Parametric Urbanism: The Means to a Beginning

Austin Samson

Parametric Urbanism can understand the dynamic and real time relationships within mass amounts of information found in quantifiable data and social issues through the use of parameters, which can then be used to create reflexive pattern and form that give architects a much more knowledgeable, although more complicated, starting point to design from resulting in the slow morph of sterile cities into flexible living environments.

Figure 1 Form and Space that is derived from the interaction between urban conditions. Source: Zaha Hadid
Traffic, inefficient living space, environmental issues, poverty, crime, and poor use of networking are some of the major problems seen in today’s sterile cities. Many have tried to solve these issues independently because the human mind cannot comprehend the amount of information needed to correct multiple large-scale problems. This is unfortunate because each issue relates and dramatically affects all the other issues creating a complex web of cause and effect scenarios. Fixing one problem may very well increase another. Visualizing and understanding this dynamic web has eluded humankind until now. With the introduction of advanced computational techniques, we can now begin to see and understand this complex web in a way that will allow us to solve multiple large-scale problems by understanding the dynamic relationships between them.

Patrik Schumacher has done the most recent research through coining the term “Parametric Urbanism” through which he shows some interesting progress through his and Zaha Hadid’s entry for the Urban Istanbul Competition. Schumacher has taken a stance that says, “Everything must resonate with everything else.”\(^1\) Here, Schumacher places an important and much needed emphasis on the relationships found within urban conditions. This is what parametric urbanism is based off of, the relationships. “This should result in an overall intensification of relations that gives the urban field a performative density, informational richness, and cognitive coherence that makes for quick navigation and effective participation in a complex social arena.”\(^2\) Unfortunately this is the most we will get out of Schumacher, as he does not explain the process and benefits of such to achieving his dream of a Parametric Jungle.


\(^{2}\) Patrik Schumacher, “My Kind of Town: The Parametric Jungle.”
In order to understand parametric urbanism we need to locate the beginning. MVRDV through the novel Space Fighter show the first two key aspects of parametric design: the ability visually understand extreme amounts of information and how use that information to understand possible design outcomes. Arie Graaffland in Games People Play analyzes MVRDV’s research and is able to bring forth these key aspects. The first point Graaffland makes is how the new goal of architecture is to use intelligence as a base of design. This intelligence can be found in two forms: practical knowledge (quantitative) and “military type” knowledge (qualitative). Graaffland states that, “intelligence like the military is able to work from seemingly endless fragments of information, rumors, and misinformation.” MVRDV was able to come up with a computer program that could handle the “endless fragments” of information, which they then used to ask the always important “what if” question. The “what if” question is a useful tool for understanding possible outcomes which can help humankind understand how to prepare for such outcomes.

In the Swiss Cross Urban Study MVRDV says traffic is the major issue of Switzerland’s city design. In order to show the effects of increased or decreased traffic flow on city function, MVRDV developed “sliders”\(^4\) that control the level of traffic flow through the city. By pushing the sliders to one extreme, such as fully intensified main transit axes, we can begin to understand how the result is a highly accessible country. “To me, this imperative urge to be concrete, to specify your demands, to polarize solutions, to figure out what new qualities you want to produce, and the interconnectedness of all these questions and solutions is the real value of this project.”\(^5\)

MVRDV set up the system that is being used today in order to perform parametric design. Matei Denes, a senior architect at Mahai Radu Architects, performed a complete urban design using parametrics that begins where MVRDV left off. The site of Denes’ intervention is Sao Paulo Brazil. Denes’ study is so informative because it is much more specific than anything MVRDV focused on.

---

4 Sliders: Quantitative mechanisms that have the capacity to transform numeric values into quantities.

Denes first selects a type of pattern known as a voronoi. The voronoi pattern is reflexive in nature because it is based off of a system of points that are governed by parameters. If points are added, moved, or altered in any way, the voronoi pattern adjusts itself to the new layout. What is so appealing about the voronoi is that its primary objective is the most efficient use of space and distance from one point to any other point in the field.
Denes then locks in three specific parameters to inform the voronoi: traffic flow, program, and landscape. Each parameter is then broken down into its component parts. For example, program is broken down into housing, commerce, and parks. Denes’ contribution to the process of parametric urbanism is his ability to effectively show how the parameters begin to interact with one another. This is the next key point to parametric urbanism: the ability to visualize the complex relationships that occur between different parameters. MVRDV creates parameters that we can study using sliders. Matei Denes took these parameters and created a way to visually see the relationships between each parameter.

“Using the brief of infrastructural flows at multiple scales, we aim to integrate the multiple levels of circulation that are currently independently organized. Our system explores ways of finding variable solutions to negotiate mass and flows by producing a high degree of connectivity and differentiation.”

