Visualising Discourse: An Approach to Archaeological Uncertainty. Interpretation and Reconstruction of the Grandi Magazzini di Settimio Severo at Portus, Italy

GARETH C. BEALE

University of Southampton
gcb205@soton.ac.uk

Abstract

The representation of uncertainty in archaeological 3D graphics has become an increasingly contentious issue. Attempts to represent uncertainty have tended to objectify the archaeological object, defining it in terms of the presence or absence of data. This paper suggests that more subtle and nuanced approaches might be possible, which encompass the plurality of the interpretive process upon which archaeological knowledge is based. The methodology proposes that reconstructions might have their bases not only in archaeological data, but that they could evolve with and be based upon collaborative interpretive discourse. These ideas will be discussed within the context of their operationalisation during the interpretation and reconstruction of the Grandi Magazzini di Settimio Severo, a Trajanic warehouse complex at Portus in Italy.

Keywords

Portus, uncertainty, visualisation, Roman architecture, collaboration, virtual reconstruction

1. Introduction

The incorporation of uncertainty into archaeological 3D graphics has for some time occupied a central position in discussions focussing on the application of these techniques. Critiques of the 'virtual reconstruction' as a representative form and of other computational approaches to the representation of archaeology have pointed to the lack of nuances, the lack of plurality and the omission of uncertainty as being flaws to these media (Gillings and Goodrick 1996; Bateman 2000; Thomas 2004a, 28). This perception is now being challenged by a range of research employing a multiplicity of techniques all of which seek in different ways to meaningfully represent complex archaeological data (Johnson 2008; Korres *et al.* 2006; Chalmers *et al.* 2003; Kensek 2007; Hermon and Niccolucci 2003).

This paper will propose that a number of the justifiable critiques levelled at 3D graphics in archaeology have arisen as a result of the objectification of the archaeological object within 3D graphics. It will go on to explore the possibilities of using 3D graphics to model not just the object but also the process of interpretation and decision making through which archaeology applies meaning to the object. Instead of representing a constant and inevitable progress toward a preconceived ideal the proposed reconstruction would constitute a record of the process of discourse which lead to the assigning of meaning to the object and as such it would incorporate all of the ambiguities and uncertainties endemic to the archaeological process.

The theoretical stance and methodology described in this paper were operationalised in the interpretation and virtual reconstruction of the Grandi Magazzini di Settimio Severo, a harbour side structure at Portus, the Imperial harbour of Rome. Subsequent to the completion of this project research into other related structures at the site has also been undertaken.

Portus was the principle harbour of Rome for more than three hundred years, servicing the Imperial capital in conjunction with the docks at nearby Ostia. Construction was initiated during the reign of Claudius in 42AD (Keay *et al.* 2005, 112) and substantial developments were begun during the reign of Trajan in the mid second century, it was during this phase of development that the Grandi Magazzini di Settimio Severo, the focus of this research, was built. Portus has been the subject of very little archaeological research in comparison to its more famous neighbour Ostia.

The research described within this paper has been undertaken alongside and represents a very small contribution towards The Portus Project, (www.portusproject.org). This research project is

directed by Simon Keay and Graeme Earl at the University of Southampton and Martin Millett at the University of Cambridge. The project represents a collaborative undertaking incorporating many bodies and individuals including the British School at Rome, and the Soprintendenza di Beni Archeologici di Ostia.

2. Aims

The purpose of this research project was to virtually reconstruct the Grandi Magazzini di Settimio Severo, a large building which formed part of the post-Trajanic harbour complex and to develop conceptualisations of the architectural form and use of space within the building.

The reconstruction was not intended to constitute end in itself. The involvement of 3D graphics in archaeology has been characterised by simplification. Ambiguities, uncertainties and disagreements have tended to be glossed over in order to create visually coherent and persuasive scenes which represent single interpretations of the past (Kensek 2007; Eiteljorg 2000, 2).

