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Sensing the City: Legibility in the Context of Mediated Spatial Terrains

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Abstract

Smartphones, with their “pervasive presence” in contact with our bodies, have come to act as sensory prosthetics that mediate our experience of the city. They activate new possibilities of navigating the urban, such that we can find exactly *what we want*, rather than *what has been placed before us*. This article argues that smartphone technologies produce a more fluid engagement with urban space: where space is not so much “given” as “enacted.” In this context, notions of “legibility” take on new algorithmic and virtual forms. Thus, according to Hamilton and colleagues, where “the legible city waited to be *read*, the transparent city of data waits to be *accessed*.” Here, stable features dissolve as urban space becomes increasingly fluid and contingent, no longer limited by static patterns of inhabitation. Instead, *how* we move and *where* we move shift in accordance with the kinds of urban resources being activated at any given location, at any given moment, and in conjunction with the shifting vicissitudes of the crowd. In this context, the virtual (in its technological definition of cyber-enabled or -enacted space) mediates and activates the *virtual* (in its philosophical definition pertaining to the capacities of an entity that may or may not be manifested depending on context). The article considers the implications of this novel spatial mediation using an ontological perspective informed by complex adaptive systems theory, which considers forms and objects not as absolutes but rather as contingent entities activated through interactions.

Keywords

smartphone, virtual space, mediation, complexity theory, urban design

Disciplines

Architecture | Ethics and Political Philosophy | Sociology of Culture | Theory and Criticism

Comments

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Sensing the City: Legibility in the context of mediated spatial terrains

Author: Sharon Wohl

Abstract:

Smartphones, with their 'pervasive presence' in contact with our bodies (Leszczynski, 2015), have come to act as sensory prosthetics that mediate our experience of the city. They activate new possibilities of navigating the urban, such that we can find exactly *what we want*, rather than *what has been placed before us*. This paper argues that smartphone technologies produce a more fluid engagement with urban space: where space is not so much 'given' as 'enacted'. In this context, notions of 'legibility' (Lynch, 1960) take on new, algorithmic and virtual forms. Thus, where "the legible city waited to be *read*, the transparent city of data waits to be *accessed*" (Hamilton et al., 2014). Here, stable features dissolve as urban space becomes increasingly fluid and contingent, no longer limited by static patterns of inhabitation. Instead, *how* we move and *where* we move shifts in accordance with the kinds of urban resources being activated at any given location, at any given moment, and in conjunction with the shifting vicissitudes of the crowd. In this context, the virtual (in its technological definition of cyber enabled or enacted space), mediates and activates the *virtual*, (in its philosophical definition pertaining to the capacities of an entity that may or may not be manifested depending upon context). The paper considers the implications of this novel spatial mediation, using an ontological perspective informed by Complex Adaptive Systems (CAS) theory. CAS considers forms and objects not as absolutes, but rather as contingent entities activated through interactions.

Key Words: Smartphone, Complexity Theory, Virtual Space, Mediation

Author's Note:

Portions of this paper appeared in an earlier version, entitled: *'The Smartphone As Urban Mediator And 'Sixth-Sense': A New Platform For Recognizing And Acting Upon The Signals Of The City'* co-authored by Sharon Wohl and Sean Wittmeyer and presented at the 14th Meeting of the AESOP Thematic Group on Planning and Complexity *'Taking Stock of Complexity Sciences: Evidence of Progress in Urban Planning?'* Held in Bamberg, Germany; Feb 11 + 12., 2016. I am indebted to Sean for his initial contribution in helping frame ideas that have since been elaborated upon in this paper.

Preamble:

A teenager is visiting Paris for the first time. Numbed by her familiarity with the ubiquitous imagery of the Eiffel Tower, she barely spares it a glance. She has, after all, seen the landmark many times before - its presence being fed to her in endless photos, video clips and webcam feeds. Her only thought is that, after all the hype, it appears smaller in real life. Her eyes return to her smartphone, which is tracking the emerging vectors leading to an Indie band's pop-up gig. Her trajectory shifts and she ignores the moving crowds ahead that might, in an earlier time, have led her towards the Champs Élysée. Instead, she follows cues emanating from her phone, heading onto a side-street where an Uber idles. At that moment a push notification sounds, causing her to pause and reconsider her options. She has arrived at a fork in her mediated virtual road. While the pop-up gig remains compelling, she is alerted to the fact that another band is trending at a club in the 18th arrondissement. Weighing her options, she checks the reviews of this new band and makes her decision based upon its ratings which, at that moment, are marginally higher. Typing a quick text, she alerts her Parisian cousin as to her course, plotting their rendezvous. Her cousin, a well-positioned node in his social network, in turn posts their evening plans on social media, amplifying the draw to the club in the 18th. The reinforcing feedback loops initiated by this sequence of events, in turn, pull greater numbers to that site, as his friends tell their friends... Meanwhile, at the other end of town, the other pop-up gig location fails to gain traction. Its niche appeal or 'fitness' is geared towards a similar demographic. Had initial conditions differed slightly – causing the teen's moment of decision to veer the other way - it might equally have manifested as the 'happening' event of the evening, but on this particular night its capacities remain dormant.

Introduction: the smartphone as bodily extension?

