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INTRODUCTION

What happens when you combine the explanatory potential of information visualization with situated and collective experiences produced by urban screens? As practices in reactive architecture and locative media converge and urban screens and projection technologies proliferate people are becoming increasingly able to interact with data in public space. This confluence presents us with modes of digitally mediated participation in urban space that highlight bodily and architectural relationships with data rich environments as well as new sets of problems and possibilities regarding aesthetics, poetics, and politics. The article will analyze works by Alfredo Jaar, Krzysztof Wodiczko, and Rafael Lozano-Hemmer, as they respectively exemplify the efficacy of the key components of public data visualization: mapping, expanded presence through architecture, and the 'incomplete' and participatory nature of relational aesthetics. A more recent example, the *E-TOWER* project, an interactive data visualization of Toronto's *energy* visualized on the CN Tower for Nuit Blanche 2010, will also be examined as a form of collective participation in public data visualization. [1] These projects provide the case studies necessary to reflect on the concept of the public, the potential of relational art strategies and the utility of play strategies for combining visualization and public space in order to enrich these spaces through the dramatization, problematization, animation, and relation of people, places, and data with from-a-distance interaction and urban screens.

ABSTRACT

As practices in reactive architecture and locative media converge and urban screens and projection technologies proliferate we are becoming increasingly able to interact with data in public space. This confluence presents us with modes of digitally mediated participation in urban space that highlight bodily and architectural relationships with data rich environments as well as new sets of problems and possibilities regarding aesthetics, poetics, and politics. The article will analyze works by Alfredo Jaar, Krzysztof Wodiczko, and Rafael Lozano-Hemmer, as they respectively exemplify the efficacy of the key components of public data visualization: mapping, expanded presence through architecture, and the 'incompleteness' and participatory nature of relational aesthetics. A more recent example, the E-TOWER project, an interactive data visualization project of Toronto's energy visualized on the CN Tower for Nuit Blanche 2010, will also be examined as a form of collective participation in public data visualization. These projects provide the case studies necessary to reflect on the concept of the public, the potential of relational art strategies and the utility of play strategies for combining visualization and public space in order to enrich these spaces through the dramatization, problematization, animation, and relation of people, places, and data with from-a-distance interaction and urban screens.*

NEW SPACES

With smart phones, networked screens, large digital public displays, and the many surfaces being mapped with images from powerful projectors, connections thicken between concurrent and contingent, on- and offline spaces and the traces that each device can obtain from the people and things that inhabit them. Large media facades, [2] reactive and relational architecture, [3] geo-tagging, projection mapping, and networked location-aware mobile devices present us with a potentially productive confluence — a fluid, digital layer [4] that permeates the city. This mix of technology and urban space creates an increasingly conflated real and virtual space — a hybrid space. [5]

In the context of a history of lights, the city, and public space, we have seen the reinvigoration of sociality in physical space via digital layers (urban screens, reactive architecture, projection mapping, geo-tagging, and augmented reality) that blanket public and private space.

The combination of networked, fragmented publics of the Internet and the publics formed in the squares, roads, and shared physical spaces of our cities, now adorned by media facades, sensors, and mobile devices, presents us with an expanded presence for cultural engagement and self-reflection. As Scott McQuire points out:

> .. *media-dense spaces, comprising a variety of platforms such as large screens, LED signage, wireless networks, and a growing range of interactive capabilities … are the inheritors of the tradition of public space constituted by street life, city squares, cafes, and public cultural institutions. They have assumed the task of catering for those who are present at a moment when being present has assumed new dimensions.* [6]

The layers constituted by the city, data, and communications networks create a new and unique point upon which identity; knowledge, narrative and experience can be constructed.

VISUALIZING DATA IN SPACE

The digital and interactive visualization of information has added yet another layer to this hybrid space. Continued advancement in computation and the increasingly ubiquitous presence of networked data gathering and data-storing processes and devices has produced an incredible surge of information available to both specialized researchers and general consumers. Information visualization is one response to the cognitive and representational challenges related to the information excess brought about by these technical advances.

Augmenting cognition is often stated as the key purpose of information visualization. [7] The externalizing of cognitive processes, rearrangement of visual information, and facilitation of pattern-recognition make visualization an incredibly powerful tool for both analysis and persuasion — a power that, the authors argue, is further increased when within the concept of visualization are incorporated public space, built structures and participation.

Some of the first instances of visualization are simple tools for counting or mapping things in geographic space. [8] By representing quantities of things or events in time and space as abstract forms, visualizations allow the visual human sensory apparatus to find shapes in data and, through more elaborate cognitive processes, infer correlations. This capacity to find patterns and meaning is augmented significantly when computers are used to amass, calculate, arrange, and animate large amounts of data. These latest forms of visualization, which include animation and interaction, allow users to see change over time and explore different spatial configurations of the data.

