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Emerging Urban Mobility Technologies through the Lens of Everyday Urban Aesthetics: Case of Self-Driving Vehicle

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Abstract

The goal of this article is to deepen the concept of emerging urban mobility technology. Drawing on philosophical everyday and urban aesthetics, as well as the postphenomenological strand in the philosophy of technology, we explicate the relation between everyday aesthetic experience and urban mobility commoning. Thus, we shed light on the central role of aesthetics for providing depth to the important experiential and value-driven meaning of contemporary urban mobility. We use the example of self-driving vehicle (SDV), as potentially mundane, public, dynamic, and social urban robots, for expanding the range of perspectives relevant for our relations to urban mobility technology. We present the range of existing SDV conceptualizations and contrast them with experiential and aesthetic understanding of urban mobility. In conclusion, we reflect on the potential undesired consequences from the depolitization of technological development, and potential new pathways for speculative thinking concerning urban mobility futures in responsible innovation processes.

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Introduction

The generational challenges of climate crisis and deep social injustices for current and future generations are also pertinent to urban transportation systems (Martens, 2017). As one interpretation of the Promethean myth would go, humanity has at its hands a range of converging digitalization and automation technologies to respond to these challenges. At the moment, the field of urban transportation is rapidly responding with a range of emerging technologies, which are still in the making and not yet fully entrenched in society.

There are several reasons why deeper conceptualization of urban mobility and urban mobility technology is especially important in the case of emerging and potentially disruptive technologies. First, the importance stems from large uncertainties in the technological development itself as well as in the ensuing societal implications, as both technology and its social embedding are still malleable (Collingridge, 1980; Sollie, 2007). As these emerging technologies are still largely unformed systematically, an integral aspect of their development consists the visions of the future and implicit values as they become used for societal learning and embedding (Jasanoff, 2016). These visions have several themes, such as addressing a perceived social need that contemporary technologies cannot fulfill, often overestimating benefits of new over prior technological alternatives. Second, the importance of emerging technologies stems from the fact that they may bring about systemic, society-wide, changes (Jasanoff, 2016). Third, we must recognize that emerging technologies typically face the challenge of institutional void (Hajer, 2003) as well as organized and distributed irresponsibility (Beck, 1992). This means that none of the current institutions has a full understanding or control over the development or the undesirable consequences of emerging technologies. In conclusion, steering the development of emerging technologies would benefit from wide-ranging speculative thinking to anticipate as many as possible socio-technical configurations and their consequences. Such speculative thinking can challenge technological determinism in the foundational stage of an emerging technology, which might otherwise lead us to conclude that technology has an unstoppable momentum, reshaping society to fit to its demands (Jasanoff, 2016).

In order to further our thinking, we use the self-driving vehicle (SDV) technology as an example of the often discussed emerging and disruptive urban mobility technologies. Similarly to the vision argument above, current visions of SDV technology typically critique the existing automotive technology, claim to address a number of social needs, and to solve many issues associated with existing automobility. In fact, SDV is an *arrangement* of sensing, computation, communication, and powertrain technologies, presented

with having a *telos* of removing some or all of the driver's actions. Essentially, SDVs are expected to navigate the environment with little or no input from the human driver, ultimately behaving like an urban robot, capable to sense-decide-act in the public domain (Mladenovic, 2019; van Wynsberghe, Donhauser, 2017). In addition, the systemic change that SDVs are expected to bring includes numerous benefits in the domain of urban transportation systems, but also in the society in general (Blyth et al., 2016; Bissel et al., 2019; Mladenovic, 2019). Such changes brought about by SDV development and introduction highlight the ensuing important ethical challenges (Goodall, 2014a,b; Hevelke and Nida-Rümelin 2014; McPherson, Mladenovic 2014). Finally, in line with the third point above, SDVs are facing an institutional void, which is especially evident in the domain of legal responsibility (Gurney, 2017; Schroll, 2014; Vellinga, 2017). Thus, SDV technology is an ideal case for simultaneous deeper conceptualization and speculative thinking in the domain of urban transportation.

We have four aims in this paper. First, we aim to deepen the understanding of urban mobility and its meaning for the urban lifeworld. Second, we aim to explicate the relation between everyday aesthetics and urban mobility. Third, we aim to summarize and reflect on the conceptualization of SDV technology so far. Fourth, we aim to point out blind spots in the current conceptualization of SDV technology as emerging urban mobility technology, and draw lessons for innovation processes more generally.

