

# Dramaturgies of PLACE: Evaluation, Embodiment and Performance in PLACE- Hampi

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## ABSTRACT

This paper examines an extensive user evaluation survey undertaken during an installation of *PLACE-Hampi*, a custom-built augmented stereoscopic panoramic interactive cultural heritage installation. The evaluation draws on the responses of 284 users of the system. This study is highly significant for two reasons. Firstly it is one of only, a few extensive evaluations undertaken to date on interactive virtual cultural heritage work designed for a mass multicultural public. Secondly, the work has traveled extensively for the last 4 years worldwide to major cultural venues, experienced by thousands of people and enjoyed a high degree of public success. The analysis here focuses on selected sections of the survey providing insight into a) virtual embodiment, dwelling and immersion, co-presence and aspects of performance between user, system and spectators—that is, the dramaturgies of PLACE. The analysis of the *PLACE-Hampi* installation also provides rich observational and quantitative data on the power of stereoscopic, panoramic interactive display systems for the exploration of heritage landscapes. The results of the analysis are highly significant for designers of situated multimodal immersive entertainment in museums and galleries.

## Categories and Subject Descriptors

**H.5 [Information Interfaces and presentation]:** Multimedia, Animations, Augmented realities, Audio Input/Output, Evaluation/methodology.

**H.5.2 [User Interfaces]:** Evaluation/methodology, Graphical user interfaces, Input devices and strategies; Interaction styles Screen design Theory and methods, User-centered design.

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**H.5.5 [Sound and Music]:** Computing-Methodologies and techniques.

**J.5 [Arts and Humanities]:** Architecture, Arts, fine and performing, Literature, Music, Performing arts

## General Terms:

Documentation, Performance, Design, Experimentation, Human Factors, Theory

## Keywords:

Virtual heritage, stereoscopic, panoramic, ambisonic, evaluation, embodiment, performance, presence, co-presence

## 1. INTRODUCTION

*PLACE-Hampi* is described as a vibrant theatre for embodied participation in the drama of Hindu mythology focused at the most significant archaeological, historical and sacred locations of the World Heritage site Vijayanagara (Hampi), South India. The installations' aesthetic and representational features constitute a new approach to the rendering of cultural experience, and give the participants a dramatic appreciation of the many layered significations of this site. The innovations in technologies surrounding the creation of *PLACE-Hampi* (hereafter *PH*) and its aesthetic, interpretive and design choices have been extensively described in previously published papers [20] [21] [22] [23] [24]. The *PH* website [46] contains video documentation of the installation and the reader is referred to it to appreciate the works' multimodal interaction paradigm, central to the discussion in this paper. *PH*'s main features will be briefly re-stated here.

*PLACE-Hampi* uses an innovatively designed visualization and interaction environment to articulate the viewer's co-presence in a narrative re-discovery of this cultural landscape (Figure 1). It is based on the artistic paradigm developed in 1995 by Jeffrey Shaw for his seminal installation *PLACE* as the interactive artwork *PLACE-A User's Manual* (and subsequently *PLACE-Ruhr* in 2000, among others). *PLACE* was renovated for stereoscopic projection by Kenderdine and Shaw in 2006. The success of *PLACE* as a compelling panoramic display system has been enduring; however it was not until 2007 that it was subject to

extensive user evaluation.

In *PH*, using a motorized platform the user can rotate the projected image within an immersive 9-meter diameter 360-degree screen, and explore high-resolution augmented stereoscopic panoramas showing many of Hampi's most significant locations. The scenography within *PH* shows a virtually representative boulder strewn landscape that is populated by a constellation of eighteen cylinders, each one of which being a high-resolution 360-degree stereoscopic photographic panorama (see Figure 2).



