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THE INFLUENCE OF PARAMETRICS ON THE INTERIOR AND ITS EQUIPMENT IN PARAMETRIC BUILDINGS

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Abstract. The article highlights the issue of the emergence and formation of parametricism as a style in architecture and design. The features of the formation of the interior and its equipment in parametric buildings are considered. An analysis of the literature and various sources of research on parametricism is carried out. It is revealed that parametricism as a style has already been formed, although it is in a state of development and requires more active implementation in real design, as well as in the process of training a young architect. Developed computer technologies and programs for creating three-dimensional complex parametric forms are the basis and a unique opportunity for achievements in this direction. World practice shows that the parametric form of a building directly affects its internal environment, the interiors of the building, and subsequently the style of the interior, and its furniture and equipment. It is shown that parametric design opens up opportunities for creating unique architectural buildings, structures, and design objects that were previously impossible or very difficult to implement. Examples of existing buildings made in the parametric style using the latest design technologies are demonstrated. All models created by architects and designers using digital tools such as 3D modeling have certain features: length, width, depth, orientation and geometry. And design, in turn, is based on the relationship between functions, parts and drawings, and it is powered by imagination. 3D modeling tools such as: BIM (Building Information Modeling), CAD (Computer-Aided Design), Parametric Design, Augmented Reality (AR), Generative Design, and others are analyzed. The use of these computer programs and applications in the work of an architect allows for more accurate calculation of the parameters of elements and their interaction with the environment.

The demonstrated examples of existing interiors in the style of "parametric design" and furniture prove that when designing, computer technologies and the latest programs are used not only in architecture, but also in design. In addition, AI (artificial intelligence) is involved in the creation of the interior and its equipment, and this reality requires mastery and scientific understanding.

Keywords: parametricism, parametric design, interior, Parametric style, architecture, artificial intelligence (AI), Virtual Reality (VR), CAD, 3D modeling, innovative design.

Relevance of the study. Nowadays, the latest technologies in the field of programming have a significant impact on the architect and on the design process as a whole. Thanks to the use of software tools that involve algorithmic calculations for the generation of forms, forms are created that, given their complexity, would be impossible to reproduce manually. Such programs can be used to design buildings, cities, as well as furniture and other interior items. Another factor that adds a plus to the use of the latest technologies is the ability to use optimization algorithms that allow you to quickly and effectively find the optimal design parameters. Such programs can be used to optimize materials, solve problems in industry and many other areas. The use of innovative technologies provides effective and fast design, reduces the time for project development, and also allows you to create more complex and effective artificially developed structures. This, in turn, allows the design industry to increase its competitiveness and product quality. [1]

The problem is stated in general terms. In modern conditions, when the demand for the creation of parametric architecture has increased, when the customer becomes more affluent and wants to be in an individual modern and refined architectural environment. When he wants to surround himself with artificial furniture and interior items, the architect cannot help but respond to such a request. Moreover, parametric architecture is created with the help of non-standard structures. Mostly, the frame of parametric buildings uses curved, smooth individual structural elements and their nodes, which penetrate the internal environment of the building and thus affect the interiors of the building. The interior is also influenced by the enclosing structures, that is, the building shell or the outer wall. The windows in such a building also play an important role. They can be of different sizes, shapes, and have different inclinations, which in turn affects the interior and lighting in the interior.

Analysis of recent research and publications. Parametricism, as a method of three-dimensional modeling, was known in the early 90s of the next century and was later used in design activities, in the form of CAD of various classes, its general interpretation and further separation into an independent style in design and architecture occurred only two decades later. Despite the fact that this style is relatively young, it is studied by a large number of famous architects and young scientists.

Thesis by T. V. Bulgakova “Computer design of the object environment based on modeling of visual perception”. [2] In her work, the author offers methods for analyzing a three-dimensional model based on modeling of visual perception using computer technologies.

Another example is the dissertation by I. O. Kuznetsova “Modeling of visual perception of objects of design, decorative and applied and fine arts”. [3] In which the author explores the influence of science and technology in the aspect of systemic multifunctionality on the creation of a high-quality design model.