As an important premise, we will position our argument within the philosophical standpoint that technology is not a neutral tool. Instead, technologies continuously mediate and co-create existence, experiences, rights and responsibilities of people (Kitchin and Dodge, 2011; Manovich, 2006; Verbeek 2005, 2011; Winner, 1977), thus having irreducible moral predispositions. Furthermore, we will ground our argument in discussions related to the responsible innovation approach (Nagenborg, 2018; van Wynsberghe, Donhauser, 2017; Ziewitz, 2016; Baumman et al., 2019) and value-sensitive design (Friedman et al., 2001; van den Hoven, et al. 2015; Stone et al, 2019). In line with our argument, we will use the term *mobility* as opposed to *transportation,* in order to underline our focus on experiential and value-driven perspectives. Ultimately, we hope to contribute to the understanding of the experiential dimension of contemporary cities as well as the evolving and difficult-to-define relationship between technological artefacts and their human co-creators.

Mobility as part of the urban lifeworld

The public discourse on mobility can often be relatively narrow. Discussions frequently tend to center on road infrastructure, public transport systems, or driving regulations.

Much of the everyday concerns address the physical phenomenon of congestion, which is reiterated on a daily basis through the media and which we usually notice once we are stuck in it. With this preconception in mind, it is easy for deeper questions regarding mobility technologies to stay implicit or seem irrelevant. For example, many would claim that social class does not determine right-of-way, and someone delayed by traffic congestion is more likely to experience frustration, rather than the sort of indignation that we ordinarily associate with the experience of injustice. In contrast, we argue that, while traffic is a physical phenomenon, mobility involves a set of social practices and a contingent hierarchy of human values with their ensuing emerging consequences. In fact, the physical phenomena itself can be understood morally as a manifestation of simultaneous human needs and interests, and respectively a process of commoning and co-creation (Mladenovic et al., 2014; Nikolaeva et al., 2019). For example, some people approaching a certain intersection might be en route to their holiday destination, while others might be traveling to the hospital in an emergency. By controlling human movement over common time-space and defining the rules for exclusivity of access, mobility technology adjudicates these simultaneous needs and interests. This process of mobility commoning mediated through technological principles defines relations from the second-by-second and the localized, to the long-term and large-scale everyday. Thus, even from understanding only one essential feature of mobility, i.e. the exclusive notion of physical access, one can conclude that mobility technology is a central aspect of the concrete instantiation of justice or injustice relations in our everyday lives (Martens 2017; Sheller 2018).

Behind these material dimensions and the utility-oriented need for access, one of the key premises about mobility is that humans are essentially moving beings (*homo mobilis*). The centrality of mobility in the human everyday can be easily understood when one starts to think about potential changes that emerging urban mobility technologies might bring about in a range of everyday activities. For example, these would include the use of time, acceptable walking distances, long-term and seasonal patterns of mode choice and travel distances, travel reliability and speed expectations, and willingness to pay for services, to name but a few. These aspects have an essential role for the overall human well-being, through physical, mental, and social effects. More important for our argument here is that everyday traveling, although often having a related need or purpose to it, is a socio-geographical and endemic fact of daily flow that can be a purposive activity in itself (De Vos et al., 2013; Jensen, 2009). Respectively, mobility technologies have an important role in creating stability, reliability and structure for mental and physical activity often associated with human well-being (Sharpe, 2013; Sheller, 2004; Stamps, 2013).

It is often forgotten, that in addition to framing our everyday activities, mobility technologies also significantly contribute to the hidden aesthetic characteristics of the everyday

