



The Ideology of Parametric Design

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Abstract

Parametric design approach is widely encountered in today's design practice and education. With the latest point reached in computer software, the development and awareness of parametric design tools is increasing. The parametric design approach, with its new understanding and search for form and form in the field of design, is evaluated by designers as a problem of making and constructing physical production. In this study, the parametric design approach to the problem mentioned not only the possibilities brought by digital design tools related to physical production but also the necessity of considering intellectual production in the parametric design approach is discussed. At this point, the study mentions this deficiency and tries to address the ideology of the parametric design approach. The article currently discusses the need to address the underlying ideology of the parametric design approach, not only as a result of technology.

1. Introduction

The effects of economic, cultural, political, social, educational and technological developments and changes in the world on society have had an impact on the field of design as well as in many areas. Technological developments enable different requirements to occur, shape and renew the design process and the tools used by the designer. In this requirement that emerges with technology, the designer must create original ideas and adopt a computational and analyzable design approach. One of these approaches is parametric design. It is very important that the parametric design approach, which is thought to emerge as a result of technology, will be possible by comprehending not only the technology but also the ideology that gives birth to and develops that technology. At this point, in this study, the parametric design approach will be mentioned and evaluations will be made to comprehend the ideology of parametric design.

2. Parametric Design

Parametric design; It is a design approach that allows various parameters to create design models by coding them and changing them by solving the link they establish with each other with parametric software tools; by influencing and changing these interdependent variables and to create alternative models by making changes between variables.

System software, which is designed by means of a computer, is used in changes in form values such as shape-form production during the design phase or light-sound-thickness-height in physical space. Parametric design is also used in the solution of the details in the structure or product and in the skeleton designs of the product. In studies with this type of approach, only one canonical formula is created; The values such as angle, dimension and measurement mentioned above can be changed such as measurement, angle, thickness and various affirmations related to the 1-rule detail solution can be created (Baykara, 2011).



By determining the relationship between the linked objects, the network between them can be determined, redesign can be produced and configured. In the parametric design, when the data is matched with the entered parameters and other parameters, the changes made in each section automatically cause the change in the other sections. This similar interaction between the alternatives is ensured by the change and transformation of parameters. The power of a parametric system to change the model by defining geometry is linked to the fact that the link between the parameters of the model cannot be dynamic.

The concept of parameter, which is the most important element of parametric design, is defined as quantitative and qualitative data that determines or defines the formation of a variable form (Oxford Advanced Learners Dictionary, 2015) and is shaped according to the form alternative of the design (Şekerci, 2020). With the Parameters tool, the relationships between various elements in a complex structure or geometry can be examined (Jabi, 2013). Parameters are used in the design context to clarify possible possibilities and to decide or limit the system. It is used to determine which segment, part or value can be changed in a parametric system and the value ranges of variables. Parameters allow for the emergence of stronger and more sound ideas in the creation of many forms, using variable values, multiple changes (Kolarevic, 2003). In parametric design, different design functions and possibilities can be determined thanks to variables. In parametric design, variables remain in the background according to the form as different forms are obtained with the changed values (Kolarevic, 2003).

Parametric Design is also an approach based on algorithms of an analytical approach and algorithmic thinking associated with it. The important thing is to manage the relationship established between the parameters of this algorithm method correctly. The number of parameters may vary and differ for each design. Here it is important to be able to manage the parameters and use them correctly. With this approach, non-standard objects can be designed and manufactured. What is meant to be expressed by non-standard is that instead of the standardization due to mass production in design, it can propose a new systematic variety based on the design and production of a series that differs from each other by small differences in the same theme and formal language produced by mass production technologies.

The Museo Soumaya art museum is a futuristic building designed by architect Fernando Romero in Mexico City. In this design, the architect used contrast and distinctiveness as a concept, considering the distinctive identity of the city that has existed since the 1940s. As an idea in his structure, the architect tried to give the user a visual example of how architecture develops into a new stage where gravity defies, walls are curved, circulation is freer. The form of the structure is inspired by the rotation of a trapezoidal contour. By evaluating the parametric design approach in the façade design of the building, 49 different types of hexagonal forms were developed and covered with 16,000 hexagonal mirrored aluminum composites. In addition, it ensured that natural light entered the interior for the best exhibition of the works of art in the museum (Figure 1) (Url5).

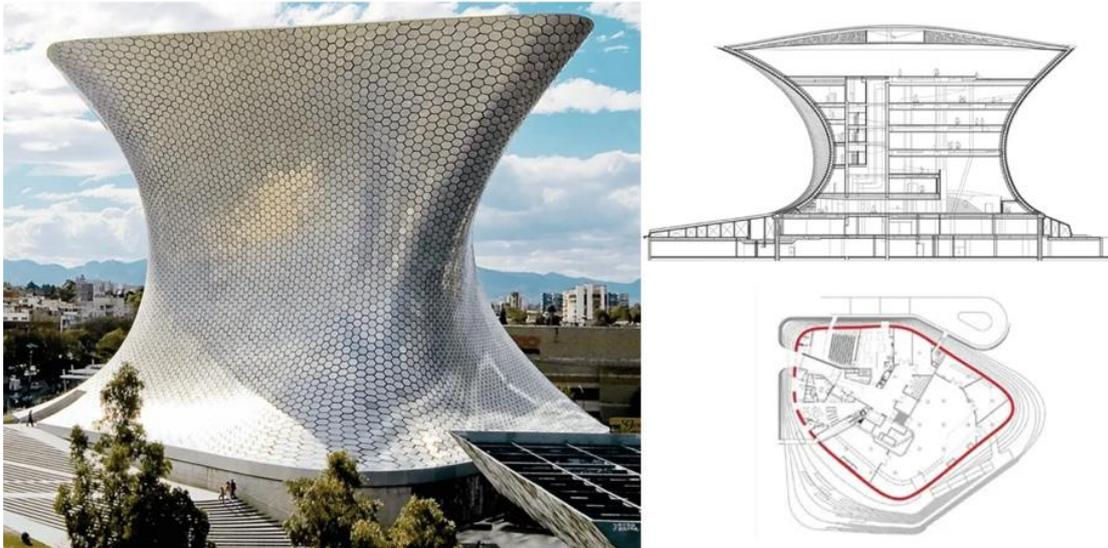


Figure 1: The Museo Soumaya Plaza Corsa, Mexico City (Url 2)

The Shimao-The Wave Showroom project is located in Binhai District on the east coast of Tianjin. In this project, the designers tried to create a symbolic structure where sea and soil unite by processing the contemporary urban, spatial sequence of human, sea and sky concepts with the basic logic of point line and plane depending on the water theme and integrating them with the concepts of water drop and wave (Url 4). This is the ideology underlying the design. He evaluated the technology that would provide this formation based on the parametric design approach (Figure 2).

