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Mediation of Knowledge Construction of Historic Sites through Embodied Interaction

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Abstract

This paper focuses upon the reframing of cultural heritage as bodily experience articulated through narrative based media. The concept of mediation is introduced and explored, as a knowledge intensive process that integrates the production and construction of information interfaces. Such interfaces are negotiated through, and translated by, bodily interaction and bodily reasoning. As such, the mediation process is shaped through the reformulation of kineasthetic, somatic and embodied experiences, that both, customize the interaction process, and shape the resultant outputs that effect construction of knowledge. For enhancement of the mediation process, guidelines for maintaining the integrity of the mediation are discussed. The approach is demonstrated over several projects that explore these concerns through low fidelity prototypes executed in an experimental manner.

Keywords-- - cultural heritage, mediation, embodied interaction, information visualisation, visual analytics.

1. Introduction

The work in this paper references theoretical framework drawn from discourses that seek to go beyond documenting cultural heritage through predominantly textual modes of representation focused on the documentation of specific sites. With the rapid growth in participative media, embodied in Web 2.0, the focus has shifted to creative production as a primary means of interaction that overshadows previous modes of interaction such as basic access with databases, archives and search engines [1]. As such, meaning is increasingly expressed in relation to a person's experience and interaction with various bodies of information that provide scenarios for exploration and knowledge construction. Such a shift, from passive mode of production to interactive and dynamic production, generates a different model to merely providing access to information. For cultural archives, such as Heritage Housing, this provides issues for representational strategies and innovative access to archival narratives within the heritage sites.

The value of interactive narrative for increased understanding of site - specific cultural content through embodied knowledge has advantages. This is in line with the work of phenomenological archaeologists who have supported the construction of knowledge systems that reference embodied sensory experience. Importantly for this work such experience is situated, considering interpretation of the past as subjective and relational. One of the benefits of such a shift in relation to cultural heritage is, the centrality of the body to create and engender dialogue based upon how the body represents the affective, corporeal and sensuous dimensions of human knowledge [2], [3].

Taking an embodied view of heritage housing provides the opportunity to decode what is often a static hierarchical geometry. Rather, the space when considered somatically becomes a space of bodily movement and sensory experience. It has been argued that kinesthetic experience is fundamental to any experience of space grounding that experience in the body itself. Through the years researchers have suggested that: (i) skilled movement is a form of thinking [4], [5]; movement is predominant in all forms of human intellectual activity [6], [7], [8], and, children learn to communicate with gestures before they learn to speak. There is research supporting the use of metaphoric thought and schemata based upon motion as a fundamental basis for the understanding of space by humans. People constantly create relations in their lives between physical reality and abstract concepts. People's conceptual structure of information space often references particular metaphors where the underlying visual schemata are based upon physical motion [9]. These form deep recurrent patterns developing image schemata. This is in line with recent research in neuroscience that indicates a neural basis for embodied understandings, specifically, in relation to mental imagery, association and memory. Some researchers now support the perspective that many, if not all, higher-level cognitive processes are body-based in the sense they make use of (partial) simulations or emulations of sensorimotor processes. Such simulation is through the re-activation of neural circuitry that is also active in bodily perception and action [10]. The argument is given that such constructs embodied in sensorimotor processes will still reference the physical system they are derived from, even when they are linked to abstract concepts.

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Similarly, understandings of basic spatial concepts are intrinsically linked to how we orientate and move in the physical world. Such bodily reasoning references the experience of the structure of our bodily movement in space.

In this paper we explore three projects that demonstrate, through low fidelity prototyping, aspects of these issues and experimental solutions. We report on an interdisciplinary lab for university design students. The students were required to respond to the brief of, how can mediation be 'framed' in cultural heritage through narrative driven interactive media. The aim of the project was to design and simulate an act of mediation into a historic house in Sydney, Australia. Two sites were selected, Elizabeth Bay House and Vaucluse House, shown in Figs 1, and 2. Both sites are under the governance of the Historic Housing Trust (HHT) of NSW, who actively contributed to the dialogue in their role as an industry partner. HHT is a statutory authority within Communities NSW. It is "one of the largest state museums in Australia and is entrusted with the care of key historic buildings and sites in New South Wales.[1] HHT was interested in engaging with archival material through bodily experience. A focus of the work was to heighten the experience of the visitors to historic housing through low budget solutions that still engender creative production as a primary means of interaction.

Discussions of embodiment are framed from the perspective of the cultural heritage visitor as end user. The work was completed over one semester and involving little, or no budget, allocation.