I wish to make the claim that the ubiquity of the smartphone as part of our day-to-day lives marks a sea change in how we intuit the world around us. The phones, now carried by more than half the world's population in rich and poor countries alike¹, are not simply a means of looking up data or staying in touch with one another. For the billions of youngsters keeping their phones with them at all times, (including in bed) smartphones have become bodily *material extensions* (Ihde, 1975): ones continuously engaged with while navigating through temporal and spatial situations. Admittedly, for those in older generations this extension is not so acute. There are those who still consider the phone as merely a tool employed on occasion to make calls or to access information formerly obtained through maps or other sources. But, for the generation growing up in the Internet age, the phone is not merely another tool that is employed on an as-needed basis. It is instead a necessary corporal extension – the removal of which (as any parent knows) is an impairment to existence. For this generation, *'the iPhone does not feel like a desktop or phone experience, but instead something immediately recognisable as a personal interface to ambient*

¹ See <https://wearesocial.com/special-reports/digital-in-2017-global-overview>.

information... embodied by tangible interfaces activating living information in the here and now' (Bratton, 2009).

In this reading, the phone - with its pervasive bodily contact vibrating notifications, alerting us with its pings – becomes a sensory prosthetic that is relied upon from the moment of waking till the moment of sleep. It imbricates human and non-human as co-entities, enabling its users to perceive the world in an intuitive manner that moves beyond the reach of normal sensory apparatuses (Leszczynski, 2015). This extended sensorial capacity highlights previously obscured information, allowing the city to be perceived in new ways. Accordingly, *'for contemporary citizens, the act of reading, filtering, and interpreting the city is increasingly performed by software...in such technologies, the perception and navigation of geospatial volumes often seem to be less a factor than the perception and navigation of screen interfaces and databases'* (Hamilton, Karahalios, Sandvig, & Langbort, 2014). Here, we observe that whereas *'the legible city waited to be read, the transparent city of data waits to be accessed'* (Hamilton et al., 2014).

In this emerging phenomenological context, a new 'transparent city' is brought to our attention by an array of Apps that, increasing, steer our day-to-day lives. Our real-time connection to data about remote environments shifts our personal sense of bounded space, distorting notions of proximity and distance: a bar forty blocks away that we pick up as 'trending' and for which we can source a nearby Uber becomes sensorially more accessible and desirable than a mainstream downtown pub just a short walk away. This *'ambient findability'* (Morville, 2005), constitutes a new engagement with the world where, *'information is in the air, literally. And it changes our minds, physically'* (Ibid).

How do we 'sense' our environment within this context, where the city is increasingly perceived as a fluid, indefinite entity that modifies itself in accordance with our needs; where earlier infrastructures that tended to privilege normative trends of inhabitation – we can think of mass transit routes or central business districts – become destabilized? How do we frame an understanding of an urban system where temporary, nimble, and adaptive systems – Lyfts and Ubers or co-work spaces located in local cafes – can quickly be mobilized to respond to independently valued flows? Here, as Nigel Thrift notes,

'environment' no longer describes a set of static co-ordinates forming a frame within which bodies move but a continually changing tableau in which bodies appear to have motility and which therefore has the ability to redefine itself in real time. The fixed frame becomes a continually unfolding, fluid and convective map of different kinds and rates of movement (2014, p. 10).

Within this context, traditional notions of civic legibility should, at minimum be reframed and, ultimately perhaps, completely reconsidered.

This paper will explore these issues in ways that are both grounded and speculative. The research is informed by the use of Complex Adaptive Systems (CAS) theory as a perspective with which to understand contingent, bottom-up, and unfolding processes. These processes have been studied at length by scientists, with their dynamics fairly well understood. This understanding is extended so as to speculate upon a future where our awareness of the urban is heavily mediated by the smartphone, resulting in new levels of information fluidity that pertain to how the city is accessed or 'read'. The paper argues that these new readings enable new actionable ways of experiencing the urban. Part One begins with a discussion of Kevin Lynch's notion of urban 'legibility' (1960), and the ways in which digital interfaces are stretching how such legibility is experienced.² Part Two moves on to discuss how Complex Adaptive Systems theory offers an ontological perspective able to frame this new kind of legibility – a perspective able to incorporate shifting realities, while still acknowledging stable (albeit contingent) vectors of convergence. I argue that CAS perspectives reconcile the multiplicity of seemingly arbitrary and individual agent-based decisions, with the emergence of coherent general patterns. Part Three considers potential political implications of this reading of the urban, highlighting how it differs from many current academic speculations regarding 'smart' urban futures by virtue of being enacted through bottom-up, rather than top-down processes. I conclude with some cautionary comments, noting that CAS processes can, if left unchecked, potentially generate emergent outcomes that undermine civility.

Part One - Shifting Pattern Perceptions, New Actionable Behaviors:

Kevin Lynch's seminal text, *Image of the City* (1960), identified five key urban features -Landmarks, Paths, Nodes, Districts, and Edges – as providing visual cues with which people mentally map their location within the broader urban context. These formal indicators have, for a generation of subsequent planners, suggested a clear and stable means by which to frame our understanding of urban fabric. According to Lynch, the urban is conceptually structured in accordance with these five features which, in turn, guide individual decision-making at the local level. Lynch's features are physical in nature, and it is their physical cues, as they impact the senses, that steer whether one turns left or right at an intersection, whether one crosses a threshold or veers away from it. The presence of boundaries like major roads or rivers, the perception of landmarks like towers in the distance, or the convergent attractor of a node, each exert a slight gravitation or repulsion that, all things being equal, will draw us along particular urban trajectories. Significantly, these 'pulls' are thought of as *shared*, with people's orientation within space guided by clear and consistent physical cues that are perceived, in a similar manner, by all.

