Portmanteau Worlds: Hosting Multiple Worldviews in Virtual Environments

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Abstract

Intending to persuade (or sell), conventional architectural representation often hides conflicting opinions, discourages participation and culls possible futures. Dissatisfied with this situation, I consider an approach that aims to emphasize co-presence of multiple voices, disclose power relationships, demonstrate lines of resistance and present existing or possible places as politically charged networks of enacted relationships. Motivated by the capabilities of interactive narrative, the paper considers polyphonic potentials of virtual environments. In spite of their interactive characteristics, virtual environments can impose preconceived worldviews as forcefully as any others. However, generative capabilities of computational media can also support construction of multiple interpretations that emerge simultaneously.

Keywords

Virtual environments, interactive narrative, serious games, architectural representation, interactive camerawork, expressive processing.

Portmanteau Analogy

In this paper, I propose that virtual environments can resemble portmanteau words. Originally defined by Humpty Dumpty, portmanteaux blend sounds and meanings of two or more distinct words.

lithe + *slimy* = *slithy*
flimsy + *miserable* = *mimsy*

Humpty Dumpty was inspired by portmanteau bags used to pack together clothes and other diverse items when traveling. Similarly, virtual environments can combine multiple representations and meanings into new and useful hybrids, or *portmanteau worlds*.

Background and Motivations

This paper is motivated by the desire to resist the flattening of multiplicities in architectural-design thinking and to complicate familiar, but misleading, binary relationships, such as those that exist between humans and nature, buildings and sites or architects and clients. This resistance arises from an acknowledgment that architectural phenomena such as places and performances are assemblages of relationships that extend beyond their apparent limits.

By way of background, this paper uses the concept of assemblages in reference to the reconsiderations of ontologies and epistemologies of society, nature and technology. Interpretations suggested by Latour [1] and De Landa [2] are particularly relevant, but further broad literature exists and synonymous terms include assemblies, rhizomes, collectives, groups, actor-networks and activity systems. In the context of the current discourse on such concepts, this paper is motivated by the need to experiment with the practical implications of efforts to rethink foundational ontologies, for example through the projects of "new materialism", "speculative realism" or "object-oriented ontologies" [3, 4]. A further discussion of concepts used in this paper can be found in my earlier work on places as performances [5].

Such general motivations can be pursued in various ways. This paper focuses on virtual environments used to represent architectural designs and considers whether and how they can sustain heterogeneous assemblages with multiple meanings.

Approach

The form of resistance to flattening and unification with which this paper is concerned involves the slowing down of attention, thinking and learning [6]. This approach has some affinity with the "slow" movement. There are several manifestations of this movement that are relevant to my approach: 1) "slow food", which seeks to promote autonomy, fluidity and complexity representative of the underlying spatially differentiated norms, practices and ecologies [7]; 2) "slow technology", which entails a desire to cater for long term, situated co-habitation with technology and a reflective attitude towards its use [8, 9]; 3) "slow knowledge", which is acquired through gradual cultural maturation and shaped to fit particular ecological and cultural contexts [10]; and 4) "slow design", which, along with co-design, social design and metadesign, acts as an expression of design activism that aims to move beyond eco-efficiency and engage with non-monetary societal metabolisms [11]. According to the slow movement, a drawback of fastness can be attributed to the fact that it discourages diversity [12]. Usability and efficiency that also pursue faster speeds have the same disadvantage. By contrast, the sacrifice of speed can encourage economical practices, thoughtfulness and an openness to difference.

In the case of virtual environments, it is common to presume that they attain their powers through specific illusions made possible by fast computation. For example, one such illusion is immersion, or the state of being deeply involved [13]. Immersion is a powerful effect in interactive media as well as in more passive forms, such as TV or books. For the purposes of my argument, immersive virtual environments can be characterized as fast because they hide the mechanics of simulations used to achieve the illusion of immersion. Indeed, it is common to emphasize the fastness of such worlds by saying that they operate in "real time". The pursuit of other illusions such as that of 1) presence, or an impression of being in a place other than where one's body is physically present; and 2) agency, or the ability to modify one's virtual surroundings, is also a common sign of the fast virtual environments.

By contrast, virtual environments that expose the processes through which their worlds are constructed at the expense of such illusions, can be characterized as slow.