(Ulrich, 1983). If one reflects further the explicit and implicit aesthetic considerations, possibilities for aesthetically significant experiences have an important influence on our mobility habits, including such aspects as choice of means of mobility, choice of destination, choice of route, and even perception of time (Boulange et al., 2017; De Vos, 2019; Gatersleben & Uzzell, 2007; Sharpe, 2013). These aesthetic considerations are vital for the overall well-being of humans, not only because most people would prefer an aesthetically pleasing environment, but also because these preferences for the positive aesthetic values can have far-reaching implications on social, health, and ecological issues (Nasar, 1988). In particular, we already know that aesthetic qualities in the everyday environment have relevance for promoting sustainable mobility behavior, such as walking or cycling (Bassett, 2004; Stefansdottir, 2014; Willis et al., 2015). This goes to show that *homo mobilis* is capable of appreciating and enjoying the aesthetic potentials that different ways of moving offer. For example, the aesthetic experience and level of engagement is different when you are cycling compared to when you are sitting in a car watching the same scene through a window. It can be argued, that active modes such as walking and cycling support a more detailed sensing of the place qualities of an environment than driving or taking public transport (Lehtinen, 2015). For the same reason, the latter options offer possibilities to experience urbanity on a much larger scale than the former ones (te Brömmelstroet et al., 2017). Summarizing, if one accepts that everyday mobility and its aesthetic dimension consists of other besides the mere physically-manifested movement, one would also agree that there is a need for a deeper and more sustained analysis and understanding of the relationship between aesthetics and mobility (Haapala & Naukkarinen, 2005). The next section focuses on this question.

The Relation between aesthetics, the everyday, and urban mobility

Aesthetic considerations play a major role in the urban everyday life, though most often, the nature and role of aesthetic values remain vague or implicit. Aesthetics plays a significant role in planning and (re)designing urban environments, but most professionals – urban planners, architects, landscape architects, urban designers – as well as decision-makers make inevitable compromises between different sets of tacit preconceptions of what good quality of urban living environments is. Moreover, there seems to be an operative consensus about what is generally regarded as an aesthetically satisfactory environment. One may also easily assume that there is no need to go into deeper analyses, or that it might be even impossible due to the largely subjective nature of aesthetic judgments. In particular, the role of movement as such in constituting the aesthetic quality of human environments has been widely neglected in philosophical discussion (Haapala & Naukkarinen, 2005; Boulange et al., 2017). An exception to this is the philosophical interest in "mobile aesthetics", which as a definition aims to underline how most phenomena within

our lifeworld become grasped first and foremost through the aesthetic qualities of their representation, including the spatio-temporal conditions of urban life, human activities, and even social relations between people (Haapala & Naukkarinen, 2005).

Even though recent advances in urban humanities or the so-called new mobilities paradigm in social sciences have been marked by a growing interest in everyday experiences, they have not so far been able to reach the fundamental layer of values based on which the current forms of human mobility operate. The philosophical approach to urban aesthetics will help to diversify our understanding of these implicit values. Urban aesthetics stems from environmental aesthetics and has been recently developed also in the wider context of the philosophy of the city (Epting, 2018b). The wide field of philosophical aesthetics has several varying definitions each with their respective interpretation of what "aesthetics" refers to, but we focus here on presenting the recent strands of everyday and urban aesthetics in order to complement in crucial aspects the overall understanding of the complex topic of human mobility. Aesthetics, in this sense, is to be understood as the very basic mode of human experience.

One strand of literature on philosophical aesthetics bridging and developing further pragmatism and phenomenology argues that there is a need to understand the very structure of the everyday – the everydayness itself – in order to understand what constitutes the aesthetic in the everyday (Haapala, 2005, 2017; Naukkarinen, 2005, 2013; Saito, 2007, 2017). It is argued, in particular, that there are hidden and elusive characteristics which define the type of the aesthetic implicit in the everyday, namely the familiar and the routine (Haapala, 2005). According to this view, the overall quality of life includes subjective aesthetic well-being which derives largely from the pleasures of the habitual and the mundane. This form of "tacit aesthetics" (Naukkarinen, 1998) takes place besides and despite the extraordinary experiences, that have traditionally been considered to be the only aesthetically relevant experiences (Saito, 2007; Leddy, 2012). Intentional attention to aesthetic features (Saito, 2007) is thus complemented by unintentional and less explicit aesthetics, that to a great extent precedes and makes the more explicit experiences possible in the first place (Lehtinen, 2015). Many everyday decisions and choices are influenced to some degree by aesthetic preferences, but the aesthetic dimension affects also on a more intuitive and basal level how the quality of the everyday life is experienced. This aesthetic undertone of everyday life highlights that role of the sensory realm for the formation of the everyday (Vihanninjoki, 2018). For example, an individually varying aesthetic dimension is linked to the familiarity of places and unique patterns of moving in and between significant locations within the sphere of one's own everyday environments.

