Chapter 12

The power of place and perspective

Sensory media and situated simulations in urban design

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It may be said that a Copernican turn in media is underway. Increasingly, we are set free from the physical constraints of traditional media locations for our regular information feed, be it the cinema house, the TV set, the radio, or our favorite reading chair. Instead, information in its many forms and the interfaces we activate to access, produce, and share it, gravitate around us as individuals. They follow us everywhere, and always, and, importantly, they do so as we move. This gives new meaning to the significance of location and perspective. Added to these dimensions is the further condition that dynamic information media engage us with the sensorial in the situations of their use. While earlier media were conceived as sensorial extensions of our nervous system (as championed by McLuhan 1964), now the metaphor applies to the handheld media devices themselves. These terminals are no longer only subordinate augmentations of our human sensory system, but have their own complex sensorial capabilities as well. We may say, then, that we are experiencing the age of situated and sensory media.

This turn away from the physical restrictedness and immobility of traditional media hardware to the individual body of the users and their always-on mobile devices will most probably cause changes in the power of place and perspective (Bratton 2009). In the following pages we explore these consequences in the context of an urban design case from Scandinavia that concerns the placement and selection of a new national museum within wider processes of urban change. The addition of location-based technologies and dynamic situated media (that are processed and interpreted on site) raises a number of challenges in negotiating relations between place, position, perspective, and perception. The use of these new technologies and related negotiations around them may open up issues for cultural policy and decision making. Consequently, they may also have some bearing on our understanding of sites of public cultural communication.

Below, we first describe the basic features of the digital platform we have been experimenting with over the last several years: We have called this situated simulations (*sitsim*), and it has been identified as a form of indirect augmented reality (Wither *et al.* 2011). Alongside this is the potential inclusion of yet another mode of visual, spatial, and now dynamic situated communication as

part of urban planning and change (Schnädelbach 2009). Digital platforms like *sitsims* are becoming part of the tools we employ to imagine our cities culturally and technically (Donald 1999; Williams and Dourish 2006; Farman 2012). Location-based technologies provide us with additional technical and spatial affordances for positioning designs for the built environment in situ (e.g., Felix *et al.* 2008). They also open out for further extensions of our projections and perceptions of the multimodally mediated designs of architects, cultural institutions, and planning agencies. This is already apparent, for example, in debates surrounding developments on delicate cultural and political sites such as the World Trade Center in New York. It reaches into the online mediation of leading architectural museum complexes such as the Tate Modern in London and the new National Museum of 21st Century Arts (MAXXI) in Rome (Pierroux and Skjulstad 2011). Architectural competition finalists are also often featured in research and design publications as exemplars of emergent and contemporary innovation in materials, computing, form, and aesthetics. Competitions for public buildings, especially large cultural institutions such as national museums, are filled with political contest; they are sites of significant mediation as part of highly competitive processes of selection and award. National museums often become cultural landmarks that are architectural as much as they are known by their collections, curatorial prowess, and quality of exhibitions. These architectural competitions are foregrounded in complex processes that entail the projected cultural location of prestige projects that will eventually be lodged in the built environment.

We draw on a developmental approach to research by design, which involves making and analyzing over time and with reference to emerging mobile technologies. In contrast to social science mobilities research (e.g., Büscher *et al.* 2011; Hjorth *et al.* 2012) influenced by sociology and studies of technological systems, our inquiries and productions are also closely related to practices and published research in the digital humanities (Morrison and Mainsah 2012). We draw on these as resources in designing and communicating how the *sitsim* redefines mediation of place and perspective. Next, we present the core case in which we have applied *sitsim* with respect to the planned building of the new national museum in downtown Oslo. Here we particularly focus on the public visualization of the new architecture and briefly contextualize it in terms of cultural debates, policies, and decision making. We then move on to describing the features of the *sitsim* and its design and trial evaluation with international students on location. This leads to a discussion of the results in context of place and perspective. Finally, we place the findings in a wider frame of interaction design, mediated communication, and cultural discourse and suggest further experiments and scenarios for this kind of experimental research and development.

Augmented realities: past and future

Since the virtual reality hype collapsed in the mid-1990s the field of augmented reality has proved itself to be an experimental research tradition in steady

growth. Augmented reality has matured and become a more diverse platform expanding and moving beyond its mixed reality origin as described by Milgram and Kishino (1994). The recent emergence and availability of sensor-based and location-aware smartphones and tablets challenges the original taxonomy of augmented reality and how it has subsequently been characterized in the research literature (Azuma 1997; Azuma *et al.* 2001). With mobile sensory devices, the mixed reality boundary no longer resides at the level of the display. The frame of the display has itself become the border between the computer graphics generated environment and the real (Liestøl 2011). These new configurations, based on the sensor fusion approach as opposed to fiducial markers and pattern recognition, have been named indirect augmented reality (Wither *et al.* 2011). A situated simulation is an example of this indirect kind of mobile augmented reality.

In a situated simulation there is approximate congruity between the user's visual perception of the real physical environment and the user's visual perspective into a 3D computer graphics environment as it is represented on the full screen of the device. The relative correspondence between the real and the computer-generated perspectives is obtained by letting the artificial camera's position and movement in the 3D environment be controlled by the location, movement, and orientation input from the hardware sensors (GPS, accelerometer, gyroscope, and magnetometer). As the user moves both herself and the device in real space, the perspective inside the computer graphics space changes accordingly. This form of constructed representation is then applied to simulate alternative versions of a given location in situ. Such a simulation may relate to and display information and versions of the environment which are no longer in existence, hidden, or have not yet come into existence; that is past, present, or future dimensions and topics, or even completely fictional spaces and scenarios.

So far we have primarily concerned ourselves with simulations of past topics: a reconstruction of the original Mission Dolores in San Francisco from 1791; a burial scene of the Oseberg Viking ship and a Viking settlement in Norway from the early Viking Age; the Parthenon and Erechtheion temples on the Acropolis in Athens; the republican and imperial fora in ancient Rome; as well as a reconstruction of the fortified city of Phalasarna on Crete as of 335 BC. Feedback from continual and controlled user testing during the design of these *sitsims* has shown that users appreciate the incremental value of the simulated environments in that they augment the experience of the specific place in engaging and rewarding ways (Liestøl *et al.* 2011, 2012; Liestøl and Morrison 2013).

Research and development of the *sitsim* platform can be exemplified by our efforts to create simulations of the Roman Forum. This has been an experimental process of trial-and-error involving students from both the University of Oslo and the Norwegian Institute in Rome. We have designed and tested numerous prototypes on location. The *sitsim* was originally a rudimentary reconstruction of Julius Caesar's Temple in the Forum around its completion in 29 BC. It has evolved into a more complex environment involving the whole Forum with reconstructions from both 44 BC and 29 BC including sequences of actions and

events related to Caesar's funeral and cremation. These versions have also served as narrative investigations, experimenting with flash backs as well as flash forwards by means of parallel movements in both time and space (Liestøl 2011).[1] Results from repeated on-location testing with students and school children across all our productions clearly indicate that this is a viable platform for further development and may be shared to form potential genres suitable for various user contexts from research and education to informal learning and guiding. Users have found it particularly rewarding to experience the double perspective the *sitsim* renders possible and the added value the extra perspective creates in its interaction with the real place.

In developing these *sitsims*, we were mindful that mobile augmented reality has its precedents in print media. As visitors to Rome we are offered books showing combined views of new and old. A common rendering of these print display techniques presents a page with a current photographic image on top of which you may turn a partly transparent leaf combining the photographed remains of ancient buildings with reconstructions of the absent parts. Turning the transparent page back and forth gives us the opportunity to compare the past and the present over time. Other types display the past and present concurrently with images positioned on opposing pages in an open book. Most common examples are the *Then and Now* books with a display tradition optimized in the eminent work of Mark Klett (2006). In the first version the juxtaposition is

Figure 12.1 The Roman Forum *sitsim* showing a now-and-then snapshot of the Via Sacra looking toward the Temple of Caesar (© G. Liestøl).

temporal, in the latter it is spatial. These different modes demand and produce different forms of perspectival actions from the user, turning pages as opposed to switching gaze. The temporal perspective is more sequential and memory demanding, while the spatial perspective gives room to simultaneous comparison of pictorial elements. This difference of display techniques in print media is mirrored in mobile augmented reality. The mixed reality (combined screen) solution gives a layered palimpsest image where the difference between past and present is turned on and off, while the indirect augmented reality mode is similar to the spatial juxtaposition of the real and the computer-generated perspectives in the now-and-then display tradition.

Based on these experiences (Liestøl *et al.* 2011) we have more recently experimented with future topics, constructing a simulation of a planned building project in downtown Oslo, Norway. Using mobile augmented reality for preconstructions of future buildings and structures also has its precedents in print technology as well as physical 3D models.

Architectural model making has undergone considerable transformation in the past two decades, principally through the near encompassing use of computer-aided design/computer-aided manufacturing (CAD/CAM) technology and tools. All in all, models have a double representational role, as we have argued earlier in respect to developments in digital media (Liestøl *et al.* 2003). On the one hand they are scaled renderings of larger projected buildings. On the other hand, they become communicative artifacts in their own right and mediate cultural values and projected and intended outcomes. In the selection of media in architectural model making Nick Dunn (2010) offers the student options that range from paper and cardboard; wood; Styrofoam and plastic; resin, clay, and cast materials; steel and other metal works; CAD/CAM; and photography and film. Edward Robbins (1994) has traced, for example, the significance of drawing in the work of a range of leading architects; the views of Kevin Lynch (1960) have continued to be influential in visualizing urban contexts where overlays, annotations, and projections have now been extended into virtual spaces (e.g., Schnädelbach 2009).

We have also witnessed a turn toward the digital in architectural and urban design (McCullough 1998, 2004), with the parametric in architectural design, such as shown in the Verb book series by Actar (e.g., Meredith *et al.* 2008), influencing too the types of public buildings and mediations we meet as consumers and future dwellers. Parametric design refers to the possible fluid relationships between componential objects in unfolding design processes and systems, maintaining aspects while modifying others through transformations and iterations. While the tools that enable such dynamics in design and the resulting aesthetics of built designs might be infused with the marks of such tools, we see their effect across studios, locations, and competitions. Today architectural competitions migrate these tools and techniques from their own "drawings" in CAD suites to companies that then render these as filmic materializations (see Hah *et al.* 2008) that have persuasive and rhetorical force, as has been the case across

media (Tostrup 2010). Importantly, architectural competitions come to be an enduring location for public use, one that is now interlinked with locative media technologies from Quick Response (QR) codes, Radio Frequency Identification (RFID) tags and social media messaging. Mobile devices already enable the download and generative use of applications ("apps") for overlaying information and interpretations upon screened content and actual sites of interest in a mode of "net locality" (Gordon and de Souza e Silva 2011).

Clearly, digital tools have a bearing on the workflows and activities as well as the practices within which a mix of professionals are now connected, from government planners to urban developers, through cultural policy makers to museum curators. Architectural competitions are characterized by intricate processes of planning, promotion, tenders, and selections (Chupin 2011), much of which is outside the purview of the wider public. However, appearance of completed designs and designs—whether by select experts or wider committee—has begun to change rather dramatically with the advent of social media and locative annotation especially as the final, mediated public stages of such contests increasingly come under public scrutiny. We have already seen several highly contested competitions that have shifted beyond their formal professional boundaries into debates across media types, interest groups, and earlier linear processes of formal decision making. Today, architectural competitions for large cultural centers and their relationships to changing urban landscapes and lifeworlds are very much in the public eye and claim in the Nordic context to include a measure of dialogue, albeit in terms of management rather than public hearings (Kreiner *et al.* 2011; Rönn 2011). Planning and design specialists to some degree are now forced to meet the responses of a varied public as projected buildings and their demonstrated uses are reviewed and discussed. These processes increasingly take place online and via social media.

However, it is still questionable as to what effect these wranglings and contested interpretations have in wider overall planning processes: Large public buildings, as well as private cultural institutions, are tendered on the basis of massive and often intricate funding mechanisms and alliances. The public meets the tail end of a large process, rarely having enough of a powerful flick to return it to its major redesign or inception. However, tenders and competition submissions now entail a mix of media: rarely do we see paper-based models, but in their place filmic renderings of the to-be-built. This is typically a world that may be described as "unreal estate" (Morrison and Skjulstad 2010) by way of its use of projected futures and hyper-real aesthetics that are enacted as persuasive devices in promoting preferable, beguiling, and better "realized" futures. Just as architectural competition now involves a high degree of film as its main mediational means, locative media technologies that draw on a mix of place, navigational, and situated mediation have begun to be taken up as part of the repertoire of architects' offices. Here the tablet has featured prominently as architects have experimented with its applications, such as *Layar*, and in layers of "augmented" mediation of urban augmented reality (UAR) app of the Netherlands Architecture

Institute (Verhoeff 2012: 129) that can be seen as a performative cartography enabled by the smartphone and its capacities to facilitate our production of hybrid screenscapes (ibid: 119). It is such dynamic qualities that we wanted to embody in our own applied uses of indirect augmented reality in the context of the new national museum in Oslo.

