Hegemonic Sensory Practices of the Smart City

And a Collective Remaking of Data-based Urban Commons

Miguel Paredes Maldonado

1. INTRODUCTION

This chapter discusses how urban life is affected by digitally mediated practices of sensing and navigation in the city. It puts forward a project that redeploys those practices to challenge the logics of "computational governance" championed by smart cities and urban platform labor. After describing the project and its proposed interventions, I will discuss how it engages with the city as a "sensing collective" to counter-balance the sensory orders established by hegemonic digital mediations: Whereas smart cities and urban platform labor aggregate and standardize human activity into a reductive model of flows, the described interventions re-introduce individual subjectivity, plurality, and agency as key components of collective life in the city.

The project that constitutes the core contribution of this chapter consists of a case where I worked alongside with student-activists, engaging with the 'models' of digital sensing and navigation prescribed by smart cities and urban platform labor in the urban scenario of Cagliari (Italy). These 'models' (and the attendant sensory orders they instigated) were called into question by creatively appropriating and disrupting their technologies and the data they produced.

This case demonstrates novel modes of engaging with urban data, challenging hegemonic, top-down urban practices in pursuit of alternative, digitally mediated practices that foster a more inclusive and democratic "public commons." In so doing, the project responds to three fundamental questions: What methods might be employed to better understand the relationship between public data and public space in the urban field? Do data-driven infrastructures play a role in restructuring the collective experience of public space, or do individuals forge space through their own data productions? How can citizens be empowered to become performative agents in the production of a data-based urban commons?

From a methodological perspective, the digitally mediated practices presented in this body of work engage two distinct emerging fields: urban hacking, the creative

use of digital media to "open up urban institutions and infrastructures to systemic change in the public interest" (Ampatzidou, Bouw, van de Klundert, de Lande, & de Waal, 2015), and critical making, the pragmatic pursuit of critical thinking through actions of goal-based physical making. In that spirit, the work develops by exploring alternative sensing practices that co-opt the cybernetic paradigms of digital sensing and navigation to generate novel perspectives on the collective dynamics of urban life. It makes use of existing open-source databases and original digital data gathered by smartphone apps. These data sources are processed through a custom digital workflow to develop interpretive maps, animations, and drawings that foreground and interrogate collective dimensions in urban life. More specifically, the case presented in this chapter looks into the commuting dynamics of university students into the city center of Cagliari, unveiling their resultant informal patterns of appropriation of urban public space through academic and social activities. Ultimately, the "sensing collectives" that unfold as a result of these processes point to means for urban intervention that overcome the structures of hierarchical, data-based optimization championed by smart city initiatives.

2. THE TRANSFORMATION OF SENSING AND SENSORY ORDERS IN THE CITY

Public space in our cities is woven together with an enormously varied array of elements and features: streets, alleys, and avenues; gardens, squares, and parks; but also, smaller objects (and groups of objects) such as kiosks, benches, playgrounds, bicycle rails, and bus shelters. A lot has been written about the many ways in which these physical components—large and small—organize and regulate our collective experience of the city (see Chapter 1 of this volume by Prinz). As we move about in the urban fabric and negotiate our interactions with its physical system of spaces and objects, we inhabit the city by jointly constructing a network of navigations against the background of public space.

If we consider the above through one of the key ideas presented in this book—the notion that sensory practices play a key role in the organization of our collective social life (Reckwitz, 2016)—, we can say that collective practices of urban navigation are part of this "sensory order" inasmuch as they generate specific forms of collective life in the city. As an example, upon approaching a busy city center by foot, we may decide to join (or to avoid) the crowds of people assembling alongside with others to partake in different activities. If we venture further into the main streets, the lights of shopfronts may invite us to enter the premises and purchase some of the goods on offer. Likewise, the smell of food and drink from nearby cafés might lead us to sit down for a short rest and a snack. This may be followed by some further browsing in a nearby market, which may trigger our curiosity upon hearing the rumble of shop-

pers and sellers from a distance. Finally, a series of conveniently signaled and well-lit bus stops may provide us with a cue to carry our newly purchased goods home in a non-strenuous manner. Throughout our time in the area, and through a series of sensory interactions, we become part of a choreography of shoppers, café-goers and revelers, participating in the kind of collective experience that we often associate with leisure in urban centers. As this paragraph tries to convey, this particular modality of "collective life" is predicated to a large extent on fostering commercial transactions. Our individual navigations both inform and are informed by this organized rhythm of sensory stimuli, subsequently giving rise to a "sensory order" that is established through the amalgamation of our collective movements and interactions in urban space.