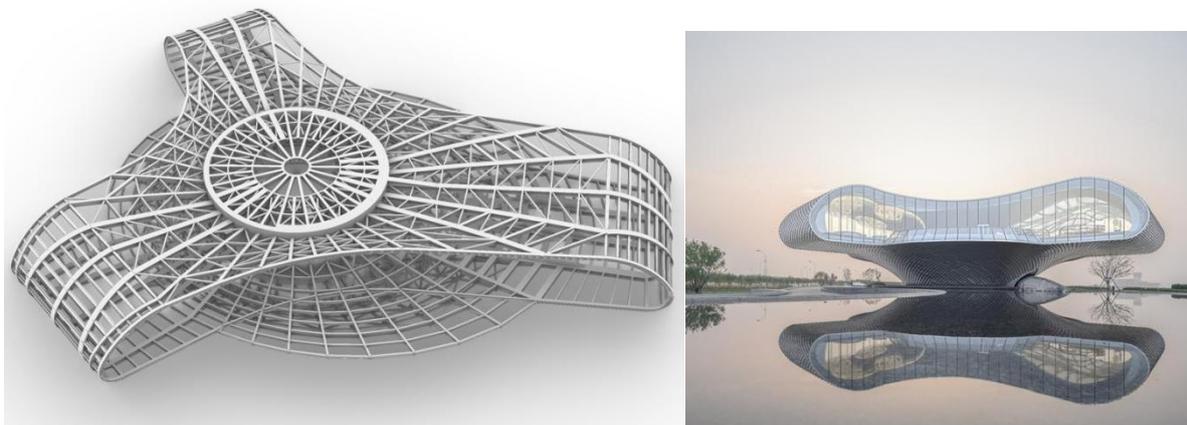


Figure 2: Shimao-The Wave Showroom (Url 3)

Serpentine Sackler Gallery was created by Zaha Hadid Architecture with the integration of the additional building created with the 21st century contemporary stretch structure system to the historical building built with the traditional architectural understanding of the 19th century. The aim of the structure, which is a synthesis of the old and the new together, is to design a parametric structure with a light structure like a breeze without damaging the historical structure. When evaluated from a parametric point of view, the combinations of brick walls and beams around the historical structure are based on computational solutions with algorithms (Figure 3).

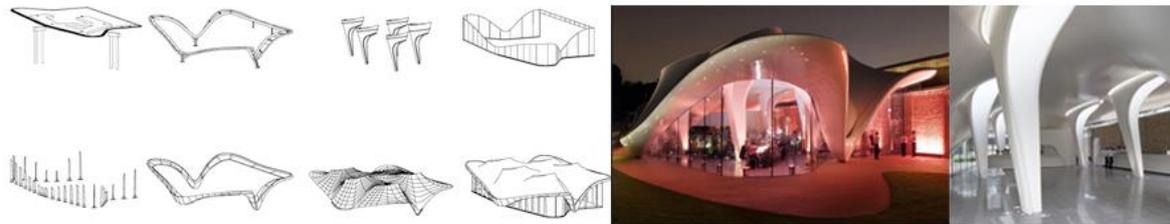


Figure 3: Serpentine Sackler Gallery and Parametric Detail Analysis (Url 1)

In addition, the limitations used in the design process and the interactive approaches that present restrictions on changes are damaging digital design methods. Challenging ways of combining the surfaces to be designed with 3D elements with insufficient resources and high cost formation in surface designs realized in building designs; Although it prevents the emergence of new shapes and forms, it puts the process into challenging conditions with increasing cost. The design methods cause more difficult processes as a result of the fact that the connections cannot interact with each other as a result of the parameter values to be planned by arranging the masses and changing or renewing the masses formed in the design scheme. (Panchuk, 2006).

Parametric design, which is the new culture in the scientific field, has fixed its place in design practice and development in a short time. Parametric design, which is the result of digital and technological design, also constitutes the methods of computational design. As a result, parametric design, which is the product of the digital and technological age, is a type of approach used in every field of design. Parametric design allows automation in design and production, ease of changeability in design and formation of differences in production in a short time.

The Concept of Ideology

The concept of ideology is expressed as the source of thoughts, the law of thoughts, the signs and relationships that express themselves. Ideology flaps its wings above all sciences, because sciences consist of our thoughts and the interaction between them. A well-known historian of philosophy also refers to ideology as a method rather than a doctrine; no principle between the observer and the human expresses people as a field that examines ideas (Meriç, 1970). According to Mannheim's definition, ideology works not only in the social, cultural and political life of individuals, but also in the form of a flow that guides our social actions (Mardin, 2006). At this point, in order to understand and question the ideology of the concept of parametric design, it is necessary to make sense of its technology and to refer to the flow of these two basic objects to each other. In this context, technology is the knowledge, thought, skill, plan, goal, opinion, method and processes that recreate the environment used to reach the needs and desires of individuals. At this point, technology should not be defined as a production process, but as an effort to make sense and make sense. What develops technology is the ideology that gives rise to it in its existence; ideas, thoughts, feelings and values (Figure 4) (Çelik, Aslan and Koçkan, 2013).

