



Data doubles co-constructing spatial practices: An empirical study

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ABSTRACT

Data doubles modulate and co-construct everyday spatial practices. These practices occur in between the individual and their multiple doubles, aggregated beings that are carried in smart devices and cards, living and acting in surveillant apparatuses, or operating in other means of data collection widespread in any spatial setting. These beings leak out of devices, and seamlessly blend with humans and their spatial practices. This study elaborates on a qualitative data collection carried out with younger generations in Turku, a medium-size city in Finland, where they were asked to reflect on their data doubles for two weeks. The shared stories show multiple types of doubles, to various degrees blending into individuals' spatial practices. The article shows how doubles are not simply passive recordings of data that individuals generate, but, rather, they are experienced as agentic beings infiltrating into human bodies' movements and behaviours while co-constructing blended, physicaldigital spaces.

1. Introduction

'Data doubles' (or simply 'doubles') is another way to call the digital footprints—'traces we leave ourselves' (Kitchin 2016, p. 6)—and shadows—'traces captured about us' (ibid.)—that individuals generate and carry with them daily, in their smartphones, laptops, smartwatches, smartcards, smart home devices (Sadowski 2020), or leave behind, when e.g. using online services or moving around (Wong 2023) any spatial setting. Doubles are fed through for example geo-location information (e.g. when relying on Google Maps to find directions), activity-tracking devices (e.g. digital wrist bands), interactions in social media (e.g. Instagram, TikTok, Facebook), or the use of services via the Internet, apps (e.g. ordering food with Foodora or buying bus tickets), etc. (Tedeschi 2024).

Spatial practices—any repeated movement or micro-action which occurs in and affects a spatial setting—are created in between the individual, their multiple doubles, and any other human or non-human entity that may be involved in the practice-formation. Specifically, when humans negotiate their being-in-space with digital tech entities, the space is reconfigured and becomes populated with intangible yet fully operational beings, or with physicaldigital entities that mirror and act on humans but are not 'quite' human. In sum, they seamlessly accompany individuals and their everyday movements and actions, so much so that it is 'impossible to live a digitally free life and not leave

data footprints and cast data shadows' (Kitchin 2021, p. 113): 'As we adopt and ubiquitously embed networked digital technologies across physical landscapes, they come to enact progressively routine orderings of quotidian rhythms, interactions, opportunities, spatial configurations, and flows' (Ash et al. 2018, p. 26).

Research on data double as a new body, or being, was born within surveillance studies, in a paper where Haggerty & Ericson (2000, p. 613) defined what a 'surveillant assemblage' is: 'We are witnessing the formation and coalescence of a new type of body ... which transcends human corporeality and reduces flesh to pure information. Culled from the tentacles of the surveillant assemblage, this new body is our "data double"'. From here on, data doubles have tended to be considered passive collections of data, separate from their 'owner' (Tucker 2023). In this article we contribute to the research on doubles by shifting the way they are usually understood from passive to active entities: as processual operations 'of data-body relations' that do not reduce activities to the human body as simply a 'content creator for data capture' (Tucker 2023, p. 6; see also Simondon 2020 [2005]). What emerges from our empirical research is that 'data operate ... to constitute the operation of events and bodies' (Tucker 2023, p. 4). We thus follow an ontogenetic approach to data doubles, which echoes feminist digital geographies (e.g. Rose 2017) looking at the 'becoming' and processual co-constitution of human and non-human entities, and the emotional complexities (Elwood & Leszczynski 2018) they generate, rather than at their being, their ontology.

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This approach reads everyday spatial practices as co-constructed emotional entanglements of human and non-human bodies generating new beings (here, the doubles) (repurposed from Barad 2007; see also Nordström et al., 2023; Tedeschi 2019, 2022; Tedeschi & Viljanen 2023). Thus, these beings may not be reduced to simple extensions of human ontology. Instead, applying an ontogenetic perspective, data doubles are new entities developing an entangled agency, populating cities, affecting and acting back on humans, and co-constructing physical/digital, blended spatialities (Benyon 2014; Benyon & Resmini 2017; Resmini & Lindenfalk 2021). This view is derived from our empirical study, carried out in Turku, Finland, which elaborates on daily stories written by individuals belonging to the younger generations. They were asked to define what data doubles were for them and reflect on their agency in urban spaces for two weeks. Accordingly, the purpose of this article is to explore what the doubles are, what is their agency, how they act back on and affect humans, and how they reconfigure everyday spaces.

The article is organised as follows. The next (second) section provides a short overview of literature on data doubles and their spatialities, unveiling the tendency of reading doubles as passive beings, even if they are part of assemblages. In the third section, the material and methods of the study (thematic content analysis of daily diaries) is illustrated in brief. The fourth and fifth sections describe the results and discuss them respectively. Conclusions are drawn in the last section, where reflections on the findings are summarised and possible future lines of research sketched.