The primary objective of this research project was to move away from a reconstruction of an imagined past and towards the visual representation of active archaeological discourse. It was hoped that through a continual process of revision and engagement with the archaeological process a virtual reconstruction might be reproduced which would capture the uncertainty and ambiguity which runs through both archaeological data and archaeological interpretation. The reconstructions were intended to provide a richer and more visually stimulating discursive environment while also capturing a visual record of the interpretive process.

3. The Problem of uncertainty

The representation of uncertainty is and always has been something of a dilemma for all archaeologists. Verbally, textually and visually archaeologists have had to develop means of expressing and incorporating uncertainty and ambiguity into the archaeological process and into their representations of archaeology. Expressions of uncertainty regarding archaeological interpretation and indeed statements regarding the nature of the understanding that an archaeologist can claim to hold have dominated theoretical

Fig. 1. A view of the exterior of the virtual Grandi Magazzini di Settimio Severo after many long discussions, (author's own).

Fig. 2. A view of the exterior of the Grandi Maggazzini Di Settimio Severo after many years, (author's own).

Fig. 3. Spot the difference: Many aspects of this view are still under discussio.

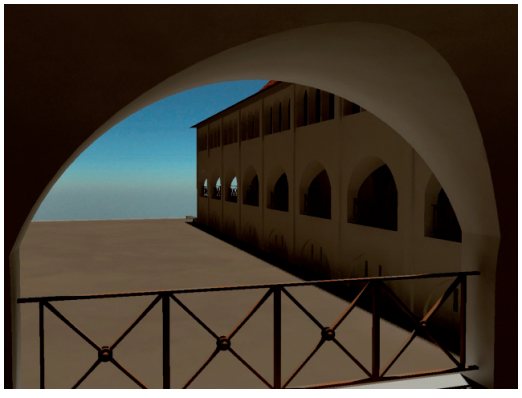

Fig. 4. The western wing of the structure.

archaeological discourse for decades (Renfrew *et al.* 1982; Thomas 2004b; Tilley 1994; Binford 1972).

What this discourse has very effectively demonstrated is that representations of archaeology and ways of thinking about archaeology cannot meet universally agreed upon standards. This remains the case for two reasons, the first of which is that archaeologists are simply unable to agree upon what constitutes valid archaeological understanding, the second and the more profound reason, is that archaeology varies so enormously in its material focus, in its methods of enquiry and in its objectives that universal policies would invariably be restrictive and inadequate.

Uncertainty regarding the location of boundaries on a plan does not necessarily require the same response as uncertainty regarding the veracity of a Roman written source or uncertainty regarding the extent to which material culture allows us to grasp Neolithic people's interactions with the landscape. The lexica and visual devices which allow archaeologists to deal with uncertainty vary between media and vary according to context. They vary because they remain culturally distinctive and they vary because archaeology is sometimes art and sometimes science. It is imperative that any continued discussion surrounding the representation of uncertainty in 3D graphical representations of archaeology must acknowledge that new flexible approaches are needed. They must be developed with an awareness of both the potential research applications of the technology and also of the cultural context within which output will be created and disseminated. Put simply, the representation of uncertainty must (and perhaps more importantly, will) vary according to the purpose of the representation, the context within which it is created and according to the perceived requirements of the intended viewer. This necessity is demonstrated by the variety of research focuses currently being explored in the field including but not limited to high physical accuracy modeling (Johnson 2006), large scale heuristic modeling (Frischer and Stinson 2002) high fidelity visual representation of data (Chalmers *et al.* 2003) and uncertainty within typological analysis (Hermon and Niccolucci 2003).

This research project has focused upon the representation of conceptualisations of architecture. As such, the reconstructions needed to accurately incorporate all available data regarding the form of the buildings in question but they also needed to reconcile this data with interpretations of the form of absent architectural elements. They needed to incorporate a range of architectural and archaeological data, while making space for creative thought.

Clearly such a consolidation of 'real' and 'imagined' has the potential to be problematic. Kensek and others have argued that by representing data and interpretation seamlessly, side by side, within a single coherent visual scene, one creates an illusion of certainty (Kensek 2007). Kensek argues that by removing explicit reference to uncertainty one makes an implicit statement of certainty. Clearly there is merit in this point to the extent that there is heuristic potential in augmenting 3D graphics with supplementary information.

