Notes on Habitat-scale Robotics and its Constraints

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Abstract

"The future of robotic architecture will be defined less by what is theoretically, mechanically possible than by the constraints it must negotiate and solve. For example, techniques derived from current research in robotic architecture may become important part of how our cities can accommodate new energy efficiencies demanded by global resource constraints. Equally plausible is that because robotic architecture adds significant and complex energy requirements to any architectural program, it will never reach fruition. In this paper, I examine such problematics through the particular lens of architectural transprogramming from one technical regime to another, and sketch how robotics may or may not enable solutions where today none exist.

The question of robotic architecture is for this workshop couched in the context of the real and proposed ubiquity of computational media and intelligence. But when we discuss ubiquity of computation, what exactly do we mean? Is it only the computational activation of objects, or the scattering like pollen of processors onto landscapes? It has been a point of conjecture from Lucretius, to Descartes and from the Church-Turing thesis and Wolfram that the physical world is itself already computational in nature. But even if we are not hard computational ontologists (and I am not making that claim) it may be a durably

useful perspective to imagine that what we are currently designing is not the first planetary computer, but the second; and further that the ultimate purpose of the second is to co-evolve dialogically (and dialectically?) with the first, providing new means to govern fragile worldly systems with lightness and care.

This image of UbiComp is not as the installation of an intelligence-layer on a mute inert earth, but as the provisional modification of sensation, calculation and communication within ecologies that are already far more complex and finely tuned that this clumsy new machine will ever be. Accordingly the assignment for habitat-scale robotics is first to absorb the permanently overwhelming depth of worldly demands made on it and to better mediate them. Only then, I would add, can the large scale geo-engineering, proposed as necessary in order to redesign climate change by redesigning the climate itself, have a chance to do more good than harm. So then how does robotic architecture justify the appearance imagined for it? I strongly argue that it must do so as to reduce the amount of architecture in the world, not increase it.

As we are well aware, our built habitats are critically inefficient in their net usage of energy and resources. As with all finite material cultures, it is imperative to radically increase the usable efficiencies from them, to adapt, recycle and re-use. It is neither necessary or likely even possible to erect architectures over the coming decades to suit the complex programmatic needs of another three billion people. It is simply not an option, even in concert with an even more ambitious program of subtraction and replacement of existing building stock. This is where the programmatic meta-flexibilites provided by robotic architecture come into view. Consider by way of one example, how much dead time most architecture endures. Offices, storefronts, entire malls, stadia, etc. are active during the day and dormant at night while in many cases residences are vacant during the day. John Thackara often uses the example of how schools and their cafeterias are largely vacant overnight in neighborhoods without sufficient public food distribution facilities. It is obvious, and perhaps even inevitable, that multi-use programs will become more commonplace, segmented by temporal switchovers where one occupation replaces another. The introduction of both blunt and nuanced robotics into this context can make possible forms of urban-scale spatial recombinancies otherwise unimaginable or impractical. In this robotics actually is less a displacement of human bodies (not currently in the business of moving partitions and floor plates on demand) and instead puts the general capacity of thermodynamic reformation at the disposal of software-level media. If it is displacing anything it is zoning, jurisdiction and certain legal governances of place, as well as the unsustainable presumption of monoprogrammatic architectures.

A preferable future of robotic architecture is a one of prudent content management, in this case of the existing stock of architectural partitions and surfaces. But, alternatively, it is also very possible that they added energy costs necessary to manufacture and power broadly-used robotically-governed temporal programs will always and forever outweigh the incremental efficiencies realized by flexible architectural forms. It is this equation that robotic architecture must solve if it is to realize itself at any historically appreciable scale.