PARAMETRICISM: A STYLE OR A METHOD?

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Abstract
In today's architectural design process, digital design tools, such as CAD and 3D design software, have become ordinary like pen and paper. Parametric design emerged as a result of digital design and it has been changing architecture within the context of design processes, design tools, construction techniques. This period of change can be likened to occurrence of Modernism. In those days, a very intense technological development and mechanization process affected to architecture and those changes reflected architecture as Modernism. Today, on the other hand digital technology is affecting and changing architecture. It is foreseen that a new architectural style could occur as a result of this process.
It can be said that Modern architecture doctrines fail to satisfy to explain the parametric design products. Architecture should generate new theoretical ideas specific to parametric design. Thus, Parametricism notion is a precious idea because it is directly related to parametric design and forms an updated theoretical base. Apart from all these this Manifesto receives a number of negative criticism and it shows that the Manifesto has some weaknesses.
Parametricism concept was firstly presented in "Parametricism Manifesto" written by Patrik Schumacher in 2008. It was asserted in this presentation that Parametricism would be the great new style after Modernism. Schumacher published three texts on this subject in 2008, 2009 and 2011. In these texts, he introduced some paths to pursue and some paths to avoid in the parametric design process. This study aims to discuss if Parametricism, which is asserted to be the great new style after Modernism, a style or a design method. Within the context of this aim, Patrik Schumacher's texts on Parametricism will be analyzed. Parametricism theory will be questioned through the selected parametric design samples and the relation between theory and architectural products will be discussed.

Introduction
The relationship between architecture – method and architecture – theory is redefined as technology changes. In parallel with that, recent developments in technology are affecting architecture as computational design methods. It can be said that parametric design also has become a part of architectural design process. New ideas and theories may be needed to discuss the architectural parametric design products within the theoretical context. Within this context, the idea of Parametricism has been presented to fill the theoretical gap in today's parametric design environment. In a conversation dated 1972 between Foucault and Deleuze, Deleuze told that at one time practice was an application of a theory and other times it inspired theory. In parallel with this idea, parametric design, in other words practice, inspires Parametricism idea, in other words the theory. It is a necessity to search the relation between method and theory, because Parametricism idea emerged as a result of parametric design. This study aims to examine if Parametricism is a style or a method by discussing the relation between theory and practice. This examination was made by searching the relation between parametric design samples and Parametricism Manifesto principles.

What is Parametricism Manifesto: The Dogmas and Taboos of Parametric Design
Parametricism notion was firstly presented as a part of "Parametricism Manifesto" written by Patrik Schumacher in 2008. It was asserted in this presentation that "Parametricism would be the great new style after Modernism". Schumacher introduced some paths to pursue and some paths to avoid within the context of his manifest dated 2008, for the first time. After then he reawakened these principles in his article dated 2009 and the book dated 2011. He described the paths to pursue as "dogmas" and the paths to avoid as "taboos".
In Parametricism as Style – Parametricism Manifesto (Schumacher, 2008) dogmas are defined as; interarticulate, hyberdize, morph, deterritorialize, deform, use splines and NURBS, generative components, script rather than model. Taboos are defined as; familiar typologies, platonic / hermetic objects, clear / cut zones, straight lines, right angles, corners, do not add or subtract without elaborate interarticulations.
In Parametricism: A New Global Style for Architecture and Urban Design (Schumacher, 2009) dogmas are defined as; all forms must be parametrically malleable, differentiate gradually, inflect or correlate

systematically. Taboos are defined as; hermetic forms, simple repetition, juxtaposition of unrelated elements / systems.
Lastly in the book named Autopoiesis of Architecture (Schumacher, 2011) dogmas are defined as; all forms must be parametrically malleable, all systems must be lawfully differentiated, all systems must be correlated with each other. Taboos are defined as; rigid geometric primitives, simple repetition of elements, collage of unrelated elements.
These three studies presented by Schumacher are analysed and it is seen that some of the dogmas and taboos of Parametricism state similar situations. For summarizing the manifesto and determining evaluation criteria, the taboos and dogmas are collected under titles. These criteria form a systematic frame for analysing the parametric design samples. The summarized principles are given in Table 1:

