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ARCHITECTURAL FORMATION: THE IMPERFECT STRUCTURAL STABILITY AND PERFECT INSTABILITY OF THE CREATION'S LANGUAGE

FORMOWANIE ARCHITEKTURY: NIEDOSKONAŁA STRUKTURALNA STABILNOŚĆ A DOSKONAŁA NIESTABILNOŚĆ JĘZYKA KREACJI

Abstract

According to the classical theory of architecture, form is an expression of visual, mathematical and social values, being the canonical criteria of evaluation of the aesthetics, logic and ethics. Digital technologies have revolutionized the creation of architectural forms, thanks to the introducing of time and information factors to the design process. The present forms of digital architecture are presented in the aspect of structural stability of the creation's language – from the indistinctness of intuitive-colloquial thinking (imperfect structural stability) to the precision of rational thinking (perfect structural instability). Digital forms partly derive from the classical criteria of the spatial structures' interpretation. Do such notions as beauty or ugliness, truth or falseness, good or bad, used in the description of the architectural form in the creative process, mean something today?

Keywords: digital architecture, intelligent form, evolving form, liberated form, imaginative rationality

Streszczenie

Zgodnie z klasyczną teorią architektury forma jest ekspresją wizualnych, matematycznych oraz społecznych wartości, należących do kanonu kryteriów wartościowania z zakresu estetyki, logiki oraz etyki. Technologie digitalne zrewolucjonizowały kreację form architektonicznych dzięki wprowadzeniu czynnika czasu i informacji do procesu projektowania. Współczesne formy architektury digitalnej przedstawiono w aspekcie strukturalnej stabilności języka kreacji – od nieostrości myślenia intuicyjno-potocznego (niedoskonała strukturalna stabilność) do precyzji myślenia racjonalnego (doskonała strukturalna niestabilność). Digitalne formy wymykają się częściowo klasycznym kryteriom interpretacji struktur przestrzennych. Czy takie pojęcia jak piękno lub brzydota, prawda lub fałsz, dobro lub zło, użyte w opisie formy architektonicznej w procesie twórczym, coś dzisiaj znaczą?

Słowa kluczowe: architektura digitalna, forma inteligentna, forma ewoluująca, forma wyzwolona, racjonalność imaginatywna

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1. Introduction

Contemporary architecture follows cultural and technological changes, seeking inspiration in the aesthetics of beyond-modernism, the virtual world of pop-culture, the Internet and video games. Architectural design, supported by the dynamic progress of information technology (*hardware* and *software*), faces the great opportunities as well as risks. The chance is the possibility of projection of almost every most intricate structure in its multidimensional complexity during the design process, controlling simultaneously its structural elements' work and optimization of matter-energy-parameters. Regarding risks, we can point to the dominance of design tools over the creator's imagination.

Digital technologies, though they are connected with risks, are fascinating tools for architects, opening new fields of creative explorations. But it is important to remember their defects to not limit human imagination to the requirements of the poor computer programs. Architects should put pressure on the programs' creators to invent simpler tools, free from excess procedures and algorithms, and more intuitive software, which would be able to approach the phenomenon of the creativeness of the human mind. Architectural programs, in their present versions, can be used rather to verify the possible states of formation of spatial structures based on different modifying functions than to create (formation vs. transformation[1]). The possibility of generating many variants of architectural forms, using the modifying functions of computer programs, raises the basic questions: whether the use of CAD program tools is a sign of extension of the exploration's field in architecture or its limitation, and whether the sequence of modified forms, using computer programs, is the architect-author's expression or an effect of creativity of the collective mind of all the creators – from architects to programmers?

In the design of digital architectural forms, there is also other important problem connected with the necessity of choice of a distinct variant from the sequences of transformed spatial structures. Digital form, going through the different phases of evolution, by using the computer modification's tools, becomes an indistinct form in regard to its content and shape as well, therefore it is difficult to evaluate its meaning. The present forms of digital architecture do not provide information about their own inner functions, and also – they, as the multi-threads, versatile and metamorphic structures, adapt themselves to any context, ways of using or interpretation.

