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# Sentient City Survival Kit: Archaeology of the Near Future

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## ABSTRACT

In this paper, I discuss the Sentient City Survival Kit, a design research project that probes the social, cultural and political implications of ubiquitous computing for urban environments. Following a discussion of the philosophical and cultural problems of attributing sentience to non-human actors, I present a brief cross-section of historical and contemporary constructions of non-human sentient beings in the fields of science fiction literature, computer science research, and applied technology. The paper concludes by introducing the notion of an archaeology of the near future as a conceptual framework for designing and fabricating a series of artifacts, spaces and media for 'survival' in the near future 'sentient' city.

## 1. INTRODUCTION

The Sentient City Survival Kit is a design research project that probes the social, cultural and political implications of ubiquitous computing for urban environments. Conceived as an archaeology of the near future, the project consists of designing, fabricating and publicly presenting a collection of artifacts for "survival" in the near-future 'sentient' city. Less invested in the business of predicting future trends in mobile media, pervasive computing or embedded information systems, the project focuses more on prototyping concrete artifacts in the present, based on current research and development in urban computing and ambient informatics, in order to facilitate a discussion around just what kind of future we might want.

As computing leaves the desktop and spills out onto the sidewalks, streets and public spaces of the city, information processing becomes embedded in and distributed throughout the material fabric of everyday urban space. Pervasive/ubiquitous computing evangelists herald a coming age of urban information systems capable of sensing and responding to the events and activities transpiring around them. Imbued with the capacity to remember, correlate and anticipate, this 'sentient' city is envisioned as being capable of reflexively monitoring our behavior within it and becoming an active agent in the organization of our daily lives.

Few may quibble about 'smart' traffic light control systems that more efficiently manage the ebbs and flows of trucks, cars and busses on our city streets. Some may be irritated when discount coupons for their favorite espresso drink are beamed to their mobile phone as they pass by Starbucks. Many are likely to protest when they are denied passage through a subway turnstile because the system 'senses' that their purchasing habits, mobility

patterns and current galvanic skin response (GSR) reading happens to match the profile of a terrorist.

The project investigates the darker side of this near future urban imaginary and posits a set of playful and ironic techno-social artifacts that explore the implications for privacy, autonomy, trust and serendipity of this highly observant, ever-more efficient and over-coded city. In the passages that follow, I trace the primary theoretical threads from which the project is woven. I begin by discussing the difference between the attribute 'sentience' and the act of 'sensing,' which leads to the philosophical problems of Cartesian dualism and non-human sentience. I then introduce related concepts of the Pathetic Fallacy and the Category Mistake as markers by which to unpack historical and cultural biases regarding the application of human-like attributes to non-human actors. Here, Latour's observations regarding the lack of an accepted vocabulary concerning agency in the absence of anthropomorphic characters is central.

Having established a set of theoretical tensions at the core of the project, I then briefly map the so-called Sentient City in terms of the persistent and pervasive meme of non-human sentience along three vectors. The first concerns the Sentient City as technological fantasy depicted in science fiction literature. The second addresses the Sentient City as technical challenge defined by corporate research initiatives in computer science and engineering. The third addresses the Sentient City as operative reality in the form of existing and emergent urban computing applications and their claims toward 'smart' or 'intelligent' urban infrastructure.

I conclude by presenting a preliminary set of items included in the Survival Kit and discussing how critical design practice offers an alternative to artistic projects focused on strategies for 're-enchanted' the urban environment. Suggesting that we might both sharpen and broaden the questions we ask when evaluating speculative projections for near future urban technologies, I introduce Greg Stevenson's notion of archeology as "the design history of the everyday" (Stevenson, 2001) as a way of refocusing artistic production on provoking public discussion about the shape of future cities.

## 2. PATHETIC FALLACIES & CATEGORY MISTAKES: MAKING SENSE AND NON-SENSE OF THE (NEAR FUTURE) SENTIENT CITY

*"And supposing there were a machine, so constructed as to think, feel, and have perception... we should, on examining its interior, find only parts which work one upon another, and never anything by which to explain a perception."*

- Leibniz, 1714/1965 [1]

What does it mean to call a city 'sentient'? The word 'sentience' refers to the ability to feel or perceive subjectively, and does not necessarily include the faculty of self-awareness. Which is to say, the possession of 'sapience' is not a necessity. Sapience can connote knowledge, consciousness, or apperception. Looking at the Latin roots of the two words can be instructive. The word 'sentience,' derived from *sentire*, present active infinitive of *sentio*, means 'to feel' or 'to hear.' Sapience comes from *sapere*, present active infinitive of *sapio*, meaning 'to know.' So a Sentient City, then, is one that is able to *hear* and *feel* things happening within it, yet doesn't necessarily *know* anything in particular about them. It *feels* you, but doesn't necessarily *know* you.