	Parametricism Manifest Principles	**Regulated Principles**
DOGMAS	▪ Script rather than model ▪ All forms must be parametrically malleable	**Parametric design**
	▪ Use NURBS ▪ Use spline	**Curvilinearity**
	▪ Hyberdize ▪ Morph ▪ Deform ▪ Inflect and correlate systematically ▪ All systems must be lawfully differentiated	**Deformation**
	▪ Generative components ▪ Differentiate gradually	**Complex repetition**
	▪ Interarticulate ▪ All systems must be correlated with each other	**Correlation**
	▪ Deterritorialize	**Universality**
TABOOS	▪ Familiar typologies ▪ Platonic objects ▪ Clear / cut zones ▪ Straight lines ▪ Right angles and corners ▪ Rigid geometric primitives ▪ Hermetic forms	**Euclidean forms**
	▪ Juxtaposition of unrelated elements / systems ▪ Collage of unrelated elements	**Unrelated forms**
	▪ Simple repetition ▪ Do not add or subtract without elaborate interarticulations ▪ Simple repetition of elements	**Simple repetition**

Table 1. Regulated principles within the context of “Parametricism Manifesto” (Oktan, 2015)

11 design samples of which parametric design processes are explained by the designers were studied. The design processes of these buildings and the final design products were discussed within the context of Parametricism Manifesto principles. As a result of this discussion it was questioned if Parametricism is a method or a style.

Parametricism: Between Style and Method

Styles are the aesthetic memories of their periods (Bayard, 2012). They can be described as the labels of the buildings. Architectural style is defined in “Dictionary of Architecture and Construction” as a classification of design products that share common attributes such as similarity in general appearance and in composition of design components, designed in a particular period of time and geographical region (Harris, 2006). In another

dictionary, styles are described as changing and adapting things through time like materials, building technology and conceptual theories (Ambrose et al., 2007). Parametricism idea has to be discussed in parallel with these definitions and its architectural environment.
The architectural environment that leads to Parametricism idea must be understood to question the Parametricism idea properly. Significant technological developments have been experienced from the period when Modernism was accepted as a style to the period when Parametricism idea was presented. Parametric design can be described as a reflection of digital technological developments in architecture. It changes architecture within the context of design process and tools, fabrication methods, formal-spatial-structural relations. This transformation period leads to new theories. Although a period of about 100 years have passed, modernist doctrines still have a significant role in architectural discussions. However, modernist doctrines are inadequate to explain today's parametric design products.
If digital design period (CAD software, etc.) is considered as "transition period"; parametric design period can be defined as a period in which digital design and its tools are internalized in architecture and become ordinary like pen and paper. In these circumstances, a new architectural style is expected to emerge as a result of digital revolution, just as Modernism which was emerged as a result of Industrial Revolution and mechanization. Patrik Schumacher introduced the first idea about the new possible style in the name of "Parametricism" and described it as a great new style after Modernism.

Criticism on Parametricism Manifesto

Schumacher's Parametricism idea led to semantic and theoretical debates. These debates focus on the term of "Parametricism" and the possibility that if such a style can be exist or not. According to Schumacher (2011), Parametricism is the most important heir of Deconstructivism and folding architecture. The most important proof of this situation is that, the Deconstructivist architects like Frank Gehry, Zaha Hadid uses the parametric design methods effectively. However, the most important difference between Parametricisim and Deconstructivism is that; Parametricism aims to be a universal style and not to be limited in a specific architectural environment. Schumacher (2011) thinks that Parametricism should not be seen as a style aims to create iconic designs. For example; the projects such as Innsbruck Train Stations, Galaxy SoHo designed by Zaha Hadid Architecture (Figure 1) show that constructing high-performance buildings in real world can be possible. He asserts that these buildings are not related to any style. According to Schumacher (2010) Parametricism is a mature style and seems to ready to become widespread.

Figure 1. Innsbruck Train Station and Galaxy SoHo Projects, Zaha Hadid (Schumacher, 2010).