Ryan demonstrates that literary criticism has long been skeptical of immersion and "the alleged incompatibility of the experience [of immersion] with the exercise of critical faculties" [14]. She also observes that interactivity has been over-promoted "as an instrument of liberation from some of the most notorious *bêtes noires* of postmodern thought: linear logic, logocentrism, arborescent hierarchical structures, and repressive forms of power" [15]. The approach discussed in this paper shares an interest in narrative with her "immersible interactivity" project. Ideas parallel to my approach can also be found in Frasca's desire to apply methods of the Boal's theater of the oppressed to games [16, 17]. This paper shares with Boal's work the conceptual background that sees knowledge as constructed rather than transmitted and, therefore, the process of construction or learning by doing as the appropriate tactics of communication.

In fast virtual environments, simulations can be based on conclusions derived from hidden and value-laden reasoning. By contrast, slower engagements can elicit the situated values of relevant stakeholders. The slow virtual environments can achieve this by facilitating experiential encounters with aspects of life-worlds, by amplifying the presence of things and relationships, by encouraging reflection and by motivating cultural exchange.

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Page numbering begins at 1 at the start of the paper.

Test Case

The test case for this approach is Virtual Braunstone, a virtual environment of a Health and Community Center in the Braunstone Estate near Leicester, UK. The Virtual Braunstone is an outcome of a research project which sought to develop a three-dimensional, virtual, navigable environment, to be operated on a standard personal computer with a screen, speakers, keyboard and mouse. In collaboration with others, I was responsible for the strategic planning of the project's research program as well as for the design and technical implementation of the virtual environment. In addition, I participated in consultations with relevant stakeholders and was co-responsible for the collection and analysis of the feedback.

The detailed description of the technical implementation of Virtual Braunstone is beyond the scope of this paper. Briefly, the project uses Virtools as its development platform. It is structured in a modular way to support flexible recombination, experimentation with multiple scenarios and collaborative development. System-level programming supports dynamic loading and initialization of externally-created content such as videos, sounds, texts or 3D models. Object-level scripts can be associated with loaded or procedurally created content manually or automatically. Interface elements receive standardized messages that can be sent by all types of objects or in response to various measured conditions. As a result, additional actors or narrative sequences can be introduced quickly and the environment can suggest interpretations surprising even to its authors.

With these technical capabilities in mind, the analysis below is an exercise in thinking about virtual environments as multiplicious, contingent and self-reconfiguring assemblages.

Places of Many Stories

This focus on the assembled character of environments is appropriate because the co-presence of multiple possible interpretations has been evident from the project's beginning. Virtual Braunstone had to tell a story about the Braunstone Health and Community Centre as a site of innovation, but the challenge of such a presentation is far from trivial. What does Braunstone Health and Community Center do? Why, how and for whom? Many simultaneous stories can serve as suitable answers. As always, different stakeholders experience and describe things differently.

Fig. 1. Opening Sequence, shot 3. [fade in from black] The camera turns to the right and zooms to find Tina, the protagonist, with a pram, moving towards the entrance of the health center. The shot traces the path to the entrance, shows the location of parking, emphasizes the distinction between the walkways and the road, illustrates the scale of the building and relates it to the surroundings.

Fig. 2. Opening Sequence, shot 5. [fade in from black] This static camera shows the entrance lobby and the view into the reception area. Tina, now without the pram but with a baby in her hands, passes through the frame. [cut]

Fig. 3. Opening Sequence, shot 10. A wide shot of the reception area with Tina in the center. The menu appears on the right of the screen. From now on, the user is in control.

During the initial conversations with the research team, the National Health Service and the architects tell a story that justifies the existence of the project. They describe a particularly troubled area of Leicester. Unemployment has been high among residents over several generations. Crime, teenage pregnancy and vandalism are common. Public facilities are missing or basic. Indeed, the New Labour Government has formally identified Braunstone "as a 'neighbourhood' of multiple disadvantage, in 1998/99" [18]. Some say (can they be serious?) that the locals have deliberately burnt down the previous health center.

According to these stakeholders, the new center is badly needed, can be substantially better than the previous center and is likely to be more acceptable to the community. This is a story about civil servants excelling at their duties.

Addressing those concerned with the provision of medical buildings, the National Health Service also claims that the center is unusual because it combines community and health services in one facility. The building will include medical suites, indoor and outdoor public areas, a café, a police outlet, rooms for social workers and a pharmacy. This story can be labeled as that of organizational innovation.

