Artist Residency at The Roman Baths, Bath Heritage Services UK

Mapping multidimensional perception experiences

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Abstract. The emergent research project explores mediated realities and mnemonic structures by examining the modality of performative engagement through raumfindung (felt-presence), in an attempt to originate composition strategies and ordination opportunities for the creation of ‘amplified somatosensory environments’. The research promotes a synergistic relationship between space, time and perception, and throughout the investigation, the paper aims to advance a theory of PhaseSpace, a theoretical model for exploring the polarity of estrangement and niche environments. The project is an international collaboration between Estranged Space, a spatiodynamic research group co-founded by Mathew Emmett and PerceptionLab from Detmolder Schule für Architektur und Innenarchitektur, Germany.

Keywords. PhaseSpace; coaction; somatosensory; niche; interaction.

INTRODUCTION

Artist Residency at the Roman Bath
The Artist Residency at Bath explores mnemonic structures, mediated environments and spatial perception through the lens of transdisciplinary architectural practice. The research aims to generate ‘co-emergent’ patterns of space-time flux relationships and orchestrates spatially complex and dynamically challenging movements, relative to three or more dimensions, as a result of somatosensory composition. By focusing on sensory triggers and behavioural cues, the project examines architectural space as a set of stimulus - response - stimulus relationships, and explores the dialogue between environmental pressures and sensory inputs, and in particular focuses on perception feedback systems in the generation of cognitive distortions, thereby challenging space-blindness and static object notions of architecture.

A principal aim for the residency project at Bath is to expand the scope of aesthetic value within a
series of underground passageways and residual voids, immediately adjacent to the main baths of the Roman Baths – a major tourist attraction visited by 840,000 people a year, and the UK's 9th most popular paid-for tourist venue. These hidden spaces are not accessible for visitors, yet within these vaulted structures, there lies a concealed wealth of uncurated Roman artifacts and archeology.

The constructive ideology of the project is underpinned by a causal hypothesis, where the nature of the enquiry seeks to provide insights through the interaction of emergent architectural ideas and experiences in analysing and composing ‘co-emergent’ cause-effect relationships within the theoretical model of PhaseSpace, an exteriorisation of the bi-directional exchange, marking a fused participation between agent and environment, whereby the environment exerts ‘ecological pressures’ on the amorphous flow of information, precipitating in extrasensory perception, giving rise to trans-temporal effects, feeding back into the construction of niche environments. The hypothesis of PhaseSpace attempts to bridge the divide between humans and architectural space via mediated environments and interactive technologies and proposes a two-way theory, placing value in the interconnection between flow and exchange, making explicit the continuity of consciousness through time and space.

The residency aims to highlight the importance of these forgotten spaces as integral and legitimate structures, although divorced from their intended purpose and era. The project proposes an interdisciplinary methodology aimed at evolving a new type of reading, a praxis that blends the rigour and criticality of scientific experimentation with the creative enquiry of site-specific and multi media art practice. The residency seeks to reveal an unheard voice, a palimpsest, a co-evolving narrative. Set against this background of forensic-styled profiling and digital amplification techniques, the project further investigates the palpable tension of estrangement and endeavours to conceptualise the vaults by typologising the space as an environment ‘eschew’, divorced and set apart from the adjacent world, and by focusing on the cues and trigger elements that exert a site force, the work attempts to externalise the cognitive pressures to access the inner workings of the relationship between perception, body and space, thereby heightening the relational space-engagement by exploring the dimensions of affective architectures presented at the Roman Baths.

The project at the Roman Bath Baths is part of an interdisciplinary, international collaboration set up by Estranged Space a tripartite research group at the University of Plymouth, University West of England, and PerceptionLab a research platform at Detmolder Schule für Architektur und Innenarchitektur, Germany.
Parties
Estranged Space is a research group specialising in multi-disciplinary methodologies crossing the boundaries of architecture, archeology, art and science, by using a range of processes including digital scanning, photography, video, sound recording, and forensic/biological science profiling techniques. The group is interested in spaces, which have been forgotten and abandoned like service tunnels, access and distribution networks, ancient vaults, mines ... Spaces which are by-and-large uninhabited, designed but unused or little used, or off-limits.