The article “Parametric Design in Architecture: Challenges and Opportunities” by Mohammadreza Pourjafar and Behzad Sarmast. The article examines the problems associated with the use of parametrics and proposes solutions to them. [4]

Thesis “Parametric Design in Architecture and Engineering”, by Anshuman Razdan. The author describes methods for parametric design - algorithmic design, generative design, parametric modeling and others. He identifies possible problems when using different methods and determines which one is best for use in a particular task. [5]

The scientific article “Parametricism – A New Global Style for Architecture and Urban Design” by Patrik Schumacher and Laura Yu. In it, the authors explore design and propose a new methodology based on parametricism as a new worldview in architecture and urban design. [6]

Purpose. The purpose of the work is to study parametric architecture, in particular public and residential buildings, to analyze the architectural style "parametricism". Analysis of the three-dimensional model and external aesthetics of parametric buildings and its impact on the interiors of these buildings. Also, the study of parametric design and the definition of the main features of the "parametric design" interior style.

Research objectives. The first task of the research was to analyze the historical experience of the emergence of the concept of parametric style. To identify the concept of “Parametric Design” in the interior. To understand the factors due to which parametric architecture affects the internal environment of the building and how the parametric forms of the structural parts of the building set the tone when designing interiors. The second task was to analyze software and the latest technologies of architectural design and their capabilities in creating non-standard forms of buildings, furniture and other interior items. The third task was to analyze the capabilities of artificial intelligence. What tasks can be solved using AI today.

Presentation of the main material. Parametric or algorithmic architecture has been successfully developing within the framework of avant-garde design for more than three decades, but

only recently has this trend begun to claim the role of a leading style - the style of the new "digital" era.

And it all started with the fact that the industrial society of mass consumption developed into a new community with a new way of life, with a new attitude to the image of life, to the choice of lifestyle and design objects in its environment. Advanced, flexible technologies in the field of design moved first from the aviation industry to the automotive industry, and then to architecture. And these changes fall on the 90s of the next century. All outstanding buildings of this period are united by the flexibility of architectural forms. [7] This transition affected not only architectural form formation. Changes in the work of the architect even affected the concept of "architecture". A new concept of "architectural design" is emerging. On the one hand, the designer and architect received a new tool for creating geometrically and structurally complex forms, on the other hand, he was faced with the need to master unconventional methods, such as writing scripts instead of a pencil.

Parametricism, as an architectural style, is unusual, combining mathematics, architecture and sculpture. It creates a complex unique model that is not subject to conventional constructive solutions.

The founder of parametricism is rightfully considered the British architect with Arab roots Zaha Hadid (1950-2016), who in the early 80s of the twentieth century. in her own studio began to create projects in a new unusual style. Zaha Hadid's first works in the parametric style were not accepted by either the architectural community or society as a whole. In 1980, she founded her own architectural bureau. In general, many of her works would have remained to gather dust on the shelves of the cabinets of her architectural bureau. But in 1988, the famous German architect and philosopher Patrick Schumacher joined Zaha Hadid's creative bureau. Schumacher and Hadid worked together for more than 30 years. These two architects were united by the use of parametric modeling in architectural planning and design. At Zaha Hadid, Patrick Schumacher was responsible for the implementation of complex forms and structures.

In 2008, Schumacher gave a talk at the 11th Venice Architecture Biennale. In the same year, he published the article "Parametricism – A New Global Style for Architecture and Urban Design", which was called the manifesto of parametricism. In the article, Patrick Schumacher proposed to consider the periods of deconstructivism and postmodernism as transitional, and to interpret parametricism as a wave of systematic innovation in architecture and design. [8]

As a conceptual definition, Patrick Schumacher offers the following formula: parametricism means that all architectural elements should be parametrically connected, thereby ensuring the flexibility of the entire system. Parameters, together with algorithmic methods of form formation, determine a fundamental ontological change within the basic, key elements, defining architectural style. Practically instead of the classical composition of ideal geometric figures instead of straight lines, rectangles, cubes, cylinders and pyramids, new elements are used - dynamic, adaptive, changing geometric objects of parametricism.

Thanks to the hard work of this genius and his ability to use the latest computer technologies in his work, many projects of the Hadid bureau have received a real embodiment. Mathematical analysis, algorithm formulas, programming and computerization gave impetus to the implementation of currently existing buildings and structures designed by the architects of the Zaha Hadid bureau. [9]

Only many years later, the bureau became known to the whole world thanks to the bold and innovative projects of its owner. Here are some of the most famous: the aquatics center in London (Fig. 1); the Sky SOHO center in Shanghai, 2014 (Fig. 2); Leeza SOHO, also known as the “Lee Za Tower” with the world’s tallest atrium (Fig. 3).

Fig. 1. Aquatics Center in London, 2011

Pic. 2. Sky SOHO Center in Shanghai, 2014

Fig. 3. Leeza SOHO, also known as "Lee Za Tower"

This style was only possible for architects and designers through the use of digital technologies. Parametric modeling was the basis for the development of CAD systems in the early stages, but at first it could not be implemented due to insufficient computer performance.

One of the ways to create a parametric geometric model is parametric design (Parametric Design), focused on determining the parameters of objects, and not their shape as such, and, accordingly, the use of various types of relationships between the elements of the object model. These relationships are the basis "... for parallel design work and allow specifying the ultimate goal of design at the early stages of project implementation". [8]

Thanks to the development of the latest software in the field of programming and the creation of computer programs for design and modeling, parametric design has become available to many architects and designers. When creating parametric architecture, architects use new modern computer programs. They allow not only parametric modeling, but also to develop mathematical algorithms that allow finding the optimal solution to the problem in automatic mode, expanding the possibilities for creating complex forms and structures. In the process of communicating with the customer, the architect or designer seeks to take into account and even anticipate the client's wishes and create an object that has multifunctional properties. Preference is given to projects that are not only aesthetic and exclusive, but also economical and practical. [10]

Modern architecture, which develops and is formed in the post-industrial era, is characterized by an endless process of creating new and new types of architectural objects. And modern architects focus on creating a functionally unique object. [8]

The external aesthetics of the parametric building could not but affect the interiors. Smooth curved lines enveloping the building penetrate inside and affect its structures and not only. Ceilings and walls cease to be perpendicular and seem to flow into each other. Thanks to these elements in the interior and decor of both residential and public spaces, unusual solutions appear that amaze others with their incredible appearance.

The process of creating an interior is quite long in time, but using modeling and parametric graphics, designers quite successfully adapt unusual interior solutions to the needs of users, that is, people. The interior becomes more large-scale, without straight and sharp corners, environmentally friendly and convenient to use.

Parametric design, as well as parametric architecture, is understood as nonlinear computer modeling - an approach characterized by geometrically irregular figures and fractal forms, that is, those that give out or resemble natural formations. [11, p. 35]

In modern architecture today, you can see many examples of parametricism in the interior of various public buildings and structures. Here are some of them: The Henderson - a 36-story skyscraper in China (Fig. 4); OPPO Headquarters, Shenzhen, China (Fig. 5); Daxing Airport, Beijing, China (Fig. 6).

Fig. 4. The Henderson — a 36-story skyscraper in China. Architect Zaha Hadid

Fig. 5. OPPO Headquarters, Shenzhen, China. Architect Zaha Hadid

Fig. 6. Daxing Airport, Beijing, China, 2019. Architect Zaha Hadid

The examples show that most of the design work is aimed at shopping malls, museums, airports, theaters and other commercial buildings. This only says that parametricism is used in large-scale buildings and structures. In large-scale projects, parametricism can manifest itself very advantageously and monumentally, at the same time gracefully and easily.

It can be concluded that the formation of a public interior thanks to parametric design occurs in three ways: the public interior space either corresponds to the architectural formation, or changes its internal component, or is a separate element of the subject environment. The first option implies that the space is already unique, because it is in a parametric building and cannot be similar to a “cube”. The walls in such a room are not parallel and can flow into the ceiling and floor. Therefore, the appearance of the interior dictates a nonlinear approach to the creation of the subject environment, furniture. The second way of forming is to change the static internal space of the building. This could be, for example, a pattern on the ceiling like a “fabric” or creating a wave with seemingly endless textural lines. Such elements unite the interior space and set a general compositional background. The third method involves a separate element of the interior. These could be furniture and decorative items in the parametric style, which become accents in the interior and give it a sense of modernity. [12]

Parametricism is a style that requires space and a certain scope, which is why parametric architecture in the interior of a private home is progressing more slowly. However, it is the design of the interior in the parametric style that allows it to be calmer, smoother and less brutal than the High-tech or Grunge styles.

Designers often use the parametric style in the decoration of walls, ceilings, as well as furniture and decorative elements in their work on the interior, which leads to the fact that the interior and its

elements become artificial and not mass-produced. In addition, the parametric interior style uses natural materials - stone, wood, metal, which in turn cause a person to feel comfortable and cozy. Decor and furniture in the parametric style have an amazing look on the one hand, and on the other hand, they are safe to use, because they do not have sharp corners. Ceilings flow into walls, which in turn are imperceptibly connected to the floor. The premises do not have right angles, which is environmentally friendly for humans. As for the color scheme, parametricism uses calm and mostly classic colors (white, ivory, gray, various shades of wood). We can say that parametricism is a very practical and multifunctional style. By the way, the famous architect Zaha Hadid did not stop only at buildings and structures in her work on designing large-scale urban development projects. In addition to large forms, Zaha Hadid created various installations. She worked on theatrical scenery, exhibition and stage spaces. Or she designed interiors – like at the Moonzun restaurant in Sapporo (Fig. 7).