2. Mediation

Mediation in this work is considered a knowledge intensive process that shapes how information is retrieved through bodily reasoning. Mediation is considered site specific and is an interaction with a previously existing, or present, space that can reflect traces of habituation, layers of materiality, topologies of structures, landscapes, atmospherics, and / or artifacts. Mediation can be mapped through a system framework, that is, considering the context of the building and its ecology. The building is reconceived as a multi - dimensional information system open to interpretation from different views rather than investigated through static image making. The process of information inquiry and bodily reasoning shape the construction of knowledge as dynamic events contributing to the narrative. Through 'framing' duration is addressed providing a certain set of information, one that is informatic. This set of information is only one in a field of relations within the whole.

It was central to the approach to keep the mediation within the confines of the heritage buildings. This was a deliberate choice given the HHT's desire to increase the visibility and experience of visitors within the physical boundaries of each site.

Figure 1. Elizabeth Bay House

Figure 2. Vaucluse House

Thus, the direction explored centered on augmenting the physical world, rather than utilizing online repositories of knowledge. The act of mediation is perceived as a 'change agent', where the experience is shaped through the visitor's form and modality (or modalities) of interaction. It is this process that provides the individual semantics derived from the context. In this sense the visitor is also being transformed by the experience derived from the mediation.

2.1. Maintaining the integrity of the mediation

Creating well-constructed and consistent visual representations remains a challenge (see Chapter 3 in [11] for some of the issues facing designers of visual representations). Information visualization needs to be embedded in a framework that provides leverage, through reasoning, to the human knowledge construction process. It is important to provide the right tools and methods for this process to unfold. Concentrating on this process, of how humans create and communicate knowledge of cultural heritage through interaction, the following ways of representing the production of cultural heritage were explored.

- *Sense-scapes.* First person methodologies, that is, to learn through the experience of the self, engender concepts that value attention to the senses. Dealing with the body, through its materiality and senses, provides meaning to experience, and generates the notion of archival content being explored through

1 http://www.hht.net.au/about

sense making. The embodied subject with its multiple concomitant ways of sensing, feeling, knowing performing and experiencing offer dynamic routes to different perceptions of the human relation to the material. Narrative agency supports personalized kinaesthetic and haptic experience.

- *Soft spaces*. Space is perceived as performative and experiential, capable of constructing and mediating dialogue. Modelling space as performative and mutable supports engagement with space as material presence, represented as flows and interactions. Space is no longer only described through its Euclidian geometry.
- *Social collaboration.* The sharing of experience enables visitors to explore narrative content through implicit and /or explicit collaborative encounters, such as, physical proximity. Semantics can be derived from social and bodily interaction.

Through these ways, singularly or in combination, cultural heritage embedded in the sites becomes visible through the application of broad and accessible digital technologies. The digital circulation of information, images, and interaction constitute a mixed reality space, which can continually produce new and personalized narratives for re-inhabiting, constructing and experiencing cultural heritage. In this process feedback loops become an integral component in the design providing the reflective, in addition to, the productive aspects of design.

2.2. Interaction: the central construct

Interaction is placed as the central unit to the modeling and the visualization of narrative. Interactions communicated through convergent media generate the feedback loops noted above. As interaction is placed as *both* the representation *and* the inquiry, an argument can be advanced that it is necessary to reflect upon the nature of interaction and the relationship between interaction and cognition. Pike et al (2009) [12], state that interaction and inquiry are inextricably connected and that it is through the interactive co-junction of parties at a visual interface that knowledge can be constructed, shared, evaluated and refined. Importantly, such displays need to be embedded in an interactive framework that supports human cognitive reasoning based on bodily knowledge. To accomplish such a task certain tools and methods are required. In the next section we discuss design guidelines for visual interfaces. As in visual analytics the central premise is that human insight is aided by interaction with a visual interface.

3. Design Guidelines for Mediation of Cultural Heritage

In this project mediation implies the process of a middle agent effecting communication in some innate way. The mediator is an instrument dedicated to processing information that creates the environment and the means for the visitors to derive knowledge in a collaborative manner. Convergent media are well suited to communicate narrative structures, as they offer unique abilities to converge time and space. Inherent in such media are design guidelines that inform knowledge construction.

We can group these guidelines into a group, namely (i) ambience. Adapted from [13] the ambient aspects of delivery of information about narrative interactions through the visualization include the following principles:

Information capacity: This design principle relates to the trade-off between the size of the visual elements, the space for the display of the elements, and the time for presenting an information segment.