Forum artis—the New National Museum

Planning and erecting public buildings in Oslo is not an easy matter, particularly when cultural institutions are involved. The ongoing and now protracted political conflicts concerning a new Edvard Munch Museum is only one of many examples of urban planning and change, which continue to haunt the Norwegian public sphere and paralyze political decision making. The history of the new national museum is also typical of this tendency. The planning process for building on the current site (Vestbanen) has been going on for decades and several competitions have been held. A winner (OMA/SpaceGroup) was declared after an international competition in 2002. But a new competition was announced in 2009. After a second round the contribution "forum artis" by Kleihues + Schuwerk was declared the winner from among five other final contenders. Their ambition is that the new museum will be "a vital national research and resource center for the visual arts. The museum complex will distinguish the National Museum as an international exhibition and communication arena" (official leaflet). The Norwegian parliament approved the project in 2013, and the National Museum is planned to be completed by 2019.

The visualizations of the Kleihues + Schuwerk architecture have been published in various media and are available both on the web and in print.[2] The illustrations included in these presentations follow a clear pattern. The aim to exhibit the yet-to-be-built structure in easy to understand overviews is obvious both with still image renderings in print and on web pages, as well as in video sequences. The relationship between framing and position tends to be of two kinds: (1) either the perspective is a bird's-eye overview with a distant wide angle framing, including as much as possible of the contextual environment (see Figure 12.2), or (2) the position and perspective is on the ground as a street level view and the structures/building elements are close up, with a focus on detail, not overview (see Figure 12.3). The combination of street-level perspective and (distance) overview framing, however, cannot be found in the various illustrations used to present the building complex.

Forum artis as a situated simulation

Contact and collaboration with the research and development department at the Norwegian Public Construction and Property Management (Statsbygg) led to the *sitsim* of the planned new national museum. Statsbygg is responsible for large-scale national building projects in Norway. Their motivation for embarking on

Figure 12.2 Example of perspective combining high altitude bird's-eye overview and distance (© Statsbygg).

Figure 12.3 Example of perspective combining street level, close up and detail. Perspectives combining large frame, wide angle, and distance are absent from the presentations (© Statsbygg).

this particular *sitsim* project was two-fold: They wanted to explore new channels and options for dissemination of planned and ongoing projects to the public, and they intended to explore the possible interface between their industry/domain standard, the BIM-platform (Building Information Modeling)—and the basic tools applied for the *sitsim* platform (Unity3D with export to both iOS and Android). The simulation itself was then designed to be demonstrated and tested by representatives from Statsbygg's research and development section as well as representatives from The New National Museum Project. Production of the prototype (NasMus for short) was carried out in the fall of 2011 and demonstrated and tested on location that November. The demo of the prototype was by all accounts a success and consequently led to additional trials over the subsequent months. One of the reactions we noticed during these trials was the fact that the people close to the planning process found the relative size between the old and the new building to differ from what they expected. To better understand this response we decided to have a more systematic user test and evaluation. We return to this in the next section.

Based on 3D models and other documentation and material from the planning process, a rudimentary environment was created including the new museum—*forum artis*—the old railroad station, some of the adjacent structures, and parts of the harbor. The *sitsim* environment had only two positioned links: One included links to Statsbygg's website for the project and the other had a "fly-in" function to access an imagined exhibition room of the Edvard Munch collection on one of the upper floors. In this case, the artificial camera is lifted vertically and fixed in a central position inside the gallery room. The ability to tilt and pan the camera, however, is intact. Consequently, the user can orient and move the artificial camera inside the graphically reconstructed gallery in any direction or angle while its position remains stable. Two universal links (buttons) were included in the hide/show dock at the bottom of the screen. One of these was for making the link layer invisible (turning informational mode off) and one for changing and adjusting the altitude of the artificial camera to twelve meters (±50 percent).

The adjacent and peripheral buildings were given a simplistic representation in a light gray color. For the Oslo West Station we used photography-based textures without editing or retouching the images themselves. The new museum building was textured with available resources provided by Statsbygg. For the demos we primarily used the iPad2, but also the iPhone4. We also activated the built-in feature "Tilt offset" which causes the artificial camera to be lifted about fifteen degrees relative to vertical tilt of the device. The reason for this feature is to not have the screen of the device in the middle of the user's sight and thus block the view, but to instead allow her to be able to hold it lower and thus make it easier to compare the real view with the simulation scenery displayed on the screen. This slight vertical displacement of the correspondence between the two perspectives has proven to function well with users. The horizontal correspondence between the two perspectives, however, remains intact. For the sake of the

illustrations in this chapter we deactivated tilt offset when taking pictures of a typical user sequence (see Figures 12.4–12.7).

In the following we exemplify a typical user sequence by means of photos taken of the *sitsim* in use on location and accompanied by explanatory captions and summaries. The new museum and its alabaster-colored hall can be seen to the right. From this view the old building is certainly not dominated by the new building (Figure 12.4). The highest section of the *forum artis* is clearly subdued by the two towers of the Oslo West Station, despite the fact that the real difference in altitude is more than ten meters. This is dramatically different from the perspective in the public illustrations from the competition and planning process. On moving toward the left, or northern, side of the old museum building, additional details of the proposed structure can be seen (Figure 12.5).

Then, as shown in Figure12.6, the old and new buildings can be seen; the stone wall of the new one directs one's eyes toward the atrium of the old. Next, while still standing on the ground and with the positioning locked, by using the fly-in function one can ascend to the Munch Gallery, and also tilt and pan the phone to look around the simulated or reconstructed room (Figure 12.7).

Trial and evaluation

As part of a Master's course in Media Innovations aimed at international students at the Department of Media and Communication, University of Oslo, we organized a trial and evaluation of the NasMus-simulation in early March 2012.

Figure 12.4 The double perspective as viewed from the starting point at a distance of about 75 meters and facing the old building of the museum (© G. Liestøl).

Figure 12.5 Moving toward the left (northern) side of the old building more details of the planned museum appears (© G. Liestøl).

Figure 12.6 Old and new. The stone wall of the new building points in the direction of the main entrance in the atrium behind the old building (© G. Liestøl).

Figure 12.7 Using the fly-in function the user can tilt and pan the device to look around in the simulated Munch room (© G. Liestøl).