Fig. 7. Moondzun Restaurant, interior, Sapporo, Zaha Hadid

She created furniture collections, several examples of her work in this indirect way: Furniture collection “UltraStellar Three Seat Bench” - Zaha Hadid Office (Pic. 8); Kitchen “Z.Island”, Milan, Italy, 2006 (Pic. 9); Futuristic installation presented at the Venice Art Biennale (Pic. 10).

Fig. 8. Furniture collection “UltraStellar Three Seat Bench”-Zaha Hadid Office

Fig. 9. Kitchen “Z.Island”, Milan, Italy, 2006

Fig. 10. Futuristic installation, (Venice Art Biennale), June 2007.

The Parametric interior design style or “Parametric design” is a relatively new and impressive trend in modern design.

The name of the Parametric interior design style comes from the word “parameter”, which indicates the use of certain variables to create and modify shapes and structures. In this style, designers use algorithms and computer programs to generate complex, often organic shapes that can change depending on various parameters. This approach allows you to create unique, innovative and dynamic interior elements.

The main features of the Parametric style include:

First - Geometric shapes: The design uses complex geometric shapes, such as curves, hyperbolic surfaces, fractals, etc. These shapes can be well-known or abstract, but they often impress with their complexity and originality.

Second - Digital design: Parametric design is often based on the use of computer programs and algorithms to create and model shapes. This allows designers to create complex structures and visualizations that would be difficult or impossible to create manually.

Third - Materials and Construction: Parametric design can use a variety of materials, such as metal, glass, plastic, which are capable of creating complex shapes. In addition, the style can use advanced manufacturing technologies, such as 3D printing or CNC milling.

Fourth - Innovative solutions: Parametric design promotes the development of innovative and experimental approaches to creating forms and structures. This may include the use of new materials, technologies, or construction methods.

Fifth - Uniqueness: The main feature of parametric design is its uniqueness and individuality. Each project can be unique and specific to its context or function, which adds aesthetic and technological interest to it. [13]

Parametric design is characterized by flowing, curvilinear forms that often resemble natural structures, such as waves, shells, or grids. This style also reflects a tendency towards personalization and adaptability, where the interior can be customized to the specific needs and desires of the user. Overall, the Parametric style reflects an innovative approach to design that combines architectural form with advanced technologies and digital methods of creation. Examples of interiors in the Parametric style: DZ Bank Building, Berlin, Germany, Frank O. Gehry (Fig. 11); the Mitzeil shopping center in the center of Frankfurt am Main, Germany, designed by the Roman architect Massimiliano Fuksas, (Fig. 12); Guggenheim Museum in Bilbao, Spain, Frank O. Gehry (Fig. 13).

Fig. 11. DZ Bank Building, Frank O. Gehry, Berlin, Germany

Fig. 12. Shopping Center "Mitzeil", Frankfurt am Main, Germany, Massimiliano Fuksas

Fig.. 13. Guggenheim Museum in Bilbao, Spain, Frank O. Gehry

That is, here we can argue that architectural objects created in the style of parametricism are closely related and directly affect the internal environment of the building and its interiors in particular.

The International Federation of Architects and Interior Designers states that “interior designers determine people’s attitude to space based on psychological and physical parameters that improve the quality of life.” The concept of virtual research allows interior designers to work on individual nodes of the project within the framework of a network of relationships that changes space and time. As Christina Heck notes, modern design methods are based on symbolic, linguistic and visual interaction. [14]

The Calvin program allows the designer, in addition to visualizations, to create a lot of numerous perspective plans at once. Interior designers can design their object in a virtual environment without creating its paper models at a certain scale. This gives the designer the opportunity to try out different options in color, texture, materials, and so on. Analyze all of them in detail and choose the optimal one.

The space created by the architect-designer is tied to the external environment, able to respond to natural changes. Climatic zones are taken into account, energy flows, wind loads, and daily temperature changes are regulated. The complex process of virtual interior design is based on architectonics, helps adapt the design form to the structural scheme, determines the budget and deadlines for the project. In practice, all data received from the designer, designers, and associates are embedded in a 3D model, on the basis of which the preparation of working documentation and the compilation of specifications continue. [15]

The world of design has changed with the development of technology, and an example of this is the global database, which today stores millions of ideas from thousands of designers around the world.

According to the new software developers, the global database will generate and store all possible visual forms and their corresponding data on a cloud-based global platform that will be accessible online. [16]

One such platform is the public platform “Parametricism”, a digital toolkit for the development of parametricism. It is curated by Daniela Gertovici (Chicago), Patrick Schumacher (London) and Lars van Vianen (Amsterdam). The platform contains cutting-edge research and projects to

communicate the latest advances in architecture and design with computational capabilities, acting as a “neural network” of positions and new directions related to parametricism. [17]

All models created by architects and designers using digital tools such as 3D modeling have certain features. These are described as length, width, depth, orientation and geometry. Design is based on the relationship between functions, parts and patterns, and it is fueled by imagination. Today, design and architectural offices, engineers and designers use various technologies and innovative programs to design objects.

Some of the most popular technologies and applications include:

1. BIM (Building Information Modeling) is a software that allows the creation of 3D models of buildings and the exchange of information between different participants in the construction process.

2. CAD (Computer-Aided Design) is a software that allows the creation of 2D and 3D models of buildings, including design and construction.

3. Parametric Design is a design methodology that uses parametric models to create dynamic and changing objects. [18]

4. Augmented Reality (AR) is a technology that allows the visualization of buildings and projects at a real scale.

5. Virtual Reality (VR) is a technology that creates interactive visualizations of buildings and projects.

6. Generative Design is a design method that uses algorithms and artificial intelligence to generate a wide range of possible designs based on input parameters and constraints. [19]

7. 3D Printing is a technology that allows you to create physical objects using 3D printers.

The use of computer programs in the work of an architect allows for more accurate calculation of the parameters of elements and their interaction with the environment. These programs, in turn, allow the designer and visualizer to visualize projects, which allows for a more accurate assessment of their effectiveness and aesthetics. But programmers do not stand still. In addition to the fact that working programs are improved every year, new plug-ins are created for them, new programs are created, IT specialists have gone further. We were offered AI. Now artificial intelligence is rapidly gaining momentum and it has not left the sphere of architecture and design out of sight.

By adding artificial intelligence (AI) to an architectural project, many complex tasks can be solved, including:

1. Optimize space - AI will solve complex space optimization tasks, help reduce construction and maintenance costs.

2. Increase user comfort and safety: AI will automatically adjust the microclimate in the building, taking into account the individual needs of the user, identify potential threats and make recommendations for their prevention.

3. Optimize the energy efficiency of the building: AI will calculate the energy efficiency of the building, as well as predict future energy consumption.

4. Analysis and prediction: AI will predict and analyze various factors affecting the architectural project, such as climate change, real estate market dynamics, etc.

This is the technical side of the application of artificial intelligence. Also, the addition of AI can improve the aesthetics and compliance with the style in the architectural project and environment through a number of functions. For example, artificial intelligence can help analyze information about stylistic and design requirements, using deep learning and analytical algorithms to ensure that the project meets these requirements. In addition, artificial intelligence can be used to create graphic images, 3D models and renderings, which allows designers to work more effectively with spatial forms and building geometry. [20]

Here, for example, interiors are created using Midjourney artificial intelligence (Fig. 14). The program is built with the necessary description of the room, for example: the dimensions of

the room, its purpose, style, colors, textures, materials, the amount and quality of lighting, and so on. And the larger and better this description, the more high-quality and attractive the visualization. At the output, the designer gets not only a beautiful picture, but also time savings on visualization and a satisfied customer.

Fig. 14. Interiors created by the artificial intelligence product Midjourney

Therefore, it is necessary to ensure a harmonious combination of all parameters - aesthetics, style, the latest technologies and functionality. And this already requires great attention to detail and high qualifications of specialists, but the use of modern technologies, such as artificial intelligence and computer programs, can significantly simplify the process and help achieve optimal results.

Conclusions. Studies of parametric architecture, in particular public and residential buildings, have shown that this style is unique. Buildings created in the parametric style are attractive and user-friendly.

Analysis of the architectural style "parametricism" has shown that parametric design, as well as parametric architecture, refers to nonlinear computer-generated form - an approach characterized by geometrically irregular shapes and fractal forms, i.e. those that give or resemble natural forms.