Of particular importance is the mapping function that occurs through a visualization operation. Donna Cox suggests that visualizations are particularly powerful in how they recontextualize data. [9] For instance, when demographic data is placed on a visual representation of the city, a *source domain* is mapped onto a *target domain*. Meaning is thus borrowed from one in order to create new meaning.

While this mapping function occurs regularly in visualizations presented on paper and screens we may also think of ways this applies to mapping *virtual* data onto other *physical* spaces. Information visualization that takes on an architectural scale often presents new data resting on a built structure where both components bring a network of meanings. In order to employ the notion of Cox's *visaphor* we need to adapt it to the way new meaning is created with physical structures. Data, according to Cox, represents the source domain and its translation into a visual model, the target domain, produces the visaphor and recontextualizes the source data. For our purposes, the visual model includes both the image (color, animation, shape) and the physical structure.

Take, for instance, Alfredo Jaar's *Lights in the City*, [10] presented as part of Mois De La Photo in Montreal in 1999. In this piece, red lights were installed in the Cupola of the Marché Bonsecours, a landmark in Old Montreal. Homeless shelters located within 500 yards of the Cupola were equipped with information about the installations. In each shelter were installed electronic buttons connected wirelessly to the red lights in the Cupola. Every time a client entered one of the shelters they were asked to push a button that would engage the lights. The lights sent a sign to the city about the unacceptable condition of the homeless while respecting their privacy. At the same time, as the Cupola had suffered from several fires in the past, the red light represented a new threat to the community, that of its own inadequacy in caring for its members.

The real-time data generated by people entering shelters and its representation in the Cupola allowed the viewers to experience a marginalized and largely invisible flow of people. Jaar succeeded in collecting and displaying data about the city and mapping it onto a powerful symbol of the city — source domain and target domain combined through light and networks of data.

There is another point to be made here about the potential of visualizing data in public space. Traditionally, visualizations have been treated as surfaces for a sole user to view. With architectural projections, these visualizations can be viewed simultaneously by a group of users. Shared experiences within large visualization environments can harness the cognitive and communicative capacity in a group of viewers.

The mapping of information onto physical contexts and the shared experience of interacting with a visualization signal a key combination of participatory and meaning-making potentials that are the focus of public data visualizations. The physical space in which the visualization is displayed as well as the opportunity for people to engage collectively can provide novel ways of experiencing space as well as opportunities of apprehending the complex data flowing between users, objects and environments.
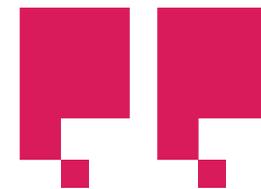
Shared experiences within large visualization environments can harness the cognitive and communicative capacity in a group of viewers.

As a precursor to the potential of visualization in public space and on existing architecture we may turn to the works of Krzysztof Wodiczko to provide an example of how imagery and physical structure can become a powerful tool for social commentary. Wodiczko's projection works create a surrealistic collision between the image of a building or monument and the projected image. In this relationship, the built environment has figured as a central element of the final work as it brings forth its own social histories. For instance, Wodiczko's *The St. Louis Projection* in which prisoners and victims of crime share their stories, was originally intended to be projected on the face of the St. Louis Historical Old Courthouse, the site of a landmark lawsuit against slavery in 1846. Due to last-minute controversy concerning the content of the project it was moved to a nearby library building. This movement signals the potential for the social histories of buildings to be re-presented along with contemporary issues through visualizations and projections.

While Jaar's installation visually abstracts the movement of people in the city, Wodiczko's installation literally places the bodies of people onto the building. Through light, architecture, and data visualization, these works, along with the E-TOWER project discussed below, allow for the creation of stories and knowledge that are directly connected and representative of viewers located in that space.

E-TOWER

Our first attempt at combining data visualization and public space was *E-TOWER*. [11] *E-TOWER* was an interactive visualization installation that was presented at Scotiabank Nuit Blanche 2010, a citywide all-night contemporary art event [12] that took place on October 2, 2010 in Toronto. *E-TOWER* asked participants to interact with Toronto's CN Tower, the world's third

tallest free-standing structure, [13] by texting the word *energy* along with any additional text that would be displayed on the *E-TOWER* Twitter feed. The color and speed of the lights on the tower varied depending on the amount of *energy* sent by participants around the city. Volunteers at five vantage points around the city handed out information cards and encouraged participation.

This project attempted to engage participants as intelligent reporters that might respond to both the visual stimulus provided by the tower and *E-TOWER* information cards and volunteers that informed the audience of the significance of the lights on the tower. The participants were entrusted with initiating and perpetuating the data visualization.