2. Data doubles in the literature

As mentioned, the concept of data double originates in surveillance studies and specifically with Haggerty & Ericson's (2000) publication 'The surveillant assemblage'. On the one hand, this assemblage combines humans and technology to exercise surveillance. On the other hand, according to Deleuze (1992), humans thus become divided individuals, i.e., individuals, divided into a consumer self ('real' body) and its purchasing behaviour (data body). Haggerty & Ericson (2000, p. 611) called this a hybrid body that is first 'broken down by being abstracted from its territorial setting', just to be reassembled in another setting through data collected about the individual's behaviour. Re-assembling makes the data double constantly changing as more data is added (Lupton 2015b). As a result, a 'decorporealized body, a "data double" of pure virtuality' is created (Haggerty & Ericson 2000, p. 611). Such data double is 'more than a persona that we wear on the internet' (Vallee 2020, p. 4), and is emotionally reflected back on the 'body and self' (Lupton 2015b, p. 108). The concept of the data double emerges alongside the rise of post-panoptical theories in surveillance studies (Galić et al. 2017). Such theories shifted from the Foucauldian (Foucault 1991) view of analysing fixed territories of surveillance, like hospitals and prisons, to considering surveillance as a process dynamically infiltrating individuals' mobility and access to spaces and information, for example. Thus, post-panoptic surveillance follows a deterritorialized view where e.g. neoliberal institutions pervasively control populations from a distance through data (Bogard 2006).

Today, data double is applied with other similar concepts, such as that of data twins (Boschert & Rosen 2016), data shadow (Kitchin 2021; originally from information science: Weinberger 2007; Westin 1967), data phantom (Green & Svendsen 2021), digital footprint and fingerprint (e.g., Lemberg-Pedersen & Haioty 2021), information shadow (from experience design: Kuniavsky 2010). Data doubles are applied, for example, in studies of refugees and immigration (Canzutti & Tazzioli 2023; Lemberg-Pedersen & Haioty 2021), law and crime (Moore & Hoffeler 2019; Moore & Singh 2018; Wilkinson & Lippert 2012), public governance (Bouk 2018; Lehman 2016; Taylor & Broeders 2015), food delivery platforms (Duus et al. 2023), retail (Resmini & Rosati 2008), and self-tracking (Lupton 2014; Ruckenstein 2014; Vermeer 2021). From the perspective of this article, two aspects of previous research on

data doubles are specifically of interest: the question of agency and the dimension of spatial practices.

2.1. Data double and agency

Let us first consider the question of agency, that is the ability of doubles to act in a socio-spatial context (Young 2018). Agencies come into play through the idea of 'assemblage', a concept widely present in geographical literature (e.g., Anderson et al. 2012; McFarlane 2011) and beyond: the 'rhizoid surveillance assemblage' by Norton (2018, p. 59); data assemblages as a way 'of defining identity and selfhood' by Lupton (2015a, p. 102); data assemblages as emotional triggers, 'from hope to disappointment, pleasure to frustration, control to obsessiveness' (Ruckenstein & Schüll 2017, p. 267). We consider assemblage through Deleuze and Guattari (1987), thus, as Galić et al. (2017, p. 21) summarise, as a 'multiplicity of heterogeneous objects, whose unity comes solely from the fact that these items function together ... Beyond this functional entity, with a stability only on the surface, assemblages comprise of [sic] discrete flows of ... limitless range of phenomena'. Similarly, within critical data studies, there is an established notion of data assemblage, derived from Foucault's dispositif: 'A complex socio-technical system, composed of many apparatuses and elements that are thoroughly entwined, whose central concern is the production of a data' (Kitchin & Lauriault 2018, p. 8). Data doubles are part of assemblages themselves: they are defined as the 'assembled data about an individual, which is increasingly used to make decisions in relation to that data subject' (Kitchin 2025, p. 62; see also Cheney-Lippold 2017).

From the cited literature, simplified examples of assemblages include digital data – non-digital data – migrant (Canzutti & Tazzioli 2023), crime victim – evidence data – judge and jury (Moore & Singh 2018), or cyclist – bike – digital application (Duus et al. 2023). All these parts of assemblage work together to result in outputs such as residence permit, sentence, or food delivery, for example. However, interestingly, the underlying ideas of agency behind assemblage and those behind data double are mismatched to some extent. Assemblage follows the ideal of human-technology (or human-data) co-agency, or co-constructed agency: simply put, different parts possess agencies that are realised in relation to the other parts. However, the data double conceptualizations as 'double', 'twin', 'shadow', 'phantom', 'dossier', 'fingerprint', and 'footprint' are passive linguistic expressions that do not suggest (co-) agency. The way in which the data double seems to 'perform' in these assemblages also tends to replicate this 'passivity': for example, in Wilkinson & Lippert (2012), video surveillance images are described as tools linking individuals and businesses in the assemblage; in Cantuzzi & Tazzioli (2023, p. 13), migrants are the agents assembling 'digital and nondigital data' themselves.

A similar point has been also raised by other scholars. Tucker (2022, 2023) mentioned the current separation between a real body and the activity that such a body performs, passively recorded as data doubles. Thus, the double remains framed in a 'mirror form, namely that an individual has a flesh and blood body, and a data double [is] mapped onto the activities of the other' (Tucker 2022, p. 13). Also, Sør & Mai (2022, p. 491) saw 'a split between a digital self and a real self' that they connect with resulting in 'concepts such as the data double'. However, there are cases where the double is assigned a capacity to act, thus an agency. Interestingly, in criminal law studies, a victim's data double is based on evidence like images of injuries, which may become more trustworthy than the victim's own expression of their story. In such a case, the data double becomes agentic by diminishing the agency of the victim, and their 'data double becomes more human than human' (Moore & Singh 2018, p. 116). Data doubles can also increase one's agency towards the goal, like in the case of self-tracking through sports watches and apps that ease a person's developing competitiveness (Lupton 2016). Lupton (2015a, p. 175) emphasises how 'data doubles support a reflexive, self-monitoring awareness of the body, bringing [it] to the fore'. This also echoes feminist digital geographies' scholarship on

the embodiment of digitalities (Elwood & Leszczynski 2018), whereby the socio-spatial agency is always already technologically mediated (Rose 2017). Discussion of agency on the part of the double is resumed and tested in sections four and five.

