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Design and use of a virtual heritage model to enable a comparison of active navigation of buildings and spaces with passive observation

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Abstract

Wide ranging and significant research in recent years has highlighted the need for greater levels of engagement with end users in planning and design of the built environment. This has been against a background of far reaching advances in IT technologies, which have facilitated the widespread use of computer modelling to present design ideas in non-traditional and non-technical formats. In the context of urban redesign and public participation, the research reported in this paper emerged from an observation that pre-rendered walkthroughs of designs have become commonplace, and that the effect on cognition and preference might be significant. For the particular case study area, it was notable that the arrangement and proximity of buildings was such that the site could arguably be best understood through navigation at human scale, as opposed to through the use of traditional drawings or plans. The research proceeded to investigate whether the active navigation of a desktop virtual model of an urban environment leads to better understanding and perception than passive observation of a walkthrough, and the methodology employed commonly available and widely used modelling packages to present a small townscape, navigable using controls commonly found in modern computer 'games'. The technical and study based results from this research have implications for how design ideas can be best presented to clients and other end users in the future, to ensure that design processes can be more clearly informed, and to avoid problems related to the interaction and understanding of architectural information by non-experts. The study results suggest that active navigation as opposed to passive observation does not affect choice between two versions of a model. However, benefits in terms of engagement, involvement, and a demonstrated tendency for the active condition to generate stronger perceptions and sensations suggest that use of navigable models could carry benefits in terms of engagement, thus adding benefits in terms of the user and study implementation without compromising or influencing the outcome. If it were the case that an exercise was required to establish whether participants could understand layout, or to establish how participants felt about the attractiveness of a place, or the sensations which might be felt once in a space, an ability to actively navigate a space better allows participants to feel that they had experienced a simulation of what the as-built space would be like.

Keywords: Virtual; Navigation; Games; Heritage; 3D; Participation

1. Introduction

The research described within this paper had two overall aims. Firstly, the research aimed to model a culturally significant area of the built heritage, constructed and maintained using vernacular construction methods. The case study used was that of the medieval village at Tinganes at Torshavn in the Faroe Islands. This aspect of the research aimed to present the results of that process through the use of high quality 3-dimensional computer models of the areas studied, and to ensure that the model provided users with the ability to interact with and navigate the spaces between buildings.

The second aim of the study was to investigate whether permitting people to actively navigate a modelled environment, as it is presented in a desktop situation, enhances understanding and perception of an environment when compared with passive observation of a walkthrough. This research builds on recognised seminal work which identified the potential value of utilising GIS, sketching, photo manipulation and online participatory tools to encourage engagement with planning and design [1–3]. Furthermore, the research aimed to explore the manner in which allowing free navigation of a virtual space might affect the level of engagement, the perceived experience and any choices made by the user.

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2. Virtual heritage

The model used to provide a virtual environment is a computer model of a cultural heritage site located in the Faroe Islands. In this sense, the model is an example of virtual heritage, a term typically used to describe works which aim to record tangible and physical aspects of cultural heritage, often through the use of computer modelling and visualisation. There have been many examples of practical applications of how computers and IT can be used to record cultural artefacts and environments (for example [4]), and that work has been the subject of debate in terms of both the technology involved and the implications for the study of cultural heritage [5].

Tinganes is designated as a conservation area, and provides an important insight into the manner in which vernacular building designers (including occupants) responded to their prevailing environment. An excellent commentary on the history of these buildings was provided in Hoydal [6], who makes an interesting case for the importance of recognising the oral tradition of northern European countries, in that the historical importance of Tinganes is arguably more important from the perspective of understanding Faroese social and cultural history, than for the architecture alone. A deeper anthropological analysis of this subject would be extremely worthwhile. The overall narrowness and undulating topography of the headland at Tinganes has dictated that the buildings take an almost organic approach to village 'layout'. The modern village buildings have developed a sense of increasing importance towards the outermost points, with an overall increase in building height, although use of materials is largely constant throughout. It was felt to be of cultural importance that an assessment and record of such buildings is realised to ensure the site is preserved for the future, and it was felt that the development of an interactive model would help to promote collaborative discussion, debate and greater levels of public participation in the future. For this site, in particular, it was also felt that the proximity of buildings, and the organic layout of the townscape, meant that appreciation of the site's topography, arrangement and design would be best appreciated and understood through navigation and viewing, rather than through the analysis of drawings, plans or photographic stills. In relation to the image in Fig. 1, it should be noted that heavy snowfall is relatively uncommon in Torshavn, and that the research team also visited the site during the summer of 2003.

Previous studies have successfully presented virtual 'tourism' sites, through which users can access virtual models of towns and cities, or interrogate information regarding cultural heritage. These include web sites containing navigable VRML models, where an emphasis is placed on providing pertinent data as users move through a space (for example, [7,8]). These studies were concurrent with research which concentrated on the development of the VRML technologies themselves, which allowed users to navigate interactive and photo-rendered spaces [9]. A key strength of such systems is that they are capable of containing and displaying a suitable range of text and image based data, potentially selected and presented in response to specific user characteristics (for example, [10]). Other recent work [11] has utilised panoramic views of cityscapes, again from the user's perspective, to allow participants to navigate public space, and subsequently make judgements regarding travel and navigation through urban areas. As the very nature of computer games 'engines' encourages the development of user-modelled environments, previous studies have used such technology to represent 'lost' or imagined spaces, for the purposes of education or debate, for example within archaeology [12,13] and within architectural spatial design studies [14].

The method used to model and represent the area within this research included aspects of site surveying, collection of texture and material samples, geometric modelling, and various visualisation techniques. Therefore, the emphasis was not

Fig. 1. Location photo from Tinganes (taken in February 2004).