An Introduction to the London Charter

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Abstract

While 3-dimensional visualisation methods are now employed in a wide range of humanities contexts to assist in the research, communication and preservation of cultural heritage, it is increasingly recognized that, to ensure that such work is intellectually and technically rigorous, and for its potential to be realised, there is a need both to establish standards responsive to the particular properties of 3D visualisation, and to identify those that it should share with other methods. Numerous articles, documents, including the AHDS Guides to Good Practice for CAD (2002) and for Virtual Reality (2002) and initiatives, including the Virtual Archaeology Special Interest Group (VASIG) and the Cultural Virtual Reality Organisation (CVRO) have underlined the importance of ensuring that 3D visualisation methods are applied with scholarly rigour, and that the outcomes of visualisation-inclusive research should accurately convey to users the status of the knowledge that they represent. There remains, however, a significant gap between theory and practice. Last February, therefore, as part of an AHRC-funded project, King's Visualisation Lab, King's College London, convened a Symposium, jointly sponsored by the AHRC ICT Methods Network and the EU Framework 6 Network of Excellence, EPOCH (Excellence in Processing Open Cultural Heritage), during which over 50 international delegates debated approaches to the issue of "transparency". A smaller expert group then debated a discussion document on which the first draft of The London Charter for the use of 3-dimensional visualisation in the research and communication of cultural heritage was subsequently based. "Cultural heritage" domains here encompass museums, art galleries, heritage sites, interpretative centres, cultural heritage research institutes, arts and humanities subjects within higher education institutions, the broader educational sector, and tourism. It is hoped that the Charter, currently in its first draft and being discussed by an international panel of experts, may be adopted as an EU and international benchmark. The Charter aims to define the fundamental objectives and principles of the use of 3D visualisation methods in relation to intellectual integrity, reliability, transparency, documentation, standards, sustainability and access. It does not aim to prescribe specific aims or methods, but rather to establish those broad principles for the use, in research and communication of cultural heritage, of 3D visualisation upon which the intellectual integrity of such methods and outcomes depend. The Charter attempts to establish principles that are sufficiently focussed to have an impact, but sufficiently abstract to remain current as methods and technologies evolve. Therefore, up-to-date guideline documents with specific recommendations about, e.g. technologies, standards, and methodologies, will be needed at subject community level.

Categories and Subject Description: H.3.7: Standards

1. Introduction

The London Charter for the use of 3-dimensional visualisation in the research and communication of cultural heritage seeks to establish what is required for 3D visualisation to be, and to be seen to be, as intellectually rigorous and robust as any other research method.

The initiative has to be seen in the context of what has become a constant burning issue in 3D visualisation applications to cultural heritage: "transparency".

Transparency is crucial if such applications are to mature as a research method and acquire widespread acceptance within subject communities. In particular, it must be possible for those communities to evaluate the choice of a given visualisation method, and how it has been applied in a particular case without having to rely exclusively on the "authority claims" of the author. This applies not only to Cultural Heritage, but to all those disciplines where 3D visualisation rightfully belongs as a methodology.

2. The Historical Background

An essay published some years ago [FNRB02] summarized some of the most important open questions concerning VR applications in the archaeological domain. In particular, it dealt with the most challenging

one, the credibility and validity of reconstruction models of objects, monuments, sites or landscapes partially or totally modified or destroyed, and virtually reconstructed based on archaeological interpretation. The essay originated from the debate developed during a symposium taking place at the end of 2000, and summarized a number of issues already represented in publications within the scientific community.

This discussion had started reasonably early among scholars. One of the first to analyze critically the risks of computer visualisation was Nick Ryan, who published two papers [Rya96] and [RR97] some ten year ago, in which he pointed out that computer reconstructions need to take into account alternative possibilities and the varying reliability of the components of a 3D model. The publication [BFS00] of *Virtual Reality in Archaeology* (2000) following the Virtual Reality Festival at CAA98 was more a celebration of results than a critical appraisal of them, although some authors as Juan Antonio Barceló, in [Bar00], offer interesting reflections. By then an awareness of the necessity of critically analyzing the impact of computer reconstructions was rapidly spreading in the scientific community (e.g. [Nic99], [GG00]). It was not just a matter of academic debate, because it also involved people active in operations, such as Maria Roussou, then director of the heritage department at FHW and in charge of many reconstructions of Greek cities in Asia Minor. Maria organized and chaired in those years several symposia (like Medi@terra, 1999, and VAST2001) where such issues were debated. Her most recent work [RD03] takes into account visualisation issues pertaining to heritage reconstructions, suggesting that hyperrealism is not always the best solution.