2.2. Data double and spatial practices

We consider co-agency between the doubles and humans necessarily spatial: agency is performed through spatial practices in physical and digital spaces, which, in turn, become blended spaces in which digital and physical commingle to create novel affordances (Benyon 2014; Benyon & Resmini 2017) through such practices. Research on data doubles also explicitly recognizes 'spatial practices', such as the many forms of surveillance in both physical and digital spaces (e.g., Hedenus & Backman 2017; Hope 2015; Galić et al. 2017; Norton 2018; Young 2015), daily interconnected mobility of people and data (e.g., Canzutti & Tazzioli 2023; Lemberg-Pedersen & Haioty 2021), applying data doubles for constructing knowledge over nation and ocean spaces (Lehman 2016; Taylor & Broeders 2015), and re-constructing self as inherently a spatial practice in physical and digital spaces (Douglas-Jones 2021; Sør & Mai 2022).

The idea of 'spatial media' (Kitchin et al. 2017) is useful to unpack the relation between data double, space, and practices. Today's interactions are increasingly mediated, recorded or accompanied by digital systems, and everyday social exchanges require people to 'provide personal data to their surroundings' (Sør & Mai 2022, p. 4). Many technologies that create data doubles are locative and spatial, meaning they map the location in real-time and apply geo-tagged data to construct the double. The doubles, spatial technologies and geo-tagged data, in turn, mediate spatial practices, like our mobility, transactions and interactions (Kitchin et al. 2017). In their study, Graham & Zook (2013) showed that the digital space of Google Maps annotates different services depending on used language. This is a good example of how data double, consisting of data about a user's language, location, and search history, often acts as a mediator and affects which routes individuals take in physical space. Individuals mediated by data doubles thus move in 'hybrid virtual—material places' (Graham & Zook 2013, p. 78) that are better defined as blends—following Fauconnier and Turner (2002)—in that they deliberately integrate 'multiple non-contiguous digital and physical spaces' (Benyon & Resmini 2017; Resmini & Lindenfolk 2021) and create a space which exhibits its own emergent structure, a different set of affordances, and enables novel experiences. Another example concerns the practice of successful food delivery that Duus and colleagues (2023, p. 190) call 'riding in app time'. The riders use their mobile phone application to accept orders that include particular timelines for picking up the food and delivering the food to customers. The app's data doubles often cause 'unwanted waiting time' of the food in restaurants, which challenges the riders to reach their customers in time and affects their decisions about routes, speed, which orders to accept, etc. (Duus et al. 2023, p. 206). The riders navigate in a space that blends the cityscape and the digital platform, preserving some—but not all—of the experiential characteristics of the two spaces (for example, the street grid of the city and the time-limits of the app) and introducing entirely novel ones (for example, unconventional routes resulting from the interplay of orders, timing, and traffic).

Indeed, mobility of people and data is a key spatial practice for data double research. In crime studies, Wilkinson & Lippert (2012, p. 311) considered mobility to epitomise the 'creation of criminalized "data-doubles"'. The mobility of Closed Circuit TeleVision (CCTV) camera data from private persons to police and court validates such a double. Video is strong evidence that can 'transcend time, space, and the corporeal' (Moore & Singh 2018, p. 120). Thus, video-based gaze in criminal justice is authoritative, truthful, and implicitly masculine (Moore & Singh 2018, p. 120). Data (doubles) continues existing and moving online, even though the person's life would change into another direction. Such data legacies can create new beings that do not actually

exist (Green & Svendsen 2021). As an example, Green & Svendsen (2021, p. 3) used online tracking of an expecting mother whose 'baby was never born in flesh and blood [...] (but) lived on as a digital commodity for targeted advertising'. A further mobility practice concerns border control, especially in the case of refugees. Their mobility is highly controlled by creating material and digital documentation whenever they cross borders, for instance, to prevent duplicate registrations (Lemberg-Pedersen & Haioty 2021). As a result, refugees are shadowed by doubles that may deny or allow them access across borders. The refugees try their best to control the doubles through practices of erasing, tracing, and reconstructing traces, but may not even see the data these doubles are based on (Canzutti & Tazzioli 2023, p. 8).

Behavior and location of people in physical space can also be traced through tracking in digital space, for instance through website cookies for online shopping, data aggregation and pattern analysis, and locating mobile phones through the cellular tower they connect through. The overseers are often hidden from 'those being watched' (Norton 2018, p. 59). A practice known as cybervetting, which entails checking a job applicants' data doubles online to learn about their backgrounds, is often applied in recruitment processes. Hedenus & Backman (2017) found out that recruiters may expect the applicants to be honest about their data doubles online. Mismatch between the data double and the applicant may be considered as problematic by the recruiters (Hedenus & Backman 2017, p. 651).

Another related practice that is widely studied in data double research is surveillance. Whereas some CCTV cameras are placed to keep an eye on (semi)public spaces in cities, airports, highways, schools, and shops, other cameras watch over private spaces like homes. Surveillance is a spatial practice of those technologies that extract the human body from its actual and physical space, and transform the body into flows of data in digital spaces (Haggerty & Ericson 2000, p. 606). Galić and colleagues (2017, p. 20) compared the theorisations of surveillance by Foucault and Deleuze. Whereas Foucault theorised surveillance in closed spaces like prisons that aim at making the person's bodies docile, Deleuze extended it as pervasive 'control at a distance', of which the practices of preventing the spread of COVID19 pandemic are an example (Vallee 2020), and which leads to socially harmful practices such as dataveillance and reduced privacy (Kitchin & Lauriault 2018). Spaces of resistance express a counterforce to being disciplined (Hope 2015), an example being school kids who hijack the surveillance, record teachers and share the videos on social media (Koskela 2011, p. 274).

This review has identified two topics that will be further explored in the Results and Discussion sections. First, there is a mismatch between the conceptualisation of diffused and shared agencies in assemblages (made of data and other entities), and the tendency to interpret the doubles as passive entities, even when part of such assemblages. Second, that these entities 'double' (as verb, rather than noun): thus, they play an important role in spatial practices' formation, as demonstrated, for instance, by the mobility examples (Graham & Zook 2013; Duus et al. 2023). After the Materials and methods section we look at a variety of cases of spatial practices involving data formations, specifically looking at how these beings are agentic and melt into individuals' behaviours and everyday spaces.

3. Materials and methods

This study was conducted in Turku, Finland. The study used observation of research participants from a distance, with 14-day daily diaries. 31 daily diaries in total were collected in two different moments: fall 2022 and fall/winter 2023. Research participants were mainly Generation Z, 28 (born after 1995 (Milotay 2020)); they needed to be over 18 to participate in the research), and three Generation Y (born after 1980), found via e.g. university communication channels, university courses, and otherwise snowball sampling. The daily diaries were used to gain insight into the research participants' daily relationships with four elements: smart devices, everyday (urban) spaces, their bodies

(with focus on their feelings and emotions), and law (broadly interpreted, to include social norms). The research participants were asked to keep regular notes on how these elements connect with each other and affect their everyday life, with specific attention to urban spaces. Upon completion, the diaries were discussed with the participants, to summarise the findings together. The discussions regarding the diaries did not follow a predefined pattern, but rather followed the participants' interest to deepen a certain topic, rather than another. The study's data protection and privacy guidelines were made available to all online, and were verbally explained to the participants. Informed consent was collected along with the daily diaries. The study complies with the ethical guidelines of the University of Turku, and the Finnish National Board on Research Integrity. For reasons of confidentiality, the data is not made openly accessible.

3.1. Daily diaries

The daily diary collection consisted of three phases: 1) preparing the instructions for the research participants, with guiding questions; 2) the 14-day activity period, and 3) discussions afterwards. Within this general framing, the participants were also invited to reflect on their 'data doubles', define what they were for them, if relevant to their everyday life. Participants were asked to devote a few minutes per day to the task and give examples. Research participants could e.g. write notes, take photographs, record voice messages, and make drawings according to their preferences. Participants were also invited to briefly explain why a specific thing (in a picture, conversation, drawing, etc.) captured their attention. Other questions and sub-questions were proposed, with the purpose of better explaining the task to the participants. Examples of these questions can be summarised as follows: 'Can you separate yourself from the digital tech devices that you use or come across daily? Think about your data-doubles. What are they, and what are they doing? Do they influence you? If yes, how?'. However, these were only guiding questions, to better clarify the tasks, and the research participants were free to follow, or not to follow them at all.

Usually, the daily diaries were returned as MS Word documents containing text notes and mixed-media materials captured with smartphones.

In Table 1, pseudonyms are replacing the real names, and language groups and countries of origin of research participants are not specified. Regardless of the language groups and the countries of origin, the diaries were written in English and the conversations carried out in English.

3.2. Data analysis

The written data (transcribed discussions, notes, daily diaries with mixed-media material) were analysed using thematic content analysis (Nowell et al. 2017) with help from the NVivo program. The aim of the method was to identify key themes and capture the complexities of meaning within the data. The first phase was about familiarisation with the data. Next, initial codes were created and the data coded accordingly. Thereafter, themes were identified, reviewed, and adjusted (Nowell et al. 2017; Braun & Clarke 2019). Material concerning data double's embodiment and modalities to act that affect spatial practices in various forms and everyday contexts was strongly evident in the data. In what follows, citations are extracted from both the diaries and the notes taken from the discussions afterwards. Not all research participants are cited, because of space limitations. However, the citations chosen represent the most important topics emerging from the analysis. When elements that may identify the person have been taken out of the citation to preserve confidentiality, a note in the text evidences the removal.

3.3. Limitations of the study

One of the limitations of this study is that it is based in one medium-

Table 1

The research participants.