This way of interpreting how we sense the city has, for decades, provided a useful way to describe how individuals use spatial cues to 'get their bearings' within the civic realm and navigate within that context. It

² Speculations regarding the nature of urban 'legibility' in an era of new information technologies is a theme that has recently been pursued by a number of researchers, including Carlo Ratti and Dietmar Offenhuber (2012), as well as Kevin Hamilton et.al. (2014). While there are similar threads in their work to that which I pursue here, previous research has not looked at these dynamics using a CAS perspective.

entails understanding the kinds of spaces that exert 'pull' by affecting the senses through their hierarchical signaling: a tower situated against a neutral backdrop draws us in, an open space within a dense urban network causes us to pause within the specificity of that node, a strong edge suggests a boundary that may feel threatening to cross. Such edges, in particular, delineate regions regarded as either 'inside' or 'outside' our territory - the tendency being to remain within the charted territory of 'insidedness', while avoiding transgressing thresholds seemingly belonging to 'the other'.

In this understanding of urban legibility, the capacity of physical cues to steer our behavior is predicated upon Lynch's urban features holding a significant enough perceptual weight in the civic landscape to garner our attention. This 'weight' is associated with primacy or hierarchy of visual presence. Physical features must in some manner signal *difference* - taken as perceptual cues within the urban context. These cues, in turn, help guide us towards urban attractors - such as bars, restaurants, and clubs - with the locations of these associated with perceivable civic Landmarks or Nodes. Individuals 'naturally' gravitate to such locations in response to the way-finding cues these spatial anchors provide. Accordingly, businesses vie for locations in close proximity to these zones. That said, there are restrictions placed upon the number of actors able to leverage a 'weighty' presence within this context: only those with sufficiently large pocketbooks tend to exert significant physical manifestations of their presence within the broader sensory realm. Further, these large-scale actors tend to market themselves towards the most neutral demographic possible: appealing to the average and the normative (witness the dominance of big chains). Accordingly, the numbers of urban offerings that are reliably perceivable are those appealing, for the most part, to the generic.

While the influence of *Image of the City* cannot be overstated - it is widely considered one of the most influential planning books of all time - Lynch wrote at a time when cognitive behaviorist methods were largely accepted, and the environment was generally perceived as 'given'. Much contemporary scholarship problematizes this view, adopting a more constructivist perspective whereby the city is not a neutral 'given' with common features experienced equally by all, but rather an entity experienced from a plurality of personal perspectives. Accordingly, the physical world is mediated in accordance with the constructs we carry, and the ways in which power and privilege shape our perspectives. The role of physical cues is thus tempered by how such cues are perceived. Notwithstanding, physical cues remain in place - it is how they are collectively perceived that is problematized.

Yet, in today's increasingly mediated world, we are experiencing an urbanism that is shaped not only by the specificities of the physical, the personal, or even the political. Instead, it is increasingly mediated by the specificities of the virtual. In this newly emerging terrain, space can be read in accordance with an individually curated experience - steered by virtual signals and indicators tuned to individual preferences, picking up signals that were previously obscured. Here, the presence of Lynch's Landmarks, Nodes, or

Districts, would seem to dissolve as stable delineators: to be supplemented with increasingly contingent, variable and customizable offerings.

I wish to argue that we are entering a phase where the lived and experienced world is augmented (and perhaps supplanted) by a virtual interface. Here, new viable options for orienting oneself in space are created. Lynch's Paths, for example, which have an inherent hierarchy that directs our sensorial choices are now traced not through visual orientation, but through App systems that have the capacity to steer our attention to *particular* pathways based upon real-time information about congestion, noise levels, distance comparisons, etc. The data associated with highlighting these pathways is not static: it can change over the course of each day and, rather than defaulting to the accreted hierarchy of past patterns of occupation, be accessed and customized such that it responds to an individual's particular preferences.³ While Lynch's categories do not disappear – we still converge to nodes of interest, to pathways of efficiency – and many of these categories remain constant as stable physical entities - we seem to be entering a time where we can also discover more fluid, more contingent, and more variable possibilities. Accordingly, Lynch's principles take on '*new, algorithmic and virtual forms*' (Hamilton et al., 2014). Further, these algorithms need not be generic, but can be individualized in accordance with the patterns exhibited by one's friends, one's past route choices, or one's recent searches.

How might we frame an ontology that captures such an environment and an epistemology that resonates with our augmented sensing capacity as we navigate within it? I believe that in order to appreciate the impact that an expanded sensorial awareness brings to the city, it is necessary to expand outside an object-oriented view of the city - where civic environments as conceived as static entities stabilized in space and shifting only slowly in time - to instead consider cities as dynamic systems in non-equilibrium: ones constantly evolving with their users and constituted by fluidities of changing densities and kinds of information. This perspective suggests that the smartphone as a mediating agent helps engender a less static view of space - something not so much 'given' as 'enacted'.

The next section will outline how Complex Adaptive Systems (CAS) theory can provide distinct conceptual tools with which to grasp and frame this shifting perceptual landscape. CAS understanding is predicated upon an ontology that sees the world as constituted not by fixed objects, but rather by shifting and contingent relationships. Accordingly, the next section will introduce key CAS concepts that might be used to conceptualize urban perceptual features.