For every ten texts we received, the lights on the tower would advance to the next *energy phase* running through a series of increasingly energetic stages and culminating in a multi-colored animation. Additional Twitter functionality allowed for a more nuanced field of interaction where, in 140 characters or less, participants could express and share their thoughts, feelings, and ideas related to the project.

Throughout the night, individuals and groups participated by sending their *energy* to the tower, creating links across physical and virtual space, in proximity and at a distance, sutured together by the tower as a shared representational and communicative beacon. Like Jaar's *Lights in the City*, *E-TOWER* allowed the city to communicate to itself with itself through a visualization of data using light and architecture. By using the CN Tower as the central transfer point for the city's participation, people's actions were mapped on to a powerful civic symbol.

PARTICIPATION AND RELATING THINGS IN PUBLIC

The convergence of publicly accessible space and viewable displays affords another possibility of relating people and things in ways that are participatory as well as revelatory. The term *public*, especially in view of the installations we are discussing, requires an elaboration in order to understand part of the potential in visualizations appearing on buildings. The notion of *public* can be defined as a group of people interested in a particular problem. [14] *Res publica* evokes the notion of a thing held in common. We take this aspect of *public* to be our basic concept to explain how public data visualization may function.

To *make things public*, as Bruno Latour advocates, [15] is to bring together a diversity of reactants that escape representation. Latour argues for an active and creative engagement with the networks of associations not only between people but also between people and things that are often disregarded. For Latour, to make things public is to make spaces for critical reflection and engagement, which entails gathering people and things that can develop active and critical engagement.

In order to manage the added complexity of ephemeral data flows and multiple actors, a mention of how relational aesthetics has been theorized may provide a useful foundation for work in this field. [16] At the heart of relational form is the idea that an installation is incomplete without participation. [17] We can think of relational aesthetics, as artist Liam Gillick puts it, as we might think of a light in a fridge: it only works if someone opens it. [18] Jaar's *Lights in the City* is an excellent example, as it remains inactive and imperceptible without the participation of clients from the homeless shelter pressing buttons in various shelters around the city. This on-going incompleteness encourages viewers and participants to enter into a dialogue not only with the artwork but with others 'present' in the space produced by the artist. [19] Meaning is

therefore elaborated collectively and the work allows for the formation of temporary publics where the relations between humans are central to the intention of the work. Relational aesthetics is concerned with fostering inter-subjective relationships. Here, if we combine Latour's concept of the politics of things and their existence as actors in public space, along with the combination and collision of these actors (which include data, architecture, and participants) within a framework of participation and relationality, we can see how complexities, data flows, and multiple actors are combined, dramatized, and externalized.

Wodiczko's work is similar in its explicit aim to create inter-subjective relations in public space. In *The St. Louis Projection*, victims and perpetrators of crime as well as other viewers enter into a public discussion with the aim of healing. With Jaar's *Lights in the City*, we can trace relations between the homeless, shelters, and the city through the lights on the tower. Inter-subjectivity between people, things, and data is co-constituted by these various actors and networks combining in the processes of the artwork.

Works that engage a relational aesthetic seek to model a possible universe [20] by creating a micro-utopia, [21] and not one where all is harmonious, but one where communication among participants is enabled and emphasized, regardless of the outcome. These works, as Bourriaud notes, bring about the conditions for social exchange and interaction with the viewer generating "processes of communication in their concrete dimensions as tools that can be used to bring together individuals and human groups." [22] Rather than represent social utopias or engage in critique, relational works attempt to create tangible spaces for social experimentation in an effort to discover new assemblages and "possible relations between discreet units by building alliances between different partners." [23] Far from being a social utopia, Jaar's work sets out a so-

cial experiment, which rests upon the cooperation and consent of various participants in making a connection, through the data they create and the communicative assemblage of electronics, light, and architecture, with a public they seek recognition from.

Claire Bishop has perhaps been one of the most notable critics of relational aesthetics. [24] She notes that the theory, as set out by Bourriaud, lacks an agonistic element crucial to democratic process. [25] She has also critiqued the emancipatory and political import that is taken for granted through the assumption, via the intention of the artist, of *producing* rather than *reflecting* social conditions, and thus trumping mere optical contemplation of the work. Although Bishop's criticisms are not unfounded, and we should not jump to conclude that relational works are automatically political and democratic, it should be noted that the works we have described thus far and related to relational aesthetics can certainly be seen as both producing *and* reflecting social conditions, allowing for an oscillation between direct participation and spectatorship, and allowing for dissensus, most notably in the option to disengage the work by non-participation. Extending relational aesthetics beyond the gallery, into public space and on to architecture, and augmenting participation through data and networks and allowing these works to remain incomplete without participation better produces and reflects the relationships that constitute our contemporary experience.