The process of creation and interpretation of the meaning of current architectural experiments, in relation to the indetermination and variability of digital forms, requires the criteria of evaluation to be re-defined. Forms of digital architecture draw partly from the classical criteria of creation and the interpretation of spatial structures. It makes it necessary to verify the topicality of the axioms from the range of the aesthetics, logic and the ethics, used in the process of creation. But first, one should define process of conceptualization of architectural form and creative language in the aspect of its structural stability, and also – distinguish and

[1] A. Kwiatkowska, *Trans-formation in the Age of Virtuality*, [in:] R. Kronenburg (ed.) *Transportable Environments 2*, p. 32–41, Spon Press, London 2003; G. Rand, *Morphosis: 'Formation' – 'In Formation' – 'Information'*, [in:] : *Morphosis – Buildings and Projects*, Rizzoli International Publ., New York 1989.

order the types of spatial structures which determine the available repertoire of forms in digital architecture. Then it will be possible to give the answer to the question, according to what criteria can one evaluate the architectural forms coming into existence in virtual reality?

2. Process of conceptualization of the architectural form

The creation of the architectural form is based on the coexistence of the antithetic, and complementary at the same time, ways of expression and definition of the spatial structures in the design process. This process can be described as a conceptualization of architectural form based on creative intuition (ignorance and imagination) and rational thinking (knowledge and comprehension)[2]. The origin of creative intuition is metaphorical thinking based on spontaneous and unordered abstractions and verbal associations[3], often being the results of a beyond-verbal state of mind, expressing itself in the form of images or emotions, in effect, leading to the specific revelation of architectural form in the process of creation.

Intuitive sources of the architectural form are connected with a subconscious metaphoric way of thinking, which determines not only our language of communication, interpretation and perception of the world, but it also influences the way of its feeling, experiencing and abilities to create new worlds. Metaphors *have the power of creation of the new reality*[4] and *they give the structure to relations between form and content*[5]. They allow the architectural creation to be experienced as the process of projection of the unconscious or conscious intentions or images on language of the architectural forms. The intuitive thinking, in its nature, is subjective, because it is connected with the perception of the world by the individual human mind. In this sense, it is determined by the personal experiences of individuals, their identities, sensibilities and imaginations, and by the cultural context of their lives as well. This last factor influences the specific limitations of intuitive thinking. Although we can create new metaphors, we are affected by already existing metaphors, which determine our way of thinking. New metaphors, being the origins of the intuitive architectural forms, rather continue or extend the existing meanings than create completely new ones.

The origin of rational thinking is the logic and aspiration of every man to understand the perceived reality (*sapere vedere* – to know, how to perceive to understand). Rationalism is based on the knowledge and the cause and effect method of thinking, which means it leads to objectivity in the ways of expressing opinions and interpretations of events. For the creators, it means the need for a conscious search for information and its logical analysis according to scientific standards and essential precision of language in descriptions of these events. The limitations of rational thinking are connected with traps of logic and reduction of reality to

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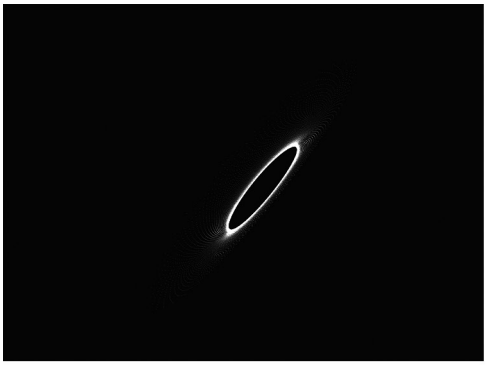
[2] A. Kwiatkowska, *Mind-games: Innovative architectural design in the digital age*, Proceedings of 2007 International Conference on Architectural Education, p. 278–283, China Architecture and Building Press, Bejing 2007.

[3] P. Ricoeur, *Teoria interpretacji: dyskurs i nadwyżka znaczenia*, PIW, Warszawa 1989.

[4] M. Johnson, G. Lakoff, *Metafory w naszym życiu*, Wydawnictwo Aletheia, Warszawa 2010, p. 197.