However, in recent times this space has also been populated with yet another category of objects: countless "data points" that are mapped against physical locations in the city. These "data points" are dynamic and changeable: Some register and store our individual impressions, for instance restaurant reviews or geo-localized photographs on social media. Others register important changes in our environment, such as live air quality information (see Chapter 6 by Husberg & Marzecová), or live updates to the schedules of bus networks. Using the appropriate digital platforms, we can access mediated collections of "data points," often adding our own data productions in the process. This has become an almost universal practice and, as it turns out, we seem to have gradually transformed into "Data Citizens": Through mechanisms of environmental sensing, surveillance systems and individual interactions with personal digital devices, our navigations in the city are increasingly informed by the production and retrieval of urban data.

Put differently, bodily embedded sensory practices in the city—and the sensory orders they give rise to—are gradually being displaced by digitally mediated forms of "sensing" which are, in turn, predicated on our interactions with a range of dynamic data. Examples of interactions include, but are not limited to, using apps to guide our movements and activities (for instance to choose a commuting route or to check the opening times of an exhibition) as well as to access services or share our whereabouts with others (for instance by ordering food for home delivery or posting our status in a social network). As the examples suggest, digitally mediated sensing in the city works in both directions: we use apps and digital platforms to look into collections of urban data and, in doing so, also add our own data to those collections. In this manner, I argue that digitally mediated practices of data-based digital sensing in the city encompass a distinct range of materials, meanings, and competences, and thus resonate with an understanding of "praxis" as a tool for the production of knowledge (Shove, Pantzar, & Watson, 2012).

3. HEGEMONIC PRACTICES OF URBAN DATA AND COLLECTIVE REPRESENTATION

In the following sections, I will discuss how these digitally mediated practices of sensing follow a particular set of logics (which I will refer to as "computational logics" throughout the text), and how these logics change the sensory orders that regulate collective life in the city. As a starting point, I identify two distinct practices that, at the time of writing this text, emerge as the prevalent models for implementing these data-based sensing practices: *smart cities* and *urban platform labor*.

The term smart cities refers to the overlay of integrated, responsive digital infrastructures that draw on data streams from mobile apps, sensor networks, social media feeds and transport information, with the goal of making urban features more responsive to changing conditions (Coyne, 2017). An example of this is the "live" coordination of motor traffic information with public transportation schedules and the provision of environmentally friendly commuting alternatives (such as rental electric bikes) across the city. Likewise, the broad category of urban platform labor refers to the digital, app-based logistical systems deployed to coordinate the provision of on-demand labor and services in the city—with an emphasis on adaptiveness and responsiveness. Well-known examples of these platforms are Deliveroo and Uber Eats (which organize food deliveries from third-party restaurants and eateries via "freelance" couriers that ride their own bikes or motorcycles) or Uber (which connects private vehicle owners with individuals seeking door-to-door transportation in the city).

Both smart cities and urban platform labor have a strong steer on the configuration of urban life through their data-based sensory orders. Expanding on the examples above, in smart cities the digital mediation or urban traffic data can be used to privilege some particular routes or means of transportation above others—effectively reconfiguring the collective experience of daily commuting. Similarly, food deliveries through Urban Platforms can potentially reconfigure the dining scene in a city—displacing patrons from restaurants to their own homes—while simultaneously forming a precarious ecosystem of "freelance" urban riders and "dark kitchens." Thus, by changing the ways in which people move about in the city smart cities and platform labor applications also affect how people performatively represent the "polis" as a collective subject.

Among the two hegemonic practices of digitally mediated urban sensing introduced here, the smart cities paradigm holds a particularly strong claim to collective representation—and consequently also to the articulation of the "polis." Therefore, I will use it as the basis for a further discussion on how performative, collective representation in the city is transformed by digitally mediated sensing. As the examples above suggest, smart cities constitute a form of urban governance and decision-making: Waste management and recycling can be optimized on the basis of

waste volume data. Crime and policing can be controlled through systems of digital surveillance. Energy consumption for urban lighting or district heating can be adjusted on the spot according to live energy use indicators, and energy sources redirected to minimize their environmental impact.

All of these interrelated urban aspects, and many others, can be jointly and synchronously addressed through the well-oiled, responsive mechanisms of the smart city. This only became possible in recent years through the combination of pervasive computing (the embedding of computational capability into everyday objects) and ubiquitous data (that emerging in a decentralized way from many different, partially overlapping sources). For architectural historian Mario Carpo, the widespread abundance of spatial data combined with an exponential increase in computational power led to a "digital turn" in spatial practice throughout the past decade (Carpo, 2017). In this process, the embedded logics of computational thought were transposed into planning, design, and governance across a broad range of scales. In the urban field, this resulted in the substitution of bodily, embedded sensory practices by computational logics that undertake decision making on the basis of the insights provided by digitally mediated sensing, as exemplified by smart cities. In that respect, it is worth noting that the second-order cybernetic theories of the 1970s have been identified as a precedent for the smart city paradigm, to the extent that the latter can be regarded as a direct re-materialization in space of the former (Krivý, 2018).