Through a lecture on the university campus the students were first introduced to the general *sitsim* platform as well as the building project of the new museum. They were shown many examples from the material used to present the *forum artis* in the competition and for later public dissemination (as mentioned above). They were deliberately not given or shown any information about the NasMus-*sitsim* itself before actual testing on location.

On location we selected a starting point at which the students were each given an iPad2. They were encouraged to walk around and view the planned National Museum from different perspectives and positions. They were also informed that there were two links they could activate for access to additional information: the project's website and the Munch Gallery. The students spent about fifteen to twenty minutes each trying out the simulation. When they returned to the meeting point they each answered a written questionnaire with nine questions.

In total ten students (three male and seven female) participated in the trial and handed in the written forms. Their ages ranged from twenty-three to thirty-one. In this group 70 percent had their own touch device, smartphone or tablet. Half of these were iOS devices, the other half were Android. All found the application and its interface fun and easy to use. They liked best the fact that another dimension could be visualized in parallel with the real environment. Many also favorably mentioned the possibility of accessing the Munch Gallery. Two students noted that they felt a bit too much drawn to the screen and thus "forgot" the real environment. One noted the fact that the GPS positioning had problems when you moved too close to the walls of the existing building. Another student wanted a mixed reality solution so that it could be possible to toggle between

virtual and real perspectives on the screen. Some also wished that a larger part of the surrounding environment could have been included as part of the simulation.

Asked to compare the visual presentations of the Museum project given in the lecture with the in situ use of the *sitsim*, all favored the use of the on-location simulation. When asked directly if they found the new museum building more or less dominating than expected prior to testing the app onsite, as compared to the information they had after the lecture, all the group agreed that the new building looked less dominating than they had expected.

Conclusion and further research

We have shown that position and perspective as mediated by use of the *sitsim* platform—a form of indirect augmented reality—makes a difference in the users' perceptions of the proposed architecture. The fixed camera perspective (still or moving) based in traditional display conventions (Figures 12.2 and 12.3) is in opposition to the free perspective and movement of the virtual camera controlled by the mobile user. This indicates a shift in the visual culture and practice of urban design and planning.

In our work with a variety of *sitsims* on different topics, information that was included by means of audio and written material, as well as reconstructions of actions and events, have been highly appreciated. There can be no question, though, that the immediate benefit for users with this form of representation and mediation is the active combination of the two perspectives, the real and the computer generated, on location and from the user's subjective point of view. The oscillation between these double descriptions generates new knowledge and added value that cannot be reduced to the two perspectives individually. With past topics this is a question of enriching a historical site with an added dimension that interacts with and improves the aura of the site (MacIntyre *et al.* 2004). With future topics it is different. This is no longer a question of reconstruction of a return or revisit to something that once existed; rather it is a question of preconstruction, of potential or imminent change and presenting the new. How may this turn be used in urban design? We have seen that the street-level perspective and position of the *sitsim* user influences the experience of a future construction in different ways than traditional illustrations. How may the subjective perspective play itself out in the hands of the public as part of future planning processes?

"Renderings" such as those we include above in the form of a *sitsim* applied to the to-be-built environment are already being taken up in architects' offices in parts of Europe, and perhaps further afield. It is likely that augmentation such as we present above will be included in the array of tools and mediational means architects employ in competitions, potentially tools in the hands of planners, students of design, and the marketing of real estate more broadly. Cultural competitions may soon be infused with *sitsim*-like contributions that will add an additional rhetorical and persuasive layer of semiosis. They too will need to be

more closely studied in terms of their perceived and actual use over time in relation to positioning and location-centric views (cf. Bates-Brklajac 2009).

With the rapid spread of location-based functionalities, locative apps on smartphones and tablets have already been widely taken up in highly developed metropolitan areas. They are increasingly connected to our own situated uses and locative mappings as urban inhabitants. *Sitsim*-like renderings may well become a more significant feature of the wider communicative and persuasive inscription of locative media within architectural discourses. For the time being, it may well be that this is most apparent in mediations of future structures and their presentation earlier on in processes of urban change, regeneration, and gentrification.

The context and orientations of *sitsims* may also open out spaces for wider public discourses and locative engagement in projections of the future urban landscape, the types of buildings and their purposes and uses (Al-Kodmany 1999). As a locative, mediational, and multidimensional genre prototype, the *sitsim* offers us a potentially navigable platform but also a site for the performative annotation of our perceptions and interpretations. In the development of our *sitsims* we have taken this from historical Viking burial sites where cultural artifacts are not visible in the Norwegian countryside to the physical remains of the Forum in the middle of today's Rome. In the case we report on here, we have moved this platform into the current urban fabric of processes of inviting, selecting, and projecting a significant new national museum in a capital city. In so doing, this *sitsim* nevertheless both incorporates and is dependent on contextualization in the physical world of the here-and-now. Yet, simultaneously, reference is also made to digital spatialization that can be annotated. This functionality gives future potential for the *sitsim* to also be actively taken up as part of the wider communicative and mediated negotiation of power, place, and participation in the city. We may see this as part of what Thrift (2004: 187) views as "new conditionings of position and juxtaposition." This is increasingly what we see as a networked city (Martinussen 2013) where layers of tools and representations may be linked in our contexts of activity and thereby span communication types, data visualizations, social media, and augmented locative designs and technologies. For Thrift (2004: 188), however,

> modern complex systems are so overdetermined that in their interleavings all kinds of gaps are likely to be found in which new kinds of "excursions" can be coaxed into existence. If things are showing up differently, we can do different things too, energetically opening up the new order of being. As the direction of attention changes, so perhaps, we make a change in the direction of our attention, sensing possible emergences and new embodiments.

However, these emergences, embodiments, and mediations need to be revised in terms of what they selectively represent, how they convey the spatial, visual, temporal, and sensorial, and what aspects they accentuate, augment, and filter via such tools and translations.

What we have shown is how we might approach the locative, mobile, and culturally contextual through hands-on design-centered innovation lodged in co-creative development that involves computational, cultural, and communicative knowledge that also needs to be critically examined further to escape the potential for locative functionalism or the mere generation of a form of mobile facades.

Design and development on the National Museum *sitsim* continues and in the late fall of 2012 a new more extensive version was published for free download on Apple App Store and Google Play. In this version users on location can give feedback directly via the *sitsim* from specific positions and thus compare their own experience of the new structure with other users, and the judgment of the jury from the last competition. This feedback will be analyzed and used for further designs and discussions of how employments of place, position, and perspective may be facilitated in continued development of *sitsims* and other mobile augmented reality solutions in urban planning.