In the above cited paper by Frischer, Niccolucci, Ryan and Barceló [FNRB02] it was suggested that the interpretive/reconstructive process of model creation consists of three steps, as in the philological analysis of a text: verify sources; analyze their reliability; and interpret/integrate data with the missing parts. The final result must show the traces of this philological work, using signs, perhaps still to be defined in 3D modelling, to denote elements corresponding to interpolations, additions and conjectures.

Nowadays, determining the credibility of a 3D reconstruction and conveying it to the user has definitely become a scientific question and many scholars are aware of its importance. However, there is still much work to do to define how this can be achieved.

Credibility is important not only for the academy. For example, in the Technical Description of the activities of EPOCH, a EU-funded project on Intelligent Heritage, it is stated:

"Validity: there has been some concern in the heritage community about the validation of computer reconstructions […] Reliability: can people rely on what is shown by visual explanations of heritage? How can they distinguish between scientifically valid communication and fantastic, video-game display? … important issues as validation and scientific annotation of reconstruction models." This is perhaps the first time that such questions are being considered in a EU-funded, technological project. Similar principles are stated in the German project that reconstructed Troy "TroiaVR", created by the University of Tübingen and by ART+COM [JKS03]. Authors define the methodology of virtual reconstructions as "based on the same theoretical and methodological principles as an interpretation of archaeological texts". They state that the "inherent limits of archaeology become much more apparent in a visualisation than in a text". Their solution: "To emphasize the difference between actually excavated remains and free reconstructions, all reconstructions not based on almost complete ground plans can be switched on and off […] plans and images shown on the interface screen […] allow for comparison between excavated remains and reconstructions".

Although some methods have been proposed to quantify uncertainty [NH06], or at least to communicate it in a meaningful way, and visual metaphors are available (see for instance [ZCG05] on techniques for the visualisation of uncertainty), guidelines for documenting how such uncertainty arises and how the modeller devises solutions to overcome it and arrive at a cohesive proposal for a complete model, are still missing. This was recently discussed at a workshop at VAST2005 and during a subsequent symposium at King's College, London, hosted by King's Visualisation Lab (KVL), King's College, University of London.

In July 2005, KVL commenced a project called "Making Space" to investigate "a methodology for tracking and documenting the cognitive process in 3-dimensional visualisation-based research," funded under the ICT Strategy Projects scheme of the Arts and Humanities Research Council (UK). In the course of this project, Drew Baker proposed the term "Paradata" to denote the intellectual capital generated during research, and highlighted that a great deal of the information essential for the understanding and evaluation of 3D visualisation methods and outcomes is currently being lost.

The project subsequently convened a Symposium and Expert Seminar at the British Academy, London and the Centre for Computing in the Humanities, King's College London, from 23-5 February 2006, jointly sponsored by the AHRC ICT Methods Network and EPOCH. During the two-day symposium, 50 delegates debated approaches to the issue of transparency, and on the third day, a smaller group of experts discussed the first 'discussion document' phase of the draft London Charter.

The Charter initiative builds on the initiatives of several groupings, such as the CAA Virtual Archaeology Special Interest Group (VASIG), which first met in Sweden 2001; and the Cultural Virtual Reality Organisation (CVRO), launched at VAST in November 2000 with the above-mentioned paper [FNRB02]. Although now inactive, CVRO was important for having

established principles which have deeply influenced important projects on both sides of the Atlantic Ocean, including EPOCH. In addition, the recommendations of the AHDS Guides for "Creating and Using Virtual Reality" [FR03] and for CAD [EFHR03], both of which appeared in 2003, have been drawn upon in the Charter initiative, which aims both to establish principles applicable across a number of domains, and to foster the development of subject-specific implementation guidelines. This initiative is now offered for the attention of the scientific community.

3. The Scope of the London Charter

The London Charter is not discipline specific; it aims to serve the whole range of Arts, Humanities and Cultural Heritage disciplines using 3D visualisation for research and dissemination.