The identity of the Center is further complicated by the conflicting stories describing the wishes and needs of its users. For example, architects think that to gain acceptance, the center has to be welcoming to the local community. Consequently, during their consultations with the neighborhood, the architects describe their design as open. At the same time, the medical professionals want security. None of them seem to live locally and most desire a sealed perimeter with controlled access. In response, the architects attempt to separate incompatible visitors and provide safety without making the building feel like a fortress. Consequently, the stories they tell doctors describe pregnant teenagers moving through separate corridors from their alcoholic fathers and emphasize that the system of parking is inaccessible to the visitors.

Further stories add other meanings. UK planning regulations and established practices tend to produce deep and dark buildings. With the relevant professionals in mind, architects create a story of

Fig. 4. Opening Sequence, shot 12. As the user is navigating Tina towards the Receptionist, the camera switches to a reverse shot showing the approaching avatar and the reception area from his perspective.

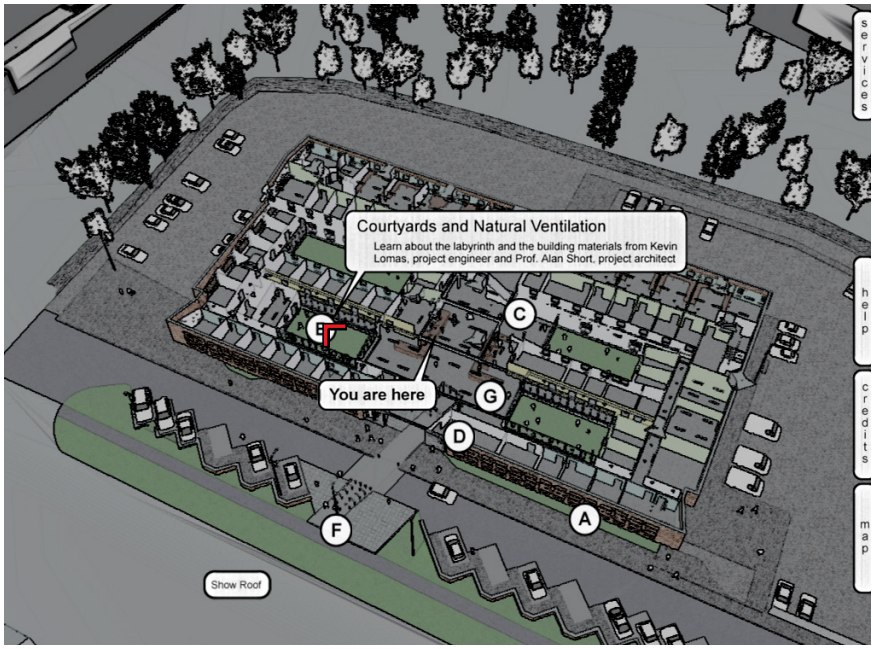

Fig. 5. Interface Elements. Pressing the Space key displays the cursor. Rolling the cursor over the letter markings brings up the titles of the missions. Interface buttons on the right brings up further interface-elements. In this case, the selected sequence is Courtyards and Natural Ventilation.

Fig. 6. Courtyard sequence, shot 2. When the user selects a mission in the aerial view, the camera flies back into the building and the conversation between the receptionist and Tina resumes. The receptionist explains the route to the destination.

Fig. 7. Courtyard sequence, shot 4. Following the instructions of the receptionist, the user steers Tina towards the courtyard. The camera pans to follow her movement.

Fig. 9. Courtyard sequence, shots 6, 7, 8. When Tina approaches the door, the camera switches again. The user steers Tina through the door and follows the corridor. The camera remains static. In the next shot, the camera is in the courtyard. It pans left-to-right as the user steers Tina towards the end of the corridor.

Fig. 8. Courtyard sequence, image 5. As Tina passes the corner of the counter, the camera switches to a static shot showing the courtyard in the background and the door, that the receptionist described earlier, to the left.

Fig. 10. Courtyard sequence, shot 9. Tina is in the courtyard. The camera smoothly transits from the third- to the first-person point of view. The user sees a video screen located in the courtyard. Shot 10 (shown). The movie is annotated by a textual tag. In it, the project architect discusses the environmental features of the design. The user is free to move about the courtyard. Rolling over buttons brings up associated textual or visual tags with information about the surroundings.

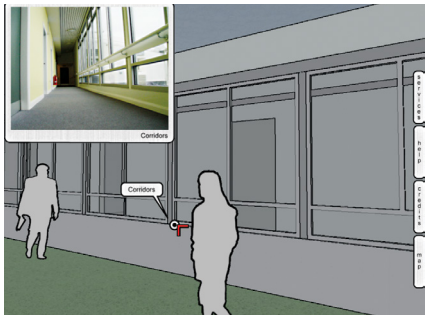

Fig. 11. Courtyard sequence, shot 12. A button triggers a sequence of images showing the detailing and appearance of the corridors.