However, this position relies upon the notion that data is an objective entity while interpretation is subjective. A cursory analysis of archaeological methodologies will demonstrate that this is in itself a simplification of the reality of the situation. From high level considerations regarding the way in which the corpus of archaeological knowledge has been gathered to low level considerations regarding what data should be gathered and why, subjectivity is endemic throughout archaeology (Wheatley 2004, 7). Were this not the case archaeological research would not be nearly as fruitful as it has been.

None of these comments are intended to undermine the archaeological process, pragmatic process is of course preferable to sedentary idealism. However it is crucial that at all stages of the archaeological process we maintain an awareness of the foundations of our knowledge and make conscious decisions regarding the ways in which we proceed.

It is important that methodologies are developed which allow not only an acknowledgement but also a visual expression of the complexities of ambiguity. In order to incorporate certain kinds of accuracy into a representation of an archaeological dataset it is not enough to visually represent the presence or absence of data it is important also to represent the state of knowledge and understanding upon which the interpretive and creative processes have been built.

4. Modelling the Grandi Magazzini di Settimio Severo

4.1. Data and interpretation

At the most fundamental level a virtual reconstruction can be considered as a consolidation exercise. All sources of information must be gathered and

interpreted before finally being compiled into a 3D visualisation. Naturally the quality of the result is dependent entirely upon the standard of the data available and also the standard of interpretation which takes place.

The first stage of interpretation involved assembly of the extant sources relevant to the Grandi Magazzini di Settimio Severo. These sources varied enormously and their consolidation into a meaningful archive was no simple task. Sources drawn upon included archaeological literature, considerable amounts of building survey data, accounts written by non-archaeologists of the site at various points during its history, a large plaster model of the site, photographs of Roman coins depicting the site and various drawings of the site from various periods, the earliest dating from circa 1582. Clearly a great deal of discretion went into deciding whether sources should be employed and if so, how. The decision making process was ongoing throughout the research process and interpretations based on these sources were constantly subject to reassessment. Keeping records of all of these interpretations and re-interpretations would become an enormous metadata challenge. It was imperative that records were kept of all decisions made regardless of their apparent triviality, for without these records the model would, upon creation, be forever dislocated from the discourse which created it and would very quickly become obscure.

The process of reconstruction also relied upon survey and photographic data. A period of field-work was undertaken during which measurements were taken of all accessible areas of the buildings in question. These measurements allowed for the accurate reconstruction of standing remains as well as providing a benchmark against which externally acquired data could be checked for accuracy and incorporated at the correct orientation and scale. The act of surveying also provided the author with an invaluable opportunity to explore and to develop an understanding of the structures in question without which the subsequent modelling process would have been impossible and invalid.

As has already been mentioned, the interpretation of the Grandi Magazzini di Settimio Severo was a collaborative undertaking. In order for the project to be a valid archaeological exercise it was imperative not only that the interpretive discourse be adequately represented within the reconstruction but also that an appropriate group of specialists be involved in the discussion. Due to the nature of the Portus Project, this was not a problem, specialists from different institutions were happy to collaborate as were many from outside the project. This group was fixed at the beginning of the research period in order that the decision making process be accountable to a limited number of individuals. Subsequent informal advisors were acquired and their advice was often utilised but only with the consultation and consent of the core advisory panel.

4.2. From words to images

One of the most profound intellectual and practical challenges of this research was managing the transition between the textual-verbal process of interpretation and the creation of a visual representation. This process was invariably guided by the author, as to proceed through the minutiae of a detailed modelling project by committee would be an arduous task. However it was crucial that at every stage the process remained accountable and as such documentation remained detailed. A record was kept of every decision made and source used, this could be consulted and critiqued at any time by the expert panel, and subsequently by anybody wishing to utilise the model. In this sense the process used was not unlike a standard process of academic referencing.