Attention attracting capacity: This design principle relates to the ability of visualization and respective media to demonstrate critical patterns in interaction, capable of rising person's alert and the need for immediate consideration during the decision - making.

Expressive power: This design principle relates to the semiotics [14] of the discrete elements that constitute the visualisation and their combinations that constitute the mediation, i.e. how the information about cultural heritage is encoded into patterns, pictures, words, or sounds that eventually convey the information about the site. Such visual semiotics relates directly to how condensed is the information delivered by the visualisation. The range is from direct presentations of low - level data for monitoring visitor interaction to metaphorical reasoning based on bodily knowledge and other graphical displays of complex and latent information structures (see [15] for a survey of diverse displays) that convey condensed information.

Aesthetics: This design principle concerns to what extent a graphical display is considered visually pleasing. Extraction and sense making of information about interactions relate to the ability to gain insights, hence, this design principle is closely connected with the principles of information capacity and attracting attention capacity.

Table 1. Design guidelines

Design principle	**Semantics**
Disjunction	The degre of disjunction between the medaition and physical frame, or fames, within the building requires transitions that people can map to the site.
Reflectivity	This design principle addresses the identification of context. In the process of interaction, parties' contexts help them identify relevant concepts and link them into appropriate structures.
Accessibility	Information design needs to be accessible to visitors for knowledge to be actively constructed. Information design of the visualizations is indexed to enabling efficient interaction and analytics capabilities of respective media.

In addition to these guidelines we consider the

following design principles are of value. In Table 1 these principles are grouped and briefly covered, with corresponding knowledge semantics.

The quest for implementing these principles acts as constraints in the development and deployment of the act of mediation perceived as a change agent. In the next section these principles are utilized to discuss the projects produced in the interdisciplinary lab.

4. Emergent Narratives

We adapt the notion of delayering applied to urban design [16]. McGrath sees this process as a way of deriving archaeological modeling: a method to unpack embeddedness. Fundamentally delayering deconstructs complexity. The process of delayering is a three dimensional operation of uncovering cultural production in the various strata of the sites as materiality constructed over time. Delayering can be unpacked through the application of the method of metaphor that maps a trajectory from the physical site to the mediation. Recent work in the application of metaphors has demonstrated the opening up of metaphor modeling from the linguistic basis commonly associated with metaphor usage. Current work is inclusive of cognitive structures that have a neurological basis upon which such modeling can function. The notion of conceptual metaphor [17] considers a conceptual metaphor is a cognitive mechanism that derives abstract thinking from the way we function in the everyday physical world. Lakoff and Nuhez (2000) argue that such conceptual systems align with our body, that the conceptual system is embodied and shaped by our physical processes, and by 'being in the world.' The process of delayering enables the isolation and analysis of the relationships between the explicit archival content displayed in artifacts, such as furniture, of the building and the embedded content.

Figure 3. Playing with re-scaling through the use of simple technology

This is an act by the designer to change the boundaries of the site by establishing new sets of relationships that modify how cultural production is experienced. In the design process, noted by [16], rescaling techniques can be introduced to create transitions between layers of information. For instance, the project, 'In the Dark,' discussed in this paper, plays with re-scaling. Through the use of simple technology the visitor is 'zoomed in' to selected tableaux that are subsequently augmented via projected content as shown in Fig. 3.

A further way to deconstruct the unified construct of heritage building can be derived from repositioning points of view. This is accomplished through different modes of representation, or, as represented in Fig 4a, 4b, through spatial proximity of information to infer connectivity. Here the image of the visitor is added to those already projected on the floor as they enter into the performative role of being both in the role of within, and without, the creative production. The visitor can then, juxtapose the perspectives of both first and third person.

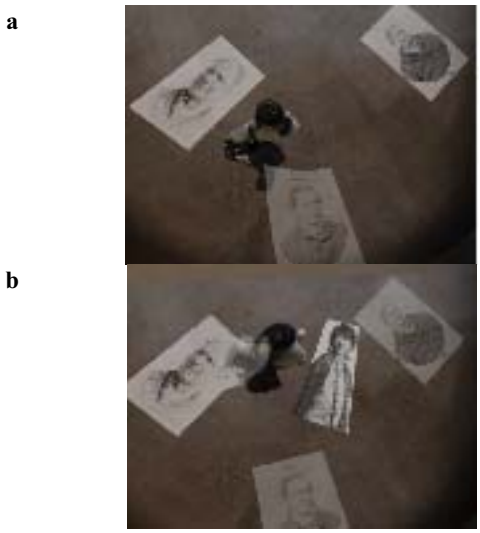

Figure 4. Inscribing performativity into the space

The projects considered all shared the common approach of tracing cultural production through actors embedded in the archival content of the sites. Actors can be traced and cross - referenced in time and space thus providing networks of relations from which to derive semantics.

