DEVELOPMENT PROSPECTS OF PARAMETRIC DESIGN IN UZBEKISTAN

Samidullo Elmurodov
Tashkent University of Architecture and Civil Engineering, Tashkent, Uzbekistan
samidullo1990@mail.ru
ORCID: 0009-0005-2351-8122
https://doi.org/10.5281/zenodo.10461033

ABSTRACT: This article examines the prospects for the development of parametric design in the architecture of Uzbekistan. Parametric design is one of the leading trends in modern architecture, and there are great opportunities for its dissemination in Uzbekistan. The study examined the current practical state of parametric design in Uzbekistan, identified the main problems and opportunities, and proposed strategies for its development. Data were collected through literature review, interviews with current industry experts, and case study analysis.

АННОТАЦИЯ: Данная сатья рассматревает перспективы развития параметрического проектирования в архитектуре Узбекистана. Параметрическое проектирование является одним из передовых направлений в современной архитектуре, и в Узбекистане осуществляются большие возможности для его распространения. В исследовании было изучено нынешнее практическое состояние параметрического проектирования в Узбекистане, выявлены основные проблемы и возможности, а так же предложены стратегии его развития. Данные были собраны посредством обзора литературы, интервью с экспертами текущей отрасли и анализа практических примеров.

KEYWORDS: *Architecture, Design Styles, Parametric Design, Design, Urban Planning, Project, Urban Environment, Landscaping.*

КЛЮЧЕВЫЕ СЛОВА: *Архитектура, Стили проектирования, Параметрическое проектирование, Дизайн, Градостроительство, Проект, Городская среда, Ландшафтный дизайн.*

INTRODUCTION. … In modern conditions of high competition among manufacturers, it is an urgent task to create a high-quality product at low cost and with low labor. One of the important stages of solving this problem is the introduction of modern information technologies in the enterprise, with the help of which it is possible to automate the design of products and implement the technological preparation of production [1].

Parametric design is a modern approach that combines computational tools and algorithms to create complex and flexible architectural and engineering solutions. This article aims to study the development prospects of parametric design in Uzbekistan, which has a developing construction industry and a rich architectural heritage. By examining the current state of parametric design practice, identifying challenges and opportunities, and proposing development strategies, this study seeks to contribute to the development of parametric design in Uzbekistan.

Modern architecture is increasingly using methods, techniques, tools and technologies that help turn buildings into interesting and attractive structures. One such method is the principle of parametricism, which was 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 in recent years and is now gaining a high tendency in architecture.

ANALYSIS OF THE RELEVANT LITERATURE. From the end of the 20th century, the emergence of new architectural styles such as deconstructivism, folding, parametricism was impossible without the emergence of a new design tool - computer and modern software tools. Computer technologies together with programming have given architects new design approaches, new possibilities and a different understanding of architectural form.

"Parametricism" is a style in modern avant-garde architecture that is promoted as a successor to post-modern architecture and modern architecture. The term was coined in 2008 by Zaha Hadid's architect partner (1950-2016) Patrick Schumacher [2].

It was these two architects who introduced a new and unusual trend to the world of architecture. The Guangzhou Opera House is the result of a collaboration between Zaha Hadid and Patrick Schumacher.

The word "parametric" itself mainly refers to the fields of mathematics, programming and modeling. Due to the use of parameters, high variability of the shape creation algorithm is achieved, in the case of parametric design, not every point of the surface is described, but the principle of shape construction is established [3].

This study used a mixed methods approach combining an extensive literature review with interviews with architects, engineers, and educators involved in design and construction in Uzbekistan. Case studies were also analyzed to provide real examples of parametric design in the country. The collected data were synthesized and analyzed to determine the current state, problems and opportunities of parametric design in Uzbekistan.

Two main advantages of parametric systems are:

1. The possibility of using such modeling for production purposes, for example: on a parametrically given curved surface, you can get a normal to each point (perpendicular to the surface), which is necessary, for example, for 3D milling of a product.

2. The form described by the parametric image allows to change the parameters of each separate part of the algorithm, working with the principles of the form, not with the form itself, which allows to make a big change in working with the project. Greater variability, in turn, leads to faster optimization capabilities.

Figure 1. "Tashkent city" Congress Hall, Tashkent.

Parametric method in Uzbekistan. There are not many project organizations involved in parametric architecture in Uzbekistan. In general, this architectural style is still not very popular in Uzbekistan, it is mainly used in small facade elements.

Examples of this are the Congress Hall building established in 2019 in the territory of the international business center "Tashkent city", the multi-purpose ice palace "Humo Area" in the city of Tashkent, and the underground mega-park for pedestrians built at the intersection of Amir Temur and Ghalaba streets in the city of Navoi. bridge constructions can be cited [4].

Figure 2. "Humo Area", Tashkent.

- Development of information technologies and digital design tools that allow creating complex parametric models of buildings and structures.
- application of the principles of sustainable development and environmental responsibility in architectural design, which helps to create energy-efficient and environmentally friendly buildings and structures.
- Cooperation with international architectural bureaus and experts with experience in the field of parametric design.
- Development and implementation of educational programs and courses on parametric design for architects, engineers and students of higher educational institutions with an architecture major in Uzbekistan.
- Participation in international architecture competitions and exhibitions, where parametric design is a relevant and popular field.

THE MAIN FINDINGS AND RESULTS. Lack of qualified specialists in the field of parametric design. Limited use of modern software and technologies. Inadequate funding for research and development in the field of parametric design. The difficulty of applying parametric design in practice due to the lack of experience and tradition in this field.

The emergence of new software and computing systems, powerful computing processors, allows to quickly and easily work with complex geometric models that make up the appearance of a parametric architectural object. The programs allow to solve the problems of calculating large data of buildings with complex geometry of parametric architecture [5].

