Somatic Knowledge and Simulated Spaces
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Abstract
The principle purpose of this paper is to investigate how simulation spaces in cultural heritage can incorporate somatic knowledge. An understanding of the past that starts with the somatics of the sensing, feeling mobile body is a radical departure from traditional approaches to digital cultural heritage where the corporeal dimension has been absent. To date simulations of cultural heritage have largely focused on processual archaeological accounts of the past to inform design practice. This has resulted in an emphasis on mathematically accurate representations of the past. While these accurate representations simulate material culture to a high degree of technical sophistication they fail to take account of the sensing body and thereby de-emphasise significance aspects of end user engagement.

This paper seeks to address this imbalance by investigating the application of somatic knowledge to the creation of an interpretative digital cultural heritage space. Using the framework of interpretative archaeology consideration is given to phenomenologically informed accounts of prehistory that focus on embodied experience of the built environment. This paper identifies approaches in the work of phenomenological archaeology that can usefully interpret the spatiotemporal characteristics of an archaeological site in relation to living moving bodies. Broader discussions of embodiment are framed from the perspective of the cultural heritage visitor as end user. The paper considers users subjectivity as in dialogue with the spatial aesthetics of the landscape morphology, and outlines how interaction design can be mobilized to explore an embodied encounter with architectural remains.

Introduction
We are at least twenty years into what can be considered a third phase of digital cultural heritage visualization. Characterized by complex data mapping systems and image modeling software and hardware this phase offers sophisticated visual simulation but omits more interpretative or contextual simulations of the past. As this congress suggests it is timely to reflect on the value of digital techniques for increasing our understanding of the past. In response to this invitation my paper will focus on how digital technologies might provide meaningful simulations of the past. I will do this by investigating how an affective engagement with prehistory might be designed for a large-scale immersive visualization environment.

Principally my concern is not with documenting cultural heritage but with broader cultural questions about how we might create digital environments that engage with culture through an affective embodied response to place. My line of thinking follows the work of phenomenological archaeologists who have argued for an archaeological knowledge system conscious of embodied sensory experience. My intention is to provoke debate about the significance of incorporating somatics within the design of simulation visualization systems and at the level of design praxis to explore the relationship between somatics (personal experiential perception) and simulation spaces (interaction visualization environments). Many of the comments can be generally applied to issues arising about uses of simulation environments for cultural heritage. However my particular focus is on a prehistoric Megalithic temple in South East Malta, Mnajdra, which dates from 3,600
BC-2,500BC and how a digital simulation of the temple environment might evoke somatic encounter with temple architecture.

**Phenomenological approaches in Interpretative Archaeology**

Drawing on feminism, post-structuralism and post-colonial theory post-processual archaeology encourages a notion of culture as adaptive (Hodder 1991). Fundamental concepts are interpretation and context often associated with the idea of self-reflexivity and dialogue. Emerging from a response to the functional and materialist context of processual archaeology, post-processual archaeology considers interpretations of the past as subjective and relational. As argued in the literature ideas about space, environment and the meaning of cultural artifacts inevitably emerges from these situated interpretations (Hodder 1991; Tilley 1994).

Digital cultural heritage has been slow to respond to these shifts in archaeological theory and practice. As has been argued in the literature condensing the real to a grided schematisation of digital space may be a poor record of a previously lived encounter between human and monument (Champion 2003; Flynn 2004; Gillings 2002). For instance traditional archaeological spatial knowledge systems such as the map, survey and grid have been used to design mathematical data sets for 3D heritage models. These models position space as a neutral surface or a universal backdrop separate from the activities of users. As an number of commentators have pointed out rather than being an objective spatial representation divorced from human agency, map making is a political system of knowledge and the underlying ideology of such space is inseparable from the acquisition of space at land and sea and the history of colonialization (Casey 2002; Vella 2004). Thus it is timely to explore how the past might be simulated in relation to a different spatial model – that of bodily or embodied space.