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Notes

1 Currently, the most updated version of the 'Roman Forum' *sitsim* is available as a free download on Apple's App Store and Google Play.
2 See: www.statsbygg.no/Utviklingsprosjekter/Nasjonalmuseet/Nasjonalmuseet-pa-Vestbanen/.

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Chapter 13

The will to connection

A research agenda for the "programmable city" and an ICT "toolbox" for urban planning

Ole B. Jensen

> The people who first built a path between two places performed one of the greatest human achievements. No matter how often they might have gone back and forth between the two and thus connected them subjectively, so to speak, it was only in visibly impressing the path into the surface of the earth that the places were objectively connected. The will to connection had become a shaping of things, a shaping that was available to the will at every repetition, without still being dependent on its frequency or rarity. Path-building one could say, is a specifically human achievement; the animal too continuously overcomes a separation and often in the cleverest and most ingenious ways, but its beginning and end remain unconnected, it does not accomplish the miracle of the road: Freezing movement into a solid structure that commences from it and in which it terminates.
>
> (Simmel 1909: 66)

Contemporary cities must be understood as complex assemblages of socio-technical networks, built environments, and human subjects. With the advent of networked technologies and increasing physical and digital mobility new perspectives and theories are in demand (Brynskov *et al.* 2012; Castells 2005; Farman 2012; Gordon and de Souza e Silva 2011; Elliott and Urry 2010; Farias and Bender 2010; Jensen 2013; Jensen and Thomsen 2008; Sheller and Urry 2006; Shepard 2011; Vannini *et al.* 2012; Wilken and Goggin 2012). Kitchin identifies the "programmable city" as a research agenda engaging with this new complex relationship between technologies, software and the city (Kitchin 2011). In this chapter I address the fields of urban planning and design and their needs for mastering networked technologies. This is done by discussing what an "Information and Communication Technology (ICT) Toolbox" for urban planners and designers might mean. A planners' and designers' "toolbox" should contain three dimensions: hardware (technological devices), software (operative code), and a manual (here understood as a theoretically informed conceptualization of the socio-cultural embedding of these networked technologies). So the argument put forward in this chapter is that there is a need for creating operational tools and understandings (or what I term manuals) that urban planners and

designers may utilize next to the technologies and software. The theoretical background for this is derived from the "mobilities turn" (e.g., Cresswell 2006; Urry 2007) as well as theories exploring network technologies and new media (e.g., Farman 2012; Gordon and de Souza e Silva 2011). To frame this agenda I refer to research undertaken at the cross-disciplinary Centre for Mobilities and Urban Studies (C-MUS) as well as in the Research Cluster for Mobility and Tracking Technology (MoTT) both located at Aalborg University, Denmark.

The chapter is structured in six sections. After the introduction, I discuss networked technologies as part of a research agenda for the "programmable city." The following section introduces the two institutional settings for mobilities research with a reference to the programmable city research agenda. In section four, the chapter addresses implications for practice. In this case the discussion is about the need for urban planners and designers to relate to the new situation of networked technologies, and the chapter argues for the need for an ICT toolbox dealing with these issues. Next, I sum up the contributions to the research field. The final section contains concluding remarks and perspectives for future research.

Networked technologies and the "programmable city"

The manifold ways that new networked technologies influence contemporary urban life lie beyond the scope of this chapter (for some of this story see: Crang and Graham 2007; Farman 2012; Gordon and de Souza e Silva 2011; Graham 2010b; Jensen 2013; McCullough 2004; Wilken and Goggin 2012). Rather I want to approach this by way of discussing a research agenda that targets these new technologies very directly. I am thinking of Kitchin's notion of the programmable city and how that research agenda may fit the aim of this chapter. Kitchin argues that when analyzing the relationship between software and the city, there are two important distinctions to be made (Kitchin 2011: 946). One is termed "translation" and has the focus of how cities are translated into code. The other is termed "transduction" and raises the question of how code reshapes city life. Within each of these dimensions a subset of questions arises. In the dimension of translation we may ask how to understand the city as digital data are generated and processed. We may inquire about managing the city in the sense of looking at how city government discourses and practices are translated into code. We may explore how the geography and political economy of software production shape various coding practices. Finally, the theme of "translation" points at the issue of how software becomes legitimated and discursively produced by power and vested interests. The second dimension termed "transduction" equally gives rise to a set of questions. How does software drive public policy in both its implementation and development? In managerial terms, how is software regulating and governing urban life? In terms of work, how does software alter the nature of work and its urban expression? And finally how does software work to transform the material and spatial dimensions of cities?

The complex issues of the research agenda for the programmable city cannot be addressed in this chapter. But I find them illustrative of some of the challenges that cross-disciplinary research environments such as C-MUS and MoTT need to engage with in the very near future. Furthermore, some of them are directly relevant to the toolbox discussion. The toolbox should contain hands-on technologies and hardware (e.g., cameras, GPS transmitters, RFID tags, etc.), software and code to operate these (e.g., custom-made apps for smartphone tracking), and finally what I would term manuals as shorthand for the theoretically informed knowledge about the social and cultural embedding of these technologies. Earlier on Kitchin and Dodge pointed at the fact that code, software, and the various hidden operative systems of networked technologies are neither neutral nor easy to escape. They coined the notion of "code/space" precisely to point out the interrelatedness and complex hybridization between code and space, the material and the virtual, the physical and the digital (Kitchin and Dodge 2011). From this rather general discussion of the programmable city I want to turn toward two specific examples of research within the realm of such thinking.

C-MUS and MoTT: exploring the programmable city agenda

Even though Kitchin's research agenda for the programmable city has been articulated in a different context, I would argue that it actually summarizes parts of the mobilities research at Aalborg University quite well. So in this section I briefly describe the Centre for Mobilities and Urban Studies (C-MUS) and the research cluster for Mobility and Tracking Technologies (MoTT) as institutional arenas where many of the research questions raised by Kitchin are actually engaging various researchers from across many different disciplines. I am confident in using these two cases for this discussion since I am a co-founder and board/task force member in both of these institutions. Kitchin's questions, moreover, are very precise in pointing at what I believe will be the urban planner's and designer's need for knowledge in relation to ICT.

The Centre for Mobilities and Urban Studies (C-MUS)

C-MUS was set up in 2008 and works across the Faculties of Social, Human, and Technical Sciences. It has taken on the "mobilities turn" as a framing perspective in a pragmatic and explorative sense, and has over the years produced results within fields as diverse as communication and culture, urban planning, traffic engineering, urban sociology, and geography to mention but a few.

