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ABSTRACT

No longer confined to our offices, schools, and homes, technology is expanding at an astonishing rate across our everyday public urban landscapes. From the visible (mobile phones, laptops, and blackberries) to the invisible (GPS, WiFi, GSM, and EVDO), we find the full spectrum of digital technologies transforming nearly every facet of our urban experience. Many current urban computing systems focus on improving our efficiency and productivity in the city by providing "location services" and/or interactive navigation and mapping tools. While agreeing with the need for such systems, we are reminded that urban life spans a much wider range of emotions and experiences. Our claim is that our successful future urban technological tools will be those that incorporate the full range of urban experiences – from improving productivity and efficiency to promoting wonderment and daydreaming. We discuss intervention as a research strategy for understanding wonderment; demonstrate an example of such a study using a matchbook experiment to expose relationships between locations and emotions within a city; and use the results to develop *Sashay* – a mobile phone application that promotes wonderment by visualizing an individual's personal patterns across the invisible, manufactured geography of mobile phone cellular towers.

ACM Classification: I.m Computing Methodologies; Misc.

Author Keywords

Urban computing, mapping, locative, *dérive*, *détournement*

Outline

In this paper we first motivate and discuss wonderment as a theme for urban computing research. We present intervention as a research strategy for uncovering wonderment within cities. As an example, we study the everyday curiosities of what others love and hate about their city using an intervention with matchbooks. Taking this emotional "love-hate mapping" as inspiration, we

develop a less emotionally charged and more reflective visualization of personal patterns of urban movement with *Sashay*, a mobile phone application.

INTRODUCTION

The industrial era metropolis is transforming into the digital era *metapolis* – a place of places, a dynamic and mutable system made up of collisions, encounters and intersections that end up yielding an extensive variety of combinations and scenarios, both real and virtual, specific and general [3]. It is natural that we wonder about our relationship within this new hyper-place and across its wide spectrum of situations. This paper demonstrates a technique for brainstorming such spaces and shows how it results in a tool for promoting wonderment.

Wonderment

More than just problem solvers, we are creatures of boundless curiosity. Mixed within our moments of productivity are brief instances of daydreaming. We find ourselves astonished and in awe of not just the extraordinary, but the ordinary. We marvel at mundane everyday experiences and objects that evoke mystery, doubt, and uncertainty. How many newspapers has that person sold today? When was that bus last repaired? How far have I walked today? How many people have ever sat on that bench? Does that woman own a cat? Did a child or adult spit that gum onto the sidewalk? These are all feelings of wonderment that color and enrich our lives. To some degree, we all experience such thoughts every day. These feelings are difficult to measure and nearly impossible to assign a value. Nonetheless, these episodes are part of our lives and as such deserve a place within the discussion of our future digital technologies. How can we design technology to support such wonderment? This paper presents a discussion and examples of one such approach to the design space of wonderment. Our work builds on a larger historical body of research exploring similar themes such as designing for the ludic [5], ambiguous [6], strange [1], slow [7, 12], noir [2], and hermeneutic [13].

Goals

Our goal is not to provide general purpose holistic solutions to problems within the complex social, cultural, political, and economic ecology of urban life. Rather, we hope to merely expand the vocabulary of potential urban technologies, enabling a wider range of choices as we form

our future urban lifestyles. Our final designs are intended to provoke open ended discussions around urban technologies rather than present "killer apps" or final solutions.

INTERVENTION AS RESEARCH STRATEGY

While observations, interviews, and surveys provide valuable insight for researchers, the challenge of exposing urban wonderment required us to study urban life "in the wild". We would need to create seemingly unplanned situations and objects that would catch people off guard and spark their desire to wonder. Adopting urban and cultural probing techniques [4, 11], we designed a direct urban intervention to study individual curiosities about each others views of love and hate within their city.

Figure 1: The Love-Hate Portland Matchbooks

Matchbooks as Interface

Playing into a "seemingly" serendipitous encounter with an ordinary abandoned object, we hoped to draw people into a state of brief wonderment. In our case, to wonder what and why others loved and hated about their city. The goal was to design a series of low-tech objects which would be of such small value that they were neither trash nor personally owned. It was important that these objects be inexpensive to produce, lack ownership thus allowing them to be found and taken without guilt, and avoid being viewed as so worthless as to be simply ignored as trash.

Our solution was to use literally thousands of custom designed functional matchbooks (Figure 1) especially designed to provoke emotional responses from locals about what they loved and hated about their city – in our case Portland, Oregon, USA. Intentionally designed to look "under designed" and non-flashy, each matchbook invited curiosity and anonymous interaction with other citizens of Portland via a simple SMS mobile phone message. The strike side of the matchbook was printed with the text: "I hate Portland. I want to know what you really think about this city". The front contained the text: "I love Portland. I don't want you to buy anything. To play, text message your secret identity (I wrote it inside) to 503.791.4542." Inside each matchbook was a unique identity that was chosen to be easily entered using T9 predictive text entry common on mobile phones. The URL lovehateportland.org was also printed on the spine of the matchbook.