**Figure 1. PLACE-Hampi platform with 360-degree stereo-capable screen and a rotating platform for user in centre**



**Figure 2. External views of panoramic cylinder distributed in the virtual landscape.**

Embedded within the rich scenery of some of these immersive panoramas, and precisely composited into their three-dimensional landscapes, are narrative events enacted by computer graphic characters based on the Hindu mythologies. These animations are modeled on the popular aesthetic of magical realism that is specific to the region. The panoramic cylinders are positioned in a terrain whose ground is marked with an iconic drawing of the simian god Hanuman, and is a symbolic representation of Kishkindha; the mythological monkey kingdom depicted in the Ramayana and considered to be located at Hampi. The monitor screen that is part of the user interface shows an aerial view of this

virtual environment centered on the viewer's position there, where the panoramic locations are arranged in relation to the 'ground plan' of Hanuman's body (see Figure 3).

The visual landscape is conjoined by a spatial aural field made from ambisonic 360-degree recordings that were recorded on site at Hampi at the exact location and time of each panoramic photograph. The panoramas that are augmented by the animations of the Hindu Gods are further enlivened by classical Carnatic musical compositions. As the user controls and navigates the space, the dynamic interactive rendering system delivers an immersive sonic experience that is intimately connected with the visually panoramic and augmented space. The conjunction of these singular audiovisual and interactive strategies of representation articulates an unprecedented level of viewer co-presence in the narrative exploration of a virtual cultural landscape. A single-user interface *PH* accommodates up to 25 people who freely move about the space responding to the primary user's orientations of the viewing window anywhere in the 360-degree screen. As such work can be broadly described as a virtual theatre for interactive cinematic experiences.



**Figure 3. LCD interface on platform showing 'steering' handles and driving controls.**

## 1.2 Context for evaluation

*PLACE-Hampi* was commissioned in celebration of France India year in 2006. It has toured internationally including: Lille3000, France (Oct 2006-Jan 2007); Berlin Festival, Martin Gropius Bau, (Oct 2007-Jan 2008); Panorama Festival, KZM, Karlsruhe, (Jan 2008-Mar 2008); eArts/ eLandscapes, Museum Science & Technology, Shanghai (Sept 2008). *PH* is currently installed in as part of a 14-month archaeological exhibition on Hampi, Ancient Hampi, The Hindu Kingdom Brought to Life at the Immigration Museum, Melbourne (Nov 2008-Jan 2010). The work is highly popular for multicultural audiences, demonstrating observable pleasure for its participants. It is pertinent to evaluate specific qualities of this experience to make explicit the strategies that contribute to its achievement as an immersive and interactive

interface. The survey provided an opportunity to examine the phenomenon of audience experience ‘in its real life context’, especially in an environment where ‘phenomenon and context are not clearly evident’ [45].

The evaluation of *PH* fills a useful gap in knowledge for those working in interpretive heritage, museums and other cultural agencies for three primary reasons. Firstly, there are few evaluations done on cultural heritage based virtual reality works in the public domain (notable exceptions are the research of heritage and museum professionals working with technologies such as Dallas [10] Forte et al, [3] Economou & Pujol [51, 52], Bonini [2], Roussou [34]). Prior research in the field of virtual heritage applications has pointed out ‘... a wide percentage of projects and applications of virtual heritage are never experimented and monitored with people, but they born and die in digital labs’. [15] In addition, evaluation of new media and virtual heritage applications has been problematic, without any well-defined guidelines for conducting such assessments. In many cases, the evaluation is related to the content itself (‘was it an accurate 3D model’ or not?) and not the analysis of users’ interactions and behaviours. [3]

Secondly, ‘interaction and feedback determine the virtual embodiment’ [16] a vital component to ‘the empathy factor really crucial for learning and communication’. [53] The *PH* survey provides many examples that explicitly draw out this interaction paradigm. The qualitative findings support the strategy that multimodal interactive worlds that focus on kinaesthetic and multisensory amplification can play a significant role in the interpretation heritage landscapes. As post-processual archaeology focuses on media, the importance of embodiment and ‘presence’ and, an artistically informed inquiry into interpretation comes strikingly to the fore. For example, see post-processual theorists Webmoor [39] [40], Witmore [43] [44] and Shanks [36]. The Presence Project (a conjunction of scientists, archaeologists and artists) recognizes the importance of immersion to the theatre of archaeology. [35] The evaluation of *PH* contributes to this emerging field of enquiry in the disciplines of archaeology and heritage.