Analysis of the three-dimensional model made it clear that the formation of these models is impossible without the use of the latest technologies and new software such as: BIM technologies; CAD (Computer-Aided Design); Parametric Design; Augmented Reality (AR); Generative Design; 3D Printing, and others.

It was concluded that the formation of public interior through parametric design occurs in three ways: public interior space either corresponds to architectural formation, or changes its internal component, or is a separate element of the subject environment.

The study of the architectural style of parametricism has proven that in modern design there is an interior style "Parametrics" or "Parametric Design", which has its own personal features, namely: complex geometric shapes; digital design; materials and construction; innovative solutions; uniqueness. Also, "Parametric Design" is characterized by smooth, curvilinear forms that often resemble natural structures such as waves, shells or grids.

Analysis of the use of artificial intelligence in design has shown the possibility of solving many complex problems, including: optimizing space; increasing user comfort and safety; optimizing the energy efficiency of the building; analysis and prediction. And most importantly, the possibility of involving AI in design at the stage of creating graphic images, 3D models and rendering, which allows designers to work more effectively with spatial forms and geometry of buildings.

Prospects for further research. Methods and methods of forming design objects in parametric design are practically unlimited and operate at all stages of their creation. The solution to the problem of developing such objects in the future lies in the plane of parametric design, based on the creation of a mathematical model that allows you to make changes to the parameters of objects and the relationship between them, a general algorithm that is a basic template. Parametric design requires new design thinking, an in-depth understanding of VR and perfect knowledge of computer programs, which allows you to reflect in a single model all the changes that occur in the design process, relating to geometry, function, color scheme, etc. That is, in the future there is a prospect of studying various computer programs, their capabilities in forming forms, and so on. And lastly, if AI pays attention to parametric buildings and other design objects, we must investigate the influence of artificial intelligence on the creation of parametric architecture and design.

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ВПЛИВ ПАРАМЕТРИКИ НА ІНТЕР'ЄР ТА ЙОГО ОБЛАДНАННЯ В ПАРАМЕТРИЧНИХ БУДІВЛЯХ.

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Анотація. У статті висвітлено питання виникнення і становлення параметризма як стиля в архітектурі та в дизайні. Розглянуті особливості формування інтер'єру та його обладнання в параметричних будівлях. Проведено аналіз літератури і різних джерел дослідження параметризма. Виявлено що параметризм як стиль вже сформувався, хоча перебуває в стані розвитку і потребує більш активного впровадження в реальне проектування, а також у процес підготовки молодого архітектора. Розвинуті комп'ютерні технології і програми для створення тривимірних складних параметричних форм є основою і унікальною можливістю для досягнень в цьому напрямку. Світова практика свідчить, що параметрична форма будівлі безпосередньо впливає на її внутрішнє середовище, на інтер'єри будівлі, а також в подальшому на стиль інтер'єру, та його меблі та обладнання. Показано, що параметричний дизайн відкриває можливості для створення унікальних архітектурних будівель, споруд, та об'єктів дизайну, які раніше були неможливими або дуже складними для виконання. Продемонстровано приклади існуючих будівель, виконаних в стилі параметрики з використанням новітніх технологій проектування. Всі моделі, створені архітекторами та дизайнерами за допомогою цифрових інструментів, таких як 3D моделювання, мають певні особливості: довжина, ширина, глибина, орієнтація та геометрія. А дизайн, в свою чергу, базується на взаємозв'язку між функціями, частинами та малюнками, і він живиться уявою. Проаналізовано засоби 3D моделювання такі як: BIM (Building Information Modeling), CAD (Computer-Aided Design), Parametric Design, Augmented Reality (AR), Generative Design, та інші. Використання в роботі архітектора цих комп'ютерних програм та додатків дозволяє точніше розраховувати параметри елементів та їх взаємодію з оточуючим середовищем.

Продемонстровані приклади існуючих інтер'єрів в стилістиці «параметричного дизайну» і меблів, доводить що при проектуванні комп'ютерні технології і новітні програми використовуються не тільки в архітектурі, а і в дизайні. Окрім того в створення інтер'єру і його обладнання залучають ШІ (штучний інтелект), й ця реальність вимагає свого опанування та наукового осмислення.

Ключові слова: параметризм, параметричний дизайн, інтер'єр, стиль «Параметрика», архітектура, штучний інтелект (ШІ), Virtual Reality (VR), CAD, 3D моделювання, інноваційний дизайн.