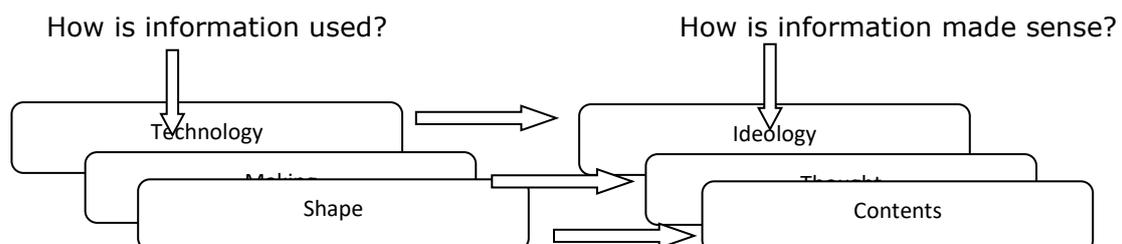


Figure 4: The Relationship Between Technology and Ideology (Çelik, Aslan and Koçkan, 2013)



When creating the designer design process, a space that must be structured by the combination of knowledge (technology) of creating the design and the idea of creating the design (ideology) should be created in the process. The aim of this platform should be to create a space for the designer to "understand the problem", "to convey the problem/design knowledge", "to produce design knowledge"; it should define the whole for the ability to do and think.

The development of technology increased towards the end of the 18th century, gained a new dimension and method with the industrial revolution and today it has left its development to production based on cyber systems. In this process, the development of technology and the act of doing has taken precedence over ideology and thinking (Savaş, 2019).

Parametric Design Thinking

The parametric design approach is expressed in three separate ideas as abstraction thinking, mathematical thinking and algorithmic thinking.

Abstraction thinking ensures that parametric design is a productive approach that allows the repeated use of design criteria to produce alternatives to the design idea. Mathematical thinking refers to formulations used to describe the process of design and the strategy of its production. Algorithmic thinking describes the situation in which the parametric design process allows a new variable to be added, subtracted, or updated the values of an existing variable to existing variables. In the form of parametric thinking, it is necessary to formulate the process for whatever purpose the design is designed. For this, it is necessary to correctly construct the relationship between the existing parameters.

When creating a model in parametric design, the designer determines the variables and the parametric software to be used, and provides model formation by playing with the values of the parameters. Rather than the traditional formation of the model, the development of design thinking is ensured by defining the productive parametric system and establishing its logical relationship. In this way, more alternative solutions can be discovered by changing logical relationships and parameters (Hernandez, 2006).

In parametric design processes, the design system is interrelated (Schumacher, 2008). Thanks to this, designers can go back at any stage of the design and refresh the parameters or rules to change their design or follow a different alternative. This ensures that the method is flexible, intervening and free in the parametric design process.

Designers often produce a limited number of alternatives in their design process (Woodbury, 2006). In the parametric design process, when the algorithmic system is applied, an unlimited number of design alternatives can be produced in parallel with the process. This situation changes multifaceted thinking and thinking styles in the design process and contributes to research processes (Hernandez, 2006, Holland, 2011).

The Ideology of Parametric Design

As a result of the use of digital technology tools in design disciplines, the concept of parametric design has emerged and studies on design show that it can prevail beyond having technology only in line with these approaches and that the design is prepared in the light of real values and data (Williams, 2004).

Faculty member Wassim, who came to the forefront with his studies in the field of parametric design, said about the ideology of the Jabi parametric design approach, "Designers develop and analyze the relationships they establish between parameters in design stages with parametric design software; as a thoughtful process that allows new alternatives and updates to the design model. According to G. Stiny, designers have stated that the computer software they use in the design process will be possible by using them

as a tool representing design, as well as as as as a platform that pushes the designer to think and produce and, moreover, to question.

Parametric design, which is used in both design and education, is a platform that requires the use of ideology (the idea of doing) together (Şavaş, 2019). This platform allows the designer to produce designs with his experience, knowledge, his own identity and functions, but also to create designs that touch the emotion, thought and soul of the individual. In short, it should define a whole of doing and thinking by using technology and ideology together. According to G. Stiny, the computer software used by the designer should be used as a tool representing design as well as as a platform that pushes the designer to think/produce and question.

In order to understand the ideology of the concept of parametric design based on the definitions made by W. Jabi and G. Sty regarding the parametric design approach, it is necessary to mention and explain the **Parameters of Making (representation)** developed by Wassim Jabi and **the Parameters of Thinking (production)** developed by Aslan.

Parameters of Doing It

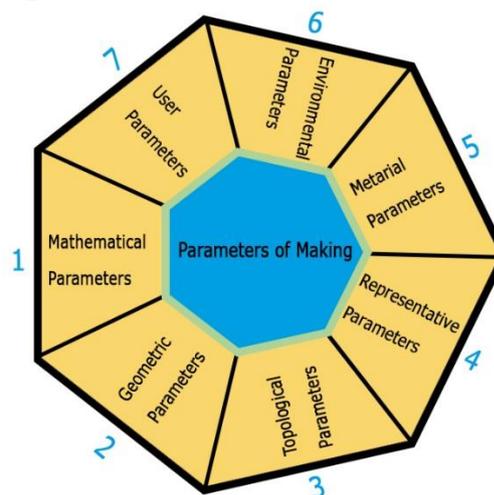


Figure 5: Parameters of Making - Wassim Jabi

Mathematical Parameters; Numbers are parameters that are represented using sequences of characters and logical values.

Geometric Parameters; They are mathematical parameters represented using lines, points and surfaces. 3D modeling software is available that can be parametrically modified and represents different types of geometric structures.

Topological Parameters; They are parameters that represent how multiple entities relate to each other (from top to bottom, facing each other, inside and outside, connected to each other). These parameters focus on how the parts are connected to each other and to the whole, with an emphasis on manufacturing, form and composition.

Representative Parameters; Representative parameters that partially describe the physical properties of the model; includes computer representations of columns, windows and walls.
Material Parameters; Friction, breakage, reflection, weight, tension, structural strength and elasticity.

Environmental Parameters; It includes environmental parameters such as heat, light, wind, time, shadow movements, magnetic field, erosion.

User Parameters; Each person has many differences physically and psychologically. It should use certain parameters for the design that suits the needs and wishes of the individual.

Parameters of Thought

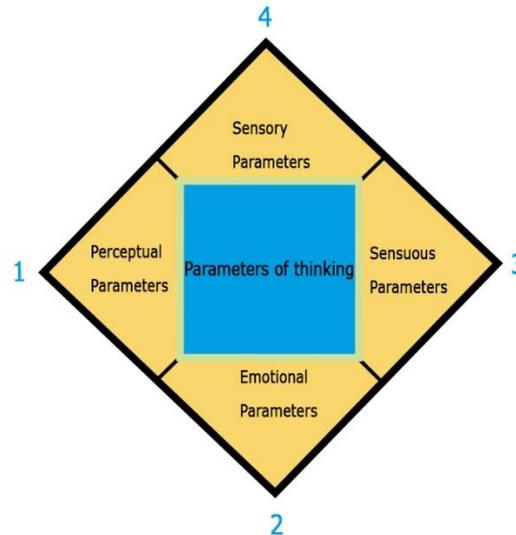


Figure 6: Parameters of Thinking, Aslan, Tracing the Trail of Design Thinking

The parametric design approach, form, method, method and systems, which are defined according to the results of the research obtained on the operation and structuring process of the design processes, undoubtedly aimed to develop an analytical and intellectual perspective on the values that complement each other and are related to each other, and whose definitions are lost in each other. This perspective is basically an attempt to go into the design process of the idea developed by the designer. (War, 2019).

