

A Role for VRML as a Multimedia Backbone in Interpreting Cultural Heritage Sites.

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This paper appraises the role of Virtual reality modelling language (VRML) based 3D computer based models of Historic Environments in increasing access for and assisting the understanding of the general public. It is argued that VRML based 3D models and linked media create a low cost easy to use and intuitively accessible interface through which transient or casual users can retrieve information or experience narrative. The same data collation and modelling process can also assist

Abstract

conservation professionals in their tasks. Criteria are discussed for determining when it is more appropriate to model rather than use photographic techniques in the light of the commonly expressed fear in conservation circles that vicarious presentations may dominate genuine historical experience. Developments are identified which may assist in improving ease of use and understanding by visitors on and off-site.

1: Introduction

Interpretation of heritage sites is seen as a specialised form of education. Interpretation is revelation based upon information, 'not what you can do with history but what history does to you'. [Barzun J]. The dimensions of discovery are the ways by which we measure the world around us, testing one against another. 'Interpretation' is a process involved in every dimension, and it is arguable that it is not the *communication* process that we take it to be, but the activity of *opinion-making*. [Machin A. 1986]. Heritage organisations perceive a need to entertain visitors but at the same time to convince them of the value of conservation of that heritage, to sustain the case for conservation in the minds of the public who directly or indirectly fund it. While originally cultural heritage sites were shrines, needing no interpretation for their educated or informed visitors, now that oral tradition has diminished and there is not a preponderance of informed fellow visitors, interpretation needs to be formalised. [Freeman Tilden 1957]

The question of when it is appropriate to model instead of or in addition to experiencing first hand is central to this paper. The Grand Canyon is cited in support of the argument that some sites do not require any visitor interpretation, (which does not however preclude the need for informed professional understanding), and that such interpretation is increasingly required the more foreign the view is to the visitors' experience. [HMSO 1975].

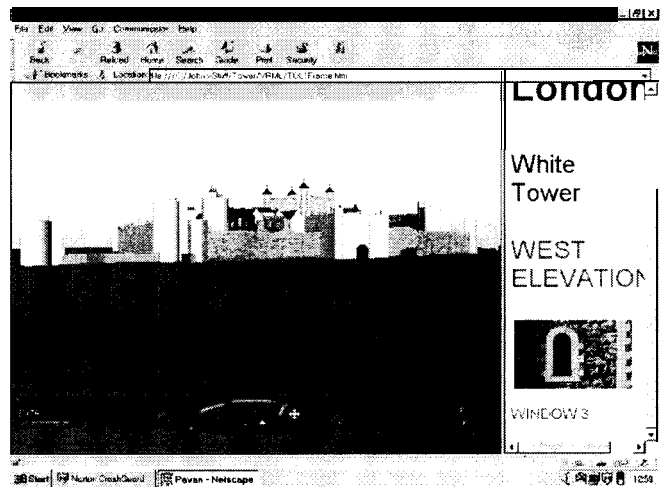


Fig 1-Tower Model in VRML with Associated WWW Page

There is a perceptible tension currently between the need to swiftly enlighten the diverse range of visitors to cultural heritage sites and an increasing risk of trivialisation. It is argued here that a digital spatial information system is an effective way of organising and accessing diverse data for which location is an important aspect. Where the spatial information relates to a complex three-dimensional structure a three-dimensional model however abstract is created within the information system. The group of potential users becomes increasingly wider the more immediately recognisable and credible the model appears. Transient or occasional users of such

systems need an interface that is intuitive and easy to use through which to retrieve information *or* experience a narrative. It is argued that Multiple Media linked to VRML 3D models takes a further step towards this goal. (figures 1 & 2)

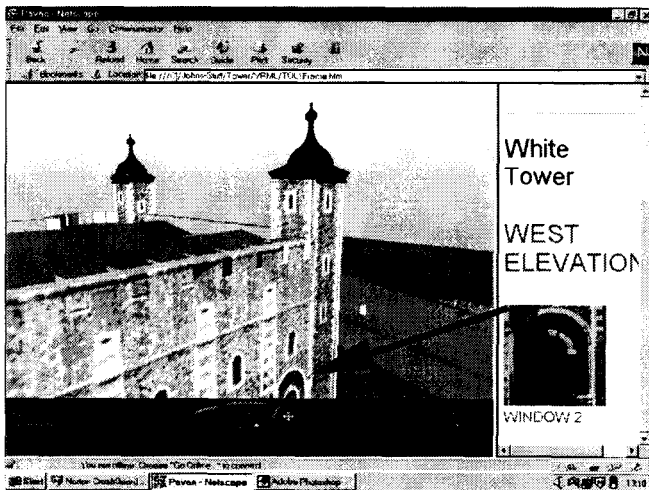


Fig 2 - Close Up of White Tower, Cupolas imported from CAD, WWW page invoked by touch sensor mapped onto Geometrv using Pavan within Mapinfo GIS.