Wherein lies this perception? How do we account for it? In the passage quoted from above, Leibniz goes on to claim that "it is in a simple substance, and not in a compound or in a machine, that perception must be sought for." His belief that the gap between the physical and the subjective is unbridgeable, that we cannot explain subjective experience through an accounting of physical processes, can be traced to Descartes and his theory of dualism [2]. Cartesian dualism, commonly known as the 'mind-body problem,' asserts that mind and matter are fundamentally different kinds of substances, and argues that mental processes are immaterial and that material organisms don't think. In *Meditations on First Philosophy*, Descartes attempted to account for animal behavior by purely physical processes as a means to distinguish living things that merely sense from those that are sentient. In doing so, he claims that this distinction marks an essential metaphysical difference: human beings are those that are sentient, all others are merely capable of sensing.

Sensing, the thinking goes, is something animals, some plants, and some machines can do. Sensing involves a sensing organ or device that enables the organic or inorganic system of which it is a part to actively respond to things happening around it. An organism or system may sense heat, light, sound, or the presence of rain, for example. Yet having a sensation or a feeling is something which goes beyond mere sensing, for it involves an internal state in which information about the environment is processed by that organism or system so that it comes to have a subjective character. 'Qualia' is the philosophical term for this, which Dennett [3] defines "an unfamiliar term for something that could not be more familiar to each of us: the ways things seem to us."

Non-human sentience has long been a flash point of controversy between the humanities and sciences. In *Modern Painters* [4], Ruskin coined the term "Pathetic Fallacy" to signify any description of inanimate things that attributes to them human capabilities, sensations, and emotions. His translation of the Latin

phrase "*natura abhorret a vacuo*" (nature abhors a vacuum) is widely known and has become part of common, everyday language – as evidenced, for instance, by its contemporary usage by a U.S. military general in a New York Times article describing reasons for NATO's swift entry into Kosovo following the withdraw of Serbian Forces in 1999 [5].

Within literature, anthropomorphism is by now an accepted literary device, yet within the natural sciences, for example, it is still considered a serious error in scientific reasoning if taken literally. Bruno Latour suggests that the difficulty lies in describing agency in the absence of anthropomorphic actors, that there is a lack of accepted vocabulary to address the non-human agency of "things," technological or otherwise. "[E]very time you do that," he states, "immediately people say... 'Oh, you anthropomorphize the nonhuman.' Because they have such a narrow definition of what is human, that whenever a nonhuman does something, it looks human, as if it's sort of a Disney type of animation" [6].

As Keller Easterling notes [7], the term Category Mistake – introduced as the fundamental mistake of Cartesian dualism by Gilbert Ryle in *The Concept of Mind* [8] – describes a seemingly nonsensical mixture of logics. For Ryle, Cartesian dualism mistakenly assumes it is sensible to ask of a given cause, process, or event, whether it is mental or physical, implying that it cannot be both. He argues that saying "there occur mental processes" does not mean the same type of thing as saying "there occur physical processes," and, therefore, that it makes no sense to conjoin or disjoin the two. Easterling elaborates on the category mistake: "For instance, one mistakes a part for a whole, or inverts levels in a hierarchy. Or a child thinks a division is a smaller part commensurate with a battalion or a squadron, when it is the overarching category for those of smaller divisions." She goes on to show how beginning with Jesus and extending to messianic characters in general, category mistakes are markers for dominant logics with universal claims, yet she also suggests how they can serve as an escape hatch out of the monotheisms of logic and discipline. "In order to find the trapdoor into another habit of mind, one would not quarrel with, but gather evidence in excess of" these dominant logics.

The Sentient City thus becomes a contested site: a theoretical construct within which longstanding claims of essential human qualities, capabilities and characteristics are critically destabilized through their attribution to non-human actors. This destabilization is understood to work actively, as a tactical maneuver enabling other ways of thinking that not so much confront dominant ideologies but elide common wisdoms about not only what it means to be human but also what it might mean to be a city. In gathering archaeological 'evidence' of near future urban conditions, the Survival Kit enters the debate on non-human sentience through the trapdoor in the floor.

This method is, of course, by no means new. In the next section I briefly review a cross-section of representations of the Sentient City culled from the fantasies of science fiction writers, the research agendas of computer scientists, and the claims accompanying recent applications deployed by corporate interests, governmental agencies, and the military. The intent here is less to provide a comprehensive overview but rather a selection of examples that point to the historical persistence and cultural pervasiveness of the sentient non-human meme.