Estranged Space tries to understand these spaces as having an aesthetic value and cultural meaning, they don't change them; rather, they amplify the latent value within them. Outputs are site-specific architectural interventions, whereby each project utilises a variety of multimedia techniques specifically charged with an operative dialogue, tracing the hidden and interpreting meaning. Interactive technologies, sound and time-based media are explored in conjunction with architectural and perception based research. The experiential attributes of space and consciousness are examined through critical engagement, leading to a database of calibrated recordings, identifying the transitions of exchange.

The PerceptionLab is a research and teaching instrument that focuses on the atmospheric impact of space in real and virtual environments. Since there are many parameters to describe atmosphere – proportions, material, light ... – and many different ways to perceive such a complex subject, atmospheric design derives generally by subjective intuition and experience – rarely based on objective parameters and scientific knowledge. The PerceptionLab tries to fill this gap between subjectivity and objectivity by measuring and evaluating impacts of space on well-being. The purpose of this laboratory is to develop empirically ascertained knowledge in connection with experiences from planning practice into an application-oriented toolkit for design and planning.

Technologies
The examination of the perceptual experience in the vaults is based namely on three methods:

- eye tracking device: visual perception;
- bio-feedback system: physiological reaction;
- auxiliary mapping notation: matrix of spatial frisson.

The eye tracking system is able to record eye movements of a subject, which can then be evaluated on different issues. In this examination it is used to analyse the spatial perception and orientation as well as user behaviour. The mobile system (iViewX™ HED by SMI), which allows the free movement in space, consists of a recording device that absorbs the movements of the eye relative to the head and associated computer software, which analyzes the incoming data and presents. A helmet, on which the two cameras are mounted, is fixed on the proband’s head. A scene camera records a video that matches the field of view of...
the subject, while an infrared cover camera records the eyes. The video images are analysed by using an image processing software in relation to the movement of the pupil: its view position is determined and brought into conformity with the scene video.

With the biofeedback system and the corresponding software different physiological/biometrical data can be recorded and analysed at a time from one subject. It can measure temperature and conductance of the skin, respiratory frequency and volume, heart frequency and rhythm and muscle tension. The system can be used to measure the complex physiological impact of space on a proband.

The auxiliary mapping notation, is a system designed by Emmett, to investigate the dynamics of spatial orientation of ‘felt space’, and examines the experiential factors categorised as ‘site force’. The mapping process vectorises the connections between situation-dependant experiences and the physical/topological qualities of the site, generating a coordinate matrix, which charts the cause and effects of spatial frisson, where the measurable intersects with the non-measurable, accentuating the dynamic nature of the inter-space between space and the agent.

**CASE STUDY**

**Starting point**

Sixteen probands from with a variety of professional backgrounds including architectural and non-architecturally related professions, separately explore an interactive environment within the vaults, during which the three perception-methodologies are deployed to record perceptual experiences. The eye tracking and biofeedback systems are used during the experiment; whilst the auxiliary perception mapping system is used directly after the event to analyse the proband’s memory of the choreographed space-event.

After installing the eye tracking and biofeedback systems, the probands are escorted to the ‘tuned’ environment, where the experiments are taped and timed against cued trigger marks, enabling the results to be measured, comparable, and to situate the experiments within a defined space and time frame. All the technology is calibrated to both record changes in spatial perception, for example change in lighting, temperature, humidity and proximity transitions in respect to the vaults architectural geometries; further, to incite changes via a feedback loop established

![Eye tracking system](image1.png)

**Figure 3 (left)**

Eye tracking system

![Auxiliary mapping notation](image2.png)

**Figure 4 (right)**

Auxiliary mapping notation
within the Max/MSP software, to test whether abruptly triggered audiovisual space-events elicit distortions in spatial cognition.

The project is split into two main phases: firstly the examination of the existing vaults, followed by the manipulation of the perceptual experience by inserting mediated ‘trigger’ instruments, via the interactive audiovisual ‘simulated apertures’, that modify the spatial profile of the vaults, thereby providing data for the analysis of space consciousness before, during and after the choreographed event.

Within the project, perceptual experiences are examined on multidimensional levels to measure the impact of space on the human body, both physically and psychologically, to gain understanding on how people perceive space. The probands are asked to record their experiences on how the atmosphere within the vaults has an impact on them, and are further questioned about the ‘estranged’ effect of being present within a tenseless place, a space devoid of a known narrative, to question the causation of a sense of uncertainty. The project utilises a space as being ‘set apart’ from the adjacent world, specifically to question the creation of non-ordinary realities, which are further magnified by the interactivity and jolting permutations of spatial distortions. These controlled conditions, aide the elimination of innumerable spatial distractions and provide a focused arena for the examination on how people directly respond to space and environmental characteristics.