2: Interpretation

Finch distinguishes between primary and secondary levels of interpretation. Primary Interpretation is defined as that of the conservator or archaeologist, the professionals' view, in order to reconstruct either hypothetically (through drawings or models) or in 3D actuality. Secondary Interpretation is defined as for the edification or education of the public. [Finch JM. 1982]. Other professionals engaged with cultural heritage sites also deploy Primary Interpretation to assist in their understanding of the site. For example conservation maintenance management is made more difficult by the accelerated wear and tear exerted by the visitors who partially or wholly fund it. Visitor management is used and Visitor Centres are created to channel visitors away from fragile and easily damaged areas. Visitor centres can also convey a briefing or preparatory function. "Off-site interpretation may or may not succeed in arousing in its audience a wish to conserve an area but it will almost certainly arouse a desire to go and see it." [HMSO. 1975]. Sharpe for example further divides Secondary Interpretation into either edification or education. [Sharpe GW. 1976]. *Edification* can be termed 'sound-bytes' for capturing fleeting visitor interest, whereas *education* has been defined as conservation education in more depth. VRML Models may be particularly useful for off-site interpretation.

The Primary Interpretation identified above can be further sub-divided between personal experience and group activity. Personal experience involves examining and comparing source data in order to gain new insights. This is in many ways similar to the examination and comparison of information from a variety of sources which underpins the personal process of conceptual design in buildings. If the data is digital but in diverse formats and databases then a single unified interface will ease that process. A group that is engaged in the same process uses media in addition to support and record their common understanding. This need becomes greater the more asynchronous and less interactive the exchange becomes. One example of this form of activity is in the group project work undertaken in schools prior to and following a visit to the actual site. Many heritage sites now provide information and study packs for schools for this purpose. It is significant that Historic Royal Palaces for example have an education team and that at many National Trust and English Heritage sites there is a room set aside for on site project work with school parties with props for study and role play.

There is now an increasing demand for the case-study recording of the design and realisation process of building projects in general which is similar to the Educational aspect of Secondary Interpretation defined above. Such recording is of paramount importance in the field of conservation of historic buildings and environments to guide and inform future conservation. The material gained in this way can be interpreted to provide a detective story narrative.

Washburne and Wagner argued that 'visitors found messages organised into comprehensive stories or concepts tied together by central themes to be more interesting than unrelated facts and identification of objects.' [Washburne RP & Wagner JA. 1972]. Many heritage sites now use museum staff members in historic costumes to enact scenarios using genuine museum **artefacts** or props to interpret family lifestyle, community linkages and historic themes. Research indicates that visitors learn and retain significantly more from participating in this form of dramatic pageant. [Hayward NG & Larkin JW. 1983].

There is a fear in conservation circles that this causes the genuine historic evidence to become secondary to the theatrical experience. For the Society for the Preservation of Ancient Buildings (SPAB) their secretary wrote that The Society doesn't really get involved in questions of interpretation and presentation, so we don't have any formal policies other than indirectly (e.g. that later layers of history should not be destroyed merely to give access to earlier ones etc; or where plaster has been removed from a wall, revealing information about early masonry construction, this should be recorded but plaster should then be reapplied). Fairly obviously we don't approve of

the “restoration” of historic buildings to some earlier form for educational purposes, and computers clearly have a role. If we have any philosophy at all I suppose it is that presentation should always be secondary to the historic fabric, and that may well mean that important things of interest will not be visible other than by photograph, video, model etc.’ [Venning P. 1995]. In fact much of the interpretation of historic buildings and sites involves drawing attention to hidden or inaccessible features where modelling may greatly assist understanding.