Part Two: Understanding Complex Adaptive Systems

³ Yahoo, for example, recently developed a way-finding app that steers people on routes corresponding with their preferences for quiet, beautiful or happy routes: (<https://venturebeat.com/2014/07/08/need-directions-yahoo-software-chooses-the-most-beautiful-travel-routes-instead-of-the-shortest/>)

When ants are seeking food, they have no signposts with which to guide them. Nevertheless if, on a warm summer day, I leave breadcrumbs out on my counter, and if there is a small hole in my screen window then, after a period of time, I will see a regular trail of ants marching along the countertop, heading towards the crumb. In the ant-world, the crumb is a *Landmark* to which the ants have clearly formed a *Path*. Equally evident is the transitory nature of the path: it only exists as long as the crumb is there, and there are no fixed demarcations that hold and constrain it. Further, while the ants are able to successfully march in the direction of the food, they have no broader cognition of what they are doing. No ant is in charge of directing (or planning) the system.

The example above is a classic instance of the dynamics exhibited by Complex Adaptive Systems. CAS are systems that: involve many agents (such as ants); enable interaction or information exchange amongst these agents (in ants, through the release of pheromones that signal the presence of food); and foster the emergence of global patterns (such as ant trails). In such systems, stable structures like ant trails emerge despite the fact that the agents involved in creating this structure act only in their own self-interest and have no broader conception of the emergent entity they help co-create. Rather, individual random ant trajectories are gradually 'steered' as ant choices slowly becoming 'weighted' in favor of certain trajectories over others. This weighting is informed by the presence or absence of pheromones (which are deposited only when ants discover food). Thus, as ants discover a food source, the deposited pheromones attract more ants, leading to the source, leading to more pheromone deposits. The emerging path, in turn, exerts agency in a recursive process that constrains subsequent agent interactions (by means of reinforcing or 'positive' feedback).

CAS are *complex* in that the dynamics of the system operate in a non-linear fashion: a small change in initial conditions of the system can lead to wildly divergent outcomes in terms of the behaviors that the system ultimately manifests. Thus, if two breadcrumbs are at different ends of the countertop, the initially random trajectories of a few ants may cause one crumb to be discovered first – whereby pheromones will be deposited leading towards that crumb, creating feedback loops that result in a trail heading towards that crumb versus the other. Here we observe that, unlike in systems governed by Newtonian dynamics, global behaviors of the system cannot be accurately predicted based upon linear assumptions where effects are proportionate with causes. That is to say, a small, random, initial cause (an individual ant initially turning left versus right) may result in a disproportionately large global effect (a significant pathway leading towards one crumb versus another).

CAS are therefore understood as having the capacity to unfold in a number of divergent *contingent* trajectories, with the trajectory that ultimately manifests being predicated upon historical circumstances. Accordingly, 'prediction' is relegated to understanding the potential *range* of trajectories ('phase space'); determining the kinds of behaviors that have a *tendency* to play out ('basins of attraction'); and, finally,

recognizing the ways in which behaviors are structured or *steered* ('feedback' and 'stigmergy').⁴ Further, CAS dynamics involve understanding a particular environmental feature (such as an ant trail) as being both a *result* of agent behavior and as a causal factor that subsequently *constrains* agent behavior in an ongoing dance of agent/environment co-evolution. Finally, CAS behavior is effectively steered from the bottom-up versus the top-down. As such, CAS research requires a shift in how we think of effective regimes, given that highly 'fit' and tuned behavioral patterns are able to emerge without the top-down organizational control we tend to associate with producing efficiencies.⁵

With these dynamics in mind, my core thesis is that the smartphone, as a mediating interface, enables CAS processes to unfold in urban space through its ability to coordinate the actions of many individual agents, broadcast signals, allow for feedback processes, and thereby foster emergent civic dynamics. Here, the shift towards distributed citizen-sensing enables a conceptual transition from a belief in urban 'given-ness' – one that accepts the stability and commonalities of Lynchian features - to one that captures the features of a much more nebulous and complex system. Not only are normally invisible caches of urban amenities highlighted through the amplified sensory capacities of the smartphone, but offerings that emerge as popular can subsequently produce reinforcing feedback loops - altering the emerging data-scape and thereby the perceived city-scape. Such rounds of feedback loops amplify initially slight signal variables, resulting in the fact that subtle shifts can cause hugely divergent urban actions (following non-linear trajectories). Consequently, in this new 'sentient city' (Thrift, 2014), *'an awareness starts to arise which invents the means to submit to its own requirements, to activate its own activation'* (Ibid: 12).

Instead of the stable equilibrium of such entities as the 'downtown business district' or the 'central plaza', CAS allows us to think of the space of the urban as a highly contingent entity that possesses a multitude of potential points of attraction or possibilities for enactment. Here, we can think of an urban '*phase space*' – the space of all possible urban enactments – that may hold differential '*attractor states*', or 'basins of attraction'. The specific ways in which trajectories of occupation are manifested – or *which* of the potential attractors comes to be activated - is contingent and subject to historical circumstances of enactment. This is due to the fact that the actions initiated by agents in complex systems, even if initially somewhat arbitrary, have the capacity to generate feedback loops that result in non-linear amplifying effects. In this way, historic circumstances shape trajectories within phase space, calling forth certain outcomes while leaving others as latent even though these might, in fact, be equally viable. Here, the choice of an agent to turn left or right, to build upon one plot versus another, or (as in the case of our teenager) to patronize one club versus another can, despite initially being arbitrary, nonetheless produce a chain reaction of amplifying effects that

⁴ Each of these terms is commonly used in discussing CAS and are fully discussed in other publications. Examples include: for 'phase space' (Batty & Torrens, 2005); for 'basins of attraction', see (Kauffman & MacReady, 1995); for feedback see (Heylighen, 2000).