## 2.1 THE SENTIENT CITY AS TECHNOLOGICAL FANTASY, TECHNICAL CHALLENGE AND OPERATIVE REALITY

Non-human sentience is no stranger to the science fiction community. From Arthur C. Clarke's *Diaspar*, the computer controlled city described in *The City and the Stars*, to his work with Kubrick on HAL (sentient machine); from Stanislaw Lem – and Tarkovsky's – *Solaris* (sentient planet) to DC Comics' *Ranx* the Sentient City created by Alan Moore; from Gibson's sentient cyberspace as portrayed in *Neuromancer*, to the sentient programs of the Matrix, or Bruce Sterling's *spime* (to name but a few), science fiction has imbued a range of inanimate "things" of all scales with forms of sentience that do not map neatly to those of ordinary humans.

These technological fantasies of non-human sentience exhibit no consensus regarding the place or nature of sentience, however. Sentience is at times centralized (Clarke, Kubrick, Moore), at times distributed (Lem, Gibson, Sterling). While Clarke and Kubrick attempt to anthropomorphize HAL, as symbolized by his iconic and omnipresent red eye and reinforced by his conversational acuity, Lem persistently portrays *Solaris'* *otherness*: the planet's sentience is evidenced through the manipulation of a simple substance constituting its oceans that has nothing in common with anthropomorphic figuration or behavior.

Addressing sentience as a technical challenge, the Economist published an article five years ago titled "The sentient office is coming" [9] that described then current research in augmenting computers and communication devices with sensors to enable them to take into account their environment and adapt to the changing conditions of their use. Here the aim was to create "convivial technologies that are easy to live with." Yet as the article points out, cohabitation with sentient things is not without dilemmas. What happens when the toaster in your home gets bored of always making toast, or the fax machine in the office thinks the tone of your fax doesn't jive with that of the firm?

Achieving "sentience" in the domain of Artificial Intelligence (AI) research is a serious research agenda with a long history. ATT/Cambridge University's Sentient Computing project [10] attempted to "combine sensors and computers to monitor resources, maintain a computational model of the world, and act appropriately." Combining sensors and computers was at the time nothing new, but the broad attempt to "maintain a computational model of the world" proved daunting. As of 2006, the project was re-focused on tracking and location systems for "sentient" vehicles and sports.

Today the emphasis is less on trying to maintain a proprietary computational model of the world, and more on using the world itself as "model" and letting ordinary people contribute to its making. More than a few early Urban Computing and Locative Media projects focused on crowdsourcing metadata about a place by enabling people to markup and annotate digital maps with notes, images and media objects geocoded to specific locations (Urban Tapestries [11], Yellow Arrow [12], Semapedia [13], to name but a few). Google Maps and Google Earth have further catalyzed the collective production of these geospatial datasets. With the introduction of the GPS enabled iPhone 3G in 2008,

location-based services building on these datasets are being mainlined to the masses.

Context-awareness plays a significant role in current research in sentient systems. In addition to knowing where someone is, factors such as whom they are with and what time of day it is reduces the possibility space within which inferences and predictions are made. This real-time information is correlated with historical data of someone's mobility patterns, purchasing history, personal interests and preferences (as reflected by user-generated profiles) in order to make more accurate predictions about what his or her wants and needs may currently be, or what actions s/he is likely to take next. MIT's Serendipity project [14], for example, draws on the real-time sensing of proximate others using Bluetooth technologies built into mobile phones to search for matching patterns in profiles of people's interests. Developed by the Human Dynamics Group at the Media Lab, the project's goal is to facilitate corporate productivity by providing a matchmaking service for workers with shared interests or complimentary needs and skills who otherwise might not encounter each other within spaces organized around the office cubicle. A typical design scenario involves one worker needing the skills of another and the system facilitating their meeting:

*"When we were passing each other in the hallway, my phone would sense the presence of his phone. It would then connect to our server, which would recognize that Tom has extensive expertise in a specific area that I was currently struggling with. If both of our phones had been set to "available" mode, two picture messages would have been sent to alert us of our common interests, and we might have stopped to talk instead of walking by each other."* (Eagle, 2004: 12) [15]

This project presents at least two assumptions that are worth exploring further. The first is that "matchmaking" should be based on comparing profiles and looking for "synergies" between two people. If the term "serendipity" is understood to mean the process of finding something by looking for something else, the Serendipity project does precisely the opposite: it simply outsources the problem of finding something we are already looking for (that "expertise in a specific area that I was currently struggling with" that I have somehow indicated in my profile). Secondly, while the introduction of "available" mode suggests that some attempt has been made to address privacy issues, there is no consideration of who has access to your profile data and how they use it.