Mark Wigley argues that there is no such style as Parametricism and it is not enough to explain what architects have been designing in recent years. He tells that doing something important is Schumacher's dream and he realizes his dream by Parametricism idea (Wigley, 2014). Leach, on the other hand, finds Parametricism problematic for some reason. He thinks that computational techniques do not meet with aesthetic values, the differences between algorithmic techniques (Grasshopper, RhinoScript, MelScript, etc.) and parametric techniques (CATIA, Revit, etc.) can not be explained and it fails to distinguish between parametric /algorithmic techniques, explicit modelling techniques and pre-computational form making processes. (Leach & Schumacher, 2012)
Daniel Davies criticizes this contradictive new style being called Parametricism. According to Davies, "parametric" is an ordinary term such as orthogonality or parallelism in maths. Parametric term does not represent a movement or a great style after Modernism. Davies thinks that Schumacher exaggerates this term and if this style had been called "Hadidism" instead of Parametricism he would have no objection with that. (Wigley, 2014).

In response to these criticism, Schumacher asserts that young architects internalise Parametricism style and this movement creates a powerful and innovative situation. He also tells that, this situation is more important than discussing the term itself. He finds it more precious that, the emergence of a new style and discussing its effects on architecture than the effects of computational design to design process. Schumacher thinks that Parametricism is an answer to the crisis of Modernism. According to Schumacher, Parametricism carries the traces of Postmodernism and it is related to Postmodernism through Deconstructivism and folding idea. Thus, within the context of Parametricism Deleuze's ideas such as rhizome and folding can be discussed over again. Leach, while agreeing that Parametricism may be the new style, he thinks it cannot be separated from Postmodernism at some points. Postmodernism's concern of designing scene, image or perspective continues in Parametricism as formalist descriptions such as "diversity", "fluidity", "correlation". The formalist concern of Postmodernism is supported with new aesthetic expectations within Parametricism. (Leach & Schumacher, 2012)

Leach (2012) supports Schumacher in three points: Although it is a controversial term, using the term of "style" is approved and it is thought that it is used in the meaning of "influence". Technic or method mediates the formation of aesthetic values. The thought of "Parametricism is a global style" is approved because computational design tools can be used in any place of the world. Computation does not only promise a new style but also leads to new design approaches that bring together both emergent systems and computational techniques. So it is necessary to focus on intelligent and logical design processes. According to Leach, "Logic would be the new form." (Leach & Schumacher, 2012)

Findings and Discussions

With reference to studied design samples, it can be said that parametric design is not a theory-driven but process-driven activity. At this point, it is asserted that architectural design process emphasises on the method not the meaning. Speaks questioned that the main question of architecture is not "What is the essence of architecture?" but "What can architecture do?" (Frichot, 2017). With parametric design tools becoming a part of the architectural design process, the essence of architecture, the theory, remained in background; the question of what architecture can do, the design process, has gained importance. Limited number of theories focuses on parametric design and modernist doctrines' inadequacy of explaining parametric design also affected to remain theory in the background.

Inadequacy of Modernist Doctrines

Architecture should update itself in terms of theory to discuss the parametric design products. In the early period when digital design tools began to affect architecture, Deleuze and Guattari's rhizome and folding ideas were important to explain the design process. Schumacher presented the Parametricism idea in the mid-2000s when parametric design tools affected architecture irreversibly and gained a universal value. This idea is important in terms of approaching parametric design from a theoretical point of view. Parametricism made it possible that, questioning the transition styles and Modernism, which is discussed for years and affected architecture from education to design process. The theory of architecture has to create new technology-driven perspectives to discuss computational design.

Parametricism Manifesto is the most important theory to discuss the new architecture of computational design in post-2000 period and this manifesto received a lot of negative criticism. This means that Parametricism is inadequate to discuss the parametric design products. In order to make parametric design more meaningful, the theoretical sub-structure has to be strengthened and more ideas needs to be generated.

Between Parametricism and Parametric Design

Patrik Schumacher's "Parametricism Manifesto" presents some paths to pursue (dogmas) and some paths to avoid (taboos). The relation between these dogma and taboo principles and parametric design samples are analyzed to research Parametricism idea in its own environment (Table 2). As a result of these analyses it is seen that complex repetition / avoid simple repetition, curvilinearity / avoid Euclidean forms and universality principles cannot be realized in every examined building samples.