Urban everyday aesthetics focuses on the experience of the everyday living conditions, including the conditions created for mobility, and the very act of moving oneself. In particular, the implicit aesthetic qualities of everyday experiences can be understood to provide the most direct path from the shared societal and material reality to the core of the subjective experience. Especially so, since the shared conditions become internalized through the sensorily afflicted intimacy of the experience. For example, large-scale negative phenomena such as ecological degradation or pollution of urban environments becomes experienced in part through their aesthetic consequences on an individual level. But it is not only the direct experiences that count. Also knowledge about the phenomena has an effect on whether we perceive these phenomena as beautiful, pleasurable, or worth pursuing, choosing or sustaining. This inevitable cognitive component shapes the aesthetic experience and may increasingly nudge one, for example, towards preferring public transportation to private car use because of its environmental and economic benefits, or to engage in walking because of its health and recreational benefits. These observations point at the importance of taking the experiential side of new and emerging urban technologies into account, while also considering the larger framework for their use.

Taking into account that different individuals have different experiences, we underline that the meaning of "aesthetic" is further understood here in a larger sense, referring to the overall "distribution of the sensible" (Rancière, 2004) or through the notion of "perceptual commons" (Berleant, 2012). Thus, the fundamental and constitutive role of the realm of the sensory experiences to the human condition underlines the need to focus on what type of experiences our currently prevailing practices make possible. The experienced elements of the physical environment and its larger socio-technological framework are organized based on not only the currently prevailing values but also on what have been the driving core values and beliefs of the previous generations. This type of intergenerational path dependency dominates also the contemporary conditions for the everyday choices and preferences of an individual. For example, one cannot simply choose the more sustainable or experientially pleasing mode of transport if it is not available due to the choice framework determined by the previous generations. Mobility as such might be seen a necessity, but the already "predetermined possibilities" – paths, roads, transport modes – shape which choices and ensuing experiences are possible in the first place (Lehtinen, 2015). Thus, modal transportation choices affect fundamentally how we perceive and experience our surroundings and what we perceive in the first place, nurturing or crippling our experiences of the city (Maskit, 2017).

Technology inarguably adds new layers to the everyday urban experience. Firstly, by predetermining the preconditions such as the available modes of transport and secondly, by

affecting and altering the experience itself. The role of technology has been surprisingly little discussed within everyday or urban aesthetics, but recent advances in philosophy of technology can be used and applied to bridge this gap (Lehtinen & Vihanninjoki, 2019). The role of different types of technologies in the human lifeworld has been described in postphenomenological philosophy of technology (Ihde, 1990, 1993, 2010), most recently through the theory of technological mediation (Verbeek, 2005; Rosenberger & Verbeek, 2015). When discussing the role and effects of the implementation of new and emerging technologies in an urban environment, the mediation approach enables taking into consideration how technology affects also features of the environment beyond the immediate functional purposes. Understood from the framework of the everyday experience of moving in the city, technologies are not mere neutral additions or facilitators of urban mobility. On the contrary, with the sheer availability of their planned and unplanned affordances, mobility technologies can fundamentally alter the urban lifeworld, in ways which are often difficult to anticipate in the early development phases.

These specifications for how the aesthetic is to be understood in the realm of urban everyday life make clear that aesthetics in itself is a fundamental factor in assessing both the environments that we live in and the ways in which they are used. In the context of different types of socio-technological visions, technology understood through the notion of the aesthetic focuses on the way particular technologies appear to their users and how they alter the relation between the person and the environments and the situations in which they are used. Ultimately, no matter what the original intentions have been, urban technologies manifest themselves as ”enablers” or as ”filters” for the currently normalized everyday experiences (Lehtinen & Vihanninjoki, 2019). Several aspects of skilled and habituated use of everyday technologies provide also opportunities to develop and shape vital paths to urban sustainability transitions. For example, individual habits can be nudged towards more sustainable choices if the technologies to support them have been developed and are equally available.

With a focus on describing the existing conditions and the experiences they entail, normative approaches in urban everyday aesthetics emphasize that we indeed can and should discuss how those aesthetic experiences should be constituted in the first place. If we have the overall human well-being in focus – as we most likely should have when developing new urban mobility technologies – aesthetic wellbeing based on repetitive, mostly routine everyday experiences makes visible some of the implicit moral dilemmas related to urban everyday mobility. In particular, aesthetics is present in defining the form and content of human activities in cities as the use of existing environments is largely based on their affordances and how they become interpreted. Ultimately, this type of understanding of everyday urban aesthetics points to the question of who is

shaping what there is to be experienced in the first place? How and by whom are the decisions over mobility experiences made? Thus, the entire aesthetic scope and prospects of one's everyday life are to a large extent dependent on the choices made by a myriad of sometimes powerful actors within a wider socio-technological process. Having elaborated here this relation between aesthetics and mobility, as well as further conceptualization of the aesthetic, we proceed to a reflection about current conceptualizations of SDVs as an everyday technology. We claim, that the aforementioned notion of the aesthetic and its implications have so far not been given enough consideration in these prevailing conceptualizations of SDVs.