3: Selection of Appropriate Media

Binks et al state that for non-specialist visitors the aim is to give them an overall picture, to explain what is happening, what is being revealed, and what its significance is. For repeat visitors it is necessary to also explain what has changed since the last visit. They add that the interpretation will need to be presented at a variety of depths. They suggest that themes and stories presented in a logical sequence relating to route from the human angle, which are participatory, which explain the detective story, effectively provide living history for the visitor. [Binks et al. 1988]. Other research has also shown that animated and interactive exhibits are more valuable than static presentations. ‘Above-expected interest was shown in the dynamic, animated, or changing presentations represented by movies, changing lighting, and audio sequences.... all the sequences with less-than-expected interest involved flatwork, suggesting a greater preference for three-dimensional presentations’. [Washburne RP & Wagner JA 1972]. Sharpe uses this research to argue that an interpretative audience prefers those interpretative media which are most closely associated with entertainment, and that the dichotomy of education and entertainment parallels that of inertness and animation. He also records that participation increases retention and that multimedia is necessary to cater for a variety of levels of information. Visitors in fact are discouraged by reading while looking at objects and prefer an audio commentary. [Sharpe GW. 1976]. The HMSO guide adds that the medium chosen to communicate the message should avoid dominance of any other media used, gain visitor interest and establish rapport. They also endorse interactive participation as particularly important for younger children and advocate self-paced material that enables an appropriate pace for the casual visitor. They define the task as helping visitors to ‘imagine accurately’ while producing a conservationist response. They infer that the chosen approach should obtain feedback by testing the recall of the visitor and that a conservationist response is produced. [HMSO. 1975].

While firsthand experience of parts of heritage sites is possible for many visitors there are problems of access for the disabled and the elderly. Howell argues that if we

consider people in our profile who have perceptual problems then an analogue within the CAD system can be used, with careful consideration, to present that part of the building which cannot otherwise be perceived. ‘In any event much of the understanding of any interior or piece of environment has to be conveyed in words. I have to say that a description of a cathedral by, say, Willis or leDuc are often brilliant analogues. It is almost inevitable that words will have to accompany the visualisations and auralisations... the words... could be transcribed into signing alongside a picture or subtitles provided for the deaf or hard of hearing.’ [Howell P. 1995]. Other parts of these sites are often temporarily or permanently closed to the public. While Finch states that the public are as interested in the process of restoration as in the restored artefact itself, it is precisely during the process of restoration that the site may be too vulnerable or too unsafe to allow general access. [Finch JM. 1982]. Equally some parts of sites may not normally be accessible at all to professionals either for similar reasons of health and safety. In addition when carrying out maintenance or repair it is necessary to consider the location of and the risk to below ground or otherwise concealed remains. Sites are large and those responsible for their care cannot at all times experience them at first-hand, nor can all those who wish to know more about them. The National Trust for example owns over 900 properties. They define their properties as fragile and beautiful and at the same time physically and historically complex. This is described as often making them hard for visitors to understand and rendering much of the information about them difficult to access. Archives and libraries are generally not available to the public because they are so fragile. They have sought various means using multimedia and visitor centres to both overcome these barriers to access and to convey a clear overview and sense of context to the visitor prior to entering a maze of rooms and corridors.

4: Tasks which may be supported by a model

It is necessary to distinguish between those conservation tasks that relate directly to preservation of the fabric and those that a model might equally well support. It is also necessary to determine when photographic images will serve and when only a model will perform the necessary tasks, (although arguably VRML can be used to integrate both 3D model and photograph in one environment).

Finch classifies seven cases of increasing intervention in heritage sites. [Finch JM, 1982]. Preservation is the first, which may only involve restraint rather than any direct action. The second, restoration, restores a previous condition. The third, conservation and consolidation, involves using new materials and tools, whereas the

fourth, reconstitution, consists of partial re-building using traditional materials and skills. The **fifth** is adaptive re-use, such as placing a new roof on a ruin in order to use it in a way it was not used originally. In the five cases above the significant elements remain. Therefore photographs, digital images or 3D scans may serve for 'off-site' interpretation. A digital model would similarly serve as an adjunct in the same sense as a visitor centre acts in a preparatory or briefing role. It would however also enable concealed aspects to be demonstrated and act as one interface to the process of maintaining and accessing records relating to the site. Case six consists of reconstruction, of vanished buildings by creation of a surrogate in the original context. It is noteworthy that the 'first-rate' building is more likely to be preserved than the 'sixth-rate' buildings that may have formed its original setting.

The Museum of London Archaeological Service use 3D CAD to understand and extrapolate from the excavated portions of sites such as London's Roman Amphitheatre, to model their interpretation of the complete original structure, thereby recreating buildings or forms that no longer exist. [MOLAS 1995]. Case seven is replication, the creation of a duplicate, which coexists with the original, often for reasons of the fragile nature of the original. In both reconstruction and replication a model is built, which may or may not be full size and as fully detailed as the original, depending on the need. With accelerating use of the WWW it is increasingly used for narrative using a mix of media, for interaction, for testing recall, for monitoring user reactions and providing a context sensitive response. Now that Virtual Reality (VR) is increasingly technically possible it is possible to consider a digital alternative to a physical model, which can also serve the information needs expressed above. Such has happened with first the creation of Lascaux II as a full-size physical model of the original cave system which **has been** followed by the more recent scanning and modelling of a VR version showing bitmap images of the prehistoric cave paintings in interactive context.