Table 2. Building analyses within the context of Parametricism principles (Oktan, 2015)

	DOGMAS						TABOOS		
STRUCTURE	Parametric design	Curvilinearity	Deformation	Complex repetition	Correlation	Universality	Euclidean forms	Unrelated forms	Simple repetition
Aviva Stadium	●	●	●	●	●	●	●	●	●
Soumaya Museum	●	●	●	●	●	●	●	●	●
Hangzhou Olympic Sports Center	●	●	●	○	●	●	●	●	○
Bishopgate Tower	●	●	●	◒	●	○	●	●	◒
Acoustic Barrier and Hessing Showroom	●	●	●	●	●	○	●	●	●
Shenzhen Bao'an Airport-Terminal 3	●	●	●	●	●	●	●	●	●
Cayan (Infinity) Tower	●	○	●	◒	●	○	○	●	◒
ICD/ITKE Research Pavilion - 2011	●	◒	●	●	●	●	◒	●	●
The Framed Pavilion	●	○	●	●	●	●	○	●	●
Moscow Urban Design Project	●	●	●	●	●	◒	●	●	●
Kartal - Pendik Urban Design Project	●	●	●	●	●	●	●	●	●

● Realized ○ Un-realized ◒ Partly realized

Complex repetition / Avoid simple repetition:

Complex repetition means diversifying gradationally of the same building component in different proportions. Avoiding simple repetition in parametric design process is a significant aspect in terms of increasing the variety of design alternatives. Diversity of design alternatives increases the design possibilities and enriches the relation between the building and the user. In order to get rid of the monotony of simple repetition, the advantages of parametric design tools can be benefitted.

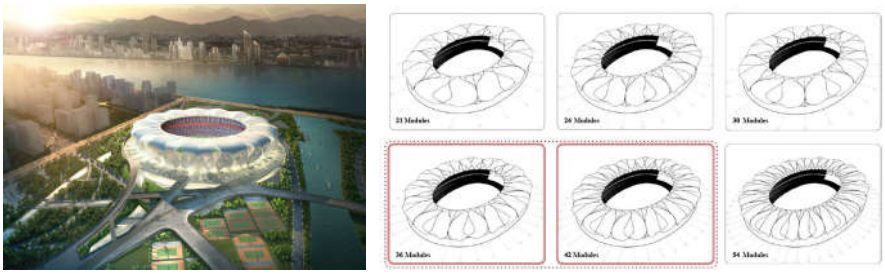

Figure 2. Hangzhou Stadium (URL-1) and its parametric design process (Miller, 2009)

Complex repetition principle is not realized in some examined buildings. For example, despite the fact that Hangzhou Stadium (Figure 2) was designed by parametric means, the "complex repetition" principle is not realised. Because the building consists of the repetition of the same module. These modules create a symmetrical order, in other words "simple repetition", which is avoided by Parametricism.

Curvilinearity / Avoid Euclidean forms:

Curvilinearity principle means using NURBS or splines in design process. The use of curvilinear shapes has become more common, as a result of the integration of parametric design methods with the design process. Patrik Schumacher (2010) asserts that curvilinearity would be one of the major features of parametric design and the Euclidean shapes of modernist era would become old-fashioned. Therefore, the "curvilinearity" principle of Parametricism Manifesto has been considered as a principle to be realized. Soumaya Museum and Aviva Stadium is two of the selected buildings that realized the curvilinearity principle.

Figure 3. Soumaya Museum (URL-2) and Aviva Stadium (URL-3)

However, in parallel with the examined buildings, it is concluded that curvilinearity may not be the major feature of parametric design. By means of parametric design, any kind of space, form or structure can be designed. Forms shall not be stereotyped in such rules like curvilinearity. Cayan Tower and The Framed Pavillion (Figure 4) were designed by the means of parametric design, but they were created by Euclidean geometries.