There are several software tools commonly used in parametric design development. These tools provide the functionality needed to create and manipulate complex parametric models. Some of the main software tools used in parametric design are:

Although I do not have specific information about the current software tools used in the development of parametric design in Uzbekistan, I can provide you with a list of software tools that are widely used in the field of parametric design globally. Perhaps some of these tools are also used in Uzbekistan:

1. Grasshopper/Rhino: Grasshopper, a visual programming language, is often used in conjunction with Rhino 3D modeling software. Grasshopper allows you to create parametric designs by connecting different components and manipulating parameters.

2. AutoCAD: AutoCAD is a versatile CAD program that supports parametric modeling. It is widely used in various fields, including architecture and engineering, to create accurate and detailed parametric designs.

3. Revit: Revit is a building information modeling (BIM) program widely used in the architecture and construction industries. It offers parametric design capabilities that allow designers to create intelligent 3D models with relevant data.

4. Dynamo: Dynamo is a visual programming platform that integrates with programs like Revit and AutoCAD. It allows designers to create parametric designs and automate repetitive tasks through a visual scripting interface.

5. CATIA: CATIA is a comprehensive 3D modeling and design software commonly used in industries such as automotive and aerospace. It provides robust parametric modeling capabilities to create complex shapes and optimize designs.

6. SolidWorks: SolidWorks is a popular CAD software widely used in mechanical engineering and product design. It offers advanced parametric modeling tools to create accurate 3D models and perform engineering simulations.

It should be noted that the software tools used in parametric design may vary depending on the specific industry, project requirements, and individual preferences. It is useful to consult with local designers or conduct special market research in the region to get more accurate information about the software tools that are widely used in the development of parametric design in Uzbekistan.

CONCLUSION. The prospects for the development of parametric design in Uzbekistan are promising, but it is necessary to solve a number of problems. This can be achieved by investing in education and training, developing partnerships and creating an enabling environment. This article has developed several aspects and recommendations that can contribute to the growth and development of parametric design in Uzbekistan.

- The need to adapt parametric design to specific conditions of Uzbekistan.
- Lack of qualified specialists in this field.
- Lack of funds for the development of parametric design.
- Difficulty in introducing new technologies to the existing infrastructure.
- The need to adapt design methods to local conditions.

Thus, the authors of the article came to the conclusion that parametric design has a significant potential for the development of architecture and improving the quality of life of the population in Uzbekistan.

References:

1.Бабанин В.С. Параметричекое моделирование деталей и оперционных заготовок : Автореф. дис. канд. Технология приборостроения. наук. — Сант-Петербург, 2016. — 3 с.
2.What is Parametric Architecture or Parametric Design? [Elektron manba]. https://architecturalmedicine.com/ (so'ngi tashrif 07.11.2023)
3.Parametrik arxitektura - kelajak uslubi, [Elektron manba] https://archidom.ru/journal/arkhitektura/parametric-architecture-style-of-the-future/
4.Parametrizmning zamonaviy arxitekturadagi o'rni/ N.Sh.Xikmatullayeva, S.S.Elmurodov/ Namangan shahri 27-28 may 2022 yil/ 101-105 bet. (3-5 rasmlar).

5.Васильков Г.В. Теория адаптивной эволюции механических систем. Ростов-на-Дону: Терра-Принт, 2007. 248 с.
6.J Tajibaev, S Elmurodov, Z Matniyazov, D Mirdjalolov, D Shoumarova. “Methods of Studying the Architectural Style and Environment Formation in Creating Design-Code Rules of the City of Bukhara” \\ Journal of Architectural Design 13, 21-27, 2022.
7.ES Salimovich, JI Jonimqulovna. “BIM texnologiyasidan foydalanish va rivojlantirish.“renga” dasturi misolida” \\ Barqarorlik va yetakchi tadqiqotlar onlayn ilmiy jurnali 2 (8), 117-120.
8.SS Elmuradov, SD Abdukhabirovna, SU Ziyodullayevna, DU Olimovna. “Possibilities of application of parametric design in architectures” \\ Asia pacific journal of marketing & management review ISSN: 2319-2836 Impact …
9.S Elmurodov, Z Matniyazov, J Tajibaev, U Saidxonova, D Abdujabborova “Principles of Location of NonStationary Trade Objects in the Zoning Method” \\ Journal of Architectural Design 13, 14-20, 2022.
10.НС Буронов. “ТЕКУЩЕЕ СОСТОЯНИЕ BIM-ТЕХНОЛОГИЙ В ПРОЕКТИРОВАНИИ В УЗБЕКИСТАНЕ: АНАЛИЗ ОПЫТА ПРИМЕНЕНИЯ” \\ E Conference Zone, 18-25.
11.AA Saidov.“International Journal of Advanced Research in Science, Engineering and …, 2018” \\ The Planning Solution and Landscape Design of Courtyard Spaces in Multi-Storey Residential Buildings of Uzbekistan.
12.ZX Adilov, ZE Matniyazov, DM Tadjibaeva, JX Tadjibaev, SS Elmurodov. “Some Aspects of the Organization of "Corridors of Health" in the Historical Centers of the Cities of Uzbekistan” \\ European Journal of Life Safety and Stability (2660-9630) 16, 105-112, 2022
13.ZX Adilov, ZE Matniyazov, DM Tadjibaeva, JX Tadjibaev, SS Elmurodov. “Landscape design projects for 4r-173 call-mountain road side” \\ International Journal of Advanced Research in Science, Engineering and …, 2020.
14.SA Valieva, ZE Matniyazov. “Landscape Environment Of Recreational Spaces In Business Centers”. \\ Texas Journal of Multidisciplinary Studies 9, 213-221, 2022.