[5] *Ibidem*, p. 187.



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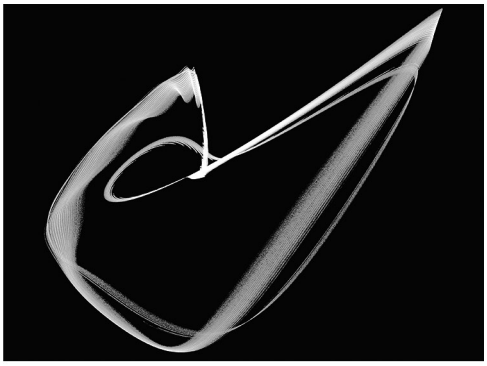

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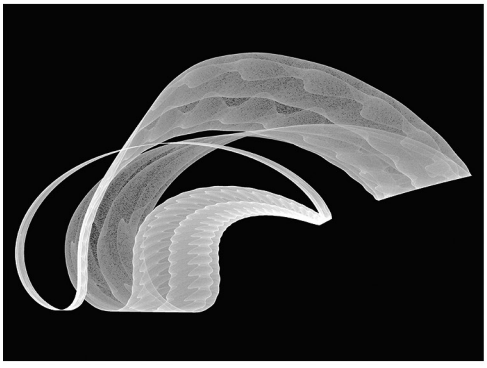

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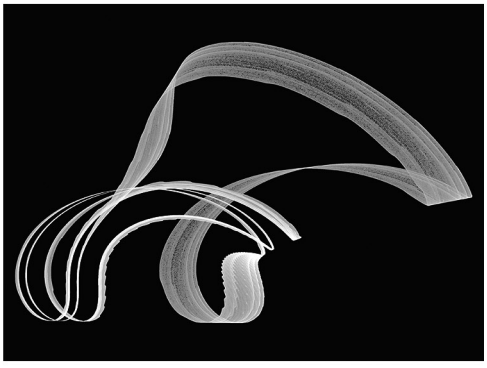

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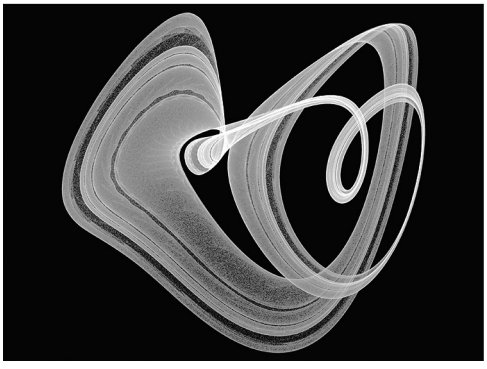

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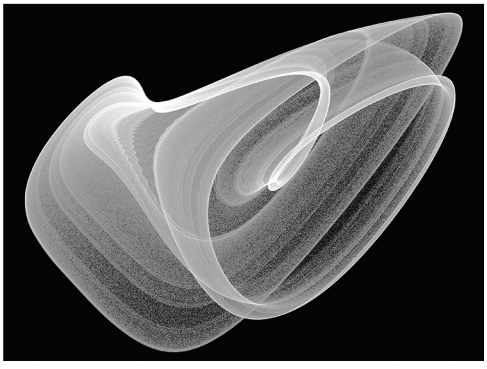

the specific analytic procedure, although it allows for deeper understanding of the perceived or created reality, it completely controls the process of creation by subordinating it to logical thinking. The need to use precise language of definition and description of events, which is a necessary condition of verification of the correctness of decision making, is the next trap of rational thinking.

In the analysis of the myths of objectivity and subjectivity, George Lakoff and Mark Johnson in their book entitled *Metaphors We Live By* notice, that "to be objective means to be rational" and "to be subjective means to be irrational"[6]. According to them, objectivity strengthens such values as "abstraction, universalism and impersonality"[7]; however, it happens at the cost of the uniqueness of human imagination, while subjectivity can lead to unreliability and loss of contact with reality. The authors define the concept of a bridge, connecting both worlds. This bridge is just metaphorical thinking in the meaning of imaginative rationality, linking *categorization, implication and drawing conclusions* (rational mind) with *seeing something in a category of something else* (intuitive mind and imagination)[8]. However, in the case of acceptance of this idea as the answer to specific dualism of the choice (either-or) between rational and intuitive thinking in creation of the architectural form, it is necessary to analyse the similarities and differences of both languages of creation, to be able to define the features of unified language, being the expression of the imaginative rationality.