In renegotiating the contextual potential of digital cultural heritage post-processual archaeology has much to offer. Phenomenological archaeology as a specific area of post-processual archaeological theory and research practice holds exciting potential for articulating the affective responsive engagement of users. Phenomenological archaeology enables speaking from and with the body representing the affective, corporeal and sensuous dimensions of human knowledge. In phenomenological terms – and I’m thinking here about writers such as Thomas, Tilly and Turnbull – how people experience and understand the world provides the fundamental ground, or starting point for our description of it (Thomas 2000; Tilley 1994; Turnbull 2000). As Tilly argues the space of the world rather than being reducible to an objective and geometric grid when considered somatically is the space of sensory experience and bodily movement. Any experience of space is grounded in the body itself, its capabilities and potentials for movement. Through time-space routines of movement and praxis or bodily practice a person knows where she or he is in relation to familiar places and objects and how to ‘go on’ in the world. Lived body-space incorporates not only habituated movement in general but also modes of walking, turning, reaching, crouching, the performance of particular acts and body movements (Tilley 1994).

It is my central argument that phenomenological archaeological research can help to reintroduce the affective register of user interaction for cultural heritage. Digital cultural heritage producers and designers ignore the important developments in post-processual archaeology at a cost. This cost can be measured in...
the disengagement of users and the reduction of archaeological and historical scholarship to overly simplistic interpretations of the past. Critics of contemporary digital cultural heritage production cite the overly didactic or prescriptive nature of information driven simulation models, the dominance of homogenous accounts of the past (Champion 2006) and the trivialization and fragmentation of historical meaning (Hodder 1992).

**Post-processual Archaeology in the Maltese context**

Maltese prehistory up until quite recently has been considered through a processual archaeology framework. The empiricist model put forward by Renfrew looked at functional variability with and between cultural norms with a focus on resources, trade and technology (Hodder 1992; Renfrew 1979). Location, orientation and the spatial ordering of the temples were understood through the imposition of a map or a grid. Researchers are familiar with the top down view, which provided the mathematical coordinates of the space as objective and quantifiable.

In more recent times a number of significant attempts have been made to explore the spatial dynamic of the Maltese temples from a phenomenological perspective. This involves thinking about navigation, wayfinding and the body’s motility in the context of the landscape setting. Tilly is perhaps one the better known of the post-processual archaeologists writing in this vein. He argues that in Maltese prehistory as in contemporary times the physical experience of the monuments affects its perception (Tilley 2004). Recognizing the phenomenological components in the contrasting forms of temple spatiality he argues for an understanding of the temple that is informed by the engagement of an embodied subject. The very physicality of the body imposes a schema on space through which it may be experienced and understood. As Grima, Turnbull and others have commented an understanding of space from a human-centered perspective reveals the artificial abstracted bias of the classic top down view. No persons inside or outside the temples would have seen the site from such a perspective (Grima 2003, 2005b; Turnbull 2002).

In his chapter on the Maltese temples in *The Materiality of Stone Explorations in Landscape Phenomenology - From Honey to Ochre*, Tilly describes a dynamic interplay between the perceiving body and that which it perceives (Tilley 2004). He understands the Maltese temples as ‘transformers of experience and performative spaces’. Mnajdra is analysed as an internal performative space that is flexible and mobile in character. Noting the adaptability of the space Tilly draws attention to the use of screens or other types of visual barriers between one chamber and the next. He proposes that these adaptations created different spaces inside and out associated with different rites, such as, the passage of the seasons, birth, reproduction and death. This sense of bodily being in a world provides the fundamental ground, or starting point for spatial enactments of the past.

