The Presence Probe

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ABSTRACT

This paper discusses the development of a presence probe, a method that can be used to capture the components of real and virtual worlds, which impact upon a person's sense of place and presence. Our early findings indicate that it identified relevant issues, was quick to administer and was usable by a wide range of participants.

Keywords

Evaluation, design, virtual reality, evaluation, benchmarking, requirements capture, presence, place

1. Introduction

The European Union funded BENOGO (Being There No-Go) project is concerned with developing photo-realistic virtual environments using image based rendering technology (IBR). The primary objective of the project is to recreate real world scenes such as galleries, museums and other public locations, so that those who cannot visit the real scenes can experience them from within head mount displays, immersive caves or panoramas.

In this paper we discuss the rationale, development and first use of the presence probe, which was developed and used for the first time during December 2003. The presence probe is loosely based on the idea of a cultural probe [1] and is used to uncover the aspects of a place, which help people feel present, for example sounds, lighting or other physical cues. The objective of the probe is so that we can compare the real and virtual scenes and gain a better understanding of what constitutes place in both real and virtual environments, with the aim that we can inform the design of virtual environments.

2. Image Based Rendering Technology

The BENOGO environments use a new form of image based rendering technology. In order to create the scenes a panorama of the location is captured using a high-resolution camera. This panorama is then used to generate the virtual world and the underlying algorithms allow for complete movement in all directions, it is also possible to add augmented objects which can exist in the virtual and/or real world. At present the technology only operates using head mount displays, however over time it will be possible to use immersive caves and panoramas. Therefore one critical aspect of our study is that the chosen locations must operate appropriately in the available technology.

3. A Sense of Presence and Place

Research into virtual environments has often explored the concept of presence (often referred to as 'a sense of being there) and how to measure it, using questionnaires [2][3] or physiological measures [4]. In our studies we take the view that a sense of place, and what constitutes a particular place is one important aspect of 'being there', and to explore this we take a predominantly phenomenological approach to the studies.

We take the view that experience of place is a product of the physical environment (the space) and its subsequent interpretation by the visitor (the place). In doing so we have borrowed heavily from Relph's model of place [5] which defines three components of 'place identity' and used them as a general framework for the testing procedure and development of the presence probe.

- Physical setting
- Activities afforded by the place
- Meanings attributed to the place

4. Previous Study Techniques

During earlier studies [6] we used a range of standard techniques to measure the sense of presence experienced by users of real and virtual environments. These included the Immersive Tendencies Questionnaire [2], ITC-SOPI [3], talk-aloud with video recording, structured interviews and repertory grids [7]. While these methods proved useful, only the talk-aloud, structured interviews and repertory explored the participant's sense of place, however these were extremely labour intensive and often produced vast quantities of data.

5. Developing the Presence Probe

The presence probe is designed to be an in-situ tool for uncovering the aspects of a real and virtual environments which are important to the participants sense of place and presence. Adopting this approach allows us to compare (or benchmark) real and virtual environments. This is particularity important with the BENOGO project as it deals specifically with re-creating real world scenes and we need to be able to measure the effectiveness of the scenes and to provide information to the designers

In designing the presence probe we wanted to develop a method which could be administered to several people with minimal supervision at the chosen real world and virtual locations, and would therefore be less labour intensive than interviews and repertory grids. While at the same time capturing a rich and diverse range of data.

5.1. Aspects of the Presence Probe

The presence probe consists of several sections, the first contains basic profile information for example, age, gender, nationality and whether they are a frequent visitor to the scene. The remaining sections specifically explore aspects of presence and place. It is hoped that while each part may uncover different data certain themes will emerge across the various parts.

5.2.1. Part 1

This part is based on the idea of a visitors book which was explored in an earlier study [8], where participants are asked write down a few sentences about their experience of being in the place they have just visited.

5.2.2. Part 2

This part focuses on the design and layout of places from a navigational perspective. Here, what we hope to gain are maps of people's experiences of the places they have just visited. The objective is to identify the most salient aspects of the environment, where people stand and to a limited degree how they move about within the space. At present there are some restrictions on the level of interaction, movement and rendering of the graphics within the BENOGO environment. The data uncovered in the sketch maps will be useful in focusing computing resources on relevant aspects of the scene, such as having higher resolutions on key objects, the location of the participant and deciding on augmentations.