Fig. 12. Courtyard sequence, shot 13. Having reached the mission's destination, the user returns to the Receptionist and has an option to answer positively or negatively to his questions: "Was the courtyard open? Have you managed to find it?"

the Center's deep-plan structure. It describes landscape courtyards that manage to deliver natural light into most spaces. Wishing to characterize their practice for colleagues and future clients, architects describe the Center's passive ventilation system, developing yet another distinct story. This list of subjective, goal-oriented accounts addressing different audiences and employing different narrative devices can be easily extended.

In response to this radical multiplicity of opinions, purposes and experiences, the design of Virtual Braunstone proposes a narrative structure that can deliver numerous and even conflicting narratives.

From Telling to Acting

These simultaneous and often incompatible narratives cannot be collapsed into one coherent mode of delivery without some loss. Accordingly, Virtual Braunstone avoids generating a master narrative and, instead, seeks to extract meaningful stories from various participants. Human participants can tell interesting stories but these stories are biased by the tellers' understandings and goals. Apart from humans, all places involve multiple types of non-human participants such as animals, natural phenomena or technical artifacts. Typically, such non-human participants cannot tell a story without human help. In both cases, a persuasive way of exploring a situation is through enactment. A performance that involves a variety of stakeholders can combine their multiple narratives with actual experiences. These experiences can be simulated or actual. For example, participants can be asked to navigate through the simulation of building's geometry. Alternatively, doctors and architects can have an actual discussion on the merits of open access in reference to the available virtual locations and views. An integration of conceived and emerging interpretations arising through such hybrid engagements challenges the concept of the "user", presenting both human and non-human participants in terms of actions they perform.

A place like the Braunstone Centre is a complex assemblage of many types of actions. For example, architects and engineers design, construct, promote and make business. Virtual-environment designers learn and retell. Local residents receive treatment, socialize and form expectations. Medical professional cure and worry. The National Health Service personnel organize and institutionalize. Non-human actors also perform. The underground labyrinth ventilates. Brick walls protect.

Some stakeholder actions are harder to simulate than others but even partial simulation can engage participants in the (re)construction of the core notions such as those of the "health center" or "design excellency". It is important to encourage this kind of engagement because the assemblages behind these terms do not have ready constitutions but are sustained through multiple partial performances. This approach has parallels in Latour's sociology of associations, or "slowciology" [19], which suggests that good research accounts perform the social in a way that makes connections explicit and removes the need for explanations.

The following sections discuss how some of such simulations can be supported by computer-sustained operations and are implemented in Virtual Braunstone.

Operations

Given that all of Virtual Braunstone cannot be described within the limits of this paper, the subsequent text focuses on several characteristic operations. The term operation here is informed by Bogost's discussion of "unit operations" [20], or various types of discrete processes that perform transformations on inputs. In this paper, operations are recognizable, repeatable and programmable. They can be initiated by different triggers and their overall outcomes are independent of the mechanisms of their implementation. Relatively autonomous, these operations can be used in different context and combinations, for example, to sustain other stories or to enrich other virtual environments.

Operation 1: Undertaking

To express and simulate a variety of experiences and viewpoints, Virtual Braunstone offers the user a series of journeys. These journeys rely on the concept of missions common to computer games. These missions encourage exploration and enactment by requiring navigation (from fig. 6 to fig. 10), participation in conversations (e.g., fig. 6 and fig. 12), study and selection of narrative themes (fig. 5) and other activities.

Each mission has a distinct topic, relates to a particular location and plots a unique path through the environment. The prototype implementation of Virtual Braunstone includes seven missions: Design Challenges, Courtyards and Natural Ventilation, Environmental Features, A Community Facility, Project Realization and Management and Neighborhood. These themes were selected to reflect the multiplicity of concerns that pertain to the Braunstone Health and Community Center. Each mission mobilizes a distinct cast consisting of 1) human speakers variously involved with the project (fig. 10); 2) photographic evidence collected on site during construction (fig. 11); 3) visualizations and simulations of technical issues, natural processes and construction procedures (not shown); 4) navigable three-dimensional geometry (all figs.); and 5) the movies of pre-rendered, animated two- and three-dimensional digital models (not shown).