As I noted in the previous paragraphs, the digitally mediated sensing practices of smart cities are not just a means of governance and decision-making: They also construct performative representations of collective life in the city and, in so doing, they can be regarded as political forms of representation. Cities constitute "entities of meaning" that are formed collectively and grounded on their very own "intrinsic logics"—the structures of their everyday life that are specific to them (Löw, 2012). Likewise, collectively assembled individual actions in the city—often manifested by movements in urban public space—do have performative qualities which, in turn, can lay claim to political representation (Butler, 2015, pp. 71–72).

Following this line of thought, if the digitally mediated sensing practices of the smart cities change the way in which people move about in urban space, they also change the ways in which they construct performative self-representations of the city through their collective subjectivities. In so doing, the city is manifested as a "polis"; a space for the unfolding of political action or, perhaps more accurately, a "spatialized politics" (Latour, 2003). This, in turn, raises important questions about the new collective representations that may emerge within the data-based sensory orders brought about by smart city practices.

4. DATA-BASED, DIGITALLY MEDIATED SENSORY ORDERS IN THE SMART CITY

In what follows I will provide a more detailed account of the sensory orders that emerge from the hegemonic, data-driven sensing practices that constitute the repertoire of the smart city paradigm. I will argue that these practices articulate three sensory orders, which I will respectively refer to as an "order of singularity," an "order of vertical hierarchization," and an "order of optimization."

The "order of singularity" refers to a "metabolic" reading of urban systems, inherited from second-order cybernetics and based on a metaphor of the city as a "circulatory body." In this conceptual framework, the subject of urban queries is the city-body. Consequently, any smaller, individually heterogeneous components of the urban are "blended" into the larger, homogeneous whole. This reading of the city gained significant traction in architectural theory throughout the "projective turn" of the 1990s (Krivý, 2016). It has also been successfully carried forward into the 21st century: Architect and theorist Kas Oosterhuis has conceptualized cities as infrastructural "bodies," recalibrating humans as "carriers" of matter, energy, and information within urban metabolic structures (Oosterhuis, 2017). This framework has also been explicitly articulated as a result of computational logics, with an insistence on the "metabolic" character of computational processes as they tackle spatial problems pertaining to the urban scale (Segraves, 2013; Weinstock, 2013).

A key aspect of this framework is that it represents the city as an "urban body" that is both "sensed" and "activated" by means of differential "flows" of matter, energy, and information. If "infrastructure governance is enacted through the representations of the infrastructural system" (Offenhuber, 2017) this circulatory metaphor, which posits fluidity as the central principle of development, has important implications: If a particular aspect of the urban cannot be readily expressed in terms of "flow" (which is to say, expressed as a dynamic differential), it cannot be "sensed" (i.e. captured as data) and therefore it escapes urban decision-making (Krivý, 2018). This is immediately apparent in the representation of urban public space: It can be captured as a "flow" only when "sensed" through the marketized notion of "footfall." Hence, this representation of the city as a circulatory body with "inputs" and "outputs" clearly privileges some urban narratives above others. Moreover, this "sensory order" ignores fine-grain practices that either operate below the scalar range of the "whole," or cannot be easily reduced to a logic of differential exchanges.

The second order, the "order of vertical hierarchization," refers to the top-down logic that characterizes design and governance in smart city practices. This logic is based on highly centralized decision making, which is subsequently "cascaded down" to a strict hierarchy of urban agents (Paredes Maldonado, 2020). It should be clarified that "top-down" refers to the direction in which the agency of data-driven

representation progresses: From institutions or corporations towards individual citizens. Conversely, I refer to bottom-up logics when the agency emerges from individuals and is disseminated "upwards" into larger constituencies. Whereas this is usually presented as a clear-cut distinction (Picon, 2015) it is often the case that data-based urban processes operate in a range between the entirely top-down and the entirely bottom-up (Offenhuber, 2017).

Notwithstanding this, it is apparent that the operation of the hegemonic digitally mediated sensory practices in the urban field is fundamentally top-down: Data flows in multiple directions between stakeholders (regardless of their relative size or power), but decision-making is highly centralized. Be it in smart cities or in platform labor, individuals (either citizens or workers) have little scope to intervene in this decision-making. Whereas in the case of platform labor this poses challenges to the establishment of fair labor relations (Gregory & Paredes Maldonado, 2020) it is more difficult to disentangle its implications in regards to institutional governance. On the one hand, it can be argued that this orientation follows the structure of political power in representative democracies, and therefore it is important that its conditions are not bypassed. On the other hand, such degree of vertical hierarchization defeats the purpose of establishing a meaningful direct dialogue with citizens. This conflict is exemplified in institutional "Civic Tech" initiatives, which articulate channels for citizens to communicate and report simple issues related to urban governance (for instance by reporting the location of potholes via SMS messaging) but offer little insight into the actual decision making that determines which actions are taken forward.

Finally, the "order of optimization" refers to a focus on quantitative standards of efficiency in the practice of digitally mediated sensing and its attendant performative representations of collective life in the city. As a direct result of this, any qualitative aspects of social life in and around public space are overlooked (Greenfield, 2017a; Haque, 2017). This preoccupation with quantitative optimization is often linked to flow-based urban resources such as electricity networks (Ratti & Claudel, 2016), public transportation infrastructures (Szell & Groß, 2014) and telecommunication services (Greco, 2014) but it also appears to have pervaded many other dimensions of urban life. Interestingly, even some of the most vigorous advocates of smart cities have reservations about the ability of the numerical optimization of differential flows to capture the full spectrum of urban phenomena (Ratti & Claudel, 2016).

To sum up, the practices of the smart city, platform labor and their attendant processes have installed hegemonic, digitally mediated sensory orders in the urban field. Under these practices, the urban is collectively performed and represented as a singular "regime" of inputs and outputs, balanced dynamically through an imperative of maximum performance. This calls into question the agency of individual cit-

izens, neighborhood communities, grassroots platforms and other non-hegemonic stakeholders in the city.

5. COUNTER-PRACTICES OF URBAN DATA SENSING

As elaborated in the previous section, in order to foster more democratic means of digitally mediated sensing, performativity, and representation in the urban field, we must first understand the socio-political agendas that are implicit into different data-based sensory orders predicated. Likewise, we must also understand the processes of algorithmic design and distribution of civic resources they give rise to (Greenfield, 2017b; Gregory & Paredes Maldonado, 2020). Put differently, whereas hegemonic data-driven practices such as smart cities and platform labor are primarily lauded as unprecedented technological achievements, I argue that their success lies somewhere else: The complete pervasiveness of the ontological model they advance.

In contrast to this pervasive technocratic model there are other alternative frameworks that tap into available data sources to drive design, performativity, and representation in urban spaces, albeit in a more socially responsible manner. A well-developed contribution along these lines is the Local Code project (de Monchaux, 2016). This body of work identifies and repurposes inner city infrastructures through data-driven strategies of fine-tuned adaptive reuse and urban biosphere remediation. However, whereas it succeeds in overcoming some of the top-down, mechanistic strictures of the smart city framework by paying attention to a broader, qualitative range of design factors, Local Code offers citizens no means to engage with its data-driven workflow in order to intervene as co-creators of their public urban landscapes. Likewise, Civic-Tech initiatives represent a more nuanced, alternative framework of data-driven spatial intelligence, predicated on using distributed citizen participation as a means to inform institutional decision-making. Such initiatives are augmented through the notion of the "hyperlocal," which champions a focus on the experiential aspects of the algorithmic engagement with Civic-Tech tools (Bullivant, 2017). In both cases, the explicit goal is to open up alternative technological modalities of collective urban dialogue that capture needs and subjectivities beyond the scope of hegemonic data-driven systems.

In an attempt to expand on the lines of work explored by these alternative models, the following sections will put forward a body of research-by-design work developed as part of my own academic practice. As noted in the introduction, this body of work is presented through a case where I worked alongside with groups of student-activists to challenge the hegemonic practices of digitally mediated sensing championed by smart cities and platform labor. The goal was to engage with those practices to subvert their attendant sensory orders, unveiling novel forms of bottom-up, per-

formative urban representation in the process. Throughout the development of the case, this "subversive engagement" was carried out through collective actions of creative redeployment of the technologies and the data produced by these platforms.

The resulting set of "alternative sensing practices" explore civic data through urban hacking and critical making in an attempt to identify and capture fine-grain urban phenomena that are inflected by individual subjectivities and their attendant actions in urban space. To that extent, they pay attention to urban issues that explicitly tackle social friction, collective experiences and contested shared resources. This entails privileging a qualitative interpretation of quantitative raw data sources, leveraging "sensory orders" where data is used as a means to unpack frictional, messy, creative forms of representative citizenship (Haque, 2017). In this manner, the smart city practices of top-down, totalizing, optimized objectivism are countered with practices that re-situate individual subjectivities as the fundamental agents within the urban millieu, identifying the domain of the commons as a "site" of representation that emerges both gradually and collectively.