The thought that underlies the parametric design approach In the light of Aslan's work Following the Traces of Design Thought, the parameters of thinking are evaluated under four headings. These are expressed as perceptual parameters, sensory parameters, sensory parameters, emotional parameters. (Aslan and Fakıba Dedeođlu, 2019).

Perceptual Parameters; It occurs by explaining the objective and subjective definition of the starting point that gives direction and light to the work. The goal is to generate insight into how the starting point is diagnosed and how it makes an impact on individuals.

Sensory Parameters; It is formed by analyzing the subjective definition that gives direction and direction to the study, by processing and synthesizing each sense separately through the data collected in its own way. The aim is to ensure that the results of these analyses blend the connections of their data with each other and put forward a common behavior by referring to recognition (how it is assimilated).

Sensory Parameters; The attitude obtained by studying and developing the senses is formed by defining an approach at the high point. The aim is to produce new variations of this approach (which will develop creativity/innovation/interpretation) by creating a language.

Emotional Parameters; It is formed by the fact that the language created by sensation can form a concrete or abstract space. The aim is to create an environment that will be defined by a utilitarian function, that can refer to excitement, fear, stagnation, stress, happiness,



etc. with an aesthetic function such as form, shape, material, texture, color, feeling, etc. with a symbolic function, or to produce design knowledge and consciousness.

It may not be correct to think of the parametric design approach only as a result of digital technologies. In the past years, it was a very difficult conception to touch equations and geometries such as non-Euclidean non-Euclidean forms, parabolas, hyperbolas, etc. in design education with traditional design approaches without computer support and to try to integrate them into the design. With the integration of technology developments into digital design, such geometries are now usable and can be controlled, functioned and produced in design. With the development of this approach and the use of non-Euclidean non-Yen geometries in the production of form and form in design, it was interpreted as a new understanding.

Result

When we consider the parametric design approach as a build-build problem, we see that the studies in the field of parametric design in design fields are mostly related to physical production, and the part related to intellectual production remains weak and is pushed to the background. However, design production is an inseparable whole, both physically and intellectually. However, many designers separate the nature of events and concepts from each other in order to be able to perceive them and to approach them analytically, and treat the form as a separate subject, the value we attach to that form as a separate subject. When we evaluate it from this point of view, it is necessary to consider design with a holistic approach with its ideology. At this point, it was concluded that the parametric design approach should be taken together with the underlying ideology at the same time that it is not only a result of computer production to be associated with technology.

In parametric design, if we base the design on parameters, we can reach numerical data through some parameters such as the use of daylight, the direction of the wind, the topography, the air conditioning, some geographical data, etc., if it is a problem of producing a form, it requires the definition of a number of technical parameters related to the production of that form only and only independent of its function. But if this is treated as an ideology problem, not a technology problem, then we need to include the parameters of thought in the design.

The designer and design educator must have the ability to define a common system and a flexible thought and doing action in which this understanding can be adapted to time by establishing the relationships between parameters that can be defined as the ability to establish relationships. Since meaning can be established with the partnership of the knowledge of doing and the idea of doing, it is possible to grasp not only technology, but also the ideology that gives birth to and develops that technology. For this reason, although the parametric design approach seems to be a computer-aided design understanding as a result of digital technologies, the underlying ideology is the expression of a thought that has existed from the past to the present.

In this study, it is concluded that the idea that is wanted to be emphasized in this study is not only limited to digital design tools, but also that understanding the ideology is as important as technology, and that the parametric design approach is an approach that expresses the necessity of using technology and ideology together.

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