The Draft adopts the format and style of the ICOMOS ENAME Charter to provide a ready-to-hand language, but also to facilitate ease of recognition within cultural heritage contexts

The Charter adopts a wide definition of the term "cultural heritage",

> *encompassing all domains of human activity that are concerned with the understanding and communication of the material and intellectual culture. Such domains include, but are not limited to, museums, art galleries, heritage sites, interpretative centres, cultural heritage research institutes, arts and humanities subjects within higher education institutions, the broader educational sector, and tourism.*

It is hoped that the Charter will acquire sufficient standing to be adopted as an EU and international benchmark and guideline.

The Charter initiative does not aim to propose radical new proposals, but rather to consolidate major principles that have been published by numerous authors, but not yet fully taken up by the community. This is why the idea of a "Charter", rather than another article, seems appropriate, and why it is important that it should emerge out of, and evolve through, discussions within its target communities.

The term "Charter" is usually reserved for documents enouncing principles of very wide generality, as the well-known Venice Charter on conservation and restoration and the Florence Charter on historic gardens and landscape [CHART]; or to documents less well-known than the above, and not yet adopted as Charters by international institutions as ICOMOS, but nonetheless of comparable relevance and importance to the Ename Charter on interpretation [ENAME]. The London Charter by contrast, which concerns a research and communication method, may as yet appear rather limited and circumscribed, and is presently perceived as having less impact on cultural heritage than the ones quoted above. However, it is our opinion that what we presently propose as methodological principles will acquire an increasingly greater importance in a future in which digital communication and visualisation technologies will pervade every aspect of culture.

Next, the most important aspects of the London Charter will be summarized and commented upon.

The current full text of the Charter, which is undergoing a review process refining its content and formulation, is available as a leaflet on request, and may be downloaded from the Charter web site [LC]. Comments and contributions are welcome.

4. Principles of the Charter

More fundamental issues underlie what is frequently the presenting problem of transparency; tackling these at the level of principles, as opposed to on a purely pragmatic level, requires us to think through disciplinary contexts, and how we formulate and assess the aims, methods and sources of 3D visualisation-inclusive research and communication operations. Consequently, these form the subject of the first three principles in the first draft of the Charter.

4.1 Subject Communities (i.e. disciplinary contexts)

While the London Charter aspires to be "valid across all domains in which 3D visualisation can be applied to cultural heritage", nevertheless, different subject areas differ very greatly in their understandings of what research is, and therefore what research methods such as 3D visualisation ought to achieve. This imposes strict limits upon the level of detail a cross-subject document can entertain. The draft consequently recommends that, while "subject areas should…adopt and build upon the principles established by this Charter," (Principle 1) they should also "develop more detailed principles, standards, recommendations and guidelines to ensure that use of 3D visualisation coheres with the aims, objectives and methods of their domain." (Section 1.1)

4.2 Ensure Cohesion between Aims and Methods

The draft recognises that "3D visualisation methods and outcomes can be used to address a wide range of research and communication aims" (Principle 2). It appeared also necessary to establish that it is only one method among many; that "it should not be assumed that 3D visualisation is the most appropriate method of addressing *all* research or communication aims." (Section 2.1) This is to ensure that, in serious contexts, it is not used simply because it is available or to impress; the draft therefore proposes that "3D visualisation should not normally be used when other methods would be more appropriate or effective."

Another exigency consisted in ensuring that the full range of 3D visualisation options should be considered: that no single approach (photo-realism or real-time navigation, for instance) should be considered a "default" expectation, but rather that each visualisation

technique "should be carefully evaluated to identify which is the most likely to address each given aim." (Section 2.3)

4.3 The nature and integrity of Research Sources

This arose, in particular, out of a presentation at the London Symposium by Daniel Pletinckx, in which he demonstrated how important and complex is the task of rigorously assessing the research sources we use, in particular of paying attention to the kinds of aesthetic and ideological factors that may condition our visual sources.

The draft proposes a definition of "sources" as "all information, digital and non-digital, considered during, or directly influencing, the creation of the 3D visualisation outcomes." (Section 3.1) and recommends that "in order to ensure the intellectual integrity of 3D visualisation methods and outcomes, relevant sources should be identified and evaluated in a structured way."