⁵ A full overview of CAS lies outside the scope of this paper. The interested reader can consult (Heylighen, 1999; Holland, 1995; Kauffman, 1996)

calls forth one contingent outcome versus another. To illustrate further, the decision of a patron to dine at a given restaurant versus the one next door causes that restaurant to appear busier— sending a signal that implies it has better food than its neighbor - in turn causing it to be more appealing to the next set of customers (who elect to patronize it), causing it to look busier, which attracts more customers, etc.

Here, urban space is seen as a fluid space of contingent potentialities, a 'phase space' that congeals and thickens at particular locations at particular moments in time (Jones, 2009, self-citation). Phase space is a notion coming from physics, where it refers to the overall 'space of possibilities' a system might explore or unfold within. We can think about the overall scope of this phase space in terms of its 'degrees of freedom', or the number of variables that comprise the system (as well as the limit range of these variables). To illustrate, we can imagine a scrabble-board overlaid with randomly placed tiles. We might permit tiles to be placed anywhere along the horizontal axis of one row on the board (one degree of freedom), or extend the placement possibilities to include all rows along the vertical axis of the board (two degrees of freedom), or extrude that to include the vertical space occupied when tiles are stacked one on top of another (three degrees of freedom). Additionally, given that tiles are imprinted with letters, we might select which letter will be displayed in any given position (four degrees of freedom). Each degree of freedom has its own limit range or boundaries. Thus, the number of squares (on the x/y axis) of the board creates limits, as does the viable stacking height (perhaps before the tiles fall), as well as the range of possible letters (A-Z). Hence, while the overall phase space of possible placement configurations is bounded, the board still offers an almost infinite range of potential placement manifestations.

I am arguing that the smartphone augments the number of degrees of freedom that we perceive within the urban phase space, allowing resources that were always present but 'under the radar' to be accessed, activated and amplified. The larger the number of discrete parameters (or degrees of freedom) available to inform decision-making, the larger the navigable phase space, or the more potential 'niches' for occupation. The smartphone's capacity to easily handle and sort information flows allows currently latent trajectories in phase space – possibilities for urban behavior – to be amplified: making these sense-able and thereby viable. But the system does not stop there. Once a new trajectory has been sensed and occupied, its gravitational 'pull' in phase space is incrementally amplified, sending out a stronger signal. The smartphone allows this amplified signal to reach new users, and a feedback loop ensues. As users of the urban sphere are drawn towards a particular trajectory – pulled in by the weight of signals not previously sensed – the gravity of that site grows stronger. Whether this attractor comes in the form of a bar, a café, a flash mob site, or a plaza, its emergence as a 'weighty' niche within the urban fabric is now no longer predicated upon its static position within a pre-determined hierarchy. Instead, these basins of attraction, whether nodes or landmarks or pathways, emerge out of the phase space of potentiality, iteratively reinforced by individuals whose actions are both steered by virtual signals and subsequently generate same.

This is not to suggest that all points in phase space are equally viable - in many instances, particular *patterns* of occupation are more likely to occur within the civic phase space than within others (and we can think of these trajectories as attractors). However, if we think of the urban as an uneven phase space of possibility – one that is enacted and made manifest over time - then the necessarily contingent nature of urban occupation becomes more evident.

Further, while urban trends might be amplified and steered by the collective actions of those occupying space, virtual signals can also be customized so as to pick up highly tuned signals that fulfill various *individually* desired outcomes. Airbnb provides a case in point. Certain rentals tracked by the popular website may emerge as prime attractors for travelers for whom location and price are the top priorities, whereas other locations may draw those for whom privacy and cleanliness are favored. By partitioning such divergent 'criteria for success' into discrete parameters, urban offerings are decomposed such that specific, individualized optima can be located within the overall phase space. Here the multiplicity of potential phase space trajectories is limited as Apps highlight only the degrees of freedom relevant for each individual. Again, to illustrate - the optima for finding an ideal co-work space might involve a range of individual preferences with regards to cost, square footage, amenities, transit proximity, number of workspaces, etc. As individuals hone in upon each of these parameters, specifying the range of applicability and priority granted to each, the viable area of the territory they *specifically* wish to occupy within phase space becomes highly tuned. In an era where smartphones are able to match specific urban niches with specific user parameters, highly discrete niches of occupation become viable, even if their location in phase space are only optimal for one individual. The smartphone makes the information associated with each point in phase space - its corresponding specific characteristics - fluid and 'findable'.