The Existing conceptualizations of self-driving vehicle as emerging urban mobility technology

Before we reflect further on our conceptualization of emerging mobility technologies, it is useful to reflect on the scope of existing conceptualizations of SDVs in the philosophical literature. At the start, conceptualization of SDVs centered on the ethical debate, which was dominantly focused on trolley-problem dilemmas, where SDV will have to make a decision who to injure or kill in the case of an unavoidable traffic accident. The discussion of these dilemmas assumes that they can be solved (Goodall, 2014, 2016a; Lin, 2016). The "answers" to these dilemmas build on a range of philosophical frameworks, ranging from utilitarian, libertarian, to Rawlsian perspectives (Fournier, 2016; Leben, 2017). In the same context of accident situations, there has been additional reframing of ethical challenges, using such concepts as relational ethics (Kumfer, Burges, 2015), expected moral value condition and tradeoff (Bhargava, Wan Kim, 2017), as well as event probability and risk management (Goodall, 2016b; de Sio, 2017; Smith, 2016b). Recently, there has been a continuation of the argumentation stream supporting the use and relevance of trolley problem thought experiments for further development of moral competencies of robots and algorithms (Wolkenstein, 2018; Keeling 2019). In addition, SDV related trolley problems have also been addressed based on the distinction between negative and positive rights, and differences in claims between those 'involved' and 'uninvolved' (Hubner, White, 2018).

In relation to the ethical focus on crash situations, there has been a number of critiques of the trolley problem and its applicability to these situations (Goodall, 2016b; Nyholm, Smids, 2016; Smith, 2016a,b). Following the premise that traffic safety is a crucial requirement of transportation, tradeoffs between passenger and all user safety have been highlighted, raising the question of perverse incentives for SDV companies and SDV users negating such a requirement (Loh and Misselhorn, 2018). As another attempt to move beyond trolley problem dilemmas, one suggestion focuses on mundane driving

situations, such as crosswalks or left turns at intersections, with the potential to explicate tradeoffs between such values as safety, mobility, efficiency, and environmental impact (Himmelreich, 2018). Following the ideals of value-sensitive design, one conceptualization focuses on keeping the system under meaningful human control with accountability (Santoni de Sio, van den Hoven, 2018). Still under the context of human-machine interaction, limited number of efforts have highlighted the possibility of re-designing user experiences, reshaping the subjectivity of the user and the moral consequences this would have (Coeckelbergh, 2016; Bissel et al., 2019).

Parallel to the above-mentioned conceptualizations, there has been an ongoing discussion about legal liability implications related to possible traffic accidents with SDVs. This strand of literature has mainly been attempting to define a fixed set of rules regarding how the vehicle should behave in different situations (Coca-Vila, 2018; Garza, 2011; Gless et al., 2016; Smith, 2014, 2016a; Gurney, 2017; Marchant, Lindor, 2012; Schellekens, 2018; Spencer, 2017). Although focused dominantly on the US legal framework, some of these efforts have focused on particular liability perspectives and thus elaborated on the insurance systems for compensations in case of traffic accidents (Gurney, 2017; Schroll, 2014; Vellinga, 2017). Furthermore, the literature does not always explicate the actors in the ethical reflections, and the authors who do make this explicit have not achieved a consensus about the roles and responsibilities of the various actors involved in the production, operation and use of SDVs. One strand of literature remains focused on the unavoidable accident scenarios, arguing for giving the user/passenger the task (and burden) of presetting the vehicle (Contissa, Lagioia, Sartor, 2017; Fournier, 2016; Hevelke, Nida-Rümelin, 2014; Loh, Loh, 2017). Another set of literature has focused on the role of the manufacturer (Gurney, 2017; Mackie, 2018), with more in-depth arguments about the responsibilities for programmers (Bhargava and Wan Kim, 2017) and vehicle designers (Borenstein, Herkert, Miller, 2017a; 2017b), simultaneously addressing the question of transparency of vehicle functionality for the user. In line with this strand, there have been arguments for including computational experts in the design process (Bringsjord, Sen, 2016), while some have recognized the role for policy-making (JafariNaimi, 2017), and planners (Epting, 2018a). Among these, only one account provides more detailed sketches for integrated thinking between engineers, designers, ethicists, and policymakers (Millar, 2016).