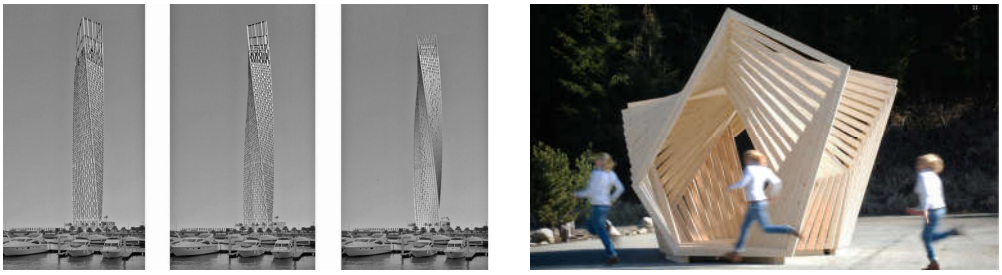

Figure 4. Cayan Tower (Gane & Haymaker, 2007) and The Framed Pavilion (URL-4)

Universality:

Universality dogma is based on the idea of deterritorialization. With the influence of globalization, similar design ideas can be seen in different geographies. This leads to non-local designs in terms of material and construction techniques.

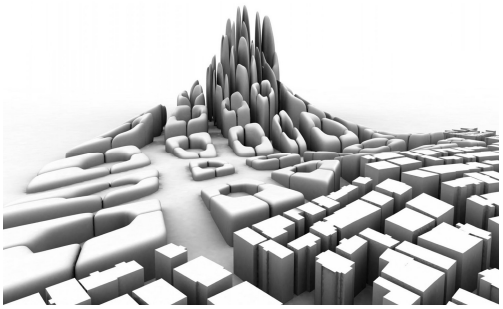

Figure 5. Kartal – Pendik Urban Design (URL-5)

Parametric designs sometimes can be formed with generative algorithms, as in Kartal – Pendik Urban Design Project. In other words, a design system is started with one or a number of subsystem/s and these subsystems are repeated complexly and form the whole system. These designs created with generative algorithms can be easily adapted to another place by changing the variables. It can be said that curvilinearity is a negative dogma in the context of modern doctrine because of its relationship with the place. Nevertheless, parametric design's point of view, a design is not only depended on the place it is designed but it is better to be adapted various places.

Results

As a consequence of examined sample buildings it can be said, they have some inconsistent points with Parametricism Manifesto. The main reason of this is that, Parametricism principles were not taken into consideration in the parametric design processes of selected design samples. Because Parametricism idea has not gained a universal quality, yet. It is also be asserted the computational design process could not be analysed properly, so the theory cannot reflect the practice in a correct way. This shows, an adequate theoretical background for rapidly-developing parametric design could not be formed, yet.

With reference to sample buildings it can be clearly seen that, the architecture is changing in terms of design and construction processes. Reducing this process to only parametric design, causes a gap in theoretical field. Computational design consists of several different design methods, such as parametric design, algorithmic design, generative design, etc. Parametric design is only a small part of the computational design process. Therefore, calling the new style as "Parametricism" causes a misunderstanding as if it is only related with parametric design.

Another critical point for Parametricism is that, it limits the design at some points. For example, curvilinearity or avoiding simple repetition are presented as dogmas in manifesto. These kinds of principles are the formal obsessions of Parametricism. But computational design methods are important for creating every kind of forms including Euclidean ones. Computational design is interested in how and why a form is created rather than which one. The design process itself is important for computational design, not the forms are.

Computation in architecture also creates new perspectives for design processes. And this new situation cannot be related to Modernism or Postmodernism, anymore. To discuss the computational design and classify the products, new theoretical backgrounds or a new style definition is needed. This possible new style would not only be about the design methods but also about searching new possibilities for the basic points of design; such as new formal seeking, functional organizations, the relation to its place, etc. This possible new style would most probably be related to computational design methods and processes.

As a result of this study, it can be said that Parametricism has some positive and negative points. The most important contribution of Parametricism to theoretical field is that, to create a new discussion area for computational design. Schumacher pointed out, there is a lack of computational theory and make people think about computational design theory. On the other hand, it can be said that Parametricism Manifesto have some conflicts with computational design process and products. The formal obsession is the most critical part of Parametricism. It can be defended that; such obsessions should be left behind. In conclusion; it can be foreseen that a great new style after Modernism would show up, but possibly with another name except Parametricism.

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