Where the RR team first had to concentrate on the content during the excavating and interpreting and it was important that all experts (archaeologists, architects, digital modelers) worked together under the authorization of the archaeologist to enhance scientific authentication, now it is important that again a team of experts – a scriptwriter, an artist/designer and the archaeologists – cooperate to think about the form of presentation (Bakker et al., 2003, p.4-5).

Bakker et al. realize though that the objectivity of a computer model is relative just like any other reconstruction. The archaeologist will therefore never be able to claim anything more than an interpretation (Bakker et al., 2003, p.7). From Jones’ (1989) and Pujol’s (2011) texts we have learned that even this simulation of interpretation is subject to historical and cultural conventions that stand as an opaque layer in between the archaeological evidence and the archaeologist’s aim to simulate the archaeological evidence when making or presenting the virtual reconstruction. To make this – so to say – opaque layer more transparent or less opaque when presenting the virtual reconstruction the RR team has to concentrate on the form while not forgetting the content – form without content is like an empty shell (Bakker et al., 2003, p.4).

Based upon Firscher’s; publications, involvement and role in many other virtual reconstruction projects and his emphasis on scientific authentication (Frischer & Stinson, 2007), he would seem to be aware of the many implications and dilemmas when presenting or communicating a virtual reconstruction to the public. For example in *From CVR to CVRO: The Past, Present, and Future of Cultural Virtual Reality* which he wrote together with Franco Niccolucci, Nick Ryan and Juan Barceló, he and his co-authors argue: “VR techniques should be used not only for description, but for expressing all the explanatory process

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34 This thus has nothing to do with making it appear more realistic, since realism is based on cultural and historical conventions.
(Frischer et al., 2002, p.9). They also critique the lack of transparency in some other archaeological reconstructions, “rarely, if ever, are we told who made the model, whether there was any consultation between the modelmaker and the archaeologists, and what elements of the model are known with certainty and which are hypothetical” (Ibid., p.4).

Therefore I am surprised by how the RR team disseminated RR in the form of fly-throughs.

THE PROBLEM OF FLY-THROUGHS

My surprise is directed towards the monolithic and non-explanatory character of the way in which the virtual reconstruction is presented by fly-throughs. The most recent fly-through starts with “ROME REBORN A virtual tour of ancient Rome in A.D. 320” and guides the viewing audience in to a monolithic experience which argues that the content shown is based on archaeological evidence and is an accurate (as accurate as possible) representation of the past. Although there is a hyperlink to the website of the RR project placed below the fly-through this form of presenting totally neglects the interpretative process of archaeology which characteristically leaves space for multiple views on the past (Sylaiou and Patias, 2004). Colleen Morgan describes it quite well, after the critique Frischer et al. (2002) posed towards the virtual reconstruction of Pompeii that was argued to be uncanny, slick, clean and sometimes cheesy, Frischer’s team now themselves “created an uncanny, slick, digital Rome where the user “flies through” column-lined streets” (Morgan, 2009, p.472).

Based on the first analysis where we studied the excavation and interpretation process, we know or at least assume from the papers of the RR team that the interpretative process in making the virtual reconstruction of RR – although highly subject to conventions – was by no means monolithic in contradiction to the fly-throughs. With the fly-throughs the RR team however makes no effort in explaining the process which is behind the virtual reconstruction. Subsequently the viewing audience has no clue of which buildings were procedurally modeled and which were not, which were the Class I elements and which were the Class II elements, which parts of the simulation can be considered more as restoration models and which parts are reconstruction models. The viewing audience is not even aware of these discrepancies that exist in one and the same simulation. People who have no archaeological or computer graphic design knowledge, are not aware of the existing techniques. In other words people not involved in the project, are practically compelled to only regard these fly-throughs as attempts of representing ancient Rome. And

35 Disseminated on websites as YouTube and Vimeo.
even when some of the viewing audience has knowledge about ancient Rome and notices discrepancies between what is generally known of ancient Rome and the simulation, still these comments are quite superficial and aimed towards the accuracy of the representational characteristics (in terms of imitation) of the simulation in general instead of criticizing any of the hypotheses or methods for creating the virtual reconstruction which is presented.