As explained earlier, the hegemonic sensory order of the smart city follows a hierarchical approach, seeking to optimize urban resources for a limited set of stakeholders. Contrary to this, the methods of urban hacking promote a creative use of digital media to "open up urban institutions and infrastructures to systemic change in the public interest" (Ampatzidou et al., 2015). In so doing, "urban hackers" use data to develop bottom-up collaborative interventions that unveil contested issues within the public commons, with a view to addressing them critically (de Waal, de Lange, & Bouw, 2017). Importantly, urban hacking does not prescribe specific "solutions," but rather "tinkers" with the urban field, testing incremental steps for data-driven action, and endeavoring to privilege collective knowledge and curiosity above strict functionality (Pe, 2017). The practices presented in this chapter mobilize the sensibilities of urban hacking through critical making: Designing and testing small interventions in actual urban contexts constitutes an ideal approach for establishing collaborative practices of participation in design (Ratto, 2011), and also articulates avenues to collectively unpack and explore the politics of such participation (DiSalvo, 2014).

A fundamental aspect of the alternative sensing practices presented here is that their goal is, above all, the production of shared knowledge. The stakeholders involved position themselves as active citizens—wary of dominant urban narratives—working collaboratively to organize alternative networks of digital civic collaboration (Townsend, 2014). Their traits and attitudes resonate with the figure of the "amateur" as described by sociologist Antoine Hennion (2005): They engage with a particular practice (mediated digital sensing) in a dedicated, inventive, experimental manner and—critically—they do that socially, that is, in reference to other members of their collective. Their creative and intimate relationship with particular aspects of the world is mediated by their activities and their endeavors,

and subsequently presented to the wider world as an open invitation for others to join the conversation.

The "sensing practices" that underpin the case presented in this chapter develop around two particular themes: circulation and play. Framed as urban phenomena, both themes appear to yield themselves well to interrogation through data-driven methods, offering fine-grain insights into human activities in the city. The first theme pertains specifically to the circulation of individuals, recorded by the individuals themselves as part of a collective exercise. It should not be confused with the notion of "flow" discussed in earlier sections. Rather than illustrating a differential displacement, the theme of circulation is framed as a critical form of agency for urban citizens. It is linked to other, non-digital practices in the city that attempt to break away from the conventional representations of the urban subject. In that spirit, Ignacio Farías and Stefan Höhne (2016) invite us to consider "… the power of circulation to unleash processes of desubjectification, enabling human bodies to enter a plane shaped by the movement and rest, the speed and slowness of destratified bodies, a field of vectors and particles intersecting in new ways, becoming something else." As discussed in the work of Michel de Certeau, circulation can also be a "tactic" to overcome functionalist structures in the city (see also, Schulte-Römer in Chapter 3 of this volume). By simply "moving about," one develops "unrecorded and un-recordable productions" (Beltzung Horvath & Maicher, 2016). As de Certeau noted "[T]rajectories trace out the ruses of other interests and desires that are neither determined nor captured by the systems in which they develop" (de Certeau & Rendall, 1984).

In the context of this body of work, the theme of "play" can be considered as a subtheme of "circulation." This draws from the well-known practices of play through serendipitous displacements in the city carried out by members of the Internationale Situationniste (Andreotti, 2000; Smith, 2005). Such practices are best exemplified in the practice of urban "drift" or "*dérive*" as originally theorized by Guy Debord (1956). Here, urban circulation is turned into a game, which individuals agree to play collectively by purposefully recording their movements and productions in the urban field. Play becomes a tactic to undermine attempts to represent the city as a singular, monolithic subject that is activated through the inescapable logics of optimized resourcing. Instead, it renders the urban as a multiplicitous accumulation of collective productions in space, which incorporates the unpredictable, the serendipitous and the creative experiences embedded into everyday life. This tactical use of play is best described by Beltzung Horvath and Maicher (2016): "to free the city from its organization, if only temporarily by games, can be a practice of liberation … Instead of encounters between subjects communicating on a plane of significance, the stripping down of subjectivity, of organization and significance allows for the becoming of a new swarm of multiplicities, a new collectivity."