3. Language of creation and its structural stability

According to the classical theory of architecture, the architectural form is an expression of visual (e.g. appearance, shape, beauty, elegance, impression), mathematical (e.g. proportions, numbers, measure) and social values (e.g. social approval, cognition)[9]. This means that the architect must operate both intuitive and rational criteria of evaluation, which allow definite design decisions to be made in the process of creating a form. The language of the architectural form's creation is characterized by the indistinctness of the intuitive-colloquial thinking on the one hand, and on the other – the precision of the rational thinking. However, there are also deeper differences between both types of thinking hidden in the structure of language and related to its structural stability. These differences have great influence on the initial assumptions, making the decisions in the process of shaping the architectural form and its evaluation.

The creation of the architectural form is a dynamic process. According to the theory formulated by Aleksandr Andronov and Lev Potryagin, relating to dynamic systems, there

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[6] *Ibidem*, p. 246.
[7] M. Johnson, G. Lakoff, *Metafory w naszym życiu*, *op.cit.,* p. 247.
[8] *Ibidem*, p.251.
[9] Witruwiusz, *O architekturze ksiąg dziesięć*, Prószyński i S-ka, Warszawa 1999.

Ill. 1.–6. Sequence of digital forms: intuitive creation of 3D-forms based on rational algorithms of computer program (author: Ada Kwiatkowska and freeware program: Chaoscope 0.3.1)

are two general states – systems with stable and unstable structures[10]. The stable system is one which does not change its own properties as a consequence of small changes, while the structurally unstable system changes its sense after the appearance of a small disorder. Bartosz Brożek, in the book *Limits of interpretation*, points out that the mathematical-logical language, in opposition to the colloquial language of communication, is characterized by the structural instability, because the alteration of the order of components changes its computational or logic value and the sense of the message. While the colloquial language of communication is characterized by structural stability, because the disturbances and small changes of components have no important influence on the general sense of the message[11].

In this meaning, the intuitive-colloquial language of creation of architectural forms is structurally stable and is characterized by a wide range of possible changes thanks of its "indistinctness, openness and ambiguities"[12]. However, the efficiency of these changes is only assured when the indistinctness and ambiguity of the thinking are limited and embedded in certain frames. The rational language of creation is structurally unstable; it requires rigorous rules of its usage to be able to examine the sense of changes. These rules should be accepted before activation of the process of creation, otherwise alteration of the logical rules can destabilize the whole creative process and subvert its sense. This means intuitive-colloquial thinking is closer to coming after an essence of form based on ambiguous notions, while rational thinking – coming after the truth about the form. However, both ways of thinking can lead the creator to a dead end, when they lack restrictive frames, like in the case of intuitive-colloquial thinking (the trap of openness), or they are subordinated to the rigorousness of rationalism, in which the tools of logical thinking cover up the truth about the essence of form (the trap of logic). These traps do not disappear by combination of both languages in the concept of a unified language of creation, so-called imaginative rationality.

To take a good look of the language of creation, it is necessary to show the creative process from the perspective of the final result, which means to present and analyse the different kinds of forms of digital architecture which come into existence during this process. It allows the manners of thinking and criteria of evaluation to be explored and could accompany the creative process, and to understand spatial consequences of the choice of a certain language of creation for shaping the architectural forms.