N	Pseudonym	Sex	Age range (years)
1	Sophia	F	18–20
2	Patrick	M	18–20
3	Louisa	F	18–20
4	Anna	F	18–20
5	Nicole	F	18–20
6	Kelly	F	18–20
7	Katie	F	21–25
8	Robert	M	21–25
9	Stephan	M	21–25
10	George	M	21–25
11	Simon	M	21–25
12	Charlotte	F	21–25
13	Alexandra	F	21–25
14	David	M	21–25
15	Mary	F	21–25
16	Patricia	F	21–25
17	John	M	21–25
18	Susan	F	21–25
19	Jessica	F	21–25
20	Paul	M	21–25
21	Jason	M	21–25
22	Betty	F	21–25
23	Sharon	F	21–25
24	Emma	F	21–25
25	Ronald	M	21–25
26	Melissa	F	21–25
27	Larry	M	21–25
28	Alice	F	21–25
29	Doris	F	31–35
30	Grace	F	36–42
31	Amanda	F	43–49

size city in Finland, a Nordic country, and that research participants were largely linked with the university (either working there, or being students there). Thus, the findings may not be generalisable, as they are not representative of the urban population. Thus, the study remains stand-alone. On the other hand, the topics emerging from the diaries and the conversations find wide resonance in the literature (as we will show in the Results and Discussion sections), and may support e.g. feminist digital geographies and media and communication studies interrogating the embodiment of the digital and its agentic role in selves and spaces' formation (see below).

The guiding questions (see 3.1) may have limited, or anyhow shaped, how the research participants wrote their diaries, even if the prompt they received specified that they were free to use them or not, depending on how useful they considered them.

4. Results

What follows summarises the results of the study, thus, the various types and degrees of doubles' agency emerging from the research participants' stories. The stories are also put in initial dialogue with the relevant scholarship on the topic presented in Section 2. A more extensive discussion is carried out in Section 5.

4.1. Data doubles and cards and readers: spaces of temporary access

Data doubles 'living' in smartphones or cards co-construct access to spaces; yet, their co-constructed agency is less complex than the one described in the following sub-sections, being limited to the simple act of being able to access (or not) a space. For example, bus cards' doubles may give smooth and effortless access to public transportation via public transportation mobile apps (Jason); electronic chips may give access to home buildings (Grace); codes registered in an electronic system may allow residents to temporarily own 'a slice of urban space', a parking spot connected with housing (John). On the other hand, access may be denied, and spaces of temporary uneasiness generated:

When I tried to check in on our new classroom space today I was locked out, and had to get the security guard to update my key to let me move around. Physically my movement within these spaces is restricted, since I can never be sure that my key actually works on the door I am trying to get through. In a way, everyone is presumed to be an intruder until proven otherwise. In those spaces, I am inseparable from that keycard. If I leave something behind in a classroom and I don't have my card on me it's in there until someone else opens the door. (Kelly; daily diary)

As Reigeluth interestingly observed, this co-constructed access to space always implies that the individual is supposed to correspond to their doubles 'without gaps or contrast' (2014, p. 251). Yet, as emerges in the next sub-sections as well, something may malfunction, incorrect information be conveyed (see here e.g. [Kitchin & Dodge 2014](#)), so that the 'non-coinciding event' generates a difference negatively affecting the person and in various ways restricting their capacity to act, overpowering them. This, together with Jason's comment (below), connects with literature on algorithmic governmentality:

I just wonder whether our tendency to make our cities digital doesn't create a group of second-class citizens. Citizens who have to visit an office to top up their bus card, who don't have google maps to tell them the most efficient route and who can't rent a scooter.

On a broader scale, this also closely resonates with [Deleuze's \(1992\)](#) control societies, and what happens when the correlation between the doubles and the physical body (that is not supposed to have gaps) is severed. It seems that the person's singularity is simply 'reduced to the degree to which she fulfills these correlations' ([Reigeluth 2014, p. 250](#)), leading to negative feelings ([Paasonen 2017](#)) and reduced capacity to perform spatial practices, in the presence of non-functioning doubles. Yet, in our study, rather than focusing on the (shadow) role that institutions and tech companies play in their efforts of moulding (human, mainly passive) bodies by nudging them through a variety of data formations, we explore the multiple, blended spatialities that are created and co-constructed in between humans and the (seemingly intangible yet fully material) data-beings populating everyday spaces: how it happens, and with what consequences, in an effort of opening conversation around the role of doubles in everyday spatial practices with current geographical scholarships and other disciplines.

4.2. Data doubles and (surveillance) cameras: spaces of appropriateness and body self-monitoring

Unsurprisingly, the city is mostly experienced by research participants as a space where they want to feel safe and secure.¹ In this sense, one of the felt purposes of surveillance cameras encountered in daily walks was in fact that they would enhance this sense of safety and security (Patricia), by e.g. preventing crime, as well as finding offenders afterwards.² Yet, cities are populated by invisible beings, doubles that, while intangible, are fully material, and, blending into human bodies, they co-construct their movements, their behaviours, and emotions also as regards sense of (un)safety in e.g. city spaces. Indeed, some accounts from research participants show how doubles identified as recordings of surveillance cameras (but also random cameras' recordings of passersby (Charlotte, Doris) or even of law violations (John)) may create spaces of discomfort (in surveillance studies literature: e.g. [Dubbeld 2003](#)), decreased agency, perceived limitation of freedom of movement (Alice), and reduction of one's own, private space (Stephan); doubts as to whether the person's spatial practice was actually recorded on the

camera, and how long and where the recorded data double would be kept afterwards, and the possible uses of such recordings (Alice, David):