Turnbull writing on the Sociology of Scientific Knowledge (SSK) similarly understands the temples as performative. Introducing the notion of the temples as ‘theatres of knowledge’ he understands space as brought into being through the movement of people through the landscape (Turnbull 2002). As he points out a characteristic of the monuments is the way the temples control and direct movement of people forming types of narrative understandings about the past. He argues that the way space is shaped by the monuments is as important a consideration as their spatial location and orientation. In this way the temples are not simply spaces for performance but have systems of knowledge embedded in them. He also proposes
a mnemonic function suggesting that the monuments function as encoded memories through the movement of people and their reading of the stones. Grima in his research on the landscape setting of the Maltese Megalithic structures extends this idea to a cosmological ritual function. He suggests that these systems of knowledge required performance in their symbolically loaded spaces in order to maintain their potency and significance (Grima 2005a). In these phenomenological readings space is dynamically created in the process of traveling through it and understood as intimately coupled with agency.

Phenomenological archaeology offers a conceptual model of the Maltese temples that speaks clearly and emphatically of embodied engagement. What this provides is a hermeneutics of interpretation that can be utilized for translating embodied experience from a physical environment to a digital environment. Interestingly post-processual archaeologists have a certain ambivalence about the value of simulation systems for enabling embodied engagement (Hodder 1992; Tilley 2004). For Tilly simulations are discounted as being associated only with processual formulaic hypothesis while Hodder is concerned with the trivialization of cultural heritage to fragmented de-centred ‘sound-bites’. Rather than accepting these as insurmountable obstacles I can reflect on the research undertaken in other fields such as new media and computer games where somatic engagement has been successfully demonstrated. Examples from new media and HCI include Char Davies’s *Osmose*, Myron Kruger’s *Videoplace* and Sha Xin Wei – *Tgarden* (Shaw 2003; Shinkle 2005; Wei 2003). From the post-processual models outlined above there are a number of interpretative features relevant to a performative approach to temple encounter. These can be summarized as follows:

- An understanding of the Mnajdra temple as a dynamic knowledge space informed and reactivated via somatic knowledge.
- Interpretations that are situated in the body and expressed through the somatics of the sensing, feeling and acting body
- The adaptability or temporality of the environment represented via temporary barriers, screens and differential seasonal lighting levels
- Differentiation in patterns of access across doorways, chambers and the various open and closed spaces.
- The necessity for performance or human agency in relation to cosmological or ritual activation.

A Digital Simulation Environment for Somatic Engagement

This section of the paper explores how a somatic understanding of the embodied experience of being in the temple environment might be translated into an engagement with the spatial morphology of the temple space in the virtual scenario. An initial question is what technologies best suit an interpretative archaeological approach. A second question is how to capture the essence of phenomenological archaeology as a set of interaction design features that position the user as affective agent. A third question is how to display the characteristics of the physical space as open to reorganization by the user.

**Technology**

In order to select a viable technology apparatus for the project a number of computer-based technologies were reviewed. In addressing what technology would best suit an affective approach to cultural heritage it
became apparent that a standard point and click interface would be inadequate. A key requirement was a technology environment that could track and respond to the mobile performing body of the user/s. For this project AVIE (Advanced Visualization and interaction Environment) – a large-scale immersive environment has been chosen. The location of AVIE is the university of New South Wales in Sydney. It is a large-scale panoramic system that has the ability to track user motion and recognise simple gestures. Made up of eight projectors in four stereoscopic pairs for displaying panoramas on a large circular screen 10 meters wide and four meters high. Eight high performance computers handle high levels of data each generating an on-the-fly image sequence for one projector and multiple stereo speakers.

The environment is an immersive space where users are co-authors in a digital interaction between physical movement and digital representations of space. Visually the images consist of multiple 360-degree photographic panoramas, videos of performers and situated contextual soundscapes. Multiple panoramas make up the large forecourt of the temple, the main semi-circular chambers and the side niches. Emergent spatial journeys are constructed through the surrounding environmental topography and contextual landscape markers.

Movement detection is a key aspect of the AIVE space. The technology is able to track single or multiple users using infrared cameras and real time software. The tracking system can generate voxel models of the users’ body and record movements and gestures. Users can explore these surrounding through a remapping of their body into the digital space. Unencumbered by cables or attached sensors the movements of the body are interpreted by the Virtoo ls engine. Shadows of the body as digital self stimulate the user to certain behaviours and gestures that enable further exploration.