Profile data considered private in one context can be publicly revealing in another. Another MIT project, code-named Gaydar, mined Facebook profile information to see if people were revealing more than they realized by using the social networking site. By looking at a person's online friends, they found that they could predict whether the person was gay. They did this with a software program that looked at the gender and sexuality of a person's friends and, using statistical analysis, made a prediction. While the project lacked scientific rigor – they verified their results using their personal knowledge of 10 people in the network who were gay but did not declare it on their Facebook page – it does point to the possibility that information disclosed in one context may be used to interpret information in another.

Looking upstream, Crang and Graham's recent paper "Sentient Cities: Ambient intelligence and the politics of urban space" [16]

does a great job at outlining how corporate and military agendas are currently driving these technological ecosystems we're likely to cohabit with in the near-future. Mapping the Sentient City as operative reality, they point to location-based search results and target-marketing databases storing finely grained purchasing histories as steps toward "data-driven mass customization based on continuous, real-time monitoring of consumers." Further, citing a study by the US Defense Science Board calling for a 'New Manhattan Project' based on Ambient Intelligence for "Tracking, Targeting and Locating" they outline an Orwellian future that is in fact currently in operation in lower Manhattan.

The Lower Manhattan Security Initiative, as the plan is called, resembles London's so-called Ring of Steel, an extensive web of cameras and roadblocks designed to detect, track and deter terrorists. The system went live in November of 2008 with 156 surveillance cameras and 30 mobile license plate readers. Designed for 3,000 public and private security cameras below Canal Street, this system will include not only license plate readers but also movable roadblocks. Pivoting gates would be installed at critical intersections and would swing out to block traffic or a suspect car at the push of a button.

While the implications of projects like Serendipity occupy a relatively benign problem space, The Lower Manhattan Security Initiative points toward possibly more serious outcomes from the false positives (or false negatives) inevitably generated by the pattern matching and data mining algorithms at the core of the system. What happens when Facebook profile data is added to the mix? How do we ensure the privacy of data about us that is collected through inference engines? What are the mechanisms by which these systems will gain our trust? In what ways does our autonomy become compromised?

### **3. TOWARD AN ARCHAEOLOGY OF THE NEAR FUTURE**

While it may be intriguing to attempt to seek answers to these speculative questions about potential futures, a more pressing challenge is to identify concrete examples in the present around which we might organize a public debate that aims to both sharpen and broaden the questions we ask ourselves about what kind of future we want. In the wake of a massive, global financial crisis and increasingly grim environmental forecasts, the general public is finally beginning to register that as a planet we need to negotiate our way of life with those of the various actants and ecosystems with which we cohabit, be they environmental, political, economic, social or technological. While Crang and Graham do help understand current corporate and military agendas, their analysis of the role of artists working with Urban Computing and Locative Media as one of "re-enchanting urban space" – of making visible the invisible traces of things past, a "haunting of place with absent others" – renders artistic practice in relatively conservative and familiar terms, casting art in a reactionary role vis-à-vis technological development. What other roles might artists, architects and designers play in shaping how we inhabit the near-future Sentient City?

The Sentient City Survival Kit takes as its method a critical design practice [17] that looks toward archaeology for guidance. Archaeology involves the (re)construction of a world through fragments of artifacts, where past cultures are reconstituted in the present through specific socializing and spatializing practices involving mapping, classifying, collecting and curating [18].

Cultural knowledge is reproduced through relating in space and time the traces and remains of people, places, things, activities and events. Collections of archaeological artifacts serve to reveal the everyday social and spatial relations of societies not contemporary with ours, yet recontextualized within the present. Stevenson [19] refers to an archaeology of the contemporary past as "the design history of the everyday," where common objects drawn from daily life do not simply (passively) reflect cultural forces (trends in taste and fashion, for example) but also actively participate in shaping the evolving social and spatial relations between people and their environment.

Positing an archaeology not of the contemporary past but of the proximate future, the project takes the practice of designing everyday artifacts as a vehicle for shaping tomorrow's cities. The aim here is to attempt to instigate the process of imagining a future city and its inhabitants through fragments and traces of a society yet to exist. Collectively, the artifacts, spaces and media that constitute the Survival Kit ask: in what kind of city would I be viable, useful, necessary, or even popular? Who made me, and for what purpose? What relations between people and their environment do I suggest? In what places, circumstances and situations would I be found?