Operation 2: Editing

In Virtual Braunstone, navigation is supported by parametrically controlled cinematic camerawork [21, 22] that utilizes action-driven editing (figs. 6 to 8), rhythm-aware shot transitions (figs. 1 and 2) and multiple forms of projection (orthogonal, perspectival and axonometric). These combinatorial capacities of interactive media reach beyond the montage in cinema by associating particular representational choices not only with narrative logic but also with particular locations. By navigating the

avatar through these locations, people who explore the virtual environment can compare the narratives offered by the designers with their own experiences.

Operation 3: Tagging

In addition to other discursive operations, Virtual Braunstone utilizes various forms of tagging (fig. 10). These tags can be textual and visual, unitary or serial, arbitrary or opportunistic. As they are location- and time-specific, they can also be triggered by narrative events. Tags can name, question, compare and highlight many types of actors and operations. They can express processes of construction or the functional behavior of building components. They can group, foreground and explain, such as when they employ a set of photographs to describe the ventilation system (fig. 10, behind the speaker) in varying degrees of completeness. They can guide the navigation and frame the behavior of the people encountering the virtual environment.

Operation 4: Rendering

Virtual Braunstone utilizes cartoon-style rendering (all figs.) as a flexible setting that allows the accommodation of multiple types of visual content. The National Health Service planned to finish the physical building before the completion of Virtual Braunstone. With this in mind, Virtual Braunstone is designed not to compete with the high fidelity of the physical site. Instead, it extends the simplicity of cartoon-style presentation with a broad variety of photographic and simulated imagery produced during different stages of construction (figs. 10 and 11). In addition, the cartoon-style representation of the architectural and natural elements allows flexible and economical inclusion of other non-photorealistic representations. For example, Virtual Braunstone incorporates outline representations of people, cars and trees (fig. 1 and fig. 2); shaded representations of main characters (fig. 2 and fig. 4); and diagrammatic pre-rendered animation (not shown).

Examples

The following text provides two examples of possible sequences of experiences within Virtual Braunstone.

Example 1: The Entry

The first example is the sequence that structures the process of entering into Virtual Braunstone (from fig. 1 to fig. 4; with some of the distinct cinematic shots omitted for brevity). This sequence introduces the non-photorealistic visual style, openly announces the artifice of the virtual-environment representation and establishes the cinematic conventions used in support of interactive missions. These conventions permit cross-fades and cuts to suggest instant relocations or time jumps as well as reverse shots to portray dialogues and relate characters' actions to the surroundings. The sequence follows the main protagonist, a partially controllable avatar of a mother with a young child. Thus, from the very beginning, Virtual Braunstone asks its visitors to consider the experiences and relationships of a participant whose needs and behaviors are different from theirs. Directing and observing actions of another person, especially in public settings, encourages reflection and discussion that could not be triggered by a neutral entity, for example by a generic human avatar or an invisible virtual camera.

Example 2: A Mission

The second example is the sequence that continues from the moment of mission selection to a destination serving as the mission's goal (from fig. 5 to fig. 12; with some shots omitted). The sequence demonstrates how cinematic editing is used to describe the character of architecture. The utilization of multiple cameras provides a variety of views. Typical first-person virtual cameras have unvarying fields-of-view and follow floors at fixed heights. By contrast, cinematic camerawork can take cameras to locations typical to building visitors (e.g., figs. 8, 10 and 11) as well as to vantage points inaccessible to, unappreciated by or unknown to them (e.g., fig. 5 and fig. 7). In turn, views from such locations can highlight significant characteristics of places, for example visual permeability, one of the center's claims to innovation (figs. 9 and 11).

In Virtual Braunstone, missions lead to destinations that host context-specific multimedia content. The Courtyard sequence of this example gives access to a series of movies discussing architectural, environmental and technical aspects of the design. In this example, the movies allow architects and engineers to explain the passive ventilation system with its courtyard air intakes and the underground labyrinth. They speak in clips, which were shot during construction or in the digitally animated environments. These movies employ further cinematic devices. For example, they assemble complex montage sequences, integrate animation and present physical simulations. Following the narrative, the movies transport the speakers between temporal and geometric locations and construct associations between events, data, interpretations and geometry.

Discussion

Human engagement provoked by virtual environments can change dramatically depending on the context of access. This is the case because virtual environments do not belong to a fixed location and their configurations have to be arranged and actively maintained in every concrete situation [23]. This is particularly applicable in the case of Virtual Braunstone. Even if its software resides on a CD, this CD has to be run on a particular computer, in a particular location and by particular people. It is typically installed during temporally bounded and structured events such as symposia or workshops. During events of this kind, the virtual environment becomes embedded into extended encounters that involve further narrative operations, such as explanations and discussions. Therefore, it becomes possible and useful to think about the experience of virtual environments as a process that involves a running software application but that gains its meaning in relationship to other interlinked performances.