4. Repertoire of digital forms and the language of creation

Digital forms are the expressions of spatial structures in the virtual world, which came into existence based on the internal algorithms of 3D CAD (computer aided design) architectural software. These forms result from use of the tools and functions of computer programs, the application of definite scripts or ready-made forms from the internal libraries of CAD software. Most of the concepts of digital architecture function as spatial visions published

[10] B. Brożek, *Granice interpretacji*, Copernicus Center Press, Kraków 2014, p. 44.
[11] *Ibidem*, p. 43–49.
[12] *Ibidem*, p. 47.

in architectural periodicals and books, only some of them are materialized in the real world. This unfavourable proportion of architectural visions in relation to the built objects results from the overproduction of digital forms in virtual space thanks to the unlimited possibilities of transformation of the spatial structures by using the architectural software. The diffusion of virtual reality and real world causes digital spatial visions to become a significant phenomenon in architecture, which influences the thinking, imagination and consciousness of architects. The achievements of digital architecture should be in the range of interests of architects and researchers, especially in the context of the analysis of the creative process, because they are not only visual notations of architectural ideas, but also the evidences of process of creating forms.

The short history of architectural forms' development, analysed in the sequence of events from formation, through information to transformation[13], allows the moment in which digital architecture can be found today to be observed – between the phases of information and transformation. The way in which information is used to generate digital forms means exploitation of its interactive potential in the creation of informed or intelligent forms. Transformation means the possibility of conversion and evolution of digital forms through interference in their genetic forms or possibility of simulation of infinite and unlimited form sequences in the topological space through the utilization of the different codes and algorithms of architectural programs (ill.1–6). It is possible to distinguish three main groups of spatial visions of digital architecture, such as: intelligent, evolving and liberated forms (e.g. competitions of digital architecture – International Digital Architectural Design Award[14], exhibitions of the experimental architecture – ArchiLAB 's[15]).

Intelligent forms are modelled on mechanical structures and computational intelligence. They are characterized by machine learning and algorithmic intelligence, being the result of information management thanks to the use of different computational models. Intelligent forms are defined by three basic parameters: initiator (the starting form), generator (the set of copies and mutations of starting form) and the rule (the algorithm ordering the structural elements of the starting form). Examples of intelligent forms are so-called generative or parametric forms, which come into existence in the way of mutations of the inner codes of spatial structures by using the mathematical operations of combinatorics or after initiating the modifiers of the algorithm of the starting form (e.g. the Data-Driven Forms, arch. M. Novak[16], Mass diversity, arch. Michel da Costa Goncalves, Strip Morphologies, arch. Daniel Coll & Capdevila, HeliXHeXa, arch. Paula Tomisaki[17]).

Intelligent forms refer to the rational thinking in regard to the information code and mathematical rules at their origins. Intelligent forms are only the expressions of rules of the inner

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[13] A. Kwiatkowska, *Trans-formation in the Age of Virtuality*, *op.cit.,* p. 32–41.

[14] Y. T. Liu (ed.), *Distinguishing Digital Architecture: 6th Far Eastern International Digital Architectural Design Award*, Birkhäuser, Basel 2007.

[15] M. A. Brayer, F. Migayrou (eds), *ArchiLab – Radical Experiments in Global Architecture*, Thames & Hudson, Orléans 2001.

[16] M. Novak, *Transmitting architecture: transTerraFirma/TidsvagNoll v2.0*, Architectural Design, no. 118, p. 43–47, London 1995.

[17] Y. T. Liu (ed.), *Distinguishing Digital Architecture*, *op.cit.*

algorithms' activities and their modifiers. Their shapes and geometry are the result of mathematical operations. In the process of creating, the necessity of defining the intelligent forms' parameters (originators, generators, rules) excludes the possibility of form design based on intuitive thinking. It is always possible to try to use the mathematical rules in intuitive ways without understanding them, but the question is, whether a creator is sufficiently intelligent to verify that an intelligent form is coming into existence during this process. Form follows information, which is rational in its essence. All algorithm errors can influence the deformation of the structure and can reset the potential of its intelligence (perfect structural instability).