Ultimately the project is less invested in forecasting future trends in technology than focused on provoking public discussion in the present about just what kind of future we might want. This involves a design process based on looking at what's happening just upstream in the computer science and engineering R&D labs and teasing out some of the more absurd assumptions, latent biases and hidden agendas at play. The production of physical working prototypes for items in the Survival Kit subsequently involves playing out the design implications these assumptions, biases and agendas.

### **4. SENTIENT CITY SURVIVAL KIT**

The Survival Kit currently consists of four items (with this number expected to grow to between 6 and 8 in total).

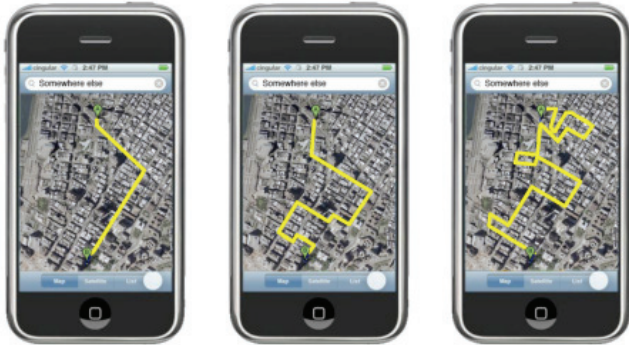
The public can engage with the project in three ways:

- 1) Public presentations of a set of working prototypes for items in the Survival Kit in the form of museum/gallery exhibitions and performances at arts festivals and related events. When exhibited in a museum/gallery, the Kit will be accompanied by video documentation demonstrating the use of its items together with a verbal and visual description of the project concept. When performed at an arts festival, festival attendees will be able to take items from the Kit out into the city to experience how they perform.
- 2) Online access to a dedicated project website containing text and images describing the project, video documentation of the performance of items in the Survival Kit, together with a set of DIY "tutorials" and design documents that describe how to make the items in the Kit.
- 3) A series of public lectures at international architecture, art and technology related panels, events, conferences and festivals.

Very much a work-in-progress, the following concept sketches and preliminary prototypes of the Survival Kit have been presented to date at conferences (Subtle Technologies, Toronto; ISEA 2009, Belfast), exhibited in galleries (The Center for Architecture, New York; The Rotterdam International



Architectural Biennial, The Netherlands) and documented online via a dedicated project website: <http://survival.sentientcity.net>.



**Figure 1 - GPS Serendipitor**

In the near future, finding our way from point A to point B will not be the problem. Maintaining consciousness of what happens along the way might be more difficult. The GPS Serendipitor is an alternative GPS navigation software application for mobile phones that determines a route to a destination that the user has not previously taken, designed to facilitate finding something by looking for something else. What are the implications of a society that needs to download an application for serendipity?



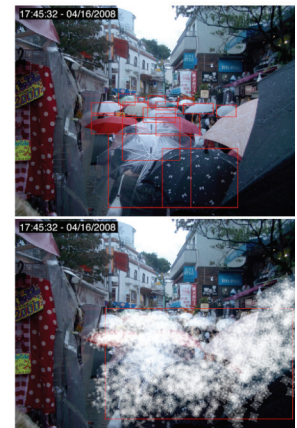
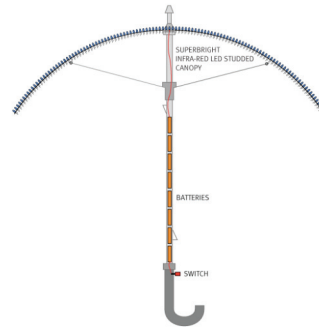
**Figure 2 - RFID under(a)ware**

In the near future sentient shopping center, item-level tagging and discrete data-sniffing are both common corporate culture and popular criminal activities. This popular product line consists of his and hers underwear designed to sense hidden Radio Frequency Identification (RFID) Tag readers and alert the wearer to their presence by activating small vibrators sewn into bras and boxer shorts.



**Figure 3 - Ad-hoc Dark (roast) Travel Mug**

In an environment where all network traffic is monitored via “smart” filters, where access privileges are dynamically granted and denied on the fly based on your credit card transaction history, and where bandwidth is a function of your market capitalization, standard commuter gear includes this travel mug designed for creating ad-hoc “dark” networks for communication along a morning commute. Consisting of a mobile phone screen embedded in the lid of the mug, together with a small wireless mesh networking radio and microcontroller, commuters share short messages tapped out on the side of the mug and picked up by a capacitance sensor.



**Figure 4 - CCD-me-not Umbrella**

When human vision is no longer the only game in town, don't leave home without this umbrella studded with infrared LEDs visible only to CCD surveillance cameras, designed to frustrate object detection algorithms used in computer vision surveillance systems.

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