Perhaps implicitly agreeing that a continuing focus on the trolley problem and accident situations would further distract from a wider set of relevant moral issues (Blyth et al., 2016; Himmelreich, 2018; Holstein, 2017; JafariNaimi, 2017), a small number of authors has aimed at developing ethical desiderata and their explicit formulation into certain technical aspects of SDV technology. For example, in the footsteps of the value-sensitive

design strand, there has been focus on vehicle motion-prediction control (Thornton et al., 2017), traffic/mobility management mechanisms (Mladenovic, Abbas, 2013; Mladenovic et al., 2014; Mladenovic, Abbas, 2015; Mladenovic, McPherson, 2016), and lighting systems (Stone et al., 2019). These works have highlighted the significance of several values, such as social cooperation, care and respect, equality, and individual autonomy. A strand grounded in design studies has tried to account for user experiences in vehicle design, understanding the role of technological mediation (Cornet et al., 2018; Kong et al., 2018). Furthermore, several authors have argued for a range of other domains of potential ethical implications beyond the traffic safety domain, such as privacy and data protection (Blyth et al., 2016; Daly, 2017), and effects for vulnerable people (Epting, 2018a). Many of these works reflect briefly on wider implications for public health, nonhumans, future generations, as well as cultural values and norms.

How to further develop the conceptualization of emerging urban mobility technology?

While previous conceptualizations have managed to bring about some important aspects, if we are to avoid further technologically optimistic and deterministic views on how highly disruptive mobility technologies will be developed, deployed and used in urban environments, we need to deepen our understanding of emerging urban mobility technology. The very definition of disruptive technology would require us to move our lens away from the SDV artefact, onto a complete urban living environment, and a range of alternative futures. Instead of being concerned with dilemmas centered on questions of machine control in complex urban spaces, we need to consider that these machines might be leading to automation of everyday activities and experiences. Moving away from an object-centered perspective, we can start to acknowledge existing and emerging social practices, being composed of a range of intertwined activities, experiences, and social values. If we are to avoid further misconceptions about technology itself, we will have to recognize that our assumptions are potentially erroneous because technological pathways are always non-linear and therefore difficult to predict, a phenomenon that is even more apparent with the increasing complexity of technologies and society. Furthermore, an essential component of our further conceptualization would require us to understand that SDV technology is not neutral tool, but a value-laden and powerful actor in itself.

A deeper conceptualization requires us to avoid misconceptions about the relation between humans and technology, and to refrain from simplifying either or their interdependence. In addition to avoiding the reduction of urban mobility technology to the simplified perspective of the artefact itself, defining the meaning of technology would require us to develop further our understanding of human beings and their relations to

technology. As humans have become profoundly technological beings, changes in technology also imply changes in defining what it means to be human, as the fuzzy boundary between the two is constantly reshaped (Pacey, 1999; Jasanoff, 2016). Looking at existing conceptualizations, the prevalent narrow meaning ascribed to SDVs is obviously not focusing on the human experience. For a start, reflections so far are neglecting the fact that our everyday is experientially colored in different ways, due to the differences in our everyday mobility experiences. For example, it is common sense that traveling for a person driving their wife in labor does not have identical experience as traveling for a person going to a vacation. Moreover, traveling is not just something that autonomous, self-determining individuals do for utilitarian purposes. It is rather an embedded, relational, and perceptual process of co-creating, distributing and sharing the mobility commons. Thus, traveling is irreducibly defined by the experience and perception of it, subtly adjusting our behavior in order to form cultural and societal norms. As a result, the very process is shaping who we are.

