Author response

Response to Commentaries on 'Visualising human life in volumetric cities: City digital twins and other disasters'

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Abstract
This short response reflects on four aspects of city digital twins addressed by its interlocutors: the variety of city digital twins; the range of visual media and genres which they cite; the distinctiveness of their digital animation; and their urban emplacement.

Keywords
City digital twins, digital animation, data visualisation, participation, critique

I'd like to thank all my interlocutors for their generous and insightful commentaries. I'm very pleased that my paper has been able to convene scholars from a range of disciplines to explore city digital twins from their various perspectives. We are agreed, I think, that urban digital technologies, no matter how hyped, must be approached as technocultural, among other things. That is, to quote Joel McKim, they 'are always discursive projections as much as they are actual things in the world'; and while my paper did not address how specific city digital twins are being deployed, that is undoubtedly an important topic for future investigation, as Germaine Halegoua suggests in their comments. There are a number of challenges in approaching city digital twins as objects of cultural critique, however. They are complex digital objects, and diverse; they are subject to both technical specification and commercial hype; they are both quite specific in the technologies they assemble but they also refer to broader trends in digital visual culture; and the power dynamics they enact thus require fuller interrogation than a single paper is able to offer. The commentaries here all make a range of helpful remarks and suggestions which extend, deepen, nuance and challenge my account, and I have four points to offer in this response that I hope will continue the conversation.

Firstly, I should acknowledge – as all the commentaries do – that city digital twins are not one single technology. Different twins are created for different uses. As Emma Fraser, Will Payne and Clancy Wilmott discuss, twins emerged from the management of manufacturing processes. They were originally designed to monitor the performance of

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engineering objects: aeroplane engines, turbines and the like. Michael Batty elaborates on their history as an urban management tool, noting their various alignments with the monitoring of urban infrastructure, their convergence with simulation modelling, big data and AI (there is more in his recent book *The Computable City* (2024)). Building on this diversity (which is also evident in smart city discourse and practice (Rose, 2020; Rose et al., 2021)), Halegoua proposes that city digital twins could therefore potentially be used in ways other than the god-trick that I describe in my paper, in collaborative and co-designed work with the humans that currently seem to appear only as mobile objects or the twin's excessive other. That city digital twins could also be designed to appear differently is an implication of Erica Stein's commentary. The penetrating aerial view and its locked-down three-dimensionality described in my paper could be eschewed, in the same way that genres of filming the city and its inhabitants also generate different visions of urban life, as Stein notes. An aesthetic other than that of Unreal Engine's ray-tracing glow might prevail. These are exciting propositions, and to be realised would require genuinely interdisciplinary conversations between digital designers, urban scholars and city managers and inhabitants (these are not exclusive categories). Certainly, I think that the volumetric twin cannot be left to become an even more comprehensive version of the global surveillance dashboard imagined in, say, the Bourne movie franchise (Flaxman, 2018), and this is as much a visual project as it is one of urban justice. Cities need twins that can visualise partial, dirty and patchy data, twins that can see gritty and damaged surfaces, twins that blink and do double-takes, twins that can see two or more things at once, that can hint at things that are diffracted or made unvisible perhaps (Browne, 2015). They also, crucially, need assemblages of users who can work with such provisional, situated and emergent city models and with each other.

Secondly, every commentator adds to the roster of influences on what city digital twins look like and how they thus mediate the urban both visually and spatially. This enriches the contextual understanding of city digital twins immeasurably. Batty and Fraser, Payne and Wilmott all dig deeper into the technical aspects of twins: their programming, their code, their software. Certainly, the relation between Geographical Information Systems and three-dimensional volumetric space deserves more attention than I give it in my paper; the history of animated maps is also relevant here. Halegoua mentions computer games and drone footage. Stein focuses on the history of filming cities, and McKim points to the imminent arrival of AI-generated animations. While much of the critical attention given to AI-generated imagery is highly critical of both how they are trained and the largely stereotypical and banal images that result, it would be interesting to consider how machine-learning algorithms might also be taught to see cities differently, and in the kinds of multiple, emergent ways indicated by Halegoua and Stein's remarks on alternative visions.

This leads me to a somewhat more sustained response to Stein's commentary. Stein suggests that city digital twins have less to do with computer graphics, GIS and digital animation than they do with a particular gaze at the urban which emerged across a range of twentieth-century, non-digital visualising technologies and practices, from documentary film and photography to aerial surveys and other 'cinematic projects'. I would agree that the gaze which desires to make the city visible in order to manage it indeed has a long history, and can be deployed as part of different kinds of urban practice. And certainly, people appeared in many of those practices, in ways that could 'exceed the particular vision and social position that orients the CDT'. However, as Stein notes, many of those modern gazes at the city were also deeply gendered, bourgeois and racialising, as the work of Saidiya Hartman (2019) and John Tagg (1988), among many others, has demonstrated (see also Rose, 1997). Moreover, their distinctively digital form of animation is a key aspect of city digital twins, it seems to me, and this does partially differentiate it from those histories. In images of city digital twins, the point of view swoops and zooms from outer space to a street – even underground – and the viewer thus also becomes far more mobile and the city more open to their gaze than was possible even with 'total cinema'. The imagery is also more composite and more mutable. Data streams

are made visible as glowing networks, the time of day can be altered, buildings are plug-and-play and can change height and footprint. While these animations are highly confined by a volumetric regime and by a representationalist compulsion to mimic the 'real' city, and propelled by a desire to see it all in order to manage it all, and thus certainly carry echoes of the urban cinema discussed by Stein, I do think they enact a very different mode of visibility from the cinematic (and Deborah Levitt (2018) would agree). In its voraciously mobile point-of-view, the animated twin mutates the god-trick beyond even (dis)embodiment, entirely discorrelating the view from any semblance of human vision (Denson, 2020). And yet, regardless, of whether animatic or cinematic, both ways of seeing underline one of the most resonant comments made by Stein: the ultimate fantasy of the city's digital twin trick is to be separated from the city. I could not agree more.

That brings me to my third point, which for want of a better term I'll call the 'mood' of the digital twin, powerfully evoked in Halegoua's commentary. I think Halegoua is absolutely right to point to the slightly weird calm that pervades these twins: perhaps it has something to do too with the lack of noise, that washed-over palette, the steady flow of people, the mild sunshine or dusk, the constant gentle movement of traffic: an urban-lite in which all is seamless efficiency. It's a calm replicated in the promotional videos that show urban managers working with a twin in their offices. All is measured, and thoughtful. In fact, emphasising how little actual disaster seems to befall the twin – even though it is hyped as a tool for managing disaster – only makes the extremes of the disaster movie more evident (*San Andreas* does actually show scientists panicking about being caught in an earthquake but Dwayne has never deserved his moniker The Rock more). It also raises the question of the modes of power and therefore critique that are invited by the imaginaries of the city's digital twin.

There are many reasons that critical urban scholarship should critique digital twins. They do not engage with questions about data justice, or with the practices of feminist data visualisation (D'Ignazio and Klein, 2020). They proffer an entirely visual mode of engaging with urban fabrics and environments. They do not allow participation by urban citizens. What I really wanted to emphasise in planning my paper, though, was that there are another set of dynamics at work in these efforts to manage urban life digitally, dynamics which I don't think are being sufficiently addressed by very much of the excellent critical work currently being done on the digitalisation of the urban. These dynamics are gestured to in the phrase 'techbros', and in Batty's citation of that statistic about the almost total domination of programming by men. Now, my paper was attempting to diagnose an epistemological claim about the urban: it was explicitly about a specific form of masculinity that is enacted by a certain 'narration' of the urban (to quote Stein quoting Penz), not about 'men': sex, gender, embodiment and ways of knowing the world do not neatly line up. The question then becomes, if something that can be described as a 'god-trick' does align with specific qualities associated with a certain form of masculinity, what exactly are its dynamics and consequences? I drew inspiration from a body of feminist cultural critique which depends on a kind of poststructuralist and psychoanalytic vocabulary to propose that certain kinds of subjectivity take collective forms, and that because their dynamics include those of splitting and projection, their symptoms appear across (digital visual) culture. (I will now add the entrepeneurial innovator to my list of techbro types, thanks to Fraser, Payne and Wilmott.) The fact that none of my interlocuters engaged with that particular mode of critique suggests I need to work on it further, more explicitly, and consider in more detail both what it disallows as well as its insights.

The final insight I take from the commentaries is offered by Stein, in their closing remark that city digital twins, and all their cousins, from computer games to movies to architectural fly-throughs, not only picture the urban, but are seen in cities, on networked screens of various kinds. In the larger project of which this is a part, I do indeed try to think through what this means (see Rose, 2025). I try to think about that emplacement as a kind of disruption to the authority claimed by the visuality of city digital twins. I theorise – imagine – that emplacement as multiple, frictional and hybridising, as images are seen in streams across screens, and in glances from

the screen to screen. In such conditions of hyper seeing (Rose and Willis, 2019), similarities and relations between images become observable and may be understood as the projections of a white masculinity at once claiming god-like insight and deeply anxious that its vision is flawed. In that richly multimedia and multisensory environment, perspectives and temporalities become evident, as do paradoxes and stumbles, diffractions and series (to take a pertinent example, not only are Nvidia building Earth 2 as McKim explains, the European Union is building a twin of the planet it calls Destination Earth, which begs the question how many twins of the world are needed and why they don't look the same). Cities can be smoothly quiet and calm; they can also be punctured and uncertain, collapsing and mended. The city is mediated by city digital twins, then, but it is not reduced to them. Other cities – the city and the city, perhaps, as imagined by China Miéville (2009) – remain, noisy, awkward, divergent, heterotopic and hypertopic (Casetti, 2015), garbled, unpleasant and inspirational. The city I imagine, with so many others, is not equivalent to the desires of its twinning.

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