**Methodology**

A somastosensory environment is a responsive environment that uses interactive technologies to create amplified forms of experience through physical and cognitive manipulations, triggering a hyper-vigilant sense of spatial awareness. The project employs movement and depth sensors via HCI (Human Computer Interaction) that enables the inhabitants to reconfigure the enveloping multimedia environment. These unfolding durations of cognitive distortions and phase shifts, are processed in real time via the Eye tracking and Biofeedback technology, which in turn are exteriorised and projected back into the space via the Max/MSP software. The performativity of the work enables participatory feedback to influence the environmental conditions and aims to demonstrate a co-emergent PhaseSpace that generates a virtuality space (McLuhan, 1969), by blending two simultaneous worlds, the incorporeal dimension together with the external environment, spawning combinational permutations through interaction transposed through ‘phases’ of immersive moments.

In order to trigger phase-shifts of spatial consciousness an event scheme for inciting cognitive distortions has to be designed. This concentrates the production of an ordination database, calibrated to articulate the interrelationship between the body, mind and serial perceptual experiences. In particular the exteroceptive and interoceptive incidents are mapped against a pentatonic milieu

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*Figure 5*

*During an examination*
of perceptual and physical experiences. This matrix describes a diverse group of spatial phenomena and potential methods for manipulating them, this is called the perception-centered notation matrix. This framework operationalises a system behaviour cues called ‘action pressures’, and when articulated through a sonification and light augmentation process, the resulting interactive installation elicits complex and disorientating forces charging the environment with a polarity of automatic and attentive recognition cues, triggering cognitive distortions enveloped within the Sphere of Influence.

The project utilises a series of qualitative and quantitative research methodologies, including the architectural interpretation of the event scores of the contemporary composer Karlheinz Stockhausen (1928–2007). Stockhausen explored musical ideas in space in parallel with notions of ‘heterophony’ as defined by Stockhausen in his collected Lectures and Interviews:

“It’s still a melody, but also a heterophony: ‘hetero’ means many, ‘phony’ means sounding together” (Stockhausen, 1971, p.65).

Stockhausen’s serialism music theory is examined here as a theoretical framework to generate a design ordination schema or ‘meta-compositional matrix’ (Bandur, 2001). By exploring Stockhausen’s music a technique is revealed for mediating audio-visual dynamics of immersive environments, that is, the use of ‘moments’ to articulate dynamic phase-events. ‘MOMENTE’ which Stockhausen started in 1961 uses this formal technique, with the aim of inducing the impression of movement within a sonic space. This technique is interpreted at Bath to incite a disjunctive gestalt, which amplifies the durational experience of sensory space as continual process, thereby accelerating spatial perception.

One of the major objectives of the project is to extend the conceptual terrain of architecture, fusing design, process and interdisciplinary methodologies into an activity of agency and emergence.

A crucial element is the generation of new spatial experiences, by deconstructing, analysing and exploring spatial reality in innovative ways. As a result, the residency situates space as the ‘unit of analysis’ and investigates the causal exchange as a mechanism to extend the philosophical terrain of architecture. By questioning how ‘cause-effect-design-affect’ models of research can be synthesised into architectural practice - an architecture described in terms of a typology of practice, chartered through moments of transitions, the residency at Bath acts as a problem statement facilitating a research strategy that positions itself as a tool to interrogate the spatial nature of signal transduction, and intensifies the interpretation of space as a ‘force-field’. Architectural dimension are thus extended through the elucidation of space, an architecture of signals and receivers, triggering moments of transitions - through which we move and experience the co-emergence of space. This is a philosophical act that is more closely attuned to the dynamical serial-experience of PhaseSpace.