Fig. 1 – The mobile body in AVIE visualization environment

**Capturing the essence of phenomenological archaeology**

From the research outlined above the essence of phenomenological archaeology is understood as performative and potentially transformative. Objects from the past such as the Mnajdra temple can provide a chance for a bodily experience of the past (Monod 2005). Interpretations are situated in the body and expressed through the somatics of the sensing, feeling and acting body. For digital design interpretation is conceptualized in relation to a dynamic spatial that is activated by user’s movement and agency. This performative approach means that there is no action without the user’s conscious or habitual movement. Users learn with the body at the level of affect.
The aim then is to rearticulate the Megalithic site in a digital visualization environment in a way that moves beyond a prescriptive information model of simulation space to include the messiness of human interaction. That is the spontaneous, awkward, inspired and deliberate expression of human movement and actions. By focusing on users’ body movement in space and gesture AIVE provides a digital environment where the morphology of temple space can be understood via the mobile sensate body. Furthermore such movement can include a sense of what UNESCO call intangible heritage – that is - rituals, performing arts, social practices and ceremony (Champion 2005).

The first stage is to translate the movements of people through the landscape and its consequent effects on spatiality into digital interaction scenarios. A fundamental issue is how the spatiotemporal characteristics of an archaeological site might be displayed in relation to the living moving bodies of visitors in the virtual environment. For translating the phenomenological foundations of interpretative archaeology into a design methodology an investigation of somatic praxis such as mind body centering techniques and ideokinesis was undertaken (Cohen 1993; Todd 1972). The process for identifying somatic responses to space focused on recording and analyzing the specifics of body movement in the temple environment. Primary research was conducted at the Mnajdra site. This was achieved through observational processes, note taking, and archival research undertaken during several field trips to Malta in 1997, 2003, 2005 and 2006.

In adopting a methodology of exploration that takes account of and analyses ‘performers’ embodied experience I engaged two movement practitioners (one from a dancing background and one from a theatre background) . A fundamental concept is the encounter between the human body and the space of the temples. An exploration of basic body movement - the somatics of the sensing, feeling and acting body provided an entry point into an understanding of how the temple architecture might be explored (Cohen 1993). This approach is characterized by an awareness of movement as an essential component in an encounter with the spatial matrix of the site. The movement practitioners ‘mapped’ the environment through developing a sensitivity and receptivity to the morphology and the sensuous qualities of the site. Movement was initiated by an impulse towards an element in the landscape, which might be a portal doorway, the texture of globigerina limestone, an artefact of the floor, the play of light and shade. The environment explored through bodily navigation is experienced as a place for contemplation, fluid or disjointed movement, dance or other performative acts rather than something merely gazed upon. The aim was to record a carnal or sensuous engagement with space that emerged from experiential gestures.

High quality video recording of the movements were used to document specific infections of the performers body in the temple space. Research undertaken by post-processual archaeologists at the temple site explores body motility in general terms that is largely visualist in focus. In post-processual accounts to date there has been no detailed analysis of specific movements or gestures in relation to temple morphology. Therefore these recordings provide a detailed template of key movements in the physical environment for data analysis. This template is then used for the design of interaction scenarios for the users movement in the digital environment. In AVIE the experience of dialogue with the physical structure changes in relation to user actions. In the same way that space is deeply enmeshed in the landscape, so body is deeply enmeshed in space. The intention is to create an environment where the mobile interaction of the body in
encountering the Megalithic environment forms a framework for experience, which is reproduced in the digital interaction between user and architecture.