The representation of plurality by providing alternative interpretations goes some way towards visualising the complexity of the interpretive process. What it cannot do is be completely accountable as a stand-alone entity. The reconstruction is able to indicate areas of uncertainty by providing various alternatives, but it cannot explain the nature of uncertainty, it cannot demonstrate preference, it cannot explain the extent of the uncertainty. Within the context of the research process for this project this was not a problem, the reconstruction was constantly being constantly informed by the interpretive discourse and as such was perpetually relevant. However it is necessary to consider the reconstruction beyond this context if it is to be a genuine record of the discursive process.

The primary means of recording and facilitating discourse was a blog. This proved effective for a number of reasons. It allowed discussion to take place in a neutral and constantly available space. Contributors to the project were located internationally and as such it was important that such a resource existed and would be accessible at all times. In a project that relied so heavily on collaboration and discussion it was

important that relevant resources were consolidated and made available. The blog provided an effective repository for relevant digital materials. These included digital photographs, references to written sources and working shots of the reconstruction during its creation. The blog allowed these resources to be simultaneously available to many users and their presence provided focus and direction to discussion.

As has already been mentioned the number of contributors to the discussion grew as the project proceeded. Many of these contributions were invaluable and it became increasingly clear that in order to maximise engagement it would not be tenable to use the blog to host all conversations. This was largely due to the number of conversations which began to take place on message boards or via email groups. The blog was however still used as an archive and all relevant discussions were saved on the blog as soon as possible after the event in order to lend the documentation a level of temporal continuity.

The dissemination of data or results was not an objective of the project, however in developing the methodology an obligation to facilitate and encourage subsequent dissemination and reuse was assumed. It was for this reason that a more human readable form of metadata in the form of a blog was chosen over more rigid schema based metadata solutions. It is hoped that this approach will maximise the accessibility of content to those unfamiliar with more abstract forms of metadata. Equally, by storing the data in this way a level of structure is maintained and subsequent efforts to convert the metadata into a machine readable resource made easier.

No user interface was developed for the reconstruction, this was not an immediate priority and would have been unfeasible owing to the fact that the reconstruction was in constant development. Content was shared through the distribution of images, 3D PDFs and copies of the model in its native format. Development of a user interface allowing the user to control the reconstruction and access metadata directly is a possibility and will be considered within the broader scheme of post excavation publication in the future.

5. Results

It is possible to say that the project was, broadly speaking a successful venture. The primary aim of the research was to develop a deeper understanding of the function and architectural form of the Grandi Magazzini di Settimio Severo and this was (and still is being) achieved. It is hard to quantify the extent to which the methods used enhanced people's understanding of the built environment beyond what would otherwise have been achievable. However it is testament to its usefulness that it was employed continually for analytical purposes and that the methods are now being employed in order to study other related architecture at the site.

It has not been the purpose of this paper to present a detailed explanation or defence of each of the decisions made during the construction of this model. Furthermore, it would be very difficult to know where to begin such a process because there is no finished model any more than there are any final interpretations, as with all archaeological interpretation there will remain many unanswered questions. Therefore any account of the model must present in detail the entire discursive process and should demonstrate how each decision made or conversation held has impacted on the modelling process and resulted in another, parallel visual interpretation.

However, within the few images above it is possible to see very clearly how ambiguity and uncertainty have caused a multiplicity of models to be created and how diverse these interpretations have often been. There are points within the images which demonstrate something approaching certainty such as the general structure and plan of the building, the nature of which can be ascertained from the standing remains (see *Fig. 2*). There are elements which have been agreed upon by the majority of collaborators, such as the number of floors, the use of shuttering and the use of walls and barriers to control movement through the internal space (see *Figs 1, 3* and *4*) and there are those elements which are still subject to discussion and even disagreement, such as the stair case illustrated in *Fig. 1.1* or the use of fences along the exterior edge of the corridor.

6. Conclusions

The key objective of this research was to demonstrate one method by which archaeological knowledge in all its complexity can be expressed visually, not through imitating the archaeological object but by expressing the archaeological thought. In this sense it is a creative exercise as well as deductive one. There can be little uncertainty that this process will have been more successful in some areas of the virtual environment than others. All arguments,

visual or otherwise, have their flaws and it is hoped that through ongoing critical discourse errors may be redressed and re-evaluations might be made, as mentioned above, there are examples of this ongoing uncertainty manifest in *Figs 1–4*.