**Goal**

The project aims to develop a process-orientated methodology and critical tool-set to explore, analyse and interpret these forgotten subterranean spaces. The project aims to explore the manipulation of perceptual experience by inserting virtual ‘trigger’ instruments that enhance, magnify and shift the multidimensionality of the spatial profile. The project extracts new meanings from the site and identifies new interpretations of architectural space from a series of underground vaults adjacent to the main Roman baths, which up to now performs an uncurated storage and access facility, and yet these spaces offers a unique opportunities and intriguing material, highlighting the importance of studying spatial perception in extreme situations, for the Bath vaults, due to their physicality, atmospheric presence, historical resonance, scale and immediateness to the body, exert intense conditions on ones emotions.
Process
The project investigates emerging techniques of mediated environments and aims to identify new possibilities for the integration of multimedia technologies within the architectural platform, by blending an intensive design studio culture with theory, research and practice. The core software used within the project is Max/MSP, and due to its accessible interface architecture, allows specifically configured ‘patches’ to process the audiovisual interaction with real time processing. The project uses ambient sound recordings, taken from the vaults at Bath, together with ‘projected artificial apertures’ processed in Max, to provide the ‘signal transduction’ for inciting interaction, causing the conflation of interior and exterior spaces. The data that processed the sound and visual system uses Human Computer Interaction (HCI), with the depth location sensor coming from a ‘prepared’ Microsoft Kinect sensor. This sensor created an immersive and interactive experience, as everything takes place in real space and time, which means that the software directly responds to human interaction, further, makes responses through sonic and image modulation. Human interaction is triggered by and responds to audiovisual stimuli, which in turn is projected back into the space via the software. Essentially the software is tuned to the vaults at Bath, as the audiovisual projections were calibrated to operate within the specified zone, giving rise to a ‘coaction field’ (Terashima, 2001). By engaging the Eye tracking and Biofeedback technologies, a feedback loop is enabled, and provides the means for exteriosing the embodied space, thus triggering conflation.

The project uses interactive media and a generative ordination systems to evoke experiential planes of an amplified somatosensory environments, whereby the architectural space at the Bath vaults are digitally manipulated to exert a visceral perceptual dimension engineered to incite transformation of the agents consciousness, giving rise to the condition of PhaseSpace. This application intensifies the research into situated cognition and challenges conventional

Results
The three examination methods generate different results:

- The eye tracking system creates a video scene in which the exact view direction is shown with a cross hair and which is the pursuit of the exact path of the proband sight during its operation.
- Each biofeedback recording generates a gradient, the recorded results can be merged to arbitrary time units to create graphical images of the examined parameters – for example mean value per time unit, number of amplitudes per time unit and amplitude level per time unit.
- By means of the auxiliary mapping notation, unconscious forms of perception can be verified and brought into consciousness by notation. The mapping serves as a diagrammatic questionnaire, which resembles a complex floor ground and contains all ranges of human spa-
tial perceptions levels – visual, auditory, kinaesthetic, olfactory, gustatory. The act of recording a ‘site force’, forces the ‘observer’ into objectifying the target & rendering the evidence as data, transcribing unconscious forms of perception into consciousness.

The PhaseSpace theory presented here is used as a vehicle to explore psychogenic architecture and examines the role of the body in negotiating sensory environments and mediated space. The body is considered here in the theoretical and critical development of the project, as a site in itself, an interface for interaction, an ego-loci for emergent dialogical experiences to be revealed, interpreted and possible recompiling opportunities.

CONCLUSION
By putting the nature of ‘felt-space’ to question the project aims to enhance our perception of spatial encounters and compile a language through systematic testing of complex organisational strategies the properties of spatial experience, to expand a more broader, deeper and fuller sense of space as a primer for a higher development of architecture. The primers for this research are to increase awareness of space, with enhanced intention on our interactions between the externally orientated realities and the inner realms of perceptual cognition, and through this negotiation create the potential for thinking differently about constructing spaces in a creative arena.

By reinterpreting spatialism through the sensory input of transient states of causality, the work considers the philosophical issues surrounding the manipulation of the physical & psychological characteristics of our encounters with space. In particular to focus on the agents’ behaviour modification perceived connection between and the spatio-temporal effects experienced through somatosensory amplification, whereby the agents’ heightened awareness or rather hyper vigilance of space is experienced, inducing a changed state of consciousness or facilitating. Thereby dismantling the nature, rules and conditions of how space is perceived, provides a shift of perspective for re-framing architecture to encompass the total-environment of multi sensorial stimuli, attentive to the spatio-temporal experience, thereby extending the morphological qualities of space, in particular accentuating the visceral experience of spatial perception through design.

OUTLOOK
In addition to a detailed publication an exhibition is planned to illustrate at one hand the results of examination and modification and at other hand the cross-functional, cross-border cooperation.

REFERENCES