5.2.3. Part 3

Part 3 is based on Osgood's [9] semantic differential studies. This is similar in a way to Kelly's [7] repertory grids but aims to be quicker. Osgood's differentials aim at developing maps of the connotative associations people have with certain words. Here we are attempting to employ the same idea to uncover the associations people have with the places they visit. The differentials we have developed have been based on constructs we developed for the repertory grids used in a previous study. Essentially we have combined Relph' s 3 conditions of place (physical features, activities afforded and affect engendered) with Osgood' s 3 axes of semantic differentials (evaluative [good-bad], potency [strong-week], activity [active-passive]). In this way we get 3 sets of 3

differentials. The first 3 consider the physical attributes of the place. The second 3 are about the activities that can be done in the place. The third 3 are about the effect of the place on the visitor.

5.2.4. Part 4

During part 4 a photograph-based approach is used, similar to the one used in Gaver's cultural probes [1]. In our version the researchers take a number of photographs on our initial visits to the various locations. These will then be put together to form a pack of photographs for a specific place. Participants are then asked to pick a photograph from the pack that best exemplifies their experience of the place. This method helps us gain an insight into what sorts of visual elements are an important part of the place and how different visual aspects of the environment affect the experience.

The final part of this section asks people to write down six words which best describe the experience of the environment they have just been in or are visiting.

6. The Prague Study

During December 2003 we completed our first study using the Presence Probe on several locations in the city of Prague. Prior to visiting Prague we consulted a range of tourist information sources such as Rough Guides, Lonely Planet and websites. This was appropriate for two reasons, initially as a group we were primarily visiting Prague for the first time which is similar to many tourists, and secondly the aim of BENOGO is to make public scenes available to those who can't visit the real world location. Therefore it was assumed that if the location was featured in guidebooks and websites it would be of interest to real and virtual visitors. Also the guidebooks are in themselves descriptions by an individual of locations and are in some ways another source of data.

From consulting the guidebooks and the project partners in Prague we then drew up a short list of locations which were of interest to the developers from a technical perspective, were feasible for them to create and were interesting places.

On arriving in Prague we visited the various locations on the short list and evaluated them against a technical checklist (known as 'the place suitability checklist') which examined items such as consistency of the lighting, the geometry of the scene (i.e. number of straight lines) and the number of people in the scene. We also took notes, photographs, and completed the presence probe ourselves. Based on these preliminary visits we decided on a final shortlist of five locations which were of interest to us from a technical and place perspective. While in Prague we completed three studies at The Church of St. Nikalas, The Czech Technical Museum and a hill-top with a panoramic view of Prague.

6.1. Methodology

Participants came from range of countries and to accommodate this the probe was available in Czech, English, French, Italian and German. All participants were people who were already visiting the location were paid 150CZK (approximately £3) for taking part. On average each participant took around 15 minutes to complete the probe.

Nearly all participants had visited the selected location and we approached them to ask if they would like to complete the probe. The only exception being the hill-top panoramic view, due to it not being on main road we had to approach most people in order to invite them to take part.

In general the participant groups were fairly mixed in terms of gender and age, with the exception of the Technical Museum which was predominantly children aged between 12-16. This was due to a number of school trips taking place on the day we carried out the study. All groups had around 30-40 participants. Despite the diverse age range used in the studies we did not experience any problems with people understanding the questions, this is unlike some of the previous methods, in particular repertory grids which often confused those taking part.

While at the various locations we also took sound recording, which could either be used in their entirety or to generate electronic soundscapes.

6.2. Some Sample Responses

Early results from the probe suggest that the participants understood what they were doing and we willing to provide rich responses, however the level and quantity of detail varied. In this section we've randomly chosen a selection of the answers from a range of participants.

The responses in the following samples (Figures 1-6 and Table 1) illustrate the diverse types of responses the probe encouraged. In the first example it is clear the visitor to the Czech Technical museum could imagine more than was actually presented, their other comments pointed to the importance of the lighting conditions and the openness of the space, these are important within the BENOGO environments as it is possible to alter the brightness and perspective.

Part 1:Please write a paragraph of description telling us about your experience of being in the place you have just visited

"Very impressive, not what I had expected. The transport and the exhibits are engaging both visually and from an educational sense also. Lots of imaginable action and movement, even through everything is very still, it was a relaxing and subtly informative experience, enjoyable in the way that everything was familiar, yet different. Bright, open space, full with exhibits but not empowering or stressful."