I was in a shopping mall. There was a real-time surveillance screen, where everyone could observe the others. So that made me very self-aware. I took a picture, and felt nervous. I took a picture of the camera: is it allowed? Where does all the data of the camera go? How long do they stay in the storage? Is there someone behind that camera? (David; notes from discussion after the diary's completion)

In the diaries, cameras sometimes co-generated a space in between, of guiltiness and uneasiness, where for example entering a supermarket but not buying anything would create anxiety (Larry) when wondering if the camera was recording them, and if the data double performing/re-enacting the behaviour of 'not buying anything' was considered acceptable or suspicious. The sense of guiltiness emerged when e.g. performing the actual movement of leaving the place and, at the same time, feeling suspected of theft:

I needed to buy these specific [elements removed to guarantee anonymity], so I decided to quickly visit my corner shop. Unfortunately, this shop was not selling them. I didn't need to buy anything else, so I just left the shop even though I felt anxious because I must have looked like I stole something. I always think that if I don't buy something from a shop, the staff thinks I am a thief. I get this same feeling also when I am at a shop and start searching for my phone or wallet or something from my bag because it makes me look suspicious on security cameras. Overall, I am very conscious about my movements when I visit supermarkets and stores. (Sharon; daily diary)

Self-consciousness of spatial movements and body gloss, or the act of reading one's own body's (re)actions and movements ([Brighenti & Pavoni 2022](#); see also [Lupton's \(2015a, p. 175\)](#) 'self-monitoring awareness'), in front of surveillance cameras is something that frequently emerged in both the diaries and the discussions.³ What is interesting to note is that doubles recorded via surveillance cameras may be seen emerging not as external, separate beings simply mirroring the person in an external device, but rather as co-constructing the spatial practice with the individual. Indeed, they generate a wide variety of emotional reactions and thoughts, spatialised into self-consciousness movements and a spatial behaviour aiming at being appropriate and 'fitting in the place'. Thus, the relevant space that seems to be constructed in between the individual and the double is of appropriateness and invisibility (with a behaviour aiming at not attracting unwanted attention): 'People do not solely have emotional responses to surveillance, but are affectively constructed *through* flows of informational surveillance' ([Tucker 2013, p. 38](#); italics in the original). This specific emphasis on how the (monitoring) object and the (monitored) subject contribute to the co-creation of temporary spaces with their own agencies, rather than being two interacting yet completely separate entities, is what resonates for example with feminist digital geographies, where the human is ontologically an unfinished being and 'becomes' through their spatial experiences, agency is explicitly assigned to the non-human world, and 'spatiality must be understood as always-already digitally mediated' ([Elwood & Leszczynski 2018, p. 634](#)). Similarly, [Rose \(2017, p. 779\)](#) analyses (post)human agencies as 'coconstituted with technologies'. In digital sociology, data doubles' agency is fully shared with the human body, thus, it is embodied: 'Data doubles feed information back to the user in ways that are intended to encourage the user's body to act in certain ways' ([Lupton 2015a, p. 174](#)). On the other hand, in surveillance studies this is being read as the bodily effects of

¹ For a recent literature review on perceptions of safety in the city see for example [Ramachandran & Ritchie \(2023\)](#).

² Increased (or not) perceptions of safety when in the vicinity of a CCTV is widely debated in literature. See for example [Ditton \(2000\)](#).

³ In literature, see for example [Goffman's \(1971\)](#) micro-sociology of everyday life, and its re-interpretation in the light of new technology; in spaces shared with others, and in front of cameras, 'the main function of a body gloss is to prevent possible misunderstandings' ([Brighenti & Pavoni 2022, p. 102](#)).

algorithmic governmentality (Reigeluth 2014), where humans' behaviours and movements are made 'docile matter' that needs to (passively) correspond to and abide by normativities set out in and through (neoliberal) spatialities.

4.3. Data doubles and one's own smart devices: spaces of selfhood formation, (un)safety, and (un)predictability

Research participants were largely aware of (and concerned about) how their data doubles act on and with them (sometimes even using the term 'data double' as subject/origin of a certain action in the sentence: 'I guess that my digital double and I were a bit naughty' (John)), and how they constantly feed them with e.g. personal data and geolocation information: 'I feed my data double whenever I track my runs or access my social media accounts' (Susan). However, the focus here would not be on the simple 'feeding' (thus, an active subject creating content for a separate, passive object), but rather, and interestingly, about how these doubles co-act and co-construct spaces where the person's selfhood, own becoming (ontogenesis; Leszczynski 2014), is also negotiated:

These [computer] applications are a large part of me: I spend a lot of time online, and many people I know only online. And they know me only online. I am myself, but also different online. Maybe if you meet me in person I am silent because there are many things going around in my head; but then I go online and I put many things in writing. I am scattered in different parts – I am in all these programmes, me but a bit different from me. (Alexandra; notes from discussion after the diary's completion; italics is ours)

This aligns with scholarships where humans are not seen as a fixed unity (Tucker & Goodings 2014; Reigeluth 2014) or clear-cut identity, but rather as a cyborgian (importantly, Haraway 1991; see also Gray 2001; Chun 2002; Hayles 2012), unfinished, ongoing assemblage of scattered elements, multiple spatialities, an indeterminate (Braidotti 2004) entity not pre-existing or separated from the 'inhuman' (Herbrechter 2012), here, from other inorganically organised entities (such as tech) (Ash 2015), or the spaces it inhabits, but rather as co-implicated and entangled (Barad, 2007) with them from the outset (Tedeschi 2022).