5: Further Development

This paper argues that the perceived advantages of VRML for construction in general are equally applicable to heritage sites and that additional value can be obtained, because of the special nature of heritage sites and the need for interpretation. VRML is a useful adjunct to firsthand experience for Secondary Interpretation, providing a multi-layered capacity for both edification and conservation education. While the attention span of the visitor to the heritage site or visitor centre may be fleeting this does not necessarily apply to a remotely accessed digital model with related information. Such a model may be explored at a variety of levels of understanding.

Equally the understanding gained from Primary Interpretation **needs** to be shared between professionals working within conservation. The physical and historical complexity of heritage sites is held to be better **modelled** in 3D than 2D to ensure commonality of understanding between all those engaged in its care. WWW Browsers and VRML plug-ins are affordable and accessible from all desktops. VRML 97 is now an ISO Standard and a useful non-proprietary neutral 3D format in which to record information about the hidden or inaccessible parts of heritage sites.

Further work is necessary to enable all these aspirations to be met by digital modelling. Thompson argues that "The best basis for understanding a ruin is therefore a wide knowledge of other structures of the same period, whether ruined or not, since the mind is consciously or unconsciously making comparisons, and the larger the stock on which it is possible to draw, the more reliable the result is likely to be." [Thompson MW, 1981]. This broad understanding can only be gained asynchronously by first hand experience at present. Linked digital models could well improve this process. For this to be effective a critical mass of heritage sites need to become available which meet the same standards and support the same classification systems so that they can be interactively linked and browsed to provide this broad understanding. Similar significant elements need to be classified similarly so that they can be inter-linked. Standards for scale of model and matching levels of detail need to be agreed and established.

Sharpe stated that "in early writings there was an element of interpretation when the writer passed on his or her impressions or observations to the recipient, the reader, who may never have been near the feature being interpreted. In present day interpretation we work more closely with the feature itself, are in direct contact with the recipient, and have a variety of media to rely on." [Sharpe GW. 1976]. This direct contact of the guide with the recipient would not apply so readily to a digital model. Yet it may also be of interest to compare the views of such as Pevsner with those of others who do not agree. A WWW based digital model could support a palimpsest of commentaries linked together. Different representations and commentary trails can be mapped onto the same model of the cultural heritage site, in a similar manner to mapping shifting political boundaries onto a less mutable physical relief map. To serve such data in the most flexible way development is needed to supply not just WWW pages on demand but frames on demand which show the requested contrasting views.

Other recent research at UWE based upon the **hands-on** science exhibits at the Bristol Exploratory has been testing cellular phone and active badge based means of delivering context sensitive audio commentary to visitors using the interactive exhibits. [Heard P et al, ESS Faculty,

UWE]. There is scope for considering portable versions of some of the information held which could be delivered in this manner as a direct complement to first-hand experience. The Digital model would in this sense become one easily used point of access to a digital archive, an integrative repository from which such information is served. There is a need for an improved feedback tool that monitors use and amends delivery to suit the individual. An interactive system is potentially capable of doing so and one aspect of the use of active badges at the Exploratory is to cue the system to deliver material appropriate to the object of focus and the length of time spent examining it.

6: Conclusion

Provided that it is widely available on the WWW and readily updated the model can serve as an off-site preparatory and briefing tool. One particular **such** need is to improve accessibility for the handicapped, permitting them to explore a model in order to plan an accessible route to points of interest, and where this is not possible to at least vicariously experience the otherwise inaccessible. However such a model does not have to be complete in all respects to be useful. It may suffice to model either the most significant points to meet visitor interpretation needs, or to model on a project specific basis over time, which would build from one case study to the next. Either would lead to building a comprehensive model through accretion. Standards would need to be defined to enable a grid of different levels of detail focusing on areas of interest, while still giving an overview and a context for the remainder.

WWW Browsers can be used to deliver interactive linked multimedia showing historic environments. This is capable of arrangement on demand to suit the diverse retrieval requirements of the professional. It is also capable of being of use to the professional in explaining interactively to colleagues or for recording that explanation to form the basis of an edited narrative for

visitors. More work is required on tools and server applications. Tools are required that enable the interactive explanation to be developed into a script or storyboard for a narrative, while retaining multi-level links through case-studies to primary source data. Server applications are required that serve on-demand frames of associated VRML and WWW pages.

Acknowledgements

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