Another common error in the current logic of technological development that we need to account for in our reflection is perceiving human ends as well-defined and static, to which we only need to provide technological means (Jasanoff, 2016). Making this assumption about the nature of human beings carries the risk of disregarding evolving relationships between us and our technology, as well as often-irrevocable changes, not solely to the built environment around us, but also to our fundamental values and norms. Going back to the question of the *meaning* of technology (Pacey, 1999), often the question is reduced to asking what a technology is supposed "to do". In the case of SDVs this often results in the claim that SDVs are "to take control over parts of or the whole driving task from the human". Yet, we cannot avoid to simultaneously ask what will "remain" for the human "to do" or to relate to through experience. Moreover, these experiences do not have to be solely connected to in-vehicle time, but to more formative aspects of our everyday life such as how we distribute our time and conscious attention and how these aspects of the everyday life evolve over longer time. In the case of SDVs, this redefinition might lead to activities such as trip planning to replace the task of driving, in line with the recent idea of *heteromation* (Ekbia & Nardi, 2017). In addition, changes might not pertain to time spent only in SDVs, but also in other available urban transportation modes. With SDV technology in mind, envisioned as mundane and ubiquitous, this reshaping has the power to affect the everyday urban lifeworld significantly.

Further implications focus on the unjustifiably dominant utilitarian focus of technology, with little attention for how a technology works out for different groups. As an example of such "technological gentrification", one could imagine several scenarios of widespread burdens and limited benefits for some social classes. For example, a wide deployment

of SDV technology might create inequality by pricing out certain segments of society in favor of those able and willing to pay. In particular, SDVs could bring about an "experience hierarchy" in which personalized experiences will command a premium price. Alternatively, instead of pricing mechanisms, SDVs could rely on monetized advertising, forcing certain audio-visual experiences to all those not willing or capable to pay. Such "experience hierarchy" could perpetuate the economic inequalities, where those with "white collar" jobs have heightened travel convenience, as they are able to perform their job activities in the car, as opposed to someone with a "blue collar" job. Ultimately, by completely commodifying urban mobility, SDVs could even impose the logic of the market by determining choice, time, and cost, making the traveler merely a client, not a citizen in the commons. This client can only purchase better service in the form of more complex technological solutions along the existing technological trajectory, but cannot ask for social justice or appreciation of her values in the design and deployment of the technology. One just has to take a moment to remember the history of the automobile to understand how exclusionary the unjust distribution of negative consequences can be, creating various societal divisions and reinforcing existing injustices over many generations (Bullard & al., 2004; Zavetoski & Agyeman, 2914).

Reflecting further on the expanded scope of everyday mobility, we have to account for the fact that diversity of values is the predicament of any political community (Rawls, 2005). Here, we have to underline that current conceptualizations neglect a direct relation between the experiential and a range of civic values, such as institutional trust, privacy, social harmony, and mutual respect. A delicate relationship between everyday experiences in commoning mobility and a constellation of civic values might even pose a risk to people's moral capacity. For example, we know that trust is essential for citizen's cooperation and participation in society. However, if SDV visions are focused on individual private vehicles, individuals could be forcibly losing the option to participate in trips in public collective vehicles, which might weaken their understanding of public goods and result in diminishing mobility commons. Extending the relations even further, it may be argued that 'alternative' mobility artefacts, such as bicycles or trams, bring with them 'alternative' aesthetic experiences, which have a crucial role in shaping the city identity. Thus, reshaping or even excluding these mobility artefacts due to safety concerns associated with SDV use might have negative consequences on (re)formation of the city identity. Another example would be the experience of traveling with SDV while knowing that this technological development is synergistic with military applications or privacy monetization (Zuboff, 2019), which even might be inevitably related to mobility automation. Similarly, one could imagine a feeling of disgust with SDV technology, just as people are increasingly prone to feel negatively about flying or using goods from distant lands upon understanding their environmental impacts (the cognitive dimen-

sion of the experiential). These considerations will inevitably lead us to understand that our conceptualization of technology is not neutral, but is implicitly constructing changes in our value systems, potentially resulting in the loss, protection, or encouragement of particular values over others.

Conclusions

In this paper, we have highlighted the need to expand the understanding of mobility as a social phenomenon with an irreducible aesthetic underpinning. Such an expansion in our conception of mobile humanity would help us in reflecting on the conception of technology, especially emerging everyday technologies. On the one hand, we aimed to explicate a complex formulation of mobility as a social phenomenon, while recognizing interdependencies between activity, experiential, and value dimensions. On the other hand, we aimed to account for a broader picture of why and how society relates to technology in the first place, and how technology shapes the everyday urban lifeworld. While reflecting SDVs as powerful mundane artefacts, we aimed to highlight their potential for reorganizing our urban life world by solidifying rules of behavior, systems of power, and ranking some values over others. Here, we have aimed to underline the importance of the aesthetic dimension of the urban everyday for understanding technological process of embeddedness and the consequences of an emerging everyday technology such as SDV.