Evolving forms are modelled on biological organisms and cellular automata. They are forms of growth and changes, which are characterized by the adaptive skills to the settings, both on the level of structures and shapes. Evolving forms come into existence as a result of the alterations and mutations of their inner information codes, similar to DNA – genetic codes of biological organisms, and their structures are derivatives of the rules of fractal geometry, e.g. L-the System, Logo, turtle graphics. These forms, in their essence, do not answer to the requirements of functional, structural or material standardization, as in the case of intelligent forms, because their inner algorithms allow the changes in these parameters dependent on necessities. The influence of algorithms on the geometry of forms takes place at the levels of codes determining the shapes (e.g. written in AutoCAD language) and codes making possible their arbitrary modifications or hybrid structure formation (e.g. written in individual scripts of AutoLISP). Examples of evolving forms are so-called metamorphic objects, characterized by structural transformations dependent on inner or outer stimuli (e.g. Embryo house, arch. G. Lynn[18], Gabion Field, arch. Andrew Thurlow, Maia Small[19]). These metamorphoses are derivative of data transmission and mutual exchange of information between form and its context. The data stream flowing through the structures causes the transformation of the architectural object according to its direction and control commands (e.g. Saltwater Pavilion, arch. K. Oosterhuis[20]).

Evolving forms refer to rational and intuitive-colloquial thinking as well. In regard to their dependence on operations of genetic codes, they are subject to mathematical rules, strengthening the rationality of their activities. However, the possibility of the transformations of the spatial structures, programmed in the codes, allow them to adapt to variable actions of different stimuli, initiating sequences of metamorphic changes. And just in this field a creator can affect, in an intuitive way, the mutual relations between form and stimuli, coming from its inner structure (*input*) or context (*output*). Similar to intelligent forms, errors related to the mutations of algorithms can lead to deformation of the spatial structures (perfect structural instability). Errors on the level of individual scripts can cause only certain fluctuations in forms' adaptation to variable stimuli, because the mechanism of adjustment should secure their stability (imperfect structural stability).

Liberated forms are set free from patterns and conventions, looking for their own unique expression in topological space. Liberation relate to all aspects of form, it means – freedom

[18] P. Zellner, *Hybrid Space: New Forms in Digital Architecture*, Thames & Hudson, London 1999.
[19] Y. T. Liu (ed.), *Distinguishing Digital Architecture*, *op.cit.*
[20] P. Zellner, *Hybrid Space*, *op.cit.*

from the contextual, formal, functional, structural, geometrical or algorithmic rigours etc. Liberated forms are characterized by a specific lack of scale. According to needs and spatial challenges, these forms can be transformed into the furniture, buildings or urban mega-structures. Liberated forms are the manifestation of a new kind of geometry, being the expression of acting forces (expressive forms) and emotions (empathic forms). Empathic forms enable the communication between users and architectural structures on different levels of complexity. Examples of expressive forms are structures that take inspirations from the human body's movement and transferring its dynamism to spatial visions. These forms are often subordinated to such aims as the simulation of motion, energy conversion, or the introduction of the active time factor to architecture (e.g. Portable House, arch. Philippe Gregoire, Claire Petetin[21], Codes, arch. Evan Douglis, Flat, arch. Francois Roche, Gradient Scale, arch. Matias del Campo, Sandra Manninger[22]).

Liberated forms refer to intuitive-colloquial thinking, rejecting the tendency of rationalism to search for patterns and control the creative process. These forms are an expression of forces and stimuli, and not of rational concepts and rules. The dilemma, which is unsolved in the case of the design of liberated forms, relates to the choice between freedom from something and freedom to something. The perception of their meanings is connected with feeling, and not with understanding. Therefore the creator, can only explore intuitionally their full potential, even blundering along (imperfect structural stability) if he frees himself from the rigour of rational thinking. The traps of the creative process result from the emotional and intuitive limits of the creator's mind, and not from the limitations of liberated forms. As in the case of intelligent forms, questioning whether a creator is intelligent enough to understand their meaning, it is possible to discuss whether the creator's imagination is free enough from ready-made patterns to design liberated forms.