Matchbook Deployment

Overall 1150 matchbooks were distributed across the city of Portland, Oregon during the first week of April 2005. The matchbooks were bundled into groups of five and dropped at a wide variety of venues throughout the city. Sites included bars, cafés, public transportation, bus stops, hotels, bookstores, newsstands, sidewalks, benches, *etc*. For each drop a familiar name for the location and an address were sent via SMS to a server. This allowed every matchbook to be geo-located on a map of Portland (Figure 2).

Matchbook Interaction: Ephemeral Dialogue

Upon discovery, a person initiated the interaction by text messaging the secret identity provided inside the matchbook. An SMS gateway server handled all incoming and outgoing messages. From each received text message, we were able to log not only the actual SMS message but also the time and sender's phone number. From the secret identity, we were also able to uniquely identify which matchbook had been found and activated.

Once activated, a user was sent the last love-hate SMS message that had been sent to the system and asked to text back what they loved or hated about their city, in this case Portland. The system required the use of the word "love" or "hate" in their reply. Their message was then delivered back to the original sender of the previous message. Some time later (minutes, hours, or days), when someone found another matchbook, activated it, and received the most recent previous love-hate message, their love-hate message in reply would be delivered to the current user. The result was an ephemeral dialogue among city dwellers across time with each user receiving only the previous and next message in the chain.

Using the URL on the matchbook, their phone number (logged from their SMS), and their secret identity, participants were also able to log in and view an interactive map of the city of Portland (Figure 2) color coded with matchbooks drops (white) and response types – love (blue) and hate (red) [9].
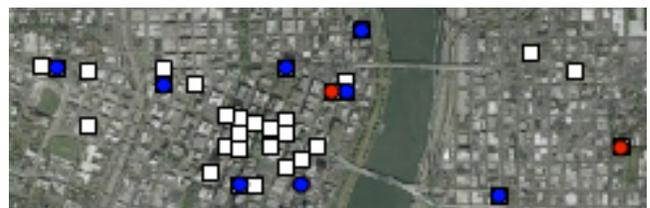

Figure 2: Partial view of the matchbook drop locations (white) in Portland, Oregon – with love (blue) or hate (red) responses

Matchbook Results

Of the 1150 matchbooks distributed across Portland, 50 were activated by participants successfully sending an SMS of their secret identity and 31 participated by providing a love-hate message to the system (2.7% participation). This far exceeded our expected participation rate of 1%. Of the 31 participants, over two-thirds were from Portland area codes. Recall that each participant only saw the message before and after their own so often brief threads emerge.

i love the blinky green thing
I love all of the hot liberals
I love that there are starbucks on every corner
I love that the tram is east and free
I hate this art project
I hate the earnestness
I hate the fact that they have not outlawed smoking like the rest of civilizalized
       America
I love skating the river path
I love the movie theatres with pizza and beer and couches...
I love the prozac in the drinking water
I love chatting up buzzed cute chicks
I think i am in love with you
I hate the teases
I love the free public transit
I hate the irregular placement of crosswalks
I love how courteous drivers are to pedestrians
I love watching dumb drunks trying to chat up cute buzzed chicks
I love the Max!
I love the eco-awareness
I hate the lack of strip clubs
I hate the pan handlers
Oh, I love that the streets down town run alphabetically
I enjoy the rich colors and smells of the farmers market
I love neighborhood bars in Portland
Hate- panhandelers love-freaks
I love the aura!
I hate the hawthorne bohemia
love free downtown transit
I love that portland lets you smell trees, even in sw
I love the confidence of its youth.
I love how green this city is. Vapir it!

The matchbook intervention generated a "love-hate mapping" of Portland. Our first intuition was to play into this "location service" with a mobile phone application that responded to these locative love-hate feelings as you crossed the city. What is the health of the city? How is my neighborhood feeling today? What are the desires – the passions of uptown and loathings of downtown? While certainly an interesting project, we wanted to more deeply invert the very notion of a location service. Just as the matchbooks sparked wonderment about the loved and hated elements of a city, how could we promote a less emotionally charged and more interpretive curiosity about invisible personal patterns of urban movement? Resisting the urge to make a literal connection to the matchbooks and love-hate mapping, we desired to design a tool that would (1) spark a similar style of provocative, open-ended curiosity as the matchbooks, (2) be driven by real data from our invisible urban landscape, (3) invite personal interpretation and reflection about its output rather than a calculated meaning or summary, and (4) demonstrate the value of avoiding the literal location mapping techniques popular in much of today's locative media systems.

LOCATIVE MEDIA AND MAPPING
Locative media, digital media applied to real social interactions and real physical places, is currently one of the fastest growing fields within urban computing. It encompasses an extraordinarily wide range of projects from restaurant recommendation mobile phone applications to neighborhood storytelling tours to GPS tactile artwork. Central to nearly every locative media project is the use of the geographically referenced position of the user on a map of the real world to trigger the experience or interaction. The user's position is typically derived by triangulating various invisible beacons (GPS, Bluetooth, WiFi) to arrive at a final latitude and longitude value for location [8].