Part Three: New Trajectories of Possibility and of Power

It is worth framing the above in relation to the ontological assumptions of complex systems as outlined by Manuel Delanda (2005, 2011). Delanda has been instrumental in detailing the differences in a given entity's *properties*, (which are inherent to an object, regardless of any interactions it is brought into) its *capacities* (which are manifested or brought into being only when entering into relations (assemblages) with other entities) and its *tendencies* (which, like attractors, are capacities that an entity is most likely to manifest). To illustrate, we can suggest that a hammer has properties of weight and shape, but that the capacity for this weight to be used to drive in a nail requires that the hammer enters into an assemblage where it is wielded by a human agent. Further, we can state that the hammer's weight could equally be used to slay a victim, though this capacity is not a general tendency. Delanda writes,

...since neither tendencies nor capacities must be actual to be real it would be tempting to give them the status of possibilities. But the concept of a possible event is philosophically suspect because it is almost indistinguishable from that of a real event, the only difference being the former's

lack of reality. Rather, what is needed is a way of specifying the structure of the *space of possibilities* that is defined by an entity's tendencies and capacities. (2011: 5 emphasis added)

It is this space of possibilities that physicists describe as 'phase space', and which DeLanda (following Deleuze and Guattari), describes as 'the virtual' (DeLanda, 2005). While the world *as lived* *actualizes* along specific trajectories, the same *virtual* space can support a multiplicity of equally viable trajectories. Philosopher John Protevi writes, '*here we should pay attention to the coexisting non-actualized (i.e., virtual) attractors*' (2013, p. 3). Acknowledging the viability of the unrealized virtual, (and at the same time the contingency of the manifested actual), moves us away from thinking about reality in stable ways. Protevi, notes that the virtual illustrates how,

...we live in an open, problematic world, as shown by the non-linearity of causes and the complex affects they give rise to and by the non-linearity of models which include multiple attractors. Thus we see that in Deleuze's world, as reconstructed by DeLanda [...] history matters but the future is open (Ibid: 5)

CAS, by conceptualizing forms and objects not as absolutes, but rather as contingent entities activated (or remaining dormant) as a result of interactions, provides an ontological perspective that can accommodate this virtual terrain. Thus, in a CAS reading, urban entities would be positioned as potential basins of attraction, never stable nor permanent, but instead having the capacity to manifest according to feedback dynamics. By recognizing the contingent and historical dynamics at play, this ontology redirects our attention so as to attune not only to so-called 'real' trajectories that unfold but also to ones equally viable (and present in phase space), that do *not* unfold.

Here, the manifestation of a specific trajectory of action (such as one that might popularize a particular node such as an urban plaza), departs from focusing only upon the node or plaza *in and of* itself. Instead, it is both the potentialities of this urban element - its latent 'capacities' – that matter as well as how these come to be activated or brought into being by other agents. Clearly, some plazas will be better positioned to serve the public than others, and accordingly, not all plazas that hold the *capacity* to become popular will also have the *tendency* to become popular. In this way, the topography of phase space, while showing all range of capacities, is still variegated enough to highlight a system's tendencies. But a CAS ontology orients us to the fact that even though one plaza may be more popular than another, this is not due to a clear-cut cause and effect relationship, where proportionate popularity is *solely* the inherent result of proportionate causes. To say that a 'plaza' is popular (situating popularity within the identity of the plaza *in and of* itself) is therefore inaccurate. Instead, the plaza/human imbrication or *assemblage* is what is productive or activated at a certain time, and a *specific* plaza's activation is highly contingent: dependent not only upon

the inherent capacities of the plaza, but also upon the historical circumstances that may have resulted in feedback calling forth the plaza as a popular node.

What is interesting about the advent of the smartphone as a ubiquitous feature of our lives, is that it brings new dynamics to bear upon how trajectories in phase space might unfold. It enables us to find and activate capacities of urban interactions: ones that may have always enjoyed a virtual existence, but because of the constrained information channels within the system did not have the *tendency* to actualize. In the past, the threads that wove together agents in space and the kinds of spaces they occupied were bundled together along much more specified and constrained trajectories – those reinforced through habit or through power. This posed a limit on the degrees of freedom seemingly available within the system, capping off with only a limited number of regimes made accessible.

But the smartphone redistributes these threads in novel ways. In this city, it is not the only the key agents, the ‘big brands’ that dominate our senses. Rather, the ‘long tail’ (Anderson, 2004) of customized urban possibilities are revealed to us - made sensible - in ways never before imagined. This has significant social implications. Rather than being gripped by normative values that shape how a city is ‘supposed’ to be experienced and lived, individuals are given augmented means by which to curate their own course. Power is nudged from the top-down to the bottom-up.

Further, the expansion of our normative boundaries to include sites previously un-sensed and un-seen permits us to navigate outside of familiar, geographically bounded settings. Here, ‘insideness’ is no longer constrained by Lynch’s geospatial boundaries of edges, but instead exists as an individually curated expanded spatial field. We determine the geographies that matter to us. We decide if we wish to navigate along quiet routes or beautiful routes or fast routes, and we decide which nodes of spatial resources we wish to navigate towards. Our boundaries may remain parochial, but it is a parochialism that we each define for ourselves, and which stretches, distorts, and occupies phase space in unique forms and imprints for each individual. Rather than being seized by the normative geographies of top-down power, we are given the sense-ability with which to grasp and make manifest our own city.

It is worth highlighting this emancipatory potential of bottom-up, technologically mediated experience, as this perspective appears to be largely absent in the larger body of ‘smart city’ critiques that have recently proliferated in academic discourse (see, for example, Kitchin, 2014). These critiques are highly attuned to the risks of a panopticon society, where everything we do is monitored in the efforts to garner big data that is analyzed and used for purposes of civic ‘optimization’. Clearly, this dystopic vision is something that should be guarded against. But at the same time, by only highlighting the risks of technology, other, more emancipatory means through which technological innovations might equally manifest have perhaps been overlooked.