Finally, cyber archaeology researchers Forte & Bonini reinforce the necessity for considering the cognitive learning models through *enaction* and embodiment emphasizing that “knowledge is enfolded in movement”. [4] This is the premise for body-anchored and experience based learning. Similar arguments for a primary acknowledgement of the body (and cognition) in the creation of meaning has been occurring across material studies, new media and cinema studies for some time e.g. [5], [37], [38]. Place-Hampi, supported by its analysis, extends this to the domains of interpretive cultural heritage and asserts a primacy for enaction through its strategies of immersive/interactive architecture and content development.

### 1.3 Evaluating phenomena in PLACE

This paper analysis *PH* using the results of a four-page form based questionnaire [50] through a phenomenological [32] framework aimed to draw specific insights and enrich the existing discussion of audience experience inside the immersive interactive works. The immersive qualities of *PH* include the power of panoramic enclosure is well documented in the historical analysis of optical devices e.g. [6] [7] [31]. The use of the panoramic strategies for the development of interactive digital

heritage has also been described e.g. [23] [25] [26]. The panorama has also been the basis for the development of new stereoscopic systems for enclosing multiple participants in hybrid multimodal spaces. Additionally the panorama is the foundation for new development in immersive machines such as the Panoscope 360 [47], Allosphere, [48] and Twister [49].

*PLACE-Hampi* combines the scale and architecture of the panorama with stereographic rendering. *PH*’s success as a kinaesthetic embodied theatre of experience is due in part to its use of stereoscopy in the way the circular movement of the projected image obligates the viewers to walk about in the installation space. Generally speaking, most media images are presented on surfaces such as the printed page, monitor and projection screen, and however illusionistic they appear, they are constrained within the boundaries of those 2D surfaces. We live in a three dimensional world, the perception of which is due to a number of factors. In the 1838 Charles Wheatstone in his discussions the stereoscope, identified ‘stereopsis’ and ‘binocular disparity’ as a key determinant of depth perception. [41] More recently, James Gibson [18] pointed out that movements in the world provide “optic flow patterns” which the brain reads to give us a perception of three dimensions. If we move around, we see the objects of the world moving across our visual field relative to each other. Thus, *PH*’s conjunction of stereo-vision (via its stereoscopic renderings of the Hampi landscape) and optic flow (via the mobility of the viewer’s bodies within the projection arena) allows it to constitute a level of perceptual and kinaesthetic realism that explains the strong engagement of its virtual world that the majority of viewer’s expressed in the evaluation reports. Users of the *PLACE-Hampi* system can be summarised by the following comment: “I myself am part of *PLACE-Hampi* and I determine in which part of the artwork I stay”. [19]

Digital technologies can be contextualized within the historical frameworks of human experience and immersion in all types of media. Interactive and immersive cinema has clear links to performance, ritual, theatre, and the circus. The inter-play between the immersion and the nature of the interactive cinematic of *PH* is highlighted through such comments as: “[...] one gets the feeling that one is ‘inside’ the film and can direct the film” [19] and, “It has something of a stroll through a virtual world and I am my own cameraman”. [19]

## 2. THE EVALUATION

### 2.1 Survey Data

The evaluation survey was undertaken in English/German at the Martin Gropius Bau, Berlin in September 2007 and the results were tabulated for 284 respondents over the course of one week. To analyze the HCI design of *PH* in relation to the body and experiential qualities of the work, the questionnaire was clustered thematically:

1. Orientation / navigation / negotiation / spatio-temporal
2. Bodily experience of the space / embodiment
3. Relationship between user and content / cross cultural aspects/the cinematic
4. Relationship between user and interface usability / participation / co-presence / orientation
5. Level of immersion (“being there”, presence, sense of travel)
6. Flow (time spent, level of involvement)
7. Social experience levels: individual and co-experience

The aggregated data for all respondents can be found on the project website. [50] We have chosen within the confines of this paper the data related to embodiment, immersive effects (including dwelling time), and *PH* as a social experience. Selected results to relevant questions (refer to online questionnaire for specific question numbers) can be seen in the Table 1).

Social experience

An overview of the data:

question no	reference	data			
1c	"Move or stand?"	Move: 205	Stand: 57		
		time	people	time	people
1d	"Time Spent"	1min: 11	5min: 99	10min: 106	
		20min: 29	30min: 4	60min: 5	
		60+min: 1			
		responses			
2a	"others presence?"	Yes: 87	No: 166		
2b	"Social exp?"	Yes: 87	No: 166		
4c	"Self-conscious"	Yes: 90	No: 34		
4d	"Self better"	Yes: 84	No: 38		
5d	"too many ppl"	73			
5e	"prefer to watch others"	44 (scopophilia)			
6c	"lose awareness?"	Yes: 75	No: 107	Sometimes: 70	

Table 1. An overview of social experience results to questions in the evaluation survey

## 2.2 Embodiment, Dwelling, Immersion

Respondents to the survey registered the impacts on the body by indicating upon a blank diagram of the body. Perhaps predictably due to the stereoscopic and ambisonic spatialized audio strategies in the application, the emphasis for engagement with the body focused prominently on the eyes, ears and hands (related to driving the rotating platform). For the aggregated data from all 284 respondents, see Figure 4.

It is worthwhile to note here that several responses to this question also indicated that physical responses were established beyond the ‘mere’ cognitive functions of viewing and steering the platform, and point to more ‘esoteric’ physical and indeed properly ‘embodied’ connections with the work (see Figure 5).

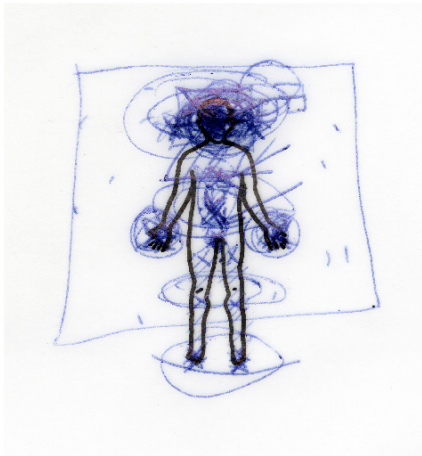


Figure 4. Graphic of *PH* aggregated data indicating where 284 participants felt the experiences on their body

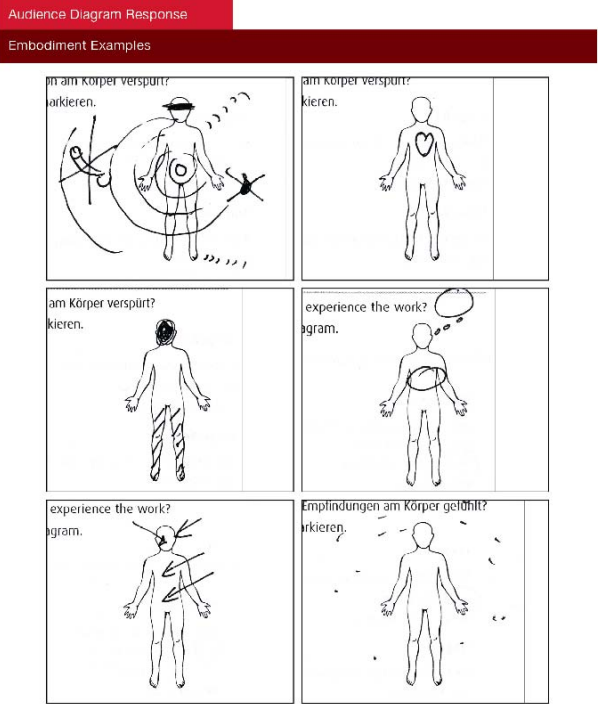


Figure 5. Graphic of *PH* individual response data indicated extra perceptual engagements.

Further support of the immersion effects was confirmed when 145 respondents confirm that they fully or partially lost ‘awareness of the other visitors’.

One of the audience reports: “I was so immersed that at one point I thought that was the reality, I was in those places, I was traveling. Then the projection went on the [exit], I have seen persons entering the door and I remembered that it was a virtual reality”. Another says: “When one operates [the platform] oneself, one completely dives into the world.” [19]

These responses to the engagement and dwelling time in *PH* significantly differ from standard museum-based exhibits, which, in a widespread survey of both passive and interactive exhibits estimated the average time spent was between only 13.8-23.8s. [42] Observational studies and interviews currently underway at *PH* at the Immigration Museum, also report multiple-visitations to the installation for extended use of the machine. *PLACE-Hampi*’s powerful immersion draws participants into a somatic engagement with the virtual in a way that is largely unprecedented in museum-based multimedia. The acts of either driving or walking are primary activities by which people view the world and this can account for some of the strong immersive effects of the system. Flow [8] [9] generally relies on an explicitly goal-driven activity in which feelings of success or frustration establish a crucial dimension of emotional and psychological involvement. The flow in *PH* by contrast emerges from inhabitation and the kinaesthetic in a way that traditional museum learning styles do not. As one user observed ‘*PH* lets you think, it does not tell you what to think’. [19] It is argued by the authors that *PH* points the way for increasingly embodied interfaces that are compelling for experiential learning and strategies of stereoscopy, spatialized



audio and panoramic immersion are primary attributes for such a system.

Between the user and the system, the concept of embodiment is of primary concern. Embodiment as a participatory activity is the foundation for exploring interaction in context, and is well supported in *PH* as the data proves. It is generally assumed that the conditions for successful immersion operate exclusively, and by losing the awareness of the surrounding environment. What is notable in the case of *PH* in addition to its immersive attributes is how the works functions as a social experience. For museums, the social is a primary mandate for experience and learning environments. The survey questions explore how the group of up to 25 participants interacts with each other revealing levels of social activity (see Figure 6).

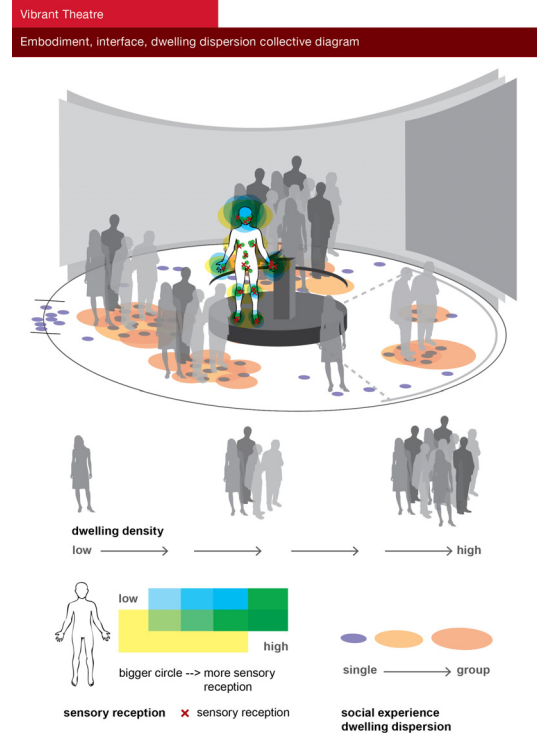
When asked directly ‘was it a social experience that you shared with other people?’ 137 responses confirmed this. It is often observed in the operation of this system that spectators will ‘direct’ the user of the system, indicating their preference of where to go in the virtual world. It is not unusual also for spectators to encourage the user to relinquish control, if they feel too eager to take control.

Co-experience is understood as the experience that users themselves create together in social interaction and share with others. Co-presence, the tacit awareness of others’ presence in the space, is clearly evident in the data. Firstly, the proximity of other audience members and the continual movement of the audience in accordance with the rotation of the platform predicate an explicit awareness of dwelling together in the space (see Figure 6). This mutuality constituted an opportunity to collaboratively journeying in *PH* and the cognitive challenges of inhabiting the virtual and real worlds simultaneously. About 15% of all interface users, collaborated in order to negotiate interface use.

### 2.3 Interface, interaction and co-presence

The analysis of *PH* concerned with the interface and its use strongly suggests that there was virtually no trepidation or hesitation in using the interface. Only 7 respondents note that they did not ‘feel confident’ while 117 respondents used the rotating platform without hesitation.

The vast majority of interface users considered ‘it easy to use’ (119 ‘yes’ 7 ‘no’). For a museum environment, this level of visitor interaction presents an impressive outcome. It is worth pointing out that the collective approach to understanding an interface (one with no instructions) creates a social dynamic of exploration and self-discovery/learning that is denied if delivered by a customer service manager or dedicated guide. The design philosophy taken to *PH* is that the systems should act independently of expert interpretation, available for non-specialist discovery.



**Figure 6. Graphic from the aggregated data: embodiment, interface, dwelling & dispersion.**

While a majority of respondents indicated that it was more enjoyable to ‘drive’, rather than watch others (84 ‘yes’) a number that should not be neglected responded (38 ‘no’). There is an observable pleasure provided by ‘just’ watching the performance of journeying through and around *PH*. Driving or watching, in fact seems attractive. Complexity on this issue is increased when reflecting on the question (‘were you self conscious that other people were watching you [while operating the interface]?’) Ninety responses affirm this sense of being watched, 34 do not. The 38 responses stating they preferred to watch are open to psychological interpretation. Firstly, the preference may be related to subjective comfort as it presents a safe mode of being inside *PH* representing a kind of withdrawal from the more active role of ‘driving’, into spectatorship. Secondly, the preference may be related to experiencing emphatically the visual 3D theatre and may in fact constitute a positive *scopophilic* dimension of the love of watching. Most people have a history of watching that comes from the cinema or TV, rather than one of interaction and performance. When as “Were you self conscious that other people were watching you [while operating the interface]?” Ninety responses affirm this sense of being watched, 34 do not. These are the dramaturgies of *PH* explored further in the following section.

### 2.4 PLACE-Hampi as performance

Recognizing the performative qualities of the human-computer interface (beginning with Laurel [27] and Auslander for example) suggests ‘one might invent the computer as performance’ [1]. In terms of the *trichotomy* of the system-user-spectators,

embodiment implies a reciprocal relationship with the context—encompassing users, interactive systems, spectators, co-users, physical surroundings and the meanings ascribed to these entities. [11] [14] Reeves *et al* address the issue of “how should a spectator experience a user’s interaction with the computer”. [33] Borrowing from performance theory the user is the inter-actor with the system and the interaction between the user and the system is the performance. While this user/system relationship is what is most described in media art and HCI, it is the *audiences/participants* relation to and experience of the performance that is also of interest.

*PLACE-Hampi* design relates not only to support the direct relationship between the user and system but also the resulting performance with its spectatorial scrutiny. This interchange, between all participants gives rise to meanings of the social for interaction design—as a defining attribute. A portion of the *PH* survey in Berlin focused on the performative aspects of the trichotomic relationships.