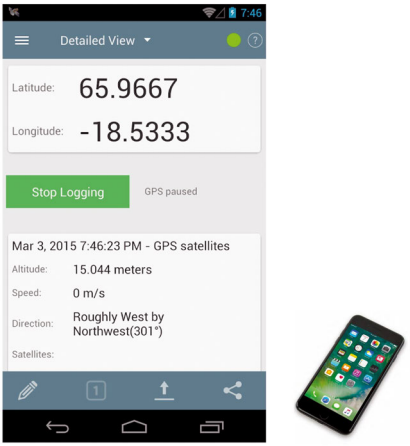
6. COUNTER-HEGEMONIC URBAN PRACTICES: A CASE STUDY IN CAGLIARI, ITALY

The set of "alternative sensing practices" that constitute this case was developed in the context of a visiting professorship at the University of Cagliari in Sardinia during the spring term of 2017. As part of a broader discussion on their collective experiences of the city, I invited a group of 79 architecture students working under my supervision to install a GPS-tracking app on their smartphones (Figure 1) and share their accumulated trajectory logs for a specified period of time. No specific ad-hoc software was developed for this purpose. Instead, the immediacy, accessibility, and ease of use of freely available tracking apps for smartphones—mostly catering to cycling and jogging enthusiasts who use them to keep records of their progress and share them with fellow cyclists and runners—allowed all group members to get ready for the proposed activity in just a few minutes. The only requirement was to use an app that could record and share trajectory logs in the GPX file format (also known as GPS Exchange Format). This is a simple, open-source file system where a sequence of time-stamped "track-points" with location data (latitude, longitude, and height) are stored in tags and can be interchanged between GPS devices and software. Critically, this extremely simple setup allowed the group to leave technical considerations aside, and to focus on agreeing paths of performative action instead. To that extent, a declared goal was to performatively test out the spatial potentials of "circulation," as outlined by de Certeau and Rendall (1984), and tactical "play," as conceptualized by Beltzung Horvath and Maicher (2016) in relation to the group's navigations in the city.

The group agreed to uninterruptedly record their position data logs for a full day, and to collate the resulting log files together afterwards. The log files were numbered sequentially with no reference to the student that originated them. They did not reveal any personal information other than the recorded positions at a series of points in time. This exercise effectively tapped into the data sources and processes that make up a key component of smart city and platform labor practices: The distributed accrual of location-specific information, obtained from individual smartphones as their users access online services to improve their experiences and navigations in the city. Planning a driving route that accounts for live traffic conditions, finding a nearby coffee shop that offers takeaway services within a certain price range, or sharing our live location with a friend for a limited period of time are some of the functions that both draw from and partake in the structure of these data platforms. However, whereas hegemonic smart city and platform labor practices tend to "flatten" the friction caused by local conditions to ensure that urban experiences remain consistent with expectations, the goal of our exercise was precisely the opposite: To foreground these conditions and the "messiness" of the individual and collective negotiations they trigger. Put differently, the underlying objective of this experimen-

tal "sensing practice" was to help revert the prevalence of quantitative information identified by Greenfield (2017a) and Haque (Haque, 2017) in hegemonic models of digitally mediated sensing, positing an alternative that resituated the qualitative components of social life in the urban public realm as the principal means for collective representation.

Figure 1: Screenshot of GPX Logger, one of the Android-based free GPS tracking apps used by participants to record their displacements in the city.



Source: GPX Logger

Once log files were collated, their position data points were imported into CAD software and assembled as trajectory curves. Each individual curve in the resulting CAD file represented one of the anonymized trajectories recorded by members of the group. Using this base material, three time-stretched animations were produced, showing all trajectories being gradually traced from the beginning to the end of the agreed recording time span. I call these animated urban plans as they are 'plans' in the architectural sense, delineated descriptions of space through vertical projection.

Each animation focused on a particular scale of observation: metropolitan, urban, and local. The resulting animations reconstructed the fabric of Cagliari and its surrounding territory through the subjective urban geographies of the participants. As noted before, the intent of this practice—formalized as an exercise of collective performance—was to steer the visual representation of urban data away from the

