City to City: Revealing Place to Place

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Abstract

City to City is an interactive artwork that visualizes the geography of the internet, from place to place, and allows individuals to see their own unique participation in it. Users conduct their online activities and observe their own inquiries, distinguished by color graphics and sound, as messages travel from their points of origin to their destinations. Participants are able to see the visible and distinctive paths that compose the larger, collective global internet. City to City's visualizations reveal the map of online traffic along with our dependency upon the invisible infrastructure of place to place connections; this infrastructure forms the foundation for all of our daily online activity.

Keywords
Visualization, Mapping, Internet, Interactive, Public Space

Introduction

City to City maps the invisible geography of internet traffic, using graphics and sound to visualize and animate paths of online activity from their points of origin to their final destinations. A large map of the world is projected on a wall. Viewers of the installation opt-in as participants and carry out their online activities. Each individual is identified by color and sound; s/he can see her/his own distinct presence on the projected map of the world. Visitors see themselves become part of a growing network of other local users, all of whom are physically present in the same space. [Figures 2, 3, 4]
As the map of visible and audible trajectories grows larger, and as each trajectory traverses across the globe, the routes connect city to city on the way to their destinations (Figure 4). In effect, this growing pattern of trajectories forms an overlaying second map which represents the hidden global interdependency of place to place, and metaphorically an emerging global intimacy, of which we are all a part.

**Related Work**

There is a growing body of works that create new cartographies outside of conventional Cartesian space through data visualization and use of the World Wide Web, and other locative media tools or systems. Some examples are listed here.

*Kit Galloway and Sherrie Rabinowitz's Hole in Space (1980)* is a seminal work using emerging satellite technologies linking two sites--Lincoln Center for Performing Arts in New York City and The Broadway department store in the Century City Mall in Los Angeles. Cameras at both sites transmitted live feeds via satellites allowing passersby to see and hear each other. While Hole in Space enabled both visual and auditory connection and ours does not, both works enabled viewers to see themselves radically differently in relationship to the larger, invisible global network system and extend their perceptions of themselves beyond local.

Like *City to City*, *The Virtual Dinner Guest* uses networks to create a site of social engagement the extends beyond the local, with a view to global community building. *The Virtual Dinner Guest* organizes dinners using video conferencing bringing people from different cultures, politics and geographic locations together to share a meal and conversation. Rooted in peace-building and conflict resolution, Eric Maddox, the project’s founder, has held dinners in thirteen countries and across four continents. (See: http://www.virtualdinnerguest.com).

Stamen Design, founded by Eric Rodenbeck in 2001, is a San Francisco based research studio using data visualization and interactive design to produce stunning, innovative maps. Using the map as an interface, the range and depth of their work are examples of the scope and aesthetics now possible thanks to emerging cartographic and analytical tools. (See: http://stamen.com)

The Satellite Sentinel Project uses satellite imagery to track evidence of atrocities on the ground in Sudan. Founded by George Clooney and John Prendergast in 2010, the project monitors changes on the ground and alerts policymakers, new organizations and activists to activate a global networked alarm system. The *Satellite Sentinel Project* fosters a new brand of global witnesses. (See: http://www.satsentinel.org/).

**Background**

*City to City* was the culminating project of a 2013-14 Fellowship which Zero1 and Google awarded to Paula Levine. The call was to develop an artwork that served to "interpret or illuminate the current state of difficulty associated with molding cultural policy so that it conforms to the reality of a society that is more connected with, and dependent on technology than ever before.”

Levine’s fellowship proposal was situated at the intersection of mapping and empathy, exploring implications of how interconnected and interdependent networks were changing and reshaping our daily lives. Her recent projects visualized the impact of distant geo-political events by transposing them upon areas otherwise untouched by those circumstances (TheWall, 2006, http://thewall.name; TheWallTheWorld, 2011, http://thewalltheworld.net; SanFrancisco-Bagdad,2004, http://shadowsfromanotherplace.net.). In effect, these works aimed to conceptually collapse geographical space so that the impact of an event could be simultaneously viewed on both familiar and unfamiliar ground.

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1 Galloway and Rabinowitz were pioneers in early Satellite Arts and founders of the Electronic Cafe (1984) which preceded current projects using satellite and web technologies to bridge borders and boundaries. (See: http://www.ecafe.com).

2 Zero1: The Art & Technology Network, is a Silicon Valley arts organization that sponsors a wide range of art, technology and science programs bringing together corporations, community and artists for project development, incubation of ideas and community collaborations. http://zero1.org.


4 See: http://paulalevine.net for detailed project descriptions.
Bridging between previous work and the Zero1/Google fellowship, Levine's initial plan was to design a platform that would, in effect, collapse the distance between local public space and public spaces elsewhere. This would allow participants to create and participate in a web of global communities that built upon the already existing place to place system of global internet connections.

Figure 5: First Friday, Installation by Paula Levine, March, 2013,

Figure 6: First Friday, Installation poster detail, March, 2013, Zero1 Garage, San Jose, CA

Process

Zero1 hosted the community of San Jose during the city's monthly First Friday events, which were described as when "street meets geek." (Figure 5). Galleries in San Jose's South First Area, including Zero1, could draw over 700 visitors to view art and participate in various cultural events and activities. Zero1 opened their Garage gallery space to visitors to view works in progress by current fellows and provide opportunity for the public to engage in conversations with them about their work.

Levine used the First Friday events in 2013 (Figures 5-7) as opportunities to conduct qualitative research focusing on visitors' use and understandings of the global internet system: how users spent their time online, their estimates of time allocated among work, research or entertainment, the places they would connect to over the course of a day, and their conceptual understandings of their own presence within the larger internet system. Through conversations, interviews and questionnaires, she consulted with about 100 participants and gathered data on patterns of use, expectations, as well as on visitors' impressions of themselves as part of the internet. Levine's goal was to formulate ideas for new designs that fostered place-based connections, such as a community-based system of networks bridging public space to public space, creating a more public global common ground for crowd-sourced global exchanges.

She discovered from research results that people thought in terms of person to person (peer to peer) rather than place to place connections. When asked about the value of place to place connections to support community building through, for example, open public platforms connecting one city or town's public space to another for networked collaborative events or message boards, participants hadn't considered such models of connections and questioned their use, application and value. Many participants expressed beliefs that diverse geographic locations already existed through multiplayer online gaming or group platforms like Google Hangout or Skype. Few could see how networked locations might function, or what they might be used for.

As the result of these conversations, it became apparent that we might focus on two initial objectives: first, to change people's perception of the World Wide Web by reflecting their own place and participation within it; second, to reveal the place-based system of connections in existence that sustained online user activities before considering ways to bridge between locations and build global community.

Our challenges became:
1. How to create an experience that would allow the public to envision themselves as a part of the global network as
active participants, indeed contributing shapers of the network itself?

2. How to make the public more aware of the invisible presence of the place to place infrastructure that was already in place, that supported and sustained their daily online lives?

City to City opened at Zero1 Garage in San Jose on January 22, 2014, and was on view through May, 2014. (See Figures 2, 3, 4, and 8 for exhibition documentation). A large map of the world is projected on the gallery wall. City to City provides a wireless access local hub for visitors to Zero1 Garage to log into and access websites. The network traffic passing through the hub is captured, traced, geolocated, and displayed on the map.

When a user visits a website, s/he is usually only aware of the two endpoints of source and destination. The messages generated by a website visit may actually pass through many intermediate routing devices, located in different time zones, geopolitical regions, and continents. In City to City, the physical paths traversed by viewers’ traffic, as they surf the World Wide Web, are interactively displayed on the map, making visible the intermediate place to place connections that enable the illusion of direct peer to peer user experiences.

In addition, as each animated network path passes through intermediate locations, pitched sounds are played on the City to City sound system. Pitches are selected based on the distance between the source (San Jose, for the opening at Zero1 Garage) and the intermediate network nodes. The result is a visually and aurally interesting display of the selected internet traffic travelling through the City to City wireless hub.

City to City

Implementation

The web is a system of interconnected devices, and we, as users, are rarely aware of the physical locations of these devices or the paths that on-line inquiries take to travel from their point of origin to their destinations. City to City, as an interactive installation, addresses both—the reality of the physical devices located at various points in the network, and the paths that connect origins and destinations.

Figure 7: First Friday, Installation detail. March, 2013, Zero1 Garage, San Jose, CA

Figure 8: City to City, Interactive installation, Zero1 Garage, San Jose, CA. January-May, 2014

Figure 9: City to City software block diagram
Technical Details
The internet is a massive network of nodes with each node identified by a unique number—the Internet Protocol (IP) address. For example, when a user at the City to City installation site in San Jose, California, makes a connection to a website hosted in Berlin, Germany, the access follows a path consisting of a number of nodes, from San Jose to Berlin. To trace and display an internet access made by a user, the City to City software system goes through the following main steps:

1) Data packets using the City to City wireless hub are detected by the Wireshark packet monitor. (https://www.wireshark.org).

2) The IP addresses of the source (always Zero1 Garage) and destination are extracted from each packet.

3) The traceroute utility, found in most Unix and other common operating systems, is used to find all network nodes in the path taken by the packet, from source to destination.

