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Convergent City: Imagining planning in a digitised future

By Ulysses Sengupta and Robert Hyde

Society is changing due to new digital technologies and planning can help define this transformation.

Any discussion about digitising the planning system is meaningless without discussion on the future context of operation and aim. This report recognises new digital technologies as a significant future disruptor (Manyika et al., 2013) across disciplines. In order to address this change proactively there is a need to engage with potential futures.

Working with future trajectories

While it is impossible to predict the specific outcomes of future technologies, current trajectories strongly indicate increased digitisation, increasing symbiosis between people and technology and the increased use of machine learning to perform tasks – such as weather pattern prediction or gene sequence analysis - requiring multiple iterations and calculations that would manually prove impossible. We may not know the future, but examples such as the governments' Open Data initiative clearly demonstrate direction, and we can choose to approach this direction in a flexible and adaptable manner.

Machine learning will enable city simulation

Machine Learning, a branch of Artificial Intelligence (AI) (McCarthy et al., n.d.), is the study of systems that learn from data. With the advent of Big Data, this branch of research has come to the forefront. Applications using machine learning already surround us. Google or Bing search engines rank websites for our web searches based on relevance, and junk mail filters learn from our habits in order to filter more efficiently. Pattern recognition - the ability to recognise or assign a value to a new input – is an essential part of machine learning, and recent developments in computer vision (E.g. face recognition) and Natural language processing (NLP) demonstrate direct translation of real world knowledge into digitally recognisable data without the need for prior categorisation. Machine learning can now create new systems that can regulate themselves based on external references, enabling the development of simulated cities that reflect real ones. The parallel behaviour of virtual/simulated cities and real ones will depend on AI research addressing the collective intelligence we see in cities (Weinstock and Gharleghi, 2013).

Cities are complex adaptive systems

Cities are complex adaptive systems (CAS). I.e. systems that exist without a singular form of top-down control and evolve over time at multiple scales through an ability to learn. Other examples are the stock market, the biosphere and the ecosystem, the immune system and most human social group-based endeavours in a cultural and social system such as political parties or communities. Parallel computing and machine learning are providing new possibilities for digital simulation of these emergent systems. CAS uses internal models to 'anticipate' the future (Holland, 1992). I.e. test multiple future scenarios and adjust current actions based on learning. Digital simulations will provide decision making tools for people, planning and governance to test actions in the context of resilience (Walker et al., 2004)(Holling, 1996) and adaptation.

The convergent city

There is an increasing convergence between the virtual and the real. This is manifested in machine learning, simulations of real world systems and the growth of the Internet of Things (Ashton, 2009). This convergence in the context of digital simulation models of cities is an essential future trajectory leading to increasingly accurate

simulations and automatic data exchange between the real and the simulated/data city. Sensors and monitoring devices installed in the name of Smart Cities may have a role to play in data acquisition, but the real potential is in the interfaces allowing interaction with these AI enabled data models.

Open data and direct democracy

Open data promises a new phase for society where people and organisations at multiple levels will access customised services in exchange for voluntary data surrender. Resilient and experimental socio-economic endeavours will result from increased flow and legibility of information allowing maximum awareness of context and changes. In the design and management of our environment, the potential of Open data lies not only in access to current information, but in direct forms of democratic city planning using interactive interfaces. Instead of having the option to object to top-down planning decisions only, citizens will be involved in a bi-directional process enabling suggestion of ideas and voting on projects and ideas they desire most. Structural change resulting in an accountable government providing feedback and real actions along with a digital simulation models to test new ideas will both be essential to such an outcome.

Digital planning

Society is changing due to new digital technologies and planning can help define this transformation. Structural shifts afforded by digital disruptors requires an interface between people, governance and the environment, more than increased efficiency of access to archival information. Digital planning must be the portal through which a) a virtual city is updated in real time; b) data is visualised in recognisable geo-spatial form; c) simulations are run to explore the viability of existing/future policies and interventions; d) urban debates and discussions take place; e) the real and virtual cities are convergent. The question of what this future interface looks like must be open-ended. However, given that we experience the complex interactions of real cities in four dimensions (including temporal), this is a useful cognitive starting point for a virtual city (with additional data displays) platform. A convergent virtual city that is updated in real time, incorporating machine learning and utilising simulations to test future scenarios to allow informed decisions and identify current and future problems and opportunities. Once in place the digital planning system must act as an open platform encouraging Civic Hacking for individuals to develop additional customised interfaces and services and become evolutionary itself.

Authors

Ulysses Sengupta is a Senior Lecturer at the Manchester School of Architecture and was previously at the University of Nottingham and the University of East London. He works with a complexity science framework to address complex urban situations produced by the rapid rate of urbanisation today and the resulting extreme changes to the physical fabric of many cities. His research is interdisciplinary and overlaps with Future Cities, Smart Cities, Big Data and Open Government agendas. Ulysses' current research focuses on how to design and manage future cities through co-productive platforms based around real time geo-spatial systems. He is also Director of Softgrid Limited a research, design and consultation practice, specialising in city planning, urban regeneration, computational methodologies and integrated approaches to sustainability.

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