4.4 Transparency Requirements.

The draft recommends that "sufficient information should be provided to allow 3D visualisation methods and outcomes to be understood and evaluated appropriately in relation to the contexts in which they are used and disseminated." (Principle 4)

This section on "transparency requirements" goes on to propose that "it should be made clear what kind and status of information the 3D visualisation represents. The nature and degree of factual uncertainty of an hypothetical reconstruction, for instance, should be communicated." (Section 4.1)

It also recognises that "the type and quantity of transparency information will vary depending on the aims and type of 3D visualisation method and outcome being used, as well as the type and level of knowledge, understanding and expectations of its anticipated users. Transparency information requirements may therefore differ from project to project, or at different phases within a project." (Section 4.2)

The transparency requirements of 3D visualisation projects may differ from those of other projects because of "the high occurrence of dependency relations within 3D models" which means that, if the process and its outcomes are to be evaluated by those outside the project, "it may be necessary to disseminate documentation of the interpretative decisions made in the course of a 3D visualisation process." (Section 4.5)

A dependency relationship is defined as a dependent relationship between the properties of elements within 3D models, such that a change in one property will necessitate change in the dependent properties. (For instance, a change in the height of a door will necessitate a corresponding change in the height of the doorframe.)

A further point that came out of the Symposium was that "the level of documentation required regarding 3D visualisation when used as a research method will vary depending on how widely and well that method is understood within the relevant communities; novel methods will require more explanation." (Section 4.6)

4.5 Documentation

"The process and outcomes of 3D visualisation creation should be sufficiently documented to enable the creation of accurate transparency records, potential reuse of the research conducted and its outcomes in new contexts, enhanced resource discovery and accessibility, and to promote understanding beyond the original subject community." (Principle 5)

Indeed, while the provision of adequate documentation about research sources, methods and interpretative decisions is at the core of solving the "transparency" problem, it is also, in practice, among the most intractable challenges.

Whereas conventional research and dissemination methods operate, by definition, within an economy of established and understood approaches which have typically evolved through long histories of explicit methodological and theoretical debate, 3d visualisation methods and outcomes lack such a history, or economy, and must more explicitly discuss the rationale for their methods. An additional layer of complexity arises in that 3d visualisation methods are often used in interdisciplinary contexts which, again, by definition, lack a common episteme or set of conventions that generally characterise subject communities.

The draft therefore notes that the frequently interdisciplinary nature of 3d visualisation requires additional consideration in which systematic documentation can play a valuable role "by articulating the relevant unspoken assumptions and different lexica of the different subject communities engaged in the common visualisation process."

4.6 Standards

Work on standards needs still to be done and although we acknowledge their importance this is still a less developed part of the Charter. Relations with existing standards need to be fully explored when declining the charter in individual domains. For instance, when developing Charter implementation guides for Cultural Heritage domains, it will be necessary to explore how the goals of the Charter may benefit from the adoption of documentation standards as CIDOC-CRM [CRM].

It is likely that it will be necessary to develop appropriate ontologies at subject area level. This task will be facilitated as we improve our understanding of *what* we are doing when we use 3D visualisation methods and outcomes, and *how* we are doing it. Consequently, the current draft simply proposes that: "appropriate standards and ontologies should be identified, at subject community level, systematically to

document 3D visualisation methods and outcomes to be documented, to enable optimum inter- and intra-subject and domain interoperability and comparability." (Section 6)

4.7 Sustainability

The draft notes that "3D visualisation outcomes pertaining to cultural heritage…constitute, in themselves, a growing part of our intellectual, social, economic and cultural heritage" and that "if this heritage is not to be squandered, strategies to ensure its long-term sustainability should be planned and implemented." It also points out that "a partial, 2-dimensional record of a 3D visualisation output should be preferred to an absence of record." (Section 7)

In the next draft of the Charter it has been proposed to lay more emphasis digital preservation, with the understanding that preservation of digital content is included in many specialized research agendas; research in this field will determine optimal strategies for preserving 3D digital content as well.

In other words, the importance of adopting preservation strategies for 3D content is acknowledged, by monitoring the results obtained from elsewhere, and without committing now to any one in particular.