The coming-together of scattered elements forming the human is not (always) a smooth operation. Conflicts in one's own selfhood formation, or becoming, may also emerge ('Are you living your life for yourself or for social media?' (Robert; daily diary)):

I spend a lot of time on instagram because I feel like it gives me inspiration to try new things. On the other hand, I sometimes feel stressed because other people post a lot of nice things about their lives there, and you compare yourself. Therefore, I deleted the app for some time. I then re-downloaded the app only for [element removed to guarantee anonymity] because I like to look at the posted pictures there later and also because my friends are interested in seeing it. (Patricia; daily diary)

This resonates with works in media studies about self-tracking (Bode & Kristensen 2015; Ruckenstein 2022) and in anthropology (Douglas-Jones 2021) about aggregates of bodies of data, where doubles reflecting the person are not *quite* the person, and the difference that is created in between interferes and conflicts 'with a person's sense of self' (Watson 2014), generating a variety of feelings and emotions, ranging from self-doubt and stress, to satisfaction and curiosity (Ruckenstein 2023). The scattered and (at times) conflicting aggregates forming the self may also indicate a different modality of emotionally embodying and performing everyday spatialities:

Some of my close friends and I have shared our locations ... so that we can always see each other's locations. Also in [element removed to guarantee anonymity], I can see where my friends are ... I get easily jealous when I see my friends on the map hanging out with

each other when they haven't invited me. The maps aren't always accurate, so I have made many misinterpretations for example about what my friends are doing and with whom. We share our locations mostly for safety reasons, but I have thought about turning it off because it affects my mood so much. (Sharon; daily diary)

The double acting in the sharing location app here draws emotional geographies of sociability, reflecting physical locations but without being *quite* them. Again, the difference created in between emotionally feeds imaginaries where the person's body is painfully absent from other doubles' social spaces, generating a conflict and altering the person's sense of self.

Sharon also mentioned that the sharing location app reinforces a sense of spatial safety. This is an important role that doubles also play: co-constructing spaces of safety and security for the physical self. Doubles fed with geo-location information would thus return e.g. organised spaces with directions, hint as to how to move around, and successfully reach a destination (Simon); doubles performing interaction in social media keep company through social media apps (Kelly); doubles fed with favourite songs affectively materialise an allegedly safe private space (within a public, or shared with other persons, space) by allowing the enjoyment of favourite playlists while being in e.g. a noisy environment:

When I wear headphones, I can have a little personal space even in the noisy environment, I don't want to be disturbed by others. And when someone else is wearing headphones, I can quickly understand that he or she doesn't want to be disturbed either. From this point of view, headphones can gently convey a do not disturb signal. Of course, in some occasions that need to communicate, wearing headphones will undoubtedly become a rude behavior. In contrast to wearing headphones, taking off headphones makes the body show a 'willingness to communicate' and 'respect for people'. When I'm communicating with others, I take off my headphones, it's a sign of respect. When I don't want to communicate with each other, I will wear headphones and hope that the other person will walk away. (Nicole; daily diary)

Yet, doubles playing music in the headphones may also produce an isolation from relevant audio-video signals coming from the urban environment, which may unexpectedly co-construct spaces of danger: 'On my way there I listened to Spotify and since I was so concentrated on the music and workout, I crossed the street when the traffic light was red. Luckily there was no traffic at that time' (Grace, daily diary).

The sense of safety that doubles co-construct with the person moving in the urban environment has the purpose of avoiding unpredictable and possibly scary events, creating a bubble of secure, private space within the unpredictability of the city-space (in urban geography literature, similar experiences are described by e.g. De Silva 2023, Hagood 2011, Viktorsson 2024). For this reason, a non-functioning double or a double that co-construct incorrect or misleading information may again generate spaces (and feelings) of uncertainty ('feeling lost') (see also Paasonen's (2017) feelings generated by non-functioning technologies):

My phone died before I got home, which never happened before here ... And because I live a little far away from the city center, I needed to go home without my phone, without technology. And yeah of course in the end it was okay, because I already know my way home, but it just felt weird. I couldn't search when the bus is leaving, I just had to go there and wait. (Melissa; daily diary)

I knew I had to cross the field to reach the [elements removed to guarantee anonymity], however, ... the field ... was private property. Lucky for me, however, I ran into the owner of the field ... and he permitted me to cross the field ... My GPS could not have told me this. (Susan; daily diary)

While some of these spaces may be temporary and fleeting, the self's

movement is still constantly challenged and re-negotiated, and its capacity to act, and thus to perform any spatial practice, has to be negotiated with the doubles within the larger assemblage of human and non-human elements.

5. Discussion

The results feature short stories of doubles as embodied beings possessing their own agency and co-constructing everyday spatial practices in a multitude of ways. Multiple types of doubles' agency emerge from the data analysis: for example, doubles simply allowing (or not allowing) access to a variety of spaces and services; doubles recorded in surveillance cameras, and actively participating in the individuals' growing self-awareness and self-monitoring of their movements in space; doubles branching out from own smartphones and negotiating one's sense of self and presence in space; doubles living in and branching out from others' smart devices, yet affecting one's movements in space.