Were stories of Virtual Braunstone, situated in the way discussed above, successful in their attempt to reflect the character of the Braunstone Health and Community Center? In conversations with the research team as well as in its internal symposia, National Health Service personnel have described the Virtual Braunstone project as a success. They have also acted as if it was useful by willingly integrating Virtual Braunstone into national and international events, such as design panels or seminars on sustainable urban development. In spite of these encouraging signs, this paper cannot evaluate the faithfulness of Virtual Braunstone as a representation because my understanding of how virtual environments operate is incompatible with the transmission model of communication that such a criterion presumes. Models that focus on transmission cannot exhibit or put together relevant assemblages because they tend to emphasize predetermined, hermetic and propagandistic narrative goals. Incompatibly with such models, important situated and social effects do

not exist "out there" but emerge through collective enactments. This is similar to conceptualizations in which the world itself has to be produced, for example in what Harman terms "the carpentry of things" [24]. In these cases, "representation" is a misleading term. It is better to talk about the staging of relevant performances or the restaging of past encounters.

Returning to the portmanteau analogy, one cannot extract from a physical suitcase something that someone has not packed. However, literary portmanteaus, when successful, are able to create and name new realities. To continue with Humpty Dumpty:

gallop + *triumph* = *galumph*
chuckle + *snort* = *chortle*

Can similarly new, alternative realities result from encounters with and within virtual environments?

Situated deployments of the Virtual Braunstone case-study illustrated that meanings in virtual environments are created not by passive receivers, but by members of interest groups who employ multiple types of knowledge. Such creative engagements can sample larger or other possibility spaces [25, 26] than those accessible through physically realized buildings. This comparative sampling encourages stakeholders to engage in discussions about issues hidden by the master narratives offered by dominant experts or suggested by the unreflective patterns of habitual use.

Are there specific strategies which might allow one to commit to the multiplicities of possible actors, performances and meanings? In Virtual Braunstone, the range of narrators is limited to set, preselected, and – one suspects – preapproved stakeholders. Is this limited and artificial collective misrepresenting? A typical move is to extend the range of creative contributions by inviting participation, for example through social media. There are some strong advantages to such an approach including breadth, spontaneity and self-direction. However, in some cases disadvantages can outweigh benefits and lead to shallow ideas, flatness, self-similarity and technologically constrained expression. Virtual Braunstone attempts to explore and enact via encounters that are numerous, heterogeneous and reconfigurable but also curated.

The central challenge of this curatorial effort is to decide what stories to tell, what encounters to stage, and what conditions to put in place to allow for participants' enacted creativity. Popular media (including interactive environments, such as games) keep telling a limited range of stories, a practice that some describe as long-standing, normal and even inevitable [27, 28]. Murray even suggests that "the formulaic nature of storytelling makes it particularly appropriate for the computer" [29]. By contrast Virtual Braunstone does not repeat canon narratives but instead induces people to act, make decisions and establish relationships.

The experience of assembling Virtual Braunstone suggests some tactics that can encourage the transition from representation as transmission towards political representation. This type of representation can be seen as speaking on behalf of stakeholders, as gathering entities into collectives and as directing these collectives. Devoid of political representation or active reflection, conventional storytelling is romantic; it focuses on humans and their emotions, often presented through standard hero-obstacle-goal structures, as can be seen, for example in Iuppa and Borst's account of serious games [30]. However, stories about places, such as Braunstone, or issues, such as health, are much broader than stories about humans and their emotional struggles. Such techno-social engagements involve multiple extended relationships between human and non-human actors, as can be illustrated by Michel Callon's discussion of scallops [31], Latour's analysis of personal transport systems [32] or Mol's sociology of the Zimbabwe Bush Pump [33]. Collectives of this kind are framed by design and are inescapably negotiatory. How can the diverse actors of such assemblages partake in choosing between possible change vectors?