![Figure 6 Comparing program and traffic flows to existing landscapes. Source: Matei Denes](image)

The last move that Denes makes is the full integration of the three parameters by studying how traffic flow and program are affected by landscape. The aim here is to, “develop programmatic typologies of towers, residential courtyards, and the bus station.” Here, we see the ability to compare three different sets of information. By doing so, we do not allow one parameter to overcome another. In this case, changes in the landscape have dramatic effect on how traffic is able to flow through the city. Couple that with how program is organized and the output is an informative, visual model that can inform how architects make design decisions. “The resulting pro-optimized spaces endorse the spontaneous activities that promote the social interactivity that characterizes the vibrant Brazilian culture.”

The final outcome points back to the ability for this type of study to create the quick navigation and effective participation that Schumacher poses as so important to urban design.

Matei Denes intervention is a necessary step in moving to the next chapter of parametric discussion. Denes does an excellent job at showing how the parameters can relate to one another, but they may not be the right parameters to be studying.

Figure 7 The final outcome shows a complex but rich visualization of the interactions. Source: Matei Denes

8 Mate Denes, “Bua.”
In order to further inform what parameters need to be studied, we move to the Berlage Institute and their project entitled Associative Design. “Associative design research is a program that links a specific design technique to the domain of architectural practice. This design research program applies new computational techniques to the forces of urbanization.”

The Berlage is able to identify the six most specific and important parameters to study from. These parameters are both quantitative and qualitative.

- Traffic
- Living Space
- Environmental Issues
- Poverty
- Crime
- Communication

Complexity is most apparent here where the web of

dynamic relationship is far too complicated to be understood by the human mind alone. Only through this process of design can the web be visualized and understood. What is important to realize here is that the studies focus on quantitative data as well as qualitative by looking at how poverty, crime, and communication are affected by modes of traffic and program layouts. But perhaps the most important notion is the next key point to be made about parametric urbanism: it has the ability to understand relationships in real time. The major relationships that the Berlage has studied are as follows:

1. Environmental Issues:
   - Sunlight – Building Orientation – Living Space – Wall Design

2. Communication:
   - Outdoor Courtyards – Private Courtyards – Public Courtyards – Amount of Communication – Types of Activity – Traffic Typologies

3. Poverty:
   - Communication – Activity – Segregation – Layout of Public Spaces

The point made above is that there is a high rate of interaction between multiple parameters. Even though these have been divided into three basic groups, there are interactions between the different groups as well creating the complex web.
The sunlight diagrams give great insight into the ability to see real time changes that occur within urban conditions, though sunlight studies have been done before. The Berlage is able to take the real time study of sunlight and apply it to how it may affect the layout of outdoor courtyards, which will have an effect on communication between people, and activities that take place in those courtyards.

The ability to understand relationships between the amounts of traffic, versus amount of activity coupled with a degree of public and private spaces, shows the changes that each has on the level of communication within the area. The parameters can be shifted in real time to show how decreasing or increasing the intensity of one effects all others. This is the true moment of reflexivity that is found in parametric urbanism. Parametric Urbanism has the ability to understand real time moments of information and show how to account for problems that either arise on moment or could arise in the future.
The essential quality of the courtyard is determined by the reciprocity among neighbors in terms of program. How it generates continuous routes to connect each housing cluster, not only access from the external entrance, but in accordance with the programs. The individual housing unit links to specific outdoor spaces in the neighborhood, for better communication and participation.10

If parametric urbanism is as important as Schumacher makes it out to be, then why hasn’t it found solid footing in today’s architectural design process? Why did Eisenman who won the competition see Zaha Hadid and Schumacher’s Istanbul Urban Design process as unfavorable to the more traditional design? Perhaps it is because the way Schumacher has chosen to display it to the world. When the average person sees am image like the one in the beginning of this

paper, they probably don’t see the potential of what is shown. Instead they ask questions like, “what kind of building is that?” or, “is that a building at all?” Even worse, when confronted with dramatic forms like this, many comment on them as being “ugly” for lack of a better term. This is because there is a misconception about parametric urbanism. Parametric urbanism is not a means to an end, it is not meant to output final building shapes or designs. Parametric urbanism is a means to a beginning. It is the pre-design stage meant to give architects a much more informed approach to begin their design from. What Schumacher is showing is potential, potential in architecture that is designed with such intelligence that it is inherently reflexive. If this is truly the case, then what will happen when architects finally take advantage of this point?

Austin Samson is a Masters Of Architecture student at the Southern California Institute of Architecture located in Los Angeles, CA. He grew up in Gales Ferry, CT where he began taking courses in carpentry and metals shop during high school. He then received a Bachelor of Science in Architecture from the Wentworth Institute of Technology located in Boston, MA. During his studies in Boston, Austin was hired as an intern for RadLab Inc, a local digital design and fabrication firm where he began focusing work and school studies on the digital aspect of design on all scales which was a major factor in the choice to apply to Sci-Arc for his masters degree.
Bibliography