5. Criteria of valuation of digital forms in the process of creation

Creation is an act of making free choices taking advantage of a definite hierarchy of values and valuation criteria from the range of logic, ethics and aesthetics. All the ambiguity and complexity of architectural forms, and design criteria, are focused on trying to find the answers to fundamental questions, whether the architectural forms are true or false (logical criteria), good or bad (ethical criteria), beautiful or ugly (aesthetical criteria). In the classical formula, architectural forms are described, classified and evaluated by the analysis of their structural, functional and visual features – their immanent attributes. The classical criteria of valuation are difficult to use in the case of digital forms, which are changing and transformable not just during the design process, but also once it has ended (e.g. intelligent and evolving forms). It is not possible to evaluate the visual aspects of forms or the properness of mathematical adequateness of structures, when they pass from one state to another. The interpretation of the present-day process of creation in digital architecture is faced with great

[21] M. A. Brayer, Migayrou F. (eds), *ArchiLab – Radical Experiments in Global Architecture*, *op.cit.*
[22] Y. T. Liu (ed.), *Distinguishing Digital Architecture*, *op.cit.*

difficulties in regard to the metamorphic character of architectural forms and the inadequateness of classical criteria for their evaluation. This situation is a challenge for architects. In the age of rapid development of digital technologies, it is important not only to be able to follow the changes in architecture, but also to manage the evaluation of different phenomena and the forms which appear along with them. It requires permanent transvaluation of the criteria of verification and their adaptation to the changing situation, which means the necessity of keeping the interpretative system open. The criteria of evaluation, from logical, through ethical to aesthetic, will not be given the once and for all, but will be subjects to reformulation.

Logical categories: truth or falsity refer to verification of the form's content, in terms of the logic of spatial organization and effectiveness of the inner structure's order. The criteria used in architecture in this sphere are very precise and objective. Many parameters of spatial structures can be optimized in terms of logic, which is connected with the fact that architecture is a part of the engineering sciences and materialized in the real world in which the laws of physics are present. Logical criteria play a special role in the creation of intelligent and evolving forms because their value is identified with computational power and logical operations on data. These forms strengthen rational thinking in the process of their creation.

Generally, there are two types of information processing in digital architecture. The first refers to the physical aspect in the meaning of quantitative flow of information through spatial structures, while the second relates to the semantic aspect – the sense of the data stream. They are connected with two sets of logical evaluation criteria which enable the physical and semantic form's content to be verified. In the physical aspect, verification of information processing of the intelligent or evolving structures refers to the problems of optimization of the information flow network, the reliability of supportive systems of the structura's work or the initiation of alternative procedures in case of data errors or appearance of events that freeze the structure's activities. Verification occurs on the level of mathematical examination of the correctness of the form's algorithm (e.g. KISS: *Keep It Short and Simple*, DRY: *Don't Repeat Yourself*). It is connected with the necessity for using rigorous language to program the form and binary criteria for the valuation of the rightness of its functioning (true – false). Every error or inversion of commands-order can cause the loss of an optimal state of work, in effect – it can lead to structural instability. In the semiotic aspect, verification of the intelligent or evolving forms refers to the problems of their communicativeness and the sense of the transmitted messages. The question is, who could achieve logical verification of their meanings. In case of evaluation by the architect, every opinion would be dependent on the cognitive apparatus of judging person, therefore it would be subjectivism-laden. In the history of modern architecture, it is possible to find architects, for whom going towards the truth is the fundamental aim in architectural form design. According to them, the form's beauty is the glare of truth (e.g. Mies van der Rohe[23]). However, in digital architecture we deal with so-called fuzzy logic in terms of the ambiguity, complexity and contradictoriness of systems connected with artificial intelligence, therefore the architects focus on the forms' communicativeness, and not on the sense of their messages. Communicativeness is interpreted as the

[23] L. Mies van der Rohe, *On Form in Architecture* (1927), [in:] U. Conrads, *Programs and Manifestoes on the 20 th –Century Architecture*, The MIT Press, Cambridge 1990.

ability of intelligent and evolving forms to generate and keep the interactions with different receivers and contexts. From this point of view, the logical estimation of their values refers to non-disruptive maintenance of data transmission, and not of its partial logical value.