Instead of using wireless signals to calculate where we are moving in the world, we chose to think of the map as the wireless signals themselves. Our movement across this everyday, invisible, manufactured, geography of the world's mobile phone cellular tower infrastructure can be the map itself – removed entirely from our actual physical geography. Our claim is that such a viewpoint does indeed have meaning and in fact provides more latitude for open interpretation and urban wonderment.

SASHAY
Sashay is a mobile phone application that leverages the fact that every fixed mobile phone cell tower transmits a unique ID that can be read within the phone's software. As a user moves throughout an urban landscape this "cell ID" changes. *Sashay* keeps track of the temporal patterns, history, and adjacencies of these cell encounters to help it build a visualization of connected "places".

Technical Details
Sashay is written entirely using the Java J2ME library for mobile phones. It uses a small unmodified tool as part of the standard Place Lab [8] install to enable access to the cell ID information. As tested the entire system operates on the Nokia 60 series platform – specifically the Nokia 6630.

Every three seconds the J2ME application queries the Place Lab tool to acquire the current cell ID. After each reading, two large internal data structures are updated followed by the visual display. The first data structure is a hashtable containing every cell ID encountered along with details for each cell such as the total number of visits, cumulative time spent in cell, and a time of day histogram for each cell visit. The other major data structure tracks every cell event. It contains information for the adjacency relationships between cells. For example, which cell we just came from, a list of all cells we have historically moved directly into from this cell, which cell are we most likely to move into, *etc*. The dataset can grow to be quite large and a special caching mechanism keeps only recent and active cells in memory. The remaining data is stored in the phone's non-volatile memory. Each time *Sashay* is launched it reads in all previous data and locates the current cell ID. It is also capable of computing the personal, historical pattern of all visited cells from the current cell. The graph is directional so path of movement is captured not simply adjacency.

Visualizing the Experience
Sashay operates as more of a peripheral application or screen saver on your mobile phone similar to Jabberwocky [10]. During everyday activity an individual can simply glance at *Sashay* to capture a sense of place and movement across a city. Each unique cell ID is represented by a small colored circle. Only a very small set of these cells are actual drawn at any given time (Figure 3). At the center of the visualization is the current cell which is highlighted.

Extending downward is the link showing the previous cells that have been actually transited to arrive at the current cell. A link is drawn between each of these circles to emphasize the connections. Extending outward in all directions from the center cell are possible future links to cells that have been encountered in the past. The most common path taken out of the current cell is drawn directly atop the current cell. Recursing, each of those possible cells again calculates and renders its set of possible cells. This simple paradigm means that when a user takes a different, or in this case literally "the path less traveled", the visualization will capture such movement dramatically as the path moves off of the center common line and onto a side forked path.

Each circle is also scaled in size such that cells that are visited frequently or where a lot of time is spent are larger than cells that are transited quickly. Finally, cells are colored based on the most common time of day when they are visited: early morning (orange), afternoon (yellow), late afternoon (green), and evening (blue). The overall visualization expresses your personal patterns across the city without interpreting its meaning. It reflects a notion of what type of city person you are. Do you stay mostly within a small range of cells? Do you move between only three main parts of a city? Do you quickly move across a city? What does a road trip to Las Vegas look like? A night out? A dog walk? A weekday morning? A weekend afternoon?

Recall that we are *not* interested in using these signals, their strengths, and the fixed locations of the cell towers to extrapolate an actual location. In fact we explicitly avoid labeling any of the cells. The value of *Sashay* is not in helping you navigate or realize that you are in downtown Austin or at a park in Boston. It is meant to explicitly remove such labeling and leave only an intentionally skeletal sketch of a person's personal patterns across a city, leaving the individual to wonder and construct their own narrative and meaning. The temptation to build a labeled map is so compelling to many researchers that we are reiterating and advocating the extraordinary value of keeping such visualizations free from literal place labelings.

It is important to remember that we are interested in exploring the notion of wandering across simply the series of everyday cell IDs as itself an invisible landscape. This simple inversion of the map-signal paradigm gives rise to a series of remarkably interesting differences. Recall that two "places" are connected if their cell IDs are simply encountered in sequence. Using this paradigm creates many new "connected" places. For example, New York's JFK Airport is now directly adjacent to London's Heathrow airport since you move seamlessly between the two cell IDs when you fly between them. Similarly, there are multiple connections between places. Driving between Oakland and San Francisco over the Bay Bridge creates a series of small connected dots as you quickly transit a series of cell IDs. However, taking the underground subway, we find Oakland and San Francisco directly adjacent to each other in the visualization since the cell IDs are seen in sequence.

Figure 3: *Sashay* mobile phone application in action

CONCLUSION

Computing in and across our urban landscapes is rapidly transforming our everyday experiences of city life. As we adopt such technologies, let's insure that we embrace the full scope of urban life with all of its emotions, from productivity and efficiency to daydreaming and wonderment. Let's not confuse frenzy with efficiency. *Sashay* presents what we believe is an encouraging and simple approach towards expanding our range of choices as we adopt technologies into our future urban lifestyles.

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