4.1. The projects

Three projects executed by design students are considered. These are:

- Tears
- Butterflies
- In the dark

All projects looked to narratives constructed around the personas derived from prior human habituation. It was

recognized across the projects that the archival content of the historic houses reflected the presence of the inhabitants through various artifacts, such as, clothing, furniture, natural collections, books and so on. Yet the lived experience of significant inhabitants was noticeably absent.

The groups selected different aspects of lived experience of past inhabitants to analyse and explore through convergent technologies. The retrieval of information, in relation to these narratives, was deployed through various perceptual interactions that reflected metaphorically the form, semantics, and function of the specific mediation. Formal approaches utilise the concept of semantic visualisation, defined as a visualisation method, which establishes and preserves the semantic link between form of the visual elements and their function in the context of the visualisation metaphor [18].

4.1.1. In the dark

This project defined itself through an interactive narrative exploring the concept of hierarchy as a navigational and spatial paradigm. The hierarchy referenced the 'upstairs- downstairs' spatial portioning between servant and 'master'. In the simulation visitors were guided through the narrative by cues perceived as measures of light - dark. The semantics for light - dark metaphorically modeled were mapped through illumination of selected objects in the house. These objects referenced set tasks associated with the work of servants. For instance, turning down the bed, winding up the grandfather clock, or lighting the fire in the drawing room.

The overriding theme of hierarchy was mapped through the narrative of life in the house and how this narrative would have effected spatial partitioning between owners and servants. Then, as noted, objects grouped as tableaux, were selected to demonstrate the daily life for servants as a series of tasks. The project was performative and theatrical. Each visitor was provided with a 'kit' that included a LED flashlight. The action of shining this light into darkened rooms, located through radii set by sensors, triggered the projection of a task associated with the object(s). The aim of such layering was to create through the embodied response of participants the somatic and kinesthetic experience of such tasks. Fig. 5 shows a simple example of how this narrative was composed as a series of events.

Figure 5. Event driven interaction

Figure 6. Augmentation of the drawing room

Figure 6 provides an example of the augmentation in the drawing room of Elizabeth Bay House.

4.1.2. Tears

The project 'Tears' focused on representations with strong kinaesthetic associations embedded within the materiality. The prime leverage to visual display was the performative basis of the selected artifacts upon which semantics were founded. Embodied in the form of a dress two states of spectatorship were presented. The states referenced the life of a key actor in the heritage house and her struggle to be recognized by the 'society 'of the day. Her ball gown was framed as a conceptual metaphor for acceptance / rejection of her personage in society. As such, the state of turning signifying acceptance (Fig.7) is contrasted to the state of rejection where the gown lies crumpled on the floor, inert and motionless. The relationship between the two performative modes rests on the difference that is expressed in the sense – scapes, as the project deals with the body, materiality and the senses. The basis of bodily knowledge that finds correspondence in these relations provides the framing for the narrative in this project.

Figure 7. Kinaesthetic association constructed through the materiality of performance

4.1.3. Butterfly affect

Butterfly affect defined boundaries to visual display through the chorography of traces utilizing multimodal inputs. Butterfly affect traced the theme of fragility and decay of the production of heritage culture through the motif of the butterfly. This referenced Alexander Macleay‘s (the person responsible for the building of Elizabeth Bay House) life long obsession with entomology. Mediation of the space was framed through the projection of butterflies. The fragility of this was emphasized by the affect the presence of visitors, communicated through sensors, had on the visual display that reflected a progression from birth, to decay, to death.

Figure 8. Knowledge construction through association

Conclusions

In this paper we have demonstrated, through an initial study, that mediation is a knowledge intensive process that integrates information discovery and embodied interaction. Mediation provides a method that can be positioned to deconstruct the layering of archival content contained in cultural heritage, by reshaping content through analogical reasoning. The potential of mediation, for augmentation of cultural heritage, supports further investigation of the inherent subjective information generation of cultural heritage. Referencing the embodied experience of the present through mediated knowledge can contribute to new strategies of knowledge construction for the visualisation of heritage sites.

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