For every expression of concern regarding monitoring, we might thus point to examples of technological mediation that are empowering. Scholar and activist Jeffrey Juris, for example, observes how smart devices were implicated in directing his actions during the #Occupy Boston movement. In orienting himself in space, he describes how *'my Android phone indicated a large group of protesters was on its way from the #Occupy Boston camp at Dewey Square and would soon turn a nearby corner...minutes later... I eagerly jumped into the crowd and joined in chanting'* (2012, p. 259). In addition to steering his physical actions, images and tweets of activist events were captured on smartphones and circulated via social media, helping mobilize further activism in ways that the mainstream media (which authoritarian governments can manipulate in order to limit what is 'sensed' by the public) could not do.

In this more optimistic, emancipatory reading, we are empowered to diverge from the norm, the 'central path', and instead construct the path that serves our immediate needs. Furthermore, we are led to discover regimes that may be popular for many others, but that previously existed only as latent potentialities. These constructs – possibilities in phase space – while always present, were mute with regards to our ability to perceive them, trust them, and draw upon their latent capacities. The smartphone brings with it the capacity to weave together different locations, persons, and times, binding together the complex civic system at the node of the personal body. But the web it weaves is tailored for each individual, with threads of connection carrying different weights and thicknesses dependent upon the nature of the individual, their propensities, and their preferences.

Part Four: Concluding Comments

The capacity to sense the city at a distance, to detect patterns and, by our actions, to modify and shape these patterns, opens up fundamental changes in how we conceptualize and analyze the urban. In this reading, the city is not so much 'given' but uniquely sensed, enacted and experienced in multiple, overlapping, and individual 'satisficing' scenarios - each of which is contingent upon the moment in time, the actors involved, and the discrete selection of which urban signals to privilege.

While the core thesis of this paper is that the smartphone opens up more fluid and contingent ways of experiencing the urban, it should be noted that such experiences are not, in and of themselves, reliant upon this new technology. The city as something that is engaged, enacted, performed, is a perspective that we can find precedents for, notably in both the Situationists explorations of the *dérive* and in Walter Benjamin's notion of the urban *flâneur*. In both these examples, the urban is something one experiences in a contingent manner through a drifting along without regard to specific trajectories.

That said, the ability to easily grasp hidden dimensions of the city and the ability to share this knowledge amongst like-minded individuals is something new – if not in kind then certainly in intensity. Highly specific

information has become ubiquitous, and with that, a new ability to steer away from normative urban offerings. Here, contingency is not the same as randomness – our attention within the city is still directed towards landmarks and nodes that matter to each us – be it the site of a momentary pop-up event or of a little-known vegan restaurant. But the ways in which certain offerings gain traction and appeal to a broader spectrum is much more reliant on the feedback mechanisms we see operating in complex systems. It is this feedback from the crowd that now skews what we see, what we note as ‘trending’ or trust as a reliable source. It is not so much that we drift in space, but that contingency enters into what we perceive as noteworthy and gravitate towards - as slight differences in initial conditions can lead to highly differentiated urban resources being highlighted for us. Here, the way we understand urban entities is increasingly mediated by the digital interfaces that we rely upon - be it through ratings, tagging, authenticating, etc.

How might we grasp this form of urban experience, one that is no longer so tightly bound up with the physical constructs we are generally accustomed to focusing upon? If we normally rely upon *mapping* (in both physical and mental forms) to help us understand urban dynamics, then how might we map this urban terrain? And what would this map contribute to future analysis, since the paths, landmarks, and nodes it captures would remain so tenuous and contingent in their manifestation? Further, if this conceptual space is populated not by inherently stable entities but instead by contingent virtual affordances, does this then negate the possibility that stable basins of attraction nonetheless emerge? Or will the urban system, mediated by an enhanced capacity to reveal a broader range of spatial trajectories, exhibit unexpected and emergent patterns of occupation and engagement that are reinforced and proven ‘fit’ over the longer term? Will co-evolving individual experiences result in emergent shared realities (such as when the actions of individual birds in a flock result in the coordinated movement of the whole), or will they remain discrete, with the urban experience splintering into multiple overlapping and co-existing realities?

CAS would suggest a rich array of the above dynamics. The information cues generated by individual experiences become signals that reverberate back to other agents in the system, in turn modifying both the nature of the urban and the possibilities of action within it. But it is unlikely that this will lead to a unified, global outcome in the system as a whole. Rather, different kinds of urban amenities or activities will tend to attract different kinds of users. We might imagine a sort of ‘niche urbanism’, with user-specified niches emerging and co-evolving with their population of users. One might argue that these parallel urbanisms already exist, as different socio-economic realities construct cities that present dramatically different kinds of urban experiences. A CAS ontology highlights the ways in which such emergent urban niches might manifest from the bottom-up, in a contingent, non-linear manner.

That said, CAS tells us nothing about the values associated with such niches, nor does it offer us any assurances that different niche realities will intersect in complementary ways. Network theory (a subject which lies outside the scope of this paper) can perhaps lead us to a better understanding of the dynamics

whereby niches might overlap and intersect through bridging nodes, rather than becoming strongly segregated from one another. This points to a key political issue: if niches fragment into isolated enclaves – the ‘filter bubbles’ that have sprung up in our Facebook feeds - they will, while doubtless appealing to our *preconceived* preferences, seldom challenge or expand them. Left unchecked, these sensorial echo chambers can be self-curated so as to reinforce parochial perspectives and propagate prejudice.

