Humanizing Parametricism

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As we increase the complexity and correlations of variables that are critical to the design of a project, we are becoming increasingly aware of the possibilities emerging from a computer integrated design process. There is such great opportunity to use these tools to manage and analyze multi variable design information, yet there is still much criticism of the design solutions created from computational design. These design solutions have been said to be "lacking any character, cultural influence, human engagement, or communication" and that "most of our contemporary architecture has forsaken this dimension of architectural discourse and it's potential for exceptional spaces." The current focus of computational investigation is primarily limited to building performance and optimization. Buildings that are designed from a purely optimizational construct without acknowledging the users desires and needs are falling short in creating "places". Optimization can be the end result, but the constructs that are being optimized must be broadened to address all facets of a project. Computational design has emerged because it has the capacity to resolve multiple constraints and deal with extreme complexity of variables. By optimizing a more holistic set of constraints, computational architecture can truly provide comprehensive design solutions.

“Parametricism aims to organize and articulate the increasing diversity and complexity of social institutions and life processes within the most advanced centre of post-Fordist network society. It aims to establish a complex variegated spatial order, using scripting to differentiate and correlate all elements and subsystems of a design. The goal is to intensify the internal interdependencies within an architectural design, as well as the external affiliations and continuities within complex, urban contexts.” Manifestos such as this by Patrik Schumaker address the power and beneficial attributes of computational design and have excited the architectural community with the potential and transformative nature brought on through its use. Unfortunately, there is little work that successfully applies all of these principals. While it may take time to fully embrace this change and develop the technology to successful apply these ideas, it should be acknowledged that some critical aspects of projects are not being addressed. Shumakers states, “It aims to establish a complex variegated spatial order, using scripting to differentiate and correlate all elements and subsystems of a design”, but in practice not all elements are being addressed. This lack of humanism in computational design has led to debate.

Missing Variables

There has been much criticism of the paradigm shift to computational architecture. Neil Spiller addresses this deficiency in his article Surrealistic Exuberance – Dark Matters. He critiques parametric design as lacking any character, cultural influence, human engagement, or communication. Because of this, he states that these projects are devoid of interest and mystery. “It is also to point out that most of our contemporary architecture has forsaken this dimension of architectural discourse and its potential for exceptional spaces…. some contemporary architects have sought to collapse ‘theory’ and ‘practice’ in new ‘algorithmic’ processes of design that avoid subjective ‘judgment’ and produce novelty through instrumental mathematical operations. Made possible by powerful computers and ingenious software, the new algorithmic magic creates novelty without love, resulting in short-lived seduction, typically without concern for embodied cultural experience, character, and appropriateness.” Like any critique and iterative design process, there is room for revision. Humanism needs to be brought back into the architectural equation. Instead of disregarding computational design as a methodology, priorities should be reset and emphasis should be placed on creating more comprehensive design solutions.

Designers that have embraced parametricism as a method of optimization are on the right track of inquiry, but they have left out some very significant puzzle pieces. Buildings and places that are designed from a purely optimizational construct without acknowledging the users desires and needs are failing in a similar fashion to those that are using the computational design strictly for ornamentation. They are selling short the potential of computational design. Optimization can be the end result, but the constructs that are being optimized must be broadened. Building performance is not the only component of a project. Optimization must be addressed in all facets of the project. While it may be difficult at this stage to expect the computer to resolve all of the design decisions, they need to be addressed.

The built environment should address the user’s psychological, informational, and social needs as well as the functional and programmatic requirements, environmental concerns, and optimization. All of these values define the success of a project. (Figure 1).