Figure 1. A response by a visitor to the Czech Technical Museum

Part 2.1: Pick 3 features of the environment that you remember and tank them in order of importance:

(1) Very Quiet

(2) Good view of Prague

(3) Contrast to the big city Prague.

Figure 2. A response by a visitor to the hill-top panoramic view.

	Very	Quite	Neither	Quite	Very	
Attractive	√					Ugly
Big	√					Small
Colourful	√					Colourless
Noisy				√		Quiet
Temporary				√		Permanent
Available		√				Unavailable
Versatile						Limited
Interactive		√				Passive
Pleasant	√					Unpleasant
Interesting	√					Boring
Stressful				√		Relaxing

Table 1. Responses to part 3.2 by a visitor to the Technical Museum.

The above table illustrates the responses to part 3.2, in relation to the Technical Museum. Such data is useful for uncovering relevant physical, activity and affective attributes of the space. We should then be able to carry out the same analysis on the virtual environments and be able to see whether participants are having similar experiences.

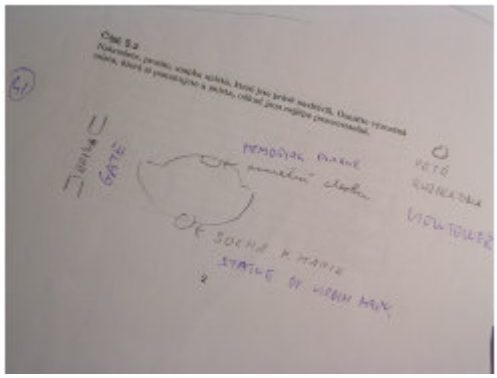

Figure 3. Part 2.2: A sketch map drawn by a visitor to the hill-top panorama

Figure 4. This was the one of the more commonly selected photographs of Prague

Part 4.2: Please write down six individual words which best capture your experience of being in the place you have just visited.

(1) Intense

(2) Dramatic
(3) Slightly stressful

(4) Overpowering
(5) Slightly impersonal

(6) Strange

Figure 5. Comments made by a participant about Saint Nikalas Church.

Part 4.3: Please write down the sounds which remember most from the environment you have just visited.

noise of the loudspeakers

Figure 6. A comment about sounds in the Technical Museum

7. Conclusions

This paper has discussed the development of a new method of recording the sense of place people experience, from the perspective of capturing a rich set of data quickly and more easily than interviews and similar methods. The probe has been developed following extensive empirical studies using other measurement methods, such as ITC-SOPI and interviews.

At this stage we believe the probe allows us to capture a sense of place in both the real and virtual scenes. This allows us to provide information to the developers of the BENOGO environments on the key features of the scenes. It also acts as an evaluation tool as it allows us to compare the real and virtual scenes.

8. Acknowledgements

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9. References

(1) Gaver, W., Dunne, A., Pacenti, E. (1999) Design: Cultural Probes. In Interactions: New Visions of Human-Computer Interaction. ACM Inc.

(2) Witmer, B.G and Singer, M.J. (1998) Measuring Presence in Virtual Environments: A Presence Questionnaire, Presence 7(3), 225-240.

(3) Lessiter, J., Freeman, E., Keogh, E. and Davidoff, J. (2000). Development of a New Cross-Media Questionnaire: the ITC-Sense of Presence, 3rd International Workshop on Presence.

(4) Slater, M., Brogni, A,. and A. Steed. Physiological Responses to a Break in Presence. In the Proc. Presence 2003: The 6th Annual International Workshop on Presence.

(5) Relph, E. (1976) Place and Placelessness, London: Pion Books.

(6) McCall, R., O'Neil, S. and Carroll, F. (2004) Measuring Presence in Virtual Environments. Proceedings of the CHI 2004: Conference on Human Factors in Computer Systems. Vienna, Austria.

(7) Kelly, G. A. (1956). Rep and Res Tests. Columbus, OH: Ohio State University

(8) Turner, P. and Turner, S. Two Phenomenological Studies of Place. Proc. British Computer Society Conference on Human-Computer Interaction

(9) Osgood, C. E., G. J. Suci and P. H. Tannenbaum, (1957) The Measurement of Meaning, University of Illinois Press, Urban