There are three main findings that are worth discussing and will be hopefully further investigated by other scholars. First, in the context of prior research on data doubles, only Moore & Singh (2018) consider feminist theory relevant to their argument, while Douglas-Jones et al. (2021) and Vallee (2020) make passing mentions in their study. Yet, the stories told by research participants clearly emphasise how data formations are not experienced as passive recordings of data; rather, as already mentioned in Section 4, they possess agency and this agency is co-constructed with, and embodied by, the participants. This clearly resonates with digital feminist geographies, which explore the embodiment of digitalities (Elwood & Leszczynski 2018) through digitally-mediated (Rose 2017) sensory affect (Degen & Rose 2024), and the impact of technologies on the making of everyday spaces and 'sociospatial relations' (Elwood & Leszczynski 2018, p. 630). Similarly, media and communication studies demonstrate how technologies are embodied (Lupton, Clark, & Southerton 2022; Ruckenstein 2023) and infiltrate and micro-shape human behaviour. Accordingly, these findings support and expand posthuman approaches to geographical scholarships, where for example philosophies of relational agencies (Barad 2007; Braidotti 2013) contribute to theorising the agential role of doubles in data assemblages and in the making of everyday spaces. Therefore, further research on data-doubles through the lens of digital feminist geographies could contribute to research of data doubles in various disciplines.

Secondly, the results show how new spaces are co-generated in between all the human and non-human entities involved in the assemblage. In our fieldwork, at least three types of such spaces have been identified: spaces of temporary access; spaces of appropriateness and body self-monitoring; spaces of selfhood formation, (un)safety, and (un)predictability. To the extent that doubles become part of human bodies, they are acting back on them, and generating or becoming part of everyday living spaces. The spaces described in the research participants' stories are of course a reduced exemplification of the myriads of co-constructed spaces that may be generated along with these doubles. While this study does not aim to produce an exhaustive, fleeting taxonomy of them, this initial mapping of such multiple experiences and micro-stories of doubles' everyday spaces may become the basis for future theoretical and empirical explorations. Potential may be seen, for example, in surveillance studies, and specifically in the fleeting spatialities generated by self monitoring practices (or self surveillance), where an external, yet embodied, eye (an 'internalised' CCTV camera) seems to be constantly judging the person's behaviour in space, and nudging and 'adjusting' it towards socio-spatial norms of acceptability (Brighenti & Pavoni 2022). This is affecting urban rituals (ibid.), for example increasing ritualities of self surveillance, which may 'need to be taken seriously by the ethnographers of social interaction' (ibid., p. 111).

Thirdly, participants did not simply use technologies; they entered into complex relationships with their data doubles, negotiating access,

selfhood, and safety in urban environments. These negotiations were rarely straightforward—they often involved tensions, conflicts, and a learning curve to navigate the new affordances provided by the blending of digital and physical space (Benyon 2014; Resmini & Lindenfolk 2021). At times they increase humans' agency; other times they decrease it (Ruckenstein 2023). In these latter cases, two opposing effects are observed: on the one hand, they generate a diffuse sense of powerlessness; on the other, they prompt a willingness to act upon data or find non-datafied spaces. Doubles also negotiate smooth and safe movements in space, but they are also a source of unpredictability: their 'non-functioning' may for example prevent individuals from accessing spaces, or lead to misbehaviour in space, or unwanted attention. What emerges is not a deterministic relationship where technology simply shapes human behavior, but rather a more complex, dynamic co-construction where both human and digital entities are intertwined. Each form of embodiment and co-construction also presents peculiarities and micro-characteristics that may be hardly generalisable, and may express hierarchies and power differences, as frequently emphasised by digital feminist geographies (Elwood & Leszczynski 2018).

6. Conclusions

Everyday spaces are populated by a variety of beings. Some of these beings (data doubles) are bodily experienced and generate effects on humans and spaces, even though the literature review carried out in Section 2 shows that doubles tend to be interpreted as passive objects/entities, even when recognised as part of assemblages. Yet, research participants tend to experience the doubles as part of their own selves (see Tucker's (2023) data-body). Not only do doubles affect human's behaviour and movements in spaces, but they also seem to become 'material' part of people's selves and their everyday spaces: they are '... not simply *inserted* in situations, ... [but] actively *shape* those situations in multiple terms' (Brighenti & Pavoni 2022, p. 100; italics in the original). Doubles emerge here as material, active tech agents possessing 'pieces' of human beings (at various degrees): 'It is literally a piece of, rather than *about*, us that is recorded' (Tucker 2013, p. 33; italics in the original). These findings do not stand alone, but connect with and could be taken up by for example feminist digital geographies, surveillance and security studies (Dubbeld 2003); microsociology (Brighenti & Pavoni 2022); affect theories (Ruckenstein 2014); quantified self studies (Lupton 2014, 2015b, 2016); psychology (Tucker 2013, 2022, 2023). Future work may expand on these findings across more diverse populations and contexts. The present study was limited to primarily younger, university-affiliated participants in a medium-size Finnish city. Examining how data doubles operate in contexts with different technological infrastructures, regulatory frameworks, and cultural attitudes toward data would contribute to improve our understanding of them.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Ethical statement

This research has collected informed consent from the research

participants, and complies with Finnish National Board on Research Integrity.

Data availability

The data that has been used is confidential.

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