The true test of the reconstruction is the extent to which it can be considered to represent a meaningful visual discourse. To the scholar the reconstruction might seem rather skewed in its focus, specific interpretations are explored at the expense of others and assumptions are made regarding elements of the building. However, this is the case only because the reconstruction is a visual manifestation of a real interpretive process, it does not claim to present a definitive study of a Trajanic storehouse. It is as much a record of a collection of archaeologists 'doing' archaeology as it is a record of an archaeological environment. Through maintaining this approach the result is a very honest archaeological account, and a very uncertain one.

Bibliography

Bateman, Jonathan (2000). Immediate Realities: An Anthropology of Computer Visualisation In: Archaeology *Internet Archaeology 8*. http://intarch.ac.uk/journal/issue8/bateman_index.html

Binford, Lewis (1972). *An archaeological Perspective*. New York: Seminar Press.

Devlin, Kate, Alan Chalmers and Duncan Brown (2003). Predictive lighting and perception in archaeological representations *UNESCO World Heritage in the Digital Age 30th Anniversary Digital Congress*. http://www.doc.gold.ac.uk/~mas01kd/publications/unesco_paper.pdf

Eiteljorg II, Harrison (2000). The Compelling Image – A Double Edged Sword *Internet Archaeology 8*. http://intarch.ac.uk/journal/issue8/eiteljorg/eit1.html

Frischer, Bernard and Philip Stinson (2002). *The Importance Of Scientific Authentication and a Formal Visual Language In Virtual Models of Archaeological Sites: The Case of the House of Augustus and Villa of the Mysteries*. http://www.iath.virginia.edu/images/pdfs/frischer_stinson.pdf

Gillings, Mark and Glyn Thomas Goodrick (1996). Sensuous and Reflexive GIS: Exploring Visualisation and VRML. *Internet Archaeology* 1. http://intarch.ac.uk/journal/issue1/gillings_toc.html

Johnson, David (2008). *Standards, methods and criteria for testing the dimensional accuracy and completeness of computer-modeled archaeological reconstructions*. Unpublished.

Keay, Simon, Martin Millett, Lidia Paroli and Kris Strutt (2005). *Portus. An Archaeological Survey of the Port of Imperial Rome*. Archaeological Monographs of the British School at Rome 15. London.

Kensek, Karen (2007). Survey of Methods for Showing Missing Data, Multiple Alternatives, and Uncertainty in Reconstructions *CSA Newsletter Vol. XIX No. 3* http://csanet.org/newsletter/winter07/nlw0702.html

Korres, Manolis (2006). *Museum of Reconstructions*. San Francisco: Museum of Reconstructions.

Hermon, Sorin and Franco Niccolucci (2003). A fuzzy logic approach to typology in archaeological research. In: Martin Doerr and Apostolos Sarris (eds.) *The digital heritage of archaeology*. Computer applications and quantitative methods in archaeology 2002. Archive of Monuments and Publications. Hellenistic Ministry of Culture, Greece: Heraklion, 307–312.

Renfrew, Colin, Michael John Rowlands and Barbara Abbott Seagraves (eds.) (1982). *Theory and explanation in archaeology. The Southampton Conference*. London and New York: Academic Press.

Thomas, Julian (2004) (a). Archaeology's Place in Modernity. *Modernism/Modernity* Vol. 11 no. 1, 17–34. http://muse.jhu.edu/journals/modernism-modernity/v011/11.1thomas.html

Thomas, Julian (2004) (b). *Archaeology and Modernity*. London: Routledge.

Tilley, Christopher (1994). A *phenomenology of landscape: places paths and monuments* Oxford: Berg.

Wheatley, David (2004). Making Space for an Archaeology of Place. *Internet Archaeology 15* http://intarch.ac.uk/journal/issue15/10/dw1.html