As Dalsgaard and Koefoed-Hansen describe:

“It is the ways in which the user perceives and experiences the act of interacting with the system under the potentially scrutiny of spectators that greatly influences the interaction as a whole...it is precisely this awareness of the (potentiality of a) spectator that transforms the user into a performer”. [12]

To highlight the unique experience of theatres (and by extrapolation virtual theatres such as *PH*) as a participatory experience, performance theorist Gay McAuley contrasts classic static cinematic experiences to those of theatre: “Actors are energized by the presence of the spectators, and the live presence of the actors means that the spectators’ relationship to them is very different from the relationship between spectator and dramatic fiction in the cinema. In the theatre, due to the live presence of both spectators and performers, the energy circulates from performer to spectator and back again, from spectator to performer and back again... the live presence of both performers and spectators creates complex flows of energy between both groups”. [30]

The key to this relationship is the ‘awareness’ of others, and that provides the context for individual activity of performance that is *in tension with*, immersion. The tension that occurs is between the spectators watching the user and the users’ awareness of being the centre of the spectators gaze. The user not only acts in relation to the system but also is propelled by the knowledge that her perception of the system is a performance for others. Dalsgaard and Koefoed-Hansen call this *performing perception* [13]. The user simultaneously engages in three actions: the act of interacting with the system; the act of perceiving herself in relation to the system and her surroundings and; the act of performing. The spectator invests in the user as a surrogate self, demanding a ‘correct’ performance of the system that brings forth the performance. These acts of perceiving and performing are central to the overall form and expression of *PH*.

The theoretical discussion of the performative qualities of the ‘virtual theatres’ often neglect the primary communication that occurs between people co-present in the real world space as they perform in the theatre of the virtual. The aesthetics of interaction is “rooted in the user’s experience of herself performing her perception” [11]. Performance theory and sociology combine with the understanding of how HCI works to suggest that the user is

simultaneously the operator of the system, the performer of the system and the spectator. In multi-participatory works, which embody a single-operator/user and multiple spectator a host of tension exists, between the user and the spectator, and between the user and the system itself. Understanding these relationships provides insight into future design scenarios and can usefully be employed in describing *PH*.

### 3. CONCLUSION

Many aspects of the *PH* evaluation are not covered within the confines of this essay. One significant aspect is related to the cross-cultural appreciation of the work and this is subject to upcoming papers [19]. In this paper we have chosen to focus on issues concerned with the phenomenological and the social experiences of the work as a form of interactive theatre where users are protagonists and the audiences have rights to intervene. This paper puts forward strategies for evaluation that which can be used in the analysis of other immersive systems. Single user interfaces such as *PH* will always have an inherent tension between full immersion and the surrounding environment (made up of both the machine interface and the other participants). From a museums perspective the social dynamics set up in *PH* are one of its desirable features. The findings support the strategy that multimodal interactive worlds that focus on kinaesthetic and multisensory amplification can play a significant role in the interpretation heritage landscapes from a phenomenological perspective. Stereoscopy, panoramic visual and auditory immersion, are the works signature strategies. *PH* is a unique HCI that has demonstrated design qualities explored in this paper.

The approach taken to the *PH* evaluation and analysis provides persuasive data for museums contemplating such systems in the main stream of their exhibitions, one that supports the museum as a place of ‘civic seeing’ [55]. One of the most significant interest for the authors of *PH* and works of its oeuvre (see for example *The Virtual Room* [26] [51], is an investment in the re-socialization of public spaces harnessing the power of large scale virtual systems, where participants come together for collective exploration, situated gaming or learning experiences. Museum ICT for the public is currently characterized by ‘interactives’ often for single users which do not exhibit ‘performance’ qualities or, audio guides which isolate users from one another (the authors acknowledge that there is increasing research in producing ‘open’ audio systems for headphone wearers that do not isolate the user). It has been argued that the primary learning experiences and potent memory experiences in museums take place through the processes of social inter-action (and not technologically enhanced social isolation). [42] The questions asked in the evaluation sort to draw out aspects of the experience not often asked in the museum context. The *PH* evaluation seeks to demonstrate and analyze the success of its interactive strategies in the real-world setting of the museum. The authors believe the research can inform other similar evaluations.

### 4. ACKNOWLEDGMENTS

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