Present concerns amongst the artistic community reflect the increased importance of relational aesthetics, particularly as it can be applied to public space. As Patricia Phillips writes: "A growing number of artists and agencies believe that the responsibility of public artists and agencies is not to create permanent objects for presentation in traditionally accepted public places but, instead, to assist in the construction of a public – to encourage through actions, ideas, and

interventions, a participatory audience where none seemed to exist." [26] Like Latour's notion of *making things public*, aspects of relational form – particularly its emphasis on the incomplete and the production of relationships through our environment including the relationship between and with non-human actors such as data and architecture – can help us think about how we might construct temporary, productive spaces that highlight associations between actors by using light, data, and the built environment.

Rafael Lozano-Hemmer is particularly adept at incorporating relationality between people, architecture, and public space. Perhaps the most well known example is *Body Movies*, which Lozano-Hemmer describes as part of a larger project on "Relational Architecture." [27] *Body Movies* has been installed in public squares across Europe, in Hong Kong, and in New Zealand, often projected on to significant public architecture. The work is activated by participants walking in front of powerful light sources and casting shadows on a wall, revealing projected photographic portraits otherwise obscured by the lights. Video surveillance tracking systems trigger new portraits when existing ones have been fully revealed by participants.

According to Timothy Druckrey: "Relational architecture disorganizes the master narratives of a building by adding and subtracting audio-visual elements to affect it, effect it and re-contextualize it." [28] In many ways, *Body Movies* achieves this by allowing people, through shadows or images, to represent themselves on an architectural scale. Druckrey goes on to note that relational architecture "is an evocation of the kind of social space in which active participation is not a by-product, but the driving force in the creation of dynamic agora." [29] Here, Lozano-Hemmer's work illustrates the kind of dynamic participatory space made possible by light, data traces, and architecture and the possibilities of relational aesthetics.

Play is important for inviting and sustaining participation in public space. Play helps to coordinate impersonal social relations and enables participants to enter into a contest or situation in which they share a common space and a set of rules.
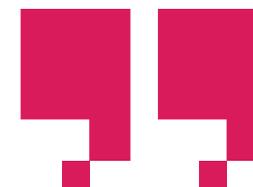
PLAY

In many ways, the work of Lozano-Hemmer exemplifies the spirit of the work of the Situationist International (SI), a group whose influence has had wide ranging impacts on how we theorize and practice what it means to be public amidst shifting political, social, and technical conditions. Constant Nieuwenhuys, a Situationist whose primary concern was architecture, outlined a theory of "unitary urbanism" that involved treating the city not as a Corbusian machine for living, but as an artist's tool, creating lived artworks that are temporary, emergent, ephemeral, transitory and volatile. [30] The Situationists envisioned cities built with movable walls and elements of public space that could be manipulated creatively and collectively, often with a spirit that was as critical as it was playful.

Ludic elements [31] may be beneficial to dramatizing public space and data. Play, Scott McQuire notes, "... is a key mechanism for testing and potentially reinventing social rules concerning appropriate modes of public behaviour." [32] Play is important for inviting and sustaining participation in public space. Play helps to coordinate impersonal social relations and enables participants to enter into a contest or situation in which they share a common space (screen, data and public space) and a set of rules. For instance, *Tentacles*, a project produced by Michael Longford, Geoffrey Shea and Rob King, invites users to add themselves to an ecosystem projected in a public common area where they can control the movements of their avatars through their respective mobile phones. [33] As their creatures interact on the shared display, players can decide to cooperate or compete as they can either steal valuable *tenticules* and inhibit the growth of others, or share resources with one another. What results is a public field of play: a space that accommodates passion and cooperation as well as adversarial positions. More importantly, play is important for increasing the frequency of personal contact that is vital for the development of culture, a point that the

Situationists advocated. **34** In fact, the Situationists envisioned cities as playing fields for new, participatory games that elicited emotional experiences. "The urbanists of the twentieth century," Debord said, "will have to construct adventures." **35**

CONCLUSION

Engaging people through light, architecture, and data, in overlapping material and immaterial spatial regimes, as the artists and theorists described above have, allows us to explore the expanded presence afforded by the current interconnected state of media, communication, and public space. This work, as Liliana Bounegru points out, can afford "opportunities for amplified consciousness of the self in relation to other beings in an intense sensorial, engaging way which goes beyond community and allows a more primary, more deep sense of human communion, a collective genesis afforded through technological mediation." **36** In public data visualizations, we can represent actors (human and non-human) and networks on physical structures in order to augment and extend the impact of these actors and the participatory processes between them while weaving a richer tapestry between physical and virtual spaces. ∎

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