**Interaction Design Features**

I will now turn to how these ideas might be practically applied to the production of a set of user interaction design features for an interactive immersive environment. A question foreground by this process is how to bring specific understanding of the body space of the temple into the experience of the user? What interaction design strategies are most appropriate for a digital visualization that affords an interpretative exploratory user driven approach. A number of design strategies for digitization and user interaction are being proposed for AVIE:

An emphasis on the topology of the environment – for example open/closed spaces and location of artefacts. This is primarily a visual and sonic consideration created via:
- Raised or lowered doorways.
- Low angle shots of doorway suggesting body movement more than traditional eye-level framing.
- Seduction of objects
- Immersive high fidelity photographic panoramas

Heightened attention to the shape and formation of the environment in order to move through the space:
- Restraints, affordances in the environment via physical objects in space (eg raised platform)
- Tactile objects - physical replicas in space.
- Ways of moving through space – movement indicated or required by the lay out of temple

Sense of inhabiting and affecting the environment:
- Re-mapping of the users body into the digital space of Mnajdra. The view of user on screen appears as a shadow or matt. The matt contains a reconstruction of temple – literally the body creating the body of the temple
- Temple as the embodied past - encoded memory
- Styles of movement: dancing/sitting/up/down as a trigger for opening access paths
- On screen persona mirroring the significant movements of the user in the liminal spaces at thresholds and doorways.

In AVIE the megalithic site of Mnajdra is rearticulated as a digital simulation that moves beyond the map or the grid model of place making. Users are co-creative in the act of place making as affective and embodied. The direction of surround panoramic images, stereo audio and video overlays triggered by user proximity and gesture affects a performative space that operates as a transformer of experience. In this way the heritage ‘object’ is treated as a complex problem involving processes rather than as a static material that can be objectively and quantifiably measured.
Conclusion – summary

This paper argues that the inclusion of somatic knowledge in a digital simulation can open up a range of possibilities for simulating the past. To date simulation has been an essential tool in the explicit testing of specific processual hypotheses and the construction of high fidelity visualization models. A more process orientated simulation approach is presented here – one that incorporates the affective register of bodily processes coupled with hermeneutic layers of meaning usually elided from traditional simulation environments. An affective simulation model moves beyond documenting the materiality of the artefact to construct a series of spatially embodied encounters with the past. Such encounters are activated through the dynamic of living mobile bodies to provide a phenomenologically rich understanding of the past.

In his description of the temples Bradley expresses the link between space and body as ‘orchestrating human experience’ (Bradley 1993). AVIE and similar virtual environments ‘orchestrate human experience’ through the direct visceral engagement of the user in a manner not possible in the geometric environment of a 3D walkthrough. The body (rather than mouse or joystick) acts as the physical interface – so that the environment becomes a performative space for experiencing the past. In this way experience of the temple space literally emerges from the body and expands beyond the particularities of place.

Bodily systems of knowledge production increase our understanding of the past through body knowledge of navigation patterns and ritualised gesture. By directly engaging user’s movements and gestures the affective dimensions of somatic knowledge treats the monuments as encoded memories so that the structures suggest multi-layered interpretations. This process of interaction presents the past as full of possibilities and open to the ‘what ifs’ of bodily encounter rather than set visualization. Drawing on prior research on high fidelity visualization and artefactual records a ‘performance of space and knowledge’ can operate as a stand-alone experience or be integrated within an archaeological rigorous framework for accessing the past.

References


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Simulation is here understood as computer data which can include hypothetical models, responsive systems and the construction of digital representations.

Previous phases of representation can be categorized as painting from late 18th century to photography in the mid 19th century with digital simulation emerging in the late 20th century. This third phase, which emerged with the advent of new digital technologies in the late 1980s has been characterized by complex data mapping systems and the production of high-level digital simulations. Alongside this extensive storage and retrieval systems have become standard museum practice for the storage, conservation and dissemination of cultural heritage.

For further information see the iCinema website at <www.icinema.unsw.edu.au>

Important contacts and research linkages were facilitated by a site specific environmental movement workshop undertaken in Malta in October 2006 under the direction of Nick Parkin.

This is located in the context of theoretical and practical exploration taking place in new media labs such as MIT with demonstrations at symposia such as Siggraph and ARS Electronica.