4) The IP2 Location geolocator\(^5\) looks up the location (i.e., name, latitude and longitude) of each node, based on its IP address. The path taken by the user’s internet access is traced on the projected map. In addition, the node location data is mapped to pitches based on distance. This sonification is rendered as the path is traced on the map.

Each viewer’s internet access is processed on-the-fly by City to City’s software system, as the outgoing message packets of an access are detected by Wireshark. Traceroute and geolocation sometimes require a few seconds to deliver their results; hence, there is a slight delay from the moment a viewer initiates her/his access, to the display of the path on the projected map.

Project Outcome
Through the opening of City to City in January, 2014, and on various subsequent First Friday events at Zero1 Garage, we observed that visitors were quickly drawn to the map of internet trajectories. They seemed to understand quickly and intuitively the main operations of the installation. This was verified in conversations with participants. While many were creating internet accesses and observing their trajectories on the map, others observed the results of the participant’s engagements. (See: Figures 2,3,4,8).

City to City exposes the unexpected. For example, shortest or most direct routes are not always taken. Instead, network messages may take paths of least resistance in situations where high traffic demands are an issue.

The project also makes visible a daily worldwide system of mutual dependency within a borderless world. City to City’s map, of seemingly frictionless connections over huge distances, appears in striking contrast to daily realities on the ground—ones of daily struggles, skirmishes and territorial conflicts over international and regional borders and boundaries.

Conclusion
We have come close to a system of networks that Leonard Kleinrock described in 2001 as one that serves “nomads as they move from place to place in a way that is transparent, integrated, convenient and adaptive. (as cited in William J. Mitchell’s The Cyborg Self and the Networked City, 2003). It appears that another model is emerging—one of a rapid globalization that is bringing people in closer proximity to each other than ever before. It is a world that, according to Jeremy Rifken, is becoming "transformed into a university public square."

While the backlash of globalization—the xenophobia, political populism, and terrorist activity—is widely reported, far less attention has been paid to the growing empathic extension, as hundreds of millions of people come in contact with diverse others.

City to City connects participants to their online activities and reveals the presence of the hidden infrastructure of place to place connections that makes online lives possible. There are many leaps from an awareness of the hidden place to place connections, to networked communities and a transformation from nomad to global citizen. The first step, however, is envisioning more innovative platforms using existing network infrastructures to foster bridges between and among people, in order to empathically connect local needs and global actions, as well as local actions and global needs.

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Installation documentation of City to City is from the Zero1 FellowshipX Exhibition, Zero1 Garage, San Jose, CA. (January, 2014-January, 2014)
http://zero1.org/exhibitions/fellowshipx.

Video documentation of the graphic and sound mapping of the network traffic generated by participants can be found at: https://vimeo.com/100775811. This video, along with addi-

\(^5\) http://www.ip2location.com
tional project information, can be found on the City-to-City website: http://city-to-city.net.

- All photographs are by Paula Levine.

References


2. VIRTUAL DINNER GUEST. virtualdinnerguest.com/


4. Satellite Sentinel Projects..satsentinel.org


Bibliography


Satellite Sentinel Projects..satsentinel.org


VIRTUAL DINNER GUEST. virtualdinnerguest.com/

Authors’ Biographies

Paula Levine is a media artist whose work brings together daily life and global politics. Utilizing various media, objects and venues, her work configures common ground between sites of political trauma or upheaval, and places untouched by these events. She has been an artist in residence at The Banff Centre for the Arts, the Experimental Television Center and the Djerassi Foundation, and has been the recipient of many awards and grants. Her essay “On Common Ground: Here as There,” is a chapter in *The Mobile Story: Narrative Practices with Locative Technologies* (Editor: Jason Farman). She is a Professor of Art, San Francisco State University. Website: http://paulalevine.net

Bill Hsu has built interactive pieces and installations in collaboration with Peter van Bergen, John Butcher, James Fei, Matt Heckert, Lynn Hershman, Jeremy Mende, and Gino Robair, among others, and performed in the US, Europe, Asia, and Australia. Articles on his work have appeared at huffingtonpost.com and slashdot.org. He teaches and does research in the Department of Computer Science at San Francisco State University. Website: http://unixlab.sfsu.edu/~whsu/art.html

Lee Periolat is a graduate student in the Master of Science program in the Computer Science Department at San Francisco State University. Lee holds Bachelor of Science degrees in mathematics and chemical engineering from M.I.T. and recently completed an internship at Stanford University under Professor Vijay Pande, the creator of Folding@Home. Lee has been programming since his dad brought home a TRS-80 Model III in the early 80’s and has worked on a wide variety of projects focused on high-performance computing for the sciences.