In logical categories, we get an increasing number of mathematical tools for evaluating digital forms in regard to the correctness of their functioning. What is alarming in the case of spreading of intelligent and evolving forms in built-environment is the dependence of their structures' functioning on the reliability of computer programs. Although the unreliability of A.I. thinking is less probable than of human intelligence, we cannot assume that it will never happen. It could mean that the human being would be found trapped in an intelligent architectural form.

Ethical categories: good or bad are rarely used in the evaluation of architectural forms. Though in colloquial thinking, beautiful things are treated as good, while ugly as bad. According to George E. Moore[24], it is possible to use ethical descriptions of the internal good and bad in relation to things, and not only to people. Things are internally good (bad), if their existence is evaluated as good (bad), even in a situation, when they would be completely alone in the world[25].

Ethical categories as used in the description of architectural form are absolutist. In this sense, there are few examples of architectural objects that would realize the criterion of the internal good in accordance with Moore's definition. Most architectural forms are ethically neutral, which means it is difficult to decide whether the world would be better with or without them. And in the case of digital architecture, in which forms are virtual existences, it seems that such a straightforward decision is not even possible. Liberated forms are the only exception in the regard to their expressiveness and appeal to empathy, which makes them be interpreted in ethical categories. However, the aspirations of architects to affect human emotions by the creation of expressive and empathic forms carry a certain risk with themselves. The influence on the users' emotions can be treated as maintaining control over them and steering their behaviours by forcing the way the forms are perceived and felt. These activities can be ethically evaluated as bad, though the border between good and bad would be difficult to define.

Aesthetic categories: beauty or ugliness dominate over logical and ethical criteria in the 21st Century – the era of figurative language. A key idea in aesthetics is the notion of beauty, which has evolved over the course of time from beauty defined as an objective and universal value to beauty as subjective and individual. It was accompanied by the specific erosion of the concept of beauty, which nowadays is situated in a wide spectrum of definitions from classical beauty, through ugliness, to anti-beauty. The reason for this juncture was the endless conflict between the contradictory criteria of beauty, such as symmetry and asymmetry, harmony and disharmony, order and disorder, proportion and disproportion or simplicity and complexity. This conflict led finally to the disappearance of differences between beauty and

[24] G. E. Moore, *Etyka*, Biblioteka Klasyków Filozofii, PWN, Warszawa 1980.
[25] A. Kwiatkowska, *Mój dom jest moją twierdzą, czyli o etycznym wymiarze architektury*, Architectus, no. 2/6, p. 63–67, Wrocław 1999.

ugliness, including ugliness in the category of beauty[26]. Beauty became a relative category in modern aesthetics, which means that a definite form, being beautiful, can be valuated as ugly and on the contrary. There is also the extra difficulty relating to the aesthetic evaluation of digital architecture. In terms of the abstract and fictitious character of the virtual world, it is not possible to perceive digital architecture by all senses. However, this doesn't mean it is devoid of qualities that could be evaluated. Aesthetic criteria, even if they are relative, are still usable. These criteria play a special role in the evaluation and interpretation of liberated forms and to some degree – evolving forms as well.

The definition of beauty as a process of "continuous becoming" (hermeneutic aesthetics – the concept of beauty *in flagranti*[27]) is the closest to the essence of evolving forms. Passing from one phase of form evolution to another is connected with their specific degradation, similar to the growing old of biological organisms. It is treated as passing from the state of formation to deformation, from order to disorder, from beauty to ugliness as the state of more sophisticated beauty. In the case of liberated forms, the closest to their essence is the definition of conceptual beauty in which the subject of evaluation is "thought as an artistic substance"[28]. It leads the creator toward relative, subjective and temporally variable beauty. The liberation of forms from the terror of order and geometry is also connected with making them free from the aesthetic criteria of beauty. These criteria are under deconstruction in the creation of liberated forms. The different interpretations and definitions used in the description of liberated forms show perfectly the present tendencies towards extending the field of aesthetical pluralism.

6. Conclusions

The potential of digital architecture expresses itself first of all in the extension of the horizons of spatial perception, strengthening the abilities of intuitive spatial imagination of architects, in experiments with the geometry of spatial structures, