Computing Sustainability

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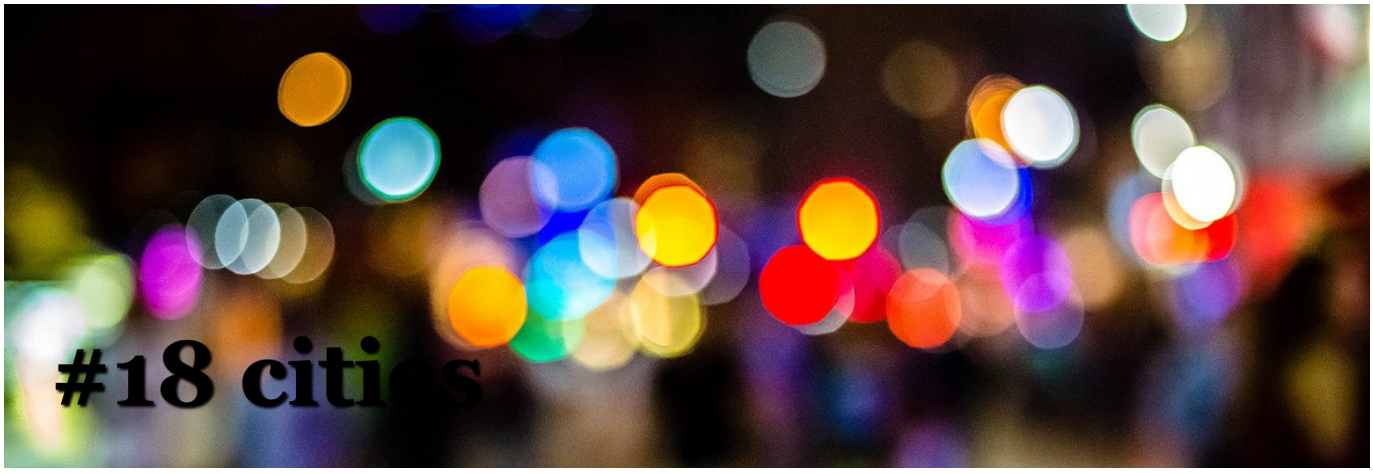
DIGITAL DEVELOPMENT DEBATES



Jascha Grübel / Tanya L. Schweinberger

Computing Sustainability

Software that learns from sensors on garbage bins adapts to urban issues and generates solutions the human eye cannot see.

Cities have grown ever more complicated and managing them has become increasingly difficult. Logistical bottlenecks, uncontrolled growth, and social unrest are only a few of the issues modern cities face. One possible solution is epitomized in the concept of smart cities. As technology increasingly permeates every aspect of daily life, it is becoming possible to collect sensor data from every corner of a city – from street lamps to garbage bins. The Internet of Things is allowing us to translate an abundance of data from physical objects into digestible bits of information and, applied to city infrastructure, constitutes the basis of what smart cities stand for. What should be done with this data is another matter. Creating a simulated city to better understand how real cities work is one promising idea. In urban areas, the variety of actors, interests and goals often results in complex processes. By steering societal action and thereby detecting and tackling issues of sustainability, simulated cities enable interactive governance.

The idea raises essential questions, such as how a simulated city would potentially impact interactive governance. Would it empower citizens or concentrate information and power in the hand of the elites?

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To understand how simulating a city works, we must address two rising phenomena of the last decade: Big Data and machine learning, where technological advances have been steady, though mostly in the background. Manifestations we encounter in our daily lives include movie suggestions on Netflix or the order of Facebook's personalized newsfeed. But in March this year, news spread that Google's AlphaGo had beaten a human in the ancient game of Go. Considered more complex than chess, Go is seen as the holy grail of strategic board games. As almost uncountable possibilities unfold with every new move, this game requires a high level of abstract thought, a task computers have so far been unable to perform. AlphaGo is a computer program specifically designed to play Go, and to improve and adapt its strategic moves by observing millions of public Go games online.

Simulating a city has moved into the realm of the possible (...) – though the implications, however substantial, have not yet been fully explored.