The fly-throughs don’t have any explanatory value in that they only address particular monuments in case the viewer does not know the names of the important monuments or sites. As immutable mobiles they are by no means innocent or objective representations of the past although they appear to be so. With the peaceful music on the background and the monolithic way of showing the buildings and monuments the immutable mobile does not only encourage particular interpretations or perspectives and obscure others (Dyke, 2006, p.370). In a fly-through all perspectives and different elements, constructed from different levels of certainty, with different techniques are merged together in one simulation it becomes a 'black box' so to say.

Instead of presenting a more nuanced perspective and different hypotheses, which is characteristic to the task of an archaeologist (Sylaiou & Patias, 2004) the RR team only focuses at the isomorphic representation of ancient Rome and merges all elements (isomorphic oriented but very different in levels of certainty) in to one ‘black box’ and loses its potential as a communication tool (Pujol, 2011, p.48). As an immutable mobile this ‘black box’ is not only obscuring or encouraging particular perspectives but radically altering the previous perspectives from which the RR team constructed the virtual reconstruction. It is altering their own perspective on the archaeological evidence and therefore from a poststructuralist perspective it could be argued that this immutable mobile is a simulacrum that constitutes a hyperreality (Lister et al., 2009, p.38-40) instead that it is representing ancient Rome or representing the archaeological evidence of ancient Rome.

Where the public regards a fly-through as representing ancient Rome or at least as a representation of the archaeological evidence of ancient Rome, it is precisely this uncritical stance towards the simulation that strengthens the argument for comprehending a fly-through as a simulacrum. There is almost no possibility to be critical towards any of the many hypotheses that were used while making the virtual reconstruction. At the same time because the fly-throughs are comprehended as real, real representations of ancient Rome;

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36 To notice that there are some problematic issues in terms of not representing the actual Rome, for instance when the simulation does not simulate the pollution, decay or overpopulation.
This is how Rome once looked.\textsuperscript{37} It becomes evident that a simulation is always real in itself at the first place (Lister et al., 2009, p.43-4), it will never fully imitate ancient Rome and does not only constitute a hyperreality because it is already real in itself the first place.

3 CONCLUSION

What do we make up of this? First of all as already mentioned in the introduction I am not proposing for a fixed position in comprehending the simulation of RR however I do argue for understanding the simulation of RR as real in itself in the first place. It exists and is experienced in a real world. The way we think about the past and subsequently about ourselves (nowadays) derived from the simulation are equally real.

Second from Pujol’s and Jones’ arguments I argue that the way we comprehend virtual reconstructions (as RR) is paradoxical and oscillates in between two parts of a continuum. The more real the virtual (re)construction seems – through conventions of photorealism – and thus the more the visualization appears to be representing the real/actual world in terms of imitation, the more it will be subject to constitute an own reality – hyperreality – of which we are not able any more to distinguish the real between the artificial. Hence – especially with photorealistic virtual reconstructions for cultural/historical heritage – it can lose its potential as a scientific and communicational tool.\textsuperscript{38} Therefore the makers of virtual reconstructions will always have to look for the right balance and be critical towards their aims and their methods for getting towards their aims.

DISCUSSION

While this paper shows just the tip of the iceberg because I did not have access to all the resources that are behind the virtual reconstruction of RR, I argue that it would be sensible for the RR team to seriously think of non-photorealistic rendering techniques as well in conveying and gaining knowledge, since an isomorphic orientation for representing ancient Rome maybe counterproductive in transferring knowledge to both specialists and non-specialists. Finally this paper will not claim the knowledge gained by the RR team is not credible, though it will never imitate ancient Rome. Sometimes it is just better to erase an illusion instead of trying to depict the truth...

\textsuperscript{37} This is the general tone of the reactions on the fly-throughs based on many reactions on YouTube and other websites that showed the fly-throughs.

\textsuperscript{38} In the opposite case the virtual reconstruction maybe too simplistic or abstract without (photo) realistic detail and therefore may impede the creation of a link between the artificial and the real. While (model) makers may argue to have created a representation of their archaeological knowledge – in case of RR – their presentations may closer relate to a simulacrum that constitutes a hyperreality.
Bibliography