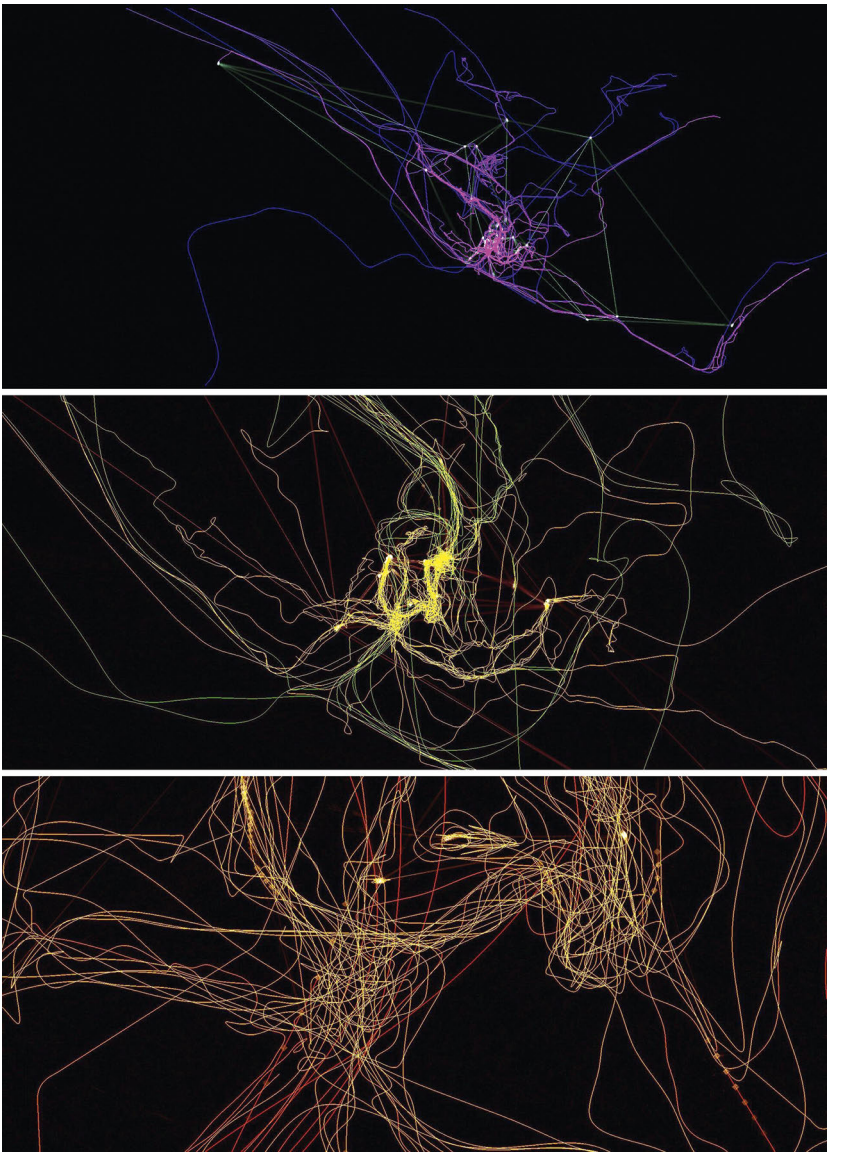
focus on optimizing the 'flow' of resources, directing it instead towards the social orders emerging from the assemblage of many heterogeneous individual subjectivities. This, in turn, revealed some of the social patterns that characterized the community of architecture students in Cagliari as they were manifested in space.

The first animated urban plan of Cagliari produced through this collective 'practice' (Figure 2) focused on the metropolitan scale. This animation revealed the most salient geographical features of the region, such as the coastline and the locations of subsidiary urban nodes. More importantly, it also revealed the strikingly broad territorial spread of the student population, informed by a distinctive culture of daily commuting into the city center from the parental homes in neighboring towns. This commute routinely took up a very substantial proportion of the working day for many of the participants. In that sense, it had become a 'place' for them; a consistent realm of space and time defined by scheduled displacements across the regional landscape. The first animated urban plan provided a visual representation of this 'bracketed' construct of space and time, foregrounding its very long physical range and suggesting that, to some extent, the commute contributed to inform the social-academic life of the students at least as much as their actual on-campus experiences.

A second animated urban plan focused on the central districts of Stampace, Marina, Villanova, and Castello—where the central university buildings and the School of Architecture are located—revealed finer-grain patterns of urban access that emerged from the specific assemblage of geographical, infrastructural, and social conditions affecting both the city and the participating students. These patterns foregrounded—among many other aspects—important issues of access and accessibility into the central campus (located at the top of an ancient fortified citadel). They also highlighted a markedly gendered experience of space and personal safety as the quaint, labyrinthine alleyways of the city center and its citadel were navigated. The snapshot image of this animation (Figure 3) shows an amalgamation of paths in and around the central urban hub of Piazza Yenne, which gradually extended towards the cluster of buildings –located in the old citadel- that comprise the School of Architecture.

A third, close-up visualization (Figure 4) showed the immediate surroundings of Piazza Yenne and the walking routes to the school of Architecture towards the Torre dell'Elefante—an historical entry point into the old citadel of Cagliari. It yielded a very accurate reconstruction of the physical configuration of the urban fabric in that particular fragment of the city. The thick amalgamation of paths revealed in this third animated urban plan foregrounded the social range of the urban university campus, assembled from a multiplicity of daily individual narratives that involved acts of commuting, shopping, studying, resting, and socializing—all of them manifested through a rhythm of displacements and stationary moments; an "urban choreography" of sorts.

Figure 2: Snapshot from the metropolitan-scale animation of student routes in Cagliari based on GPS-traced displacements; Figure 3: Snapshot, intermediate urban scale. Animation of student routes in Cagliari based on GPS-traced displacements; Figure 4: Snapshot, close-up into the surroundings of Piazza Yenne. Animation of student routes in Cagliari based on GPS-traced displacements.



Source: Miguel Paredes Maldonado

Considering the three visualizations as a single, consistent body of work, it seems clear that—much like in Debord's circulatory practice of urban "*dérive* [or drift]" (1956)—quantitative parameters of efficiency play only a limited role in the collective organization of this emerging, multi-scalar landscape of navigations. Social detours, shortcuts, leisurely stops and renegotiations of the individual routes at stake play an important role in the circulation of students across the city and the territory, to at least the same extent as more quantifiable parameters such as bus schedules, traffic routes and teaching timetables.