Computer simulations have become more pervasive in almost every field of human interest. Nonetheless, city planning has so far resisted large-scale automatization due to the immense complexity a city poses. The rise of complex algorithms such as AlphaGo illustrates how machines can dissect complex systems more efficiently – and potentially better – than humans. Simulating a city has moved into the realm of the possible thanks to these advances – though the implications, however substantial, have not yet been fully explored.

Smart cities are often discussed in the context of their benefits for city management, meaning the optimisation of processes and thus the reduction of costs. Boston's city government, for instance, displays its live smart city data not only to the mayor, but also on a website accessible to the general public. This data ranges from the number of public transport delays and potholes repaired in a day, to the number of grants for the arts.

To illustrate the potential impact of simulated cities on interactive governance, assuming that all technical aspects have been resolved, it is helpful to explore both the worst- and the best-case scenario.

Ideally, simulated cities could improve nearly every aspect of urban life. This is crucial, as urban areas worldwide are experiencing rapid increases in population. Placing newcomers sustainably and providing citizens with services more effectively, for example, could potentially improve the way we live together.

Hence, simulated cities are means of upholding interactive governance.

Another major impact is the utility a smart city can give its inhabitants. It can provide predictions for traffic, pollution, electrical shortages, public resources, and more. In general, simulated cities have the potential to enhance the efficiency of public services. They can become a valuable foundation for achieving the Sustainable Development Goals. Citizens' interests, expertise and knowledge can be involved and integrated into decision-making processes. Concurrently, the simulation of a city allows public insights into how cities work and is an opportunity for citizens to appreciate how they can further and contribute to their city's well-being. Hence, simulated cities are means of upholding interactive governance.

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In the worst-case, however, it could further empower elites and tighten their grip. As faculty co-director of the Berkman Center for Internet and Society at Harvard University Yoachai Benkler has noted, data acquisition produces single points of control. Whoever controls the data will have the most knowledge about a city and can limit what information others are able to obtain about it. This could endanger advances made in interactive governance by concentrating generated knowledge in the hands of the few and excluding the majority of society.

Furthermore, the high density of complex information in the data provided by smart cities and additional context from the simulated city could be exploited to violate individual privacy on previously unseen levels ranging from insights into precise daily patterns to predicting successes in personal endeavours. For instance, conclusions could be drawn from social indicators (area of residence, income of parents, social connections etc.) that could then influence an individual's chances of employment. Simulated cities therefore lead to a malignant and covert form of discrimination and control due to their inherent opaqueness and ultimately result in the severe reduction in social mobility – not unlike the world George Orwell depicted in his novel "1984".

We are at a turning point (...) and public deliberation should be our greatest concern.

It is most likely, however, that we will see both scenarios appear concurrently and with different levels of intensity. Present developments, as exemplified by Boston's Smart-city Cloud-based Open Platform & Eco-system (SCOPE) project, have contributed to citizens embracing interactive

governance, as it enables them to view data on road quality, and see smart city developments live on the web, among other things. On the other end of the spectrum, Cathy O'Neil, an Occupy Movement activist and self-prescribed data sceptic, has pointed out how predictive crime modelling in the US has led to over-policing at potential crime hotspots, transforming governance into an automatic machine response to algorithmic results. We are at a turning point where the impact could go either way and public deliberation should be our greatest concern.

"We need to discuss who owns our data infrastructure, what roles the public and private sector should have, and what role we as citizens play."
(Gavin Starks)

Gavin Starks of the Open Data Institute in London put it succinctly in a recent blog post: "We need to discuss who owns our data infrastructure, what roles the public and private sector should have, and what role we as citizens play." The concept of a simulated city offers both opportunities and dangers which require room for discussion about what is desirable in a societal context.

On the one hand, simulating a city contributes to achieving the Sustainable Development Goals by furthering our understanding of how cities work and helping us find ways to promote sustainable development. On the other hand, it risks disenfranchising large parts of society by shifting participation out of their reach and fundamentally inhibiting interactive governance.

The discussion on such issues requires a platform and structure, and it is crucial to acknowledge that such debate cannot be viewed in static terms or confined to a few actors. It must take place as a dynamic process closely connected to changing norms and circumstances in society. Consequentially, the debate would have the potential to yield a political, social and legal framework for addressing the implications arising from the simulation of cities. This issue of Digital Development Debates has the potential to promote this important process by stimulating and shaping discourse on the topic.

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