By avoiding bringing forth the dynamics and reshaping of the human experience in reflecting about technological development, a simultaneous risk of not accounting for the full extent of moral implications is perpetuated. Rethinking and changing the existing mobility paradigms on the societal or city-specific level is challenging but can be done, as shown by cities around the world that are creating car-free city centers or are building completely new public transport and cycling networks. Sustainability aspirations provide crucial incentives for rethinking the urban sphere. But even then, the imagination seems limited concerning the extent and direction of rethinking what could improve the experienced quality of urban life at the same time. In creating and comparing future scenarios, focus on the human experiential, aesthetic consequences of how new technologies become used would thicken the value base needed for sustainable future decisions.

The argument presented here is action-oriented, in order to not miss an opportunity for divergent reflection about technological possibilities, while opening up these possibilities for deliberation and disagreement on values and experiences. A value-sensitive design approach asks how technological mechanisms support or hinder human values - making these effects transparent in the process of technological development, to vari-

ous actors involved, from coders, to engineers and decision-makers. In the context of SDV, questions about challenges in sensors and communication technology, privacy, increased hacking vulnerability, implications for urban form, long-distance travel, urban design, and ownership models for mobility services are some of the obvious ones to address. However, we claim that by applying the perspective of aesthetics, the range of issues regarding design and evaluation criteria can be broadened. In this way, it will be possible to account for the inevitable experiential changes in urban everyday activities and the relation to civic values that these changes have. Special attention should be paid to a shift of human activity, experience, and value space, accounting for individual user input in the technological operation process. For example, SDV could include visions of socially sustainable lifestyles, including effects on human health, social equity, and improved long-term quality of life.

Accepting the everydayness of SDV technology, the values and principles at stake in its development and implementation can be expected to be a subject of deep and reasonable controversy. In order to have a better technology for a better society, there is a need for active seeking and shaping of visions of the future. Instead of approaching the future as something that is strongly and uni-directionally shaped by technology, the procedural change would assume that the future is something that can be imagined and shaped by social action. However, in this process we cannot hide from acknowledging value-based contradictions, as well as their relation to citizens' moral capacity. Here, the experiential potential of alternative mobility artefacts has a crucial role to play. Instead of only imagining futures with SDVs, we have to engage in contrasting envisioning exercises. Such envisioning efforts would aim to imagine how mobility systems would be experienced if we invested equally much societal resources (e.g., money, time, human resources, intellectual efforts, etc.) into other urban alternatives, such as walking, cycling, and rail-based transport. Certainly, in this process we might benefit from visions of undesirable futures of the everyday, which could help us seek paths toward the desirable ones. Moreover, aiming not to hide from deep value-based contradictions might also lead the deliberation efforts to recognizing the fact that some norms and institutions will be irretrievably lost (e.g., private car ownership, collective transport, proximity to nature), and that these development efforts cannot remain depoliticized.

Having in mind experiential differences in everyday travelling, it is alarming that some of the current mobility conceptualizations rely even explicitly on externalizing travel-related decision-making further away from the individual urban dweller's reach. Consequently, we cannot reduce practical questions about quality of life or desirable cultural values to technical problems solved by experts. Neither cannot we eliminate the need for public and democratic discussion of the relevant societal values that technology shapes.

As a result, there is a need to engage transparently all relevant societal constituencies in critical conversations and decision-making about SDV technology development, and related distributions of benefits and burdens. Therefore, the discussions necessary for effective policy development have to be sufficiently critical, imaginative and democratic, and we need to seek out novel methods and tools for participatory and constructive technology assessment. Aesthetic conceptualizations have an important role to play in developing further such immersive methodologies. Finally, we urge for greater transdisciplinary efforts between philosophy, sociology, psychology, and transport studies. Particularly important will be the role of philosophers of technology in attempting *a mobility turn* in theoretical and applied philosophy, similar to the one that occurred in sociology at the beginning of the 21st century. Perhaps, through a hermeneutic circle between deeper conceptualization and rigorous empirical investigations, we can understand better the mechanisms of our relationship with technology, which should not impose limits to our collective capacities of imagination.

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