In general terms the research within C-MUS mainly aims at the transductive dimension of Kitchin's research agenda (even though there are projects falling within the translation dimension as well). But in relation to Kitchin's research agenda for the programmable city, I would indicate three research dimensions of

particular relevance. One dimension is related to planning, policy making, governing, and orchestrating mobilities. Another relates to mundane everyday practices of mobilities and their socio-cultural embedding. The third area turns toward communication technologies and their facilitation and affordance of various forms of mobilities (physical, as well as virtual). Most importantly for the discussion of the programmable city and a planners' and designers' toolbox is, however, the fact that all this research is carried out in cross-disciplinary settings by researchers with such diverse backgrounds as engineering, sociology, planning, culture and communication studies, and urban design.

The research cluster for Mobility and Tracking Technologies (MoTT)

I shall move on to a smaller group established in 2011 under the Department of Architecture, Design, and Media Technology named *Mobility and Tracking Technology* (MoTT). MoTT is more dedicated and focused to the research agenda of the programmable city and one might in fact speculate whether we might have used Kitchin's ideas more directly had we known these prior to forming the research cluster. In MoTT there are media technology researchers with backgrounds in engineering, software development, computer vision, etc. mixed with researchers from urban design and architecture. Accordingly MoTT focuses on five key challenges (see web link at the end of the reference list for this chapter):

1 Exploring situational human–technology interaction concerning multiple human sense modalities. For example, within software for facial recognition used in surveillance systems.
2 Developing and testing monitoring and tracking technologies within a wide range of approaches (GPS, RFID, Bluetooth, Infrared scanning, etc.). For example, tested in urban design and mobility planning contexts.
3 Contributing to theoretical explanation models and concepts capturing the societal and technological importance of monitoring and tracking technologies. For example, cross-disciplinary theory building of mobility, monitoring, and tracking technologies.
4 Exploration of new visualization techniques and tools in order to capture mobilities within monitoring and tracking technologies. For example, by making new models of mapping and visualization techniques.
5 Exploration of the normative, cultural, and ethical repercussions for a society increasingly embedded with mobility monitoring and tracking technologies.

With this institutional framing we move closer to the translation dimension of Kitchin's agenda. Again this is in general terms since there are issues such as items 4 and 5 from the above list that are more related to the transductive dimension. My

main point here is, however, that C-MUS and MoTT foreground the two dimensions of the programmable city with different emphasis. Another key difference that might be said to exist is that the research efforts undertaken by MoTT are more technologically driven and thus more focused on the translation dimension with its awareness of the way networked technologies are shaping and affording mobilities, looking both "inward and outward" so to speak. In other words, the MoTT research perspective takes its point of departure in the hardware and software that is currently "out there" and explores technologically how these may be altered, improved, or customized. The issues of the societal embedding and the ethical discussions for instance are, however, important. The MoTT research agenda is of relevance to all three toolbox dimensions as it engages with the hardware and software in a very hands-on fashion, as well as being occupied with exploring what might be the adequate theoretical underpinning; and thus is concerned with how a theoretically informed manual exploring both the social and ethical implications of a given networked technology might take shape.

From briefly illustrating how the programmable city research agenda might become institutionalized I want to move toward the more concrete discussion of the relationship between the need for tools and the actual research across these institutional settings.

ICT toolbox for urban planners and designers

The need for an ICT toolbox reaches across all disciplines engaged in the complex endeavor of planning and designing cities. City planners, architects, urban designers, and various engineering fields thus need to factor in the meaning of networked technologies and their repercussions for contemporary urban life (see Huang 2012 for an account of an ICT urban planning strategy in Taipei). In Denmark there is a beginning multidisciplinary and cross-professional practice related to urban design and planning. This is only in its infancy and many municipal planners and urban designers working out of architectural companies still cling to their professional identities as relatively isolated and at times even insulated professions. Municipal organizations often contribute to such insular perspectives by organizing e.g., "traffic" within a dedicated Traffic or Technical Department and e.g., "urban space design" within a Planning Department. Obviously these are intimately connected and thus should be thought of across organizational and professional lines of division. This is not a new situation, but with the advent of location-based technologies, mobile communication devices and networked technologies, the blurring of physical/digital, local/global, and visible/invisible makes the upholding of strict lines of demarcation even more problematic. If we add to this a situation in which a fairly large proportion of the planners, designers and architects are reaching the age of retirement, there is a technological "generation gap" as well. Surely some professionals dealing with urban planning and design realize that new networked technologies are part of the city as well as being potential new tools for

"reading" the city. But there is still a climate of suspicion and even moral fear related to these technologies that very often are associated with surveillance and "Big Brother" dictatorship.

At a recent meeting with municipal planners in a Danish city I experienced this rather directly. After the meeting a group of us were sitting in the Technical Department's lunch canteen. I was seated next to an architect urban planner, who spontaneously reacted to my telling her about our research into GPS tracking by saying: "yes, these are scary." Obviously we may be scared by new technologies and there are plenty of gloomy scenarios (see e.g., Graham 2010a), but it struck me as something of a problem if planners and urban designers only tap into the "dark side" (Jensen 2013) understanding of these technologies. This was just one incident and thus not enough to describe a full field of practice. However, in a recently published article targeting urban planners in Denmark, Jørgensen points to the same problem as something of a much more general nature:

> It is widely believed that personal media technologies remove us from what is important. This idea is based on the assumption that meaningful relationships can only occur in face-to-face meetings. Such an approach leads to urban planning strategies that focused solely on physical space, and neglecting the virtual. I do not agree with that assumption. In modern society personal media such as smartphones are the interface between our social networks and the physical world. When this interface is mobile and context-sensitive, we can weave together these various spaces in new ways. It adds another dimension when the city begins to "respond" to its citizens, through more or less visible technologies embedded in urban spaces. Examples of this can be when traffic lights are optimized for traffic surveillance, cameras track criminals, and pollution sensors and dynamic signage allows you to divert heavy traffic. You could say that the city itself to a far greater degree than previously is to be understood as a living, sentient entity.
>
> (Jørgensen 2011: 19, my translation)

So to return to the introductory quote from Georg Simmel, we might want to enquire how the "will to connection" is played out in cities among networked technologies and city dwellers. But we may focus this question and narrow it even further to start thinking about the urban planners and designers and their "will to connection." How do urban planners and designers embrace, engage with, or resist networked technologies? This is an issue worthy of its own full-fledged research agenda. Here I confine myself to stipulating how research such as the work done in C-MUS and MoTT engages with facilitating and disseminating knowledge related to the technologies in the toolbox. I think it is safe to say that the networked technologies ought to interest all planners and urban designers for at least four reasons. First of all because they are simply "out there working" as we speak. This means, like it or not, that networked technologies are as much a part of the city as roads, pavements, city plazas, and buildings.