As the account of the working methodology that led to these visualizations suggested, the agency of participants was not restricted to their own data productions, but also involved coordinated input into the collectively assemblage of trajectories into a single CAD file. The authorship of the resulting visualization was, thus, distributed and flattened. This aligned the work with the tradition of critical countermapping practices, inasmuch as the purposes of the spatialized visualizations were rendered transparent, and collective decisions were made on the specific aspects of the data collection that were to be foregrounded (Genz & Lucas-Drogan, 2018). In that sense, the collective politics of this collaborative process—from learning to capture and map smartphone data to determining the rules for the recording of trajectories—constitutes the core act of "critical making" as defined earlier in reference to the works of Ratto (2011) and DiSalvo (2014). Working dedicatedly, pragmatically and with a spirit of invention to digitally 'sense' the information they accumulated collectively, the participants also aligned themselves with Hennion's (2005) figure of the "amateur." Furthermore, in resonance with Townsend's views on the production of shared knowledge (2014) and by partaking in this alternative, digitally mediated sensing practice, the student-activists organized a platform of civic collaboration that cast a critical gaze on established smart city narratives.

It is worth emphasizing how the bottom-up, multi-scalar urban narratives discussed above give rise to an instance of performative self-representation that emerges from a distinct social group: For the students involved in the project—and paraphrasing Latour (2003)—the political space of the city unfolds in a very specific manner. At the same time, it is also important to acknowledge that the group of participants represented only a very small subset of the population of Cagliari, and therefore the insights gained by the exercises of data collection and subsequent mapping could not be extrapolated to other, larger urban constituencies or groups. In other words, and drawing from the theoretical discussion developed earlier this chapter, their claim to collective representation is necessarily limited. Notwithstanding this, their value can be found along the lines advanced by Butler (2015, pp. 59–60): highlighting social modes that exist at the critical edge of the recognizable in the urban field. In doing so, the sensory orders emerging from this alternative sensing practice offer a practical model of collective, bottom-up appropriation of

urban data, which leverages self-awareness of the range and extent of our shared productions as a data-citizens.

Moreover, this work also offers potential vectors for exploration and collective action towards a more democratic, socially responsible governance of the urban commons. Some of the urban insights revealed in the Cagliari experiment deal with pervasive issues and concerns that, while difficult to render visible, have a strong bearing in our experiences of the urban commons. In that respect, the methods outlined in this "sensing practice" offer avenues for further testing, increased visibility and eventual action.

7. CONCLUSIONS AND REMARKS

Using the themes of leisure, play, and circulation as drivers for generating and interrogating performative representations in the urban field, the case introduced in this chapter demonstrates alternative modes of collective engagement with urban data. These novel modes of engagement challenge the computational logics of digitally mediated sensing championed by smart cities and urban platform labor. In contrast to the top-down, standardized sensory orders instigated by these two hegemonic paradigms, the set of "alternative sensing practices" developed in Cagliari take a bottom-up approach to foreground the subjectivity, plurality, and agency of individuals in urban space. Thus, these practices engage social life in the city as a "sensing collective" where the movements, activities, and performances of people can become digitally mediated data productions, assembled collectively to construct more inclusive and diverse forms of political representation in urban space.

In doing so, these alternative sensing practices demonstrate that multiple, novel "sensory orders" can be activated through critical, creative engagements with urban data. In Cagliari, the particular sensory order that emerges through the collected smartphone data of participants paints a distinct picture of academic life: An endeavor that is no longer associated with the classroom or the university buildings, but rather described as a choreography of movements into the city, within the city and out of the city, spread throughout the totality of the working day. As demonstrated throughout the discussion of the case, these novel "sensory orders" can be effectively encapsulated through collectively assembled representations of digitally mediated sensing, which tap into some of the productive processes that generate urban data in the first instance. Their attendant sensing practices also demonstrate how these representations unpack and manifest a range of "social orders," expressed as collective urban narratives that intersect the spatial fabric of the city with their own, thematized data productions.

Ultimately, the case presented in this chapter advances viable alternatives to the sensory orders championed by the computational logics of smart cities and platform

labor in the urban realm. First, it dispels the notion of the city as a self-consistent "aggregated body," instead putting the focus on the constellation of individual agencies that make up urban life. Second, it resists the top-down narratives of "computational governance" by offering a range of tools to collectively generate bottom-up instances of performative representativity. Third, it exposes the limitations of numerical optimization as a driver of digitally mediated urban sensing by uncovering otherwise hidden qualitative insights into a range of social functions in everyday city life. Although the claims to collective representation afforded by the alternative practices that constitute the core of the Cagliari case are necessarily limited—and could be the subject of substantial debate—they are nonetheless successful in pointing us in the direction of more transparent, democratic forms of data-based urban praxis.

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