4.8 Access

During the London Symposium, David Robey, Director of the AHRC's ICT Programme, underlined the importance of continuing to make the case for technologically expensive work in the Arts and Humanities – to explain its value, and value for money – and also to consider that work in cultural heritage (broadly defined) is, for the most part, publicly funded, and many 3D visualisation outputs have a high re-purposability, as it is incumbent upon us to consider whether our work might have a value beyond our own immediate uses. Hence, draft Principle 8 states that "consideration should be given to the ways in which the outcomes of 3D visualisation work could contribute to the wider study, understanding, interpretation and management of cultural heritage assets."

3D visualisation clearly has important roles to play in "enhancing access to cultural heritage [that is] not otherwise accessible for health and safety, disability, economic, political, or environmental reasons, or because the object of the visualisation is lost, endangered, dispersed, or has been restored or reconstructed." (Section 8.2)

The draft recognises that "3D visualisation permits types and degrees of access not otherwise possible, including the study of change over time, magnification, modification, virtual object manipulation, multi-layered embedded data and information, instantaneous global distribution, with consequent expanded curatorial possibilities", (Section 8.3) but it is worth noting that there may also be potential *economic* benefits to both the research/education and tourism/interpretation sectors from increased communication and collaboration with each other.

5. Charter Implementation

The Charter is designed to establish principles that are sufficiently focussed that they have an impact, but sufficiently abstract that they remain current as methods and technologies evolve.

While the Charter operates on the level of principles, therefore, more specific recommendations (e.g. about technologies, standards and methods), while they are needed, belong to a different kind of document: Charter Implementation Guides.

The importance of subject perspective is enshrined as a principle in the Charter:

"Specialist subject communities will need to develop more detailed principles, standards, recommendations and guidelines to ensure that use of 3d visualisation coheres with the aims, objectives and methods of their domain." (Section 1.1)

Implementation guides might help, for example, to develop consensus around visual conventions and technical approaches for different methods.

We hope that the Charter initiative will provide the impetus for a series of guides, to be developed within different subject areas, as well as a series of case-studies designed to test the implementation of "Charter compliancy".

The case-study process has already begun. At the Expert Seminar, it was proposed to conduct a number of case studies to see what kind of paradata should be recorded in 3D visualisation projects, and how.

It has been suggested that, in order to do this, we may first need systematically to observe, how we reflect upon, choose, and communicate ('traditional') research methods. This would help us to build up a profile of what kinds of methodological and processual information it is considered necessary to document for other research methods, and to base our recommendations on comparability with established academic standards. In addition to benefiting from their example, it could enable us to make persuasive arguments to 'traditional' scholars about the validity of 3D visualisation methods in terms that they would more readily understand.

A number of researchers has volunteered to develop case studies; additional ones would be of course welcome.

6. Future work

It is envisaged that as the London Charter is revised in response to consultation within the various subject communities for which it has direct relevance, it will both stimulate debate on key issues and, in its various versions, may progressively come to act as a *de facto* standard.

As 3D Visualisation refers to a widely-used method, rather than a domain, there is at present no single organisation that can coordinate structured consultation and redrafting among key stakeholders. The Charter process will therefore be Chaired by Franco Niccolucci (VAST Lab PIN and EPOCH) and Richard Beacham (KVL), while Dr. Anna Bentkowska-Kafel and Julie Tolmie, Research Fellow and Network Development Officer (respectively) for the JISC 3D Visualisation in the Arts and Humanities Network (3D VISA) will act as "Secretariat" under the direction of Hugh Denard.

A website, www.londoncharter.org has been launched, carrying the current draft, the history of the initiative, and an explanation of the consultation process, and a list of consultation events. Other recommendations are welcome.

In particular, we need to identify how to set in motion a high-profile consultation exercise among the Charter's target communities. Without doubt, EPOCH and other such organisations will have a pivotal role here.

As far as the Cultural Heritage domain is concerned, involvement of ICOMOS is paramount. On this regard, contacts with the ICIP (ICOMOS scientific Committee for Interpretation and Presentation) have already been established. It is likely that the London Charter declination relevant for CH will be presented as a set of technical guidelines aiding the implementation of the principles of the Ename Charter that pertain to 3D visualisation techniques. However, such a low-profile starting point may eventually grow into a major contribution as the visualisation technology is acknowledged by heritage scholars and professionals for the importance that it is increasingly gaining in culture as in many other fields of human life.

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