This paper cannot fully answer this strategic question. However the experience of constructing and deploying Virtual Braunstone suggests that the integration of slow, unit-based and reconfigurable narrative with elements of immersive simulation can expose diverse thought processes and ways to behave. In Virtual Braunstone, one can observe different types of expertise in action; for example when experts by training (architects or engineers) campaign for particular interpretations of the place, or when experts through the length of involvement (local residents) talk about their visions of the past and their hopes for the future. This type of storytelling resembles political representation in places for negotiations, such as direct democracy forums, parliaments or courts. At the same time, such storytelling aims to avoid didactic messages intending to propagandize or Hollywood recipes aiming to entertain. Alongside this type of curated but deliberately multiplicious narrative, Virtual Braunstone implements engagements in first and third person. This move, borrowed from computer games, shifts what can initially be recognized as simulations closer to what can be better understood as participatory performances. These performances do not simply simulate for observation and analysis but also make those encountering Virtual Braunstone act out or resist the opinions and arrangements of the experts.

The discussion of virtual environments as devices for the staging of places in architecture, urban design, heritage and beyond is of interest because these fields are yet to engage with the meaning-making strategies developed in the fields of games or interactive art. Relevant literature includes Murray on the possible character of stories in a distinct "digital medium" [34], Jenkins on "narrative architecture" and the ludologist/narratologist debate [35], Ryan on computer games as narrative [36] or Bogost [37] and Wardrip-Fruin [38] on process-dependent expressive characteristics of games.

Narrative sophistication is also uncommon in other "serious" virtual environments. For example, it is illustrative that narrative does not constitute a significant theme in Anderson et al.'s [39] thorough overview of the state of the art in serious games. Instead, the examples they found have didactic characteristics associated with the transmission model where experts teach lay people. These experts do use immersive environments or animated avatars, but employ such devices for tactical reasons that are subservient to their goals and pre-conceived notions. Clearly, game-like virtual environments of this kind can be very useful in spite of these limitations. However, this paper contends that the integration of multiple and heterogeneous points of view can help virtual environments be more persuasive and interrogative.

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References and Notes

1. Bruno Latour, *Reassembling the Social: An Introduction to Actor-Network-Theory* (Oxford: Oxford University Press, 2005).

2. Manuel De Landa, *A New Philosophy of Society: Assemblage Theory and Social Complexity* (London: Continuum, 2006).

3. Diana H. Coole and Samantha Frost, eds, *New Materialisms: Ontology, Agency, and Politics* (Durham, London: Duke University Press, 2010).

4. Levi R. Bryant, Nick Srnicek, and Graham Harman, eds, *The Speculative Turn: Continental Materialism and Realism* (Prahran, VIC, AU: re.press, 2011).

5. Roudavski, Stanislav, *Staging Places as Performances: Creative Strategies for Architecture* (PhD, University of Cambridge, 2008).

6. Bruno Latour, *Politics of Nature: How to Bring the Sciences into Democracy*, trans. by Catherine Porter (Cambridge, MA: Harvard University Press, 2004).

7. Jonathan Murdoch, *Post-Structuralist Geography: A Guide to Relational Space* (London; Thousand Oaks, CA: SAGE, 2006).

8. Lars Hallnäs and Johan Redström, "Slow Technology: Designing for Reflection", *Personal Ubiquitous Computing*, 5, 3, (2001), pp. 201–212.

9. Phoebe Sengers, Kirsten Boehner, Shay David and Joseph 'Jofish' Kaye, "Reflective Design", in *Proceedings of the 4th Decennial Conference on Critical Computing: between Sense and Sensibility*, ed. by Olav W. Bertelsen, Niels Olof Bouvin, Peter G. Krogh and Kynd Morten (Aarhus, Denmark: ACM, 2005), pp. 49–58.

10. David W. Orr, *The Nature of Design: Ecology, Culture, and Human Intention* (New York: Oxford University Press, 2002).

11. Alastair Fuad-Luke, *Design Activism: Beautiful Strangeness for a Sustainable World* (London; Sterling, VA: Earthscan, 2009)

12. Linda Leung and Daisy Tam, "The Art of 'Slow': Taking Time in the Digital Age", in *Digital Experience Design Ideas, Industries, Interaction*, ed. by Linda Leung (Bristol: Intellect Books, 2008), pp. 49–56.

13. Janet H. Murray, *Hamlet on the Holodeck: The Future of Narrative in Cyberspace* (Cambridge, MA: MIT Press, 1997).

14. Marie-Laure Ryan, *Narrative As Virtual Reality: Immersion and Interactivity in Literature and Electronic Media* (Baltimore; London: Johns Hopkins University Press, 2001), p. 10.