Any designer or planner concerned with the city should therefore mobilize an interest in these technologies if they claim to know the city. Second, the technologies at work are producing data about the city that urban planners and designers may as well make use of in their attempts to monitor and track the city and its dynamics (setting aside the at times rather subtle legal issues related hereto). Third, and this may appeal to many process-oriented planners, these technologies offer new opportunities for engaging with the public, to facilitate new public participation processes and involve segments of the city's population that are not normally very vocal in urban planning processes. There is a wider discussion about digital divides and age groups to be taken into account here. Some seem to think that applying new networked technologies in public participation processes excludes the "digitally illiterate" and the senior segments of the population. However, if these technologies are used in supplement to existing and well-proven methods of citizen involvements like planning charrettes and public hearings, I would rather claim that the toolbox has been supplemented with new tools adding to the competencies rather that substituting one exclusion with another (the "old" participation tools may be said to exclude the younger segments of the population as well). This debate should call for more investigation and research really to be substantiated.

The fourth and final reason why this is important to urban planners and designers is that the new networked technologies increasingly are being explored by artists and creative designers testing out how technologies may afford new aesthetic sensations, cultural interchanges, social and playful experiences. I want to term this field of technology application within urban planning and design "performative urban spaces." This refers to the way networked technologies in material spaces may start "working" and perform as a consequence of people's engagements. This fourth level might be the most complex level of the toolbox, but nevertheless a field where the public is already experimenting with various playful projects and technologies (Gordon and de Souza e Silva 2011; Jensen and Thomsen 2008).

The research undertaken in C-MUS and MoTT targets the translation and the transduction dimensions, as well as engaging with all four reasons for paying attention to the development of networked technologies. From here I present a short overview of C-MUS and MoTT research.

GPS, GIS, SMS, and RFID

Researchers have undertaken a large number of projects using GPS technologies to map and track users of anything from inner city spaces, to urban parks and zoological gardens. The research has worked on bridging the use of dedicated GPS devices (prior to the advent of smartphones), GIS, and various interview and survey techniques. However, lately the development of apps for smartphones has entered the field of research, as well as a new approach linking GPS data to SMS messages. This latter dimension has been an attempt to capture people's

immediate sensations and impressions as they move in the city (Reinau *et al.* 2012). The research furthermore has been visualized in various forms of GIS maps and other digital representation tools. Some of the research projects have been focusing on the way GPS tracking may be used by neighborhood residents to "draw their city with their feet" and thus open up to new methods of public participation (Harder *et al.* 2012; Knudsen *et al.* 2011; Nold *et al.* 2008). The toolbox technologies are here very much about "capturing mobilities" and mapping the activities in the city. Moreover, some of them lend themselves to particular framings and ways of re-presenting flows like GIS maps as "heat maps" showing various forms of mobile geolocated intensities. The SMS research together with the participatory explorations of apps in community mapping projects are illustrative of the dimension of the toolbox where the technologies are not only mapping "what is there" but may be proactively used in citizen participation processes, e.g., in identifying sites or routes of particular interest and quality (or the opposite). Recently a project utilizing radio frequency identification (RFID) has been applied to indoor locations. Through the use of RFID research has tracked user occupancy in public buildings and cultural houses (Suenson 2012; Suenson and Harder 2011). This research might move toward open spaces and city spaces as a next phase. This is research in its very early phases, and the work undertaken in these projects has been done indoors due to various constraints to the technology. However, larger urban zones may be equipped with RFID transmitters and receivers, such as parking payment zones.

Geolocation tracking and real-time data collection are crucial as new tools for urban planners and designers exploring the whereabouts of the citizens, the usage of urban spaces, as well as the new potentials of areas and sites in the city.

Camera tracking

Much of the literature on uses of cameras in urban and public spaces is about the ethics of surveillance and how the various closed circuit television (CCTV) systems are often utilized in relation to crime prevention schemes. In the examples I mention here the types of cameras are, however, of another type. Utilizing heat-sensitive (thermo) cameras provides an advantage in a Danish context where the regulations for surveillance of public space are fairly strict. This means that getting permission to utilize cameras in public spaces and various measures to secure privacy for people being filmed can be both time and resource consuming. In cases where the research question does not require individual identification, the use of heat-sensitive cameras solves the problem since personal identity is safeguarded as one cannot see faces or other identifying features on these representations. I want to mention a project utilizing thermo cameras but also point to research done with much more sophisticated technologies for facial recognition and social detection (e.g., Social Signal Processing or "SSP," see Moeslund 2012). But these technologies are yet in their infancy and

will not reach urban planners' and designers' toolboxes for a considerable time to come.

The so-called Kennedy Project (named after the plaza where it took place) was a project detecting people's movement across a transit space in front of the rail station in Aalborg, Denmark. There was a complicated relationship to the lighting at the square that I will elaborate on below, but in terms of camera tracking the important thing to notice was that by utilizing heat-sensitive cameras we obtained data on the movement patterns and flow rhythms without jeopardizing people's right to privacy. The camera was fixed to a building wall many meters above the square and produced fairly reliable data (Poulsen *et al.* 2012a). For now the use of ordinary CCTV type of camera as well as heat-sensitive cameras are very relevant tools for urban planners and designers, and these technologies potentially provide important information about real-time usage of streets, squares, and public spaces in the city. In a longer term perspective the technologies of "Social Signal Processing" (SSP) where people may be identified by facial expressions or bodily gestures will become more prevalent and of interest to systems of security and police monitoring.

Performative urban spaces

I want to end this very brief list of examples by pointing out how the "ordinary" tracking technologies may in fact be inserted into projects wherein there are even artistic ambitions. These are examples that reach beyond ordinary ICT uses and point toward experiential city design (Marling *et al.* 2009). Many of the described technologies are applicable to these types of more artistic projects where the focus is on enhancing the experience of new types of public spaces and playful interaction with networked technologies. These projects are often more complex than many of the abovementioned explorations of technologies, but may be understood as an important level of planner and designer ICT toolbox application. So in addition to the three first reasons why urban planners and designers should pay attention to the new networked technologies, there is the goal of rearticulating the meaning of public spaces and the creation of new playful installations in the city. These are part of the global trend toward rethinking inner city public spaces as "scenes" for social and cultural interaction and public domain (Hajer and Reijndorp 2001; Gordon and de Souza e Silva 2011; Jensen and Thomsen 2008; Marling *et al.* 2009).

I want to return to the Kennedy Project since besides using heat-sensitive cameras as described above this project also went into interaction with people crossing the public square by turning up and down the lights as well as shifting colors depending on the number of people and their routes crossing the square (Poulsen *et al.* 2012a). The lesson of interest to this chapter is that the Kennedy-Project showed how important not only technical skills are (calibrating cameras, software, lamps, etc.) but also how to reflect about the movement patterns and people's understanding of an urban transit space. In other words, next to the

hardware and code that were absolutely necessary, this project also illustrates that social knowledge about people's movement patterns as well as their preconceptions of urban transit spaces are important features of a toolbox (the dimension I term manuals). During the last couple of years other similar projects have been made in Aalborg. For example, the *Red Pavilion* was an installation screen at the harbor front, changing lights in accordance with music played and people interacting (Poulsen *et al.* 2012b). Also the *Nora Project* was aimed at setting up a feedback loop between people's presences and movements through a pavilion where both sound and color were reflecting the patterns of human movement (Jensen and Thomsen 2008). At the more exotic end, I want to end this listing with a project in which a robot dressed as Santa Claus moved about inside the transit node of the Kennedy Arcade (Tranberg *et al.* 2009). The robot identified, tracked, and followed people, while a set of research assistants observed and interviewed people about the experience. The project gave insights into the very technical discussion about robot calibration and laser range finder sensitivity, as well as issues of what a robot in public spaces might mean to people, how they perceive transit spaces, and how these may be challenged as instrumental transport spaces only.

The list could be extended significantly as well as accompanied by much more thorough explanations to do justice to the research projects. Here I merely have intended to illustrate that within C-MUS and MoTT there are projects of relevance to the ICT toolbox of urban planners and designers. What would be interesting to investigate in more depth in technological terms are WiFi and Bluetooth technologies as well as more dynamic visualization techniques.

So what's in the toolbox? Contribution to an emerging research field

I like to think of these networked technologies as both related to hardware, software, and manuals. In other words the toolbox needs to contain hardware technologies such as GPS trackers, CCTV, heat-sensitive cameras, RFID tags, GIS maps, 3D dynamic visualizations and animations, and many other forms of code, software, and hardware. However, this is not enough to comprise a reasonable and operational toolbox. The manual or theoretically informed knowledge about the social and cultural embedding of these technologies is just as important. In other words, next to the many existing software and hardware "out there," urban planners and designers also need to harvest the key insights from the part of the "mobilities turn" literature that concerns itself with the meaning of networked technologies, how they afford or prevent social and cultural practices, and ultimately how the city becomes an assemblage of socio-technical systems, artifacts, flows of people, goods, vehicles, and information in a complex geography of connectivity. The toolbox needs a manual in the sense of a well-informed and theoretically underpinned set of statements and analytical positions on the technologies (which also should contain the ethical issues related to these new

technologies). The toolbox manual should contain theories and concepts for understanding how these technologies both are present in the city as data producers to be tapped into, as well as they may afford new types of public participation. In this chapter I have used the research within C-MUS and MoTT as examples even though there obviously are many other institutions and areas bringing about knowledge of networked technologies.

The theoretical input for the manual may generally be derived from the "mobilities turn" literature I have listed earlier in this chapter. But to become more specific I would point at the situational and everyday life perspective as a fruitful underpinning of the toolbox manual (see Jensen 2006, 2007, 2009, 2013). Spanning both the translation and the transduction dimensions I believe the manual can put focus on how mobile subjects are being empowered by the new technologies even as these are inscribing new power structures in the everyday life. Moreover, the programmable city research agenda points to the ICT toolbox as being both a rational and instrumental way of providing data about the city, as well as it becomes a new participatory tool and also a new interface between mobile urbanites in their daily practices. Thus the networked technologies reconfigure people's relationships to other people and places, and the way they think of self, other, and the built environment. This huge task of bringing in new technologies in urban planners' and designers' professional practice can of course neither be accomplished by one or two research environments nor can it be dealt with from the point of view of one academic discipline. In this chapter I have, however, wanted to point at ongoing research efforts of relevance to dealing with this task and to point toward the "mobilities turn" as a cross-disciplinary platform from which to launch some of the future activities that may afford the creation of a constructive and professional engagement with networked and mobile technologies in the city. In Kitchin's words:

> I have made the case that we are entering a period of *programmable urbanism*, and that to understand this new form of urbanism we need to examine the various components of how the city is translated into code and how the resulting software is reshaping city life—that we need to understand the internal workings of the black box in order to better understand its external work. In so doing we can start to address a series of important lacunae in understanding and theorizing contemporary urbanism, opening up new comprehensions of the city at a time when urban life is going through profound changes with respect to its organization, scaling, and management
>
> (Kitchin 2011: 950, my emphasis)

Concluding reflections

In the period of "programmable urbanism" new challenges await all sorts of professions. In this chapter I have wanted to point toward urban planners and designers as a particular group in need of engaging with these technologies. I

indicated four key reasons why I find this of high importance. First because the technologies are already "out there," urban planners and designers must know about these since they are as important a part of the contemporary city as asphalt, sewers, houses, and public plazas. Second, the networked technologies are producing data about the city that planners and designers might as well make use of to create more accurate and sophisticated decision-making frameworks. Third, the networked technologies (despite all the "digital divide" discussion) offer a potential for new types of public participation processes and civic engagement in urban planning and design. Fourth, the new technologies can do more than map and report the activities in the city. They offer themselves to become active and dynamic layers of new experiences and creative practices of the city. The "performative" dimensions of networked technologies should become tools in the box that also open up new technology-driven discussions about cross-departmental collaboration as well as inclusion of artists and creative agents. Thereby, if it plays out well, there is a potential for using these technologies to open up the fields of urban planning and design toward more creative and artistic dimensions (something I believe these fields would benefit from indeed). The manual helping urban planners and designers to fully grasp the social and cultural implications of the networked technologies should be anchored in the "mobilities turn" literature in general, with a specific focus on the mundane everyday life and its reconfiguration as an effect of these technologies.

The "will to connection" is as old as humans' movements across the surface of the Earth. However, we need to understand that the traces are no longer only visible. Networked technologies are creating new challenges, and urban planners and designers might benefit from expanding their toolbox with important ICT technologies. As mentioned, people are already engaging with these technologies and their mobility affordances regardless of what planners and designers might think thereof. The time has come for urban planners and designers to mobilize their "will to connection."

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Research Cluster for Mobility and Tracking Technologies (MoTT) www.create.aau.dk/MOTT/.