



THE ROLE OF PARAMETRISM IN MODERN ARCHITECTURE

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Article DOI: <https://doi.org/10.36713/epra10190>

DOI No: 10.36713/epra10190

ANNOTATION

The article examines the history of the emergence and stages of development of Parametrics. The origins of this method, its specific features, main tasks and sources of information for design are studied. The main problems in the development of the application of parametricity in buildings and structures in Uzbekistan are covered.

KEY WORDS: *parametric architecture, parametric design, parametricism, Zaha Hadid, Patrick Schumacher.*

INTRODUCTION

Modern architecture is increasingly using methods, techniques, tools and technologies to help turn buildings into interesting and attractive structures. One such method is the principle of parametrisation, co-founded by German architect Patrick Schumacher and Iraqi-British architect and designer Zaha Mohammad Hadid. According to Patrick Schumacher, the new style and its latest developments are based on advanced parametric design systems and scripting methods. This style has been developed over the last 15 years and is now gaining a high trend in architecture.

The main trends of modern architecture are focused on the modernization and application of more technically advanced methods, techniques to create a unique image of the building. Therefore, it is important to find answers to the questions of how curved surfaces using methods such as parametric architecture are produced, who needs them, and even can implement it.

While Parametric Architecture or Parametric Design is not new, the last twenty years have seen a huge increase in architectural designs of this design style around the world.

In the mid-20th century, designers such as Frei Otto, engineers created these curves using mathematical equations as "parameters" to design these curves and shapes.

Historical sources state that parametricism emerged as a theory-based avant-garde design movement in the early 1990s, with its first practitioners as Greg Lin, Jesse Reiser, Lars Spuybroek, and Cas Oosterhuis.

"Parametrics"- it is a style in modern avant-garde architecture and is promoted as a successor to post-modern architecture and modern architecture. The term was coined in 2008 by Patrick Schumacher, an architectural partner of Zaha Hadid (1950-2016) [2] (see Figure 1). It was these two architects who introduced a new and unusual flow into the world of architecture. Guangzhou Opera House is the result of a collaboration between Zaha Hadid and Patrick Schumacher.



Figure 1. Zaha Hadid and Patrick Schumacher

Parametrisation arises from a parametric design based on constraints on a parametric equation. It relies on programs, algorithms, and computers to manipulate equations.

Patrick Schumacher states that he states that "the work of Frei Otto (1925 - 2015) is the founder of parametricism because Frei used physical processes as simulation and design engines to" find "a shape, not to draw simple or invented shapes."

Initially, a separate line -**parametricism** appeared and after a while became independent on its basis **parametric architecture** formed [3].

As a result, the architect begins to explore new tools for further work - animation, parametric modeling, mutations, and other advances in modern computer graphics. Thus, with the emergence and development of advanced parametric design systems, parametric architecture emerged as a distinct style and became increasingly popular and relevant.

Parametric architecture- it is a unique modern style that combines knowledge in the field of sculpture, architecture and mainly mathematics, going beyond simple constructive solutions and forms. This type of architecture has a very strong connection to mathematics, and the connection between the human factor, the building built, and the environment must be taken into account. Creating projects in parametric architecture requires not only modeling of objects, but also long work in modern computer programs such as Grasshopper, which helps to develop logical conditions and mathematical algorithms. This gives architects more options for creating complex structures and shapes, giving them the best solution for a project in automatic mode. Most of the designers' work in this area has focused on shopping malls, restaurants, galleries, museums and other commercial buildings.



Figure 2. Chanel Mobile Art Pavilion designed by Zaha Hadid Architects

Information sources for parametric design. Software design tools are currently being used that allow you to skip the document creation phase. For example, in Grasshopper and Rhino, the architect only works on creating the model, while all documents are created automatically. The architect examines the environment, collects the required parameters, sets the tasks, creates a specific algorithm to solve them, and then the program calculates all possible options for the given parameters according to the given algorithm. As a result, the most economical and conceptual option is selected. There are

Published by Patrick Schumacher in 2009 "**Parametrics - a new global style of architecture and urban design**" All aspects of this trend and its role in future construction are described in detail in [5]. This work identifies five functions of parametrisation:

1. **Parametric interarticulation of subsystems.** The goal is to move from changes in one system (facade details) to several groups of subsystems (shape, structure, internal structure), changes in any system are interrelated with changes in others.
2. **Parametric accentuation.** The goal is to strengthen organic association through interaction. The connected system should emphasize the original differentiation (separation).
3. **Parametric design.** Environmental parameters and object parameters must be combined into a single parametric system.
4. **Parametric response.** The urban and architectural environment takes the opportunity to reshape and adapt in response to human action.
5. **Parametric urbanism**- deep relativity. Many buildings are interconnected according to certain laws of continuity. Structural changes in morphology have a strong impact on the urban environment and facilitate orientation in the region.

An almost perfect example of parametric architecture by Zaha Hadid Architects. Architect Karl Lagerfeld based his model of a bag with a large number of belts. Despite the complexity of the design, the pavilion can be assembled in just one month and completely disassembled in a few weeks [6] (see Figure 2).

also digitally controlled applications in the production of structural elements. Parametrics is only the continuous development and application of complex computational geometry. may be available via Ilish. Today, it is impossible to compete in modern architecture without mastering these methods [7].

The parametric architecture of entire cities, individual buildings, parametric interiors and the design of buildings are becoming more convenient for all professional architects and designers. After all, anyone can create the house or piece of

furniture of their dreams in a short time using parametric modeling.

The number of educational literature in this area is increasing and it is becoming more convenient for ordinary people interested in parametric architecture. *3D max, Quest3D Professional and more* a number of simulation programs are available, helps architects create parametric works.

With the help of a whole range of programs on parametric modeling, you can create simple (small interior items such as chairs or lamps) and complex (an entire residential building or even a city block) objects [8].

Books on parametric architecture provide an in-depth study of the concepts of “parametricism”, “parametric

architecture”, their role in modern architecture, and projects for the future.

The method of parametricism in Uzbekistan. There are not many project organizations in Uzbekistan that deal with parametric architecture. In general, in Uzbekistan, this architectural style is still less popular and is used mainly in small forms and facade elements. Examples include the Congress Hall building in 2019 at the Tashkent City International Business Center, the Humo Area Ice Palace in Tashkent, and the pedestrian mega-bridge at the intersection of Amir Temur and Galaba streets in Navoi. bridge structures can be cited (see Figures 3-5).



Figure 3. The building of the Congress Hall on the territory of the International Business Center "Tashkent city"



Figure 4. Humo Area Ice Palace in Tashkent



Figure 5. Construction of an underground mega-bridge for pedestrians in Navoi

The main problems faced by parametric architects are:

1. The customer is unaware of this style (they do not know what the parameters are).
2. Insufficient funding. The economic performance of such projects is high.
3. Difficulties in production. Not all construction organizations are ready for such a complex construction process.
4. The difficulty of learning a software product.

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CONCLUSION

There is a lot of debate about the creative side of the parametric design process. In many cases, this approach to architects seems too mathematical, and the traditional creative approach seems to be lacking. This is because the modeling process is largely automated. But digital design offers many options for a form with the same parameters, and the choice of the final result that best reflects the concept remains with the architects. In general, parametric architecture is a very specific modern approach. Of course, no machine can replace the mind and creative flight of a living person. However, their alliance is capable of yielding results, the significance of which we cannot yet imagine.

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