15. Ryan [14] p. 8.

16. Gonzalo Frasca, "Rethinking Agency and Immersion: Videogames As a Means of Consciousness-Raising", *SIGGRAPH 2001 N-Space Art Gallery* (2001) <http://www.siggraph.org/artde-sign/gallery/S01/essays/0378.pdf>.

17. Augusto Boal, *Theater of the Opressed*, trans. by Charles A. McBride, McBride, Maria-Odilia Leal, and Fryer, Emily (London: Pluto, 2008 [1974]).

18. Kevin Broughton, Nigel Berkeley, and David Jarvis, "Neighbourhood Regeneration in an Era of Austerity? Transferable Lessons from the Case of Braunstone, Leicester", *Journal of Urban Regeneration & Renewal*, 6, 4, (2013), pp. 381-393.

19. Latour [1] pp. 122, 138.

20. Ian Bogost, *Unit Operations: An Approach to Videogame Criticism* (Cambridge, MA: MIT, 2006), pp. 3–19.

21. Stanislav Roudavski and François Penz, "Context Design and Cinematic Mediation in Cuthbert Hall Virtual Environment", in *Virtual Storytelling; Using Virtual Reality Technologies for Storytelling Second International Conference, ICVS 2003*, ed. by Olivier Balet, Gérard Subsol and Patrice Torguet (Heidelberg: Springer, 2003), pp. 112–115.

22. Stanislav Roudavski and François Penz, "Spatial Context of Interactivity", in *Interactive Convergence: Critical Issues in Multimedia*, ed. by Scott P. Schaffer and Melissa L. Price (Oxford: Inter-Disciplinary Press, 2003).

23. Stanislav Roudavski, "Virtual Environments as Techno-Social Performances: Virtual West Cambridge Case-Study", in *CAADRIA2010: New Frontiers, the 15th International Conference on Computer Aided Architectural Design Research in Asia*, ed. by Bharat Dave, Andrew I-kang Li, Ning Gu and Hyoung-June Park (2010), pp. 477–86.

24. Graham Harman, *Guerrilla Metaphysics: Phenomenology and the Carpentry of Things* (Chicago: Open Court, 2005).

25. Candy, Stuart, *The Future of Everyday Life: Politics and the Design of Experiential Scenarios* (PhD, University of Hawai'i at Mānoa, 2010).

26. Heape, Christopher Robert Ashton, *The Design Space: The Design Process as the Construction, Exploration and Expansion of a Conceptual Space* (PhD, Mads Clausen Institute, University of Southern Denmark, 2007).

27. Joesph Campbell, *The Hero With a Thousand Faces*, (Princeton, NJ; Oxford: Princeton University Press, 2004).

28. Vladimir Propp, *Morphology of the Folktale*, trans. by Laurence Scott, 2nd edn (Austin; London: University of Texas Press, 1968 [1928]).

29. Murray [13] p. 187.

30. Nicholas V. Iuppa and Terry Borst, *Story and Simulations for Serious Games: Tales from the Trenches* (Oxford: Focal, 2007), pp. 35-37.

31. Michel Callon, 'Some Elements of a Sociology of Translation: Domestication of the Scallops and the Fishermen of Saint Brieuc Bay', in *Power, Action and Belief: A New Sociology of Knowledge?*, ed. by John Law (London: Routledge & Kegan Paul, 1986), pp. 196-233.

32. Bruno Latour, *Aramis: Or the Love of Technology*, trans. by Catherine Porter (Cambridge, MA; London: Harvard University Press, 1996[1993]).

33. Marianne K. de Laet, and Annemarie Mol (2000). 'The Zimbabwe Bush Pump: Mechanics of a Fluid Technology', *Social Studies of Science*, 30, 2, (2000) pp. 225–263.

34. Murray [13].

35. Henry Jenkins, "Game Design as Narrative Architecture", in *First Person: New Media as Story, Performance, and Game*, ed. by Noah Wardrip-Fruin and Pat Harrigan (Cambridge, MA: MIT Press, 2004).

36. Marie-Laure Ryan, *Avatars of Story* (Minneapolis: University of Minnesota Press, 2006).

37. Ian Bogost, *Persuasive Games: The Expressive Power of Videogames* (Cambridge, MA: MIT Press, 2007).

38. Noah Wardrip-Fruin, *Expressive Processing: Digital Fictions, Computer Games, and Software Studies* (Cambridge, MA: MIT Press, 2009).

39. Eike Falk Anderson, et al., "Developing Serious Games for Cultural Heritage: A State-of-the-Art Review", *Virtual Reality*, 14, 4 (2010), pp. 255–275.