By contrast, Lynch’s coherent Landmarks and Nodes, while conceived within a framework that held to a now discredited belief in universals, brought with them the promise of serving as public attractors for all: fulfilling a social and political role that brings different populations and perspectives together, shoulder to shoulder.⁶ If a sensorially mediated urbanism serves only to reinforce and amplify differences it would indeed be dystopic, albeit a ‘bottom-up’ dystopia that differs from the top-down panopticon models that are currently being cautioned against.

While this paper attempts to outline a more optimistic perspective on the potential of smart media in our lives, I am well aware that glowing claims of how ‘technologies will solve our problems’ are often naïve and should be tempered with skepticism. Notwithstanding this critique, the role that the smartphone as an extended sensory technology will ultimately play in our lives is far from evident. Choices we make now may lead us towards a technologically mediated world that monitors and steers us, or one that we are able to control and configure in accordance with our own needs. It is not yet evident which of these potentials is more likely. Perhaps, both are equally viable potentials in the phase space that extends before us. If history provides us with lessons, these only serve to indicate that we are poor forecasters of where innovations will ultimately lead.

What is evident is that smartphone technology is here to stay, and that our corporal bodies are becoming increasingly bound up within its new capacities. Their full impact upon our sensorial lives has yet to be clearly understood. Clearly, Lynch’s ‘sense-making’ urban categories outlined in *Image of the City* no longer adequately encompass the full range of urban experiences (and likely never did). In an increasingly mediated world, the security of Lynch’s coherent images will necessarily shift out of focus, taking on multiple, unique overlays, only some of which will be intersecting and reinforcing. Our perceptions of what constitutes a Landmark, Edge, Node, Path, and District will become increasingly customized and the cities they lead us through increasingly fluid and contingent. Hopefully, this will lead us closer to grasping the city we want – one that fulfills not only our own desires and curated needs, but also embraces a heterogeneous civility.

Bibliography:

⁶ The role of ‘bridging nodes’ - the ‘third spaces’ where different communities can come together, is a topic I consider in depth in elsewhere ([Author Name](#), 2016).

- Anderson, C. (2004). The Long Tail: Why the Future of Business Is Selling Less of More.
<http://doi.org/10.1111/j.1540-5885.2007.00250.x>
- Batty, M., & Torrens, P. M. (2005). Modelling and prediction in a complex world. *Futures*, 37(7), 745–766.
- Bratton, B. H. (2009). iPhone City. *Architectural Design*, 79(4), 90–97.
- DeLanda, M. (2005). *Intensive Science & Virtual Philosophy* (New editio). Continuum.
- DeLanda, M. (2011). *Philosophy and Simulation: The Emergence of Synthetic Reason*. London: Continuum International Publishing Group.
- Hamilton, K., Karahalios, K., Sandvig, C., & Langbort, C. (2014). The image of the algorithmic city: a research approach. *Interaction Design and Architecture(s) Journal*, 20, 61–71.
- Heylighen, F. (1999). The Science Of Self-Organization And Adaptivity. *Knowledge Management, Organizational Intelligence and Learning, and Complexity, in: The Encyclopedia of Life Support Systems EOLSS*, 253--280.
- Heylighen, F. (2000). Evolutionary Transitions: how do levels of complexity emerge? *Complexity*, 6(1), 53–57.
- Holland, J. (1995). *Hidden Order: How Adaptation Builds Complexity*. Canada: Basic Books.
- Ihde, D. (1975). The Experience of Technology: Human-Machine Relations. *Philosophy & Social Criticism*, 2(3), 267–279.
- Jones, M. (2009). Phase space: geography, relational thinking, and beyond. *Progress in Human Geography*, 33(4), 487–506.
- Juris, J. S. (2012). Reflections on #Occupy Everywhere: Social media, public space, and emerging logics of aggregation. *American Ethnologist*, 39(2), 259–279.
- Kauffman, S. (1996). *At Home in the Universe: The Search for the Laws of Self-Organization and Complexity*. Oxford University Press, USA.
- Kauffman, S., & MacReady, W. (1995). Technological Evolution and Adaptive Organizations.
- Kitchin, R. (2014). The real-time city? Big data and smart urbanism. *GeoJournal*, 79(1), 1–14.
<http://doi.org/10.1007/s10708-013-9516-8>
- Leszczynski, A. (2015). Spatial media/ation. *Progress in Human Geography*, 39(6), 729–751.
- Lynch, K. (1960). *The Image of the City*. The MIT Press.
- Morville, P. (2005). *Ambient Findability: What We Find Changes Who We Become*. O'Reilly Media.
<http://doi.org/10.1080/03615261003622999>

Offenhuber, D., & Ratti, C. (2012). Reading the City — Reconsidering Kevin Lynch's Notion of Legibility in the Digital Age,. In Z. Berzina, B. Junge, W. Westerveld, & Z. Carola (Eds.), *The Digital Turn - Design in the Era of Interactive Technologies*., Park Books.

Protevi, J. (2013). *Review of Manuel DeLanda, Intensive Science & Virtual Philosophy*.

Thrift, N. (2014). The "sentient" city and what it may portend. *Big Data and Society*, 1(June), 1–21.