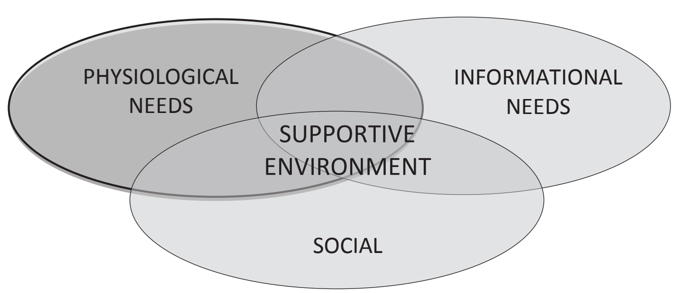

Figure 1. “Supportive Environment”

Integrating Qualitative Research

Architects and engineers have gotten very good at using the computer for optimization, but it is critical that the tools now address the qualitative building performance as well. These design components are often overlooked in current practice, and this area does not seem to be addressed in computational design. It seems since there are so many parameters that influence a design project, many of the qualitative measures of the design have been left out. Instead, the focus should be to figure out how to embrace the number of parameters needing to be that are addressed in parametric design strategies and create a more holistic and more valid design response. If there cannot be a singular system that addresses all of the needs of a building or design, then a system must be developed where all parameters are examined and possible individual studies of each can then inform the design process.

This is important to architectural discourse because in an age where builders, engineers, and even computers have the ability to create buildings, and efficient ones at that, there is a reason and importance for the architectural profession to understand the complexity of not only the building performance, but the social and contextual issues. Architects are distinct in that they have the advantage and knowledge if applied to create "places". It is unfortunate that these are the areas that are lacking attention within computational design, but by introducing the human construct back into computational architecture we are drawing closer to inspiring those manifestos.

With the collaboration and research in the fields of Neuroscience and Architecture, Environment and Behavioral Studies, Environmental Psychology, and more cross disciplinary research; we now have a large amount of empirical data that can greatly contribute to the success and performance of the built environment. Evidence based design is now mainstream and the data produced seems to be a good match for setting constraints in computational design.

The quality of the built environment and the implication of design decisions have been studied by various disciplines including environmental psychologists, environment and behavior researchers, and even design professionals. To define a quality environment, EBS researchers use the term "supportive environment," one in which the physiological, informational, and social needs of the users are supported by the physical environment. While it would make sense to most design professionals that this should be evident in all projects, it is often not the case.

While architects are trained to ensure the environment is suited to the physiological needs of the user, the informational and social needs of the user are often overlooked. This is not new and has been studied rigorously in the films, "The Social Life of Small Urban Spaces" and Kevin Lynch's, "Imageability." Attributes of the city are often part of curriculum in architecture programs, but there is little attention paid to the mounting research and evidence of how humans perceive and learn through environmental interactions, as well as how this changes significantly from children to the elderly. Wouldn't designers be able to create better design of housing and facilities for the elderly knowing the implications of sensory and cognitive changes of the elderly when designing? Isn't it important to understand the limitations of young children in spatial cognition in the design of educational institutions?

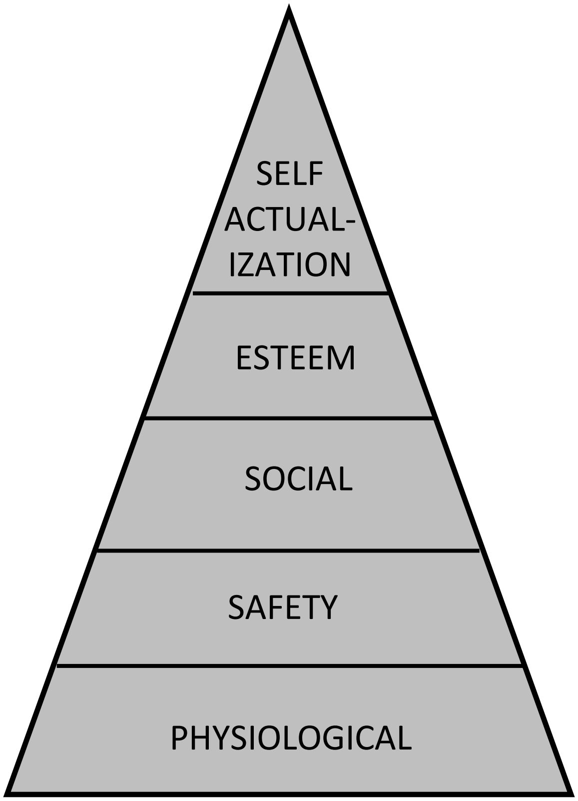

Figure 2. Maslow's hierarchy of needs.

While there are not many projects incorporating this research into computational design, there is no reason to view these qualitative design constraints any differently than other variables used in a computational framework. There is great potential in investigative measures infusing this knowledge in the current body of work, but there needs to be further investigation into how to address the informational and social needs of the user and the most appropriate method of defining and setting those design constraints.

This study should begin by looking at some of the existing research and findings as a starting point. There has been much research in understanding the percetio-cognitive system: how humans perceive their environment, how the cognitive system interprets that perception and creates mental images that allow us as humans to store information, create route knowledge and spatial understanding of the environment. Spatial understanding is critical to any design and since this legibility is linked to human preference, it can be used as a predictor of user satisfaction.

Gestalt theory in psychology has been applied to EBS to deconstruct how humans perceive the built environment. "Gestaltists proposed that the nervous system is predisposed to group incoming sensory elements by certain rules: Proximity, simplicity, closure, continuity and similarity," the research has then translated these Gestalt laws to design applications. Design applications of these Gestalt laws have already been broken down into defined variables that determine how well a space is understood. These application variables include: figures, patterns, form and space. Creating "imageable" spaces are significant and necessary to create and store spatial information. Imageability attributes have been defined by Appleyard as environmental features that affect attention and memory including imageability, distinctiveness, visibility and significance. These are all rules that can apply to design elements and set constraints on how we order and create visual elements in design.

Within the application of architecture, the cognitive process is crucial to the success of a project. Hunt defines legibility as the ability to organize environmental elements and orient oneself. The attributes that contribute to this understanding include perceptual access, architectural differentiation and plan configuration. Within this research it has also been determined that structured variety must be evident to aid in this spatial understanding. Legibility and wayfinding greatly contributes to the satisfaction and emotional security of the user. According to Hunt, an individual's wayfinding ability "affects their capacity to enjoy and appreciate the surrounding environment and encourages exploration and interaction". The inability to understand ones environment can be a safety issue as well as cause confusion, stress and anger which, as is well documented in healthcare design, indirectly affects health and well-being. Agent based simulations are beginning to address some of these concerns , and there is great potential for investigative modeling to be used to determine how to optimize spatial cognition to enable a person to formulate a mental image with optimal organizational structure as quickly and efficiency as possible.

Human preference is influenced by both informational needs and social needs, and has been thoughougly researched. While the findings are somewhat instinctive to many designers, it is important to test and validate these conclusions through practice. Preference process qualities such as flexibility and content qualities such as views, environmental features, and the golden proportion are all variables that could be addressed through computational means. Perhaps more critical than optimizing human preferences would be to avoid undesirable human conditions. Visual overload could be combatted by setting limits, then automatic clustering as that limit. Spaces that reach a size limit would be forced to be subdivided into conceptual spaces, and visual escapes could be varied into the equation all in an effort to avoid the feeling of crowding.

Social needs of users are often addressed in current architectural design, but in many cases designs are unsuccessful or not used as the designer intended. There are many variables that can be addressed by computational design to predict the success of those spaces. The significance of clustering and home range has been studied to predict the success of spaces. Technology could contribute to this success by setting constraints and running simulations that would ensure social spaces would fall within the home range of the users. Designing sociopetal spaces and using proxemics are all design variables that would be addressed by computational architecture to create more supportive environments.

Buildings that are designed from a purely optimizational construct without acknowledging the users desires and needs are falling short in creating “places”. Optimization can be the end result, but the constructs that are being optimized must be broadened. Building performance is not the only component of a project. Optimization must be addressed in all facets of the project. Computational design has emerged because it has the capacity to resolve multiple constraints and deal with extreme complexity of variables. By optimizing a more holistic set of constraints, computational architecture will be difficult to contend with. The fusion of human understanding and technology enables designers to revolutionize the practice of architecture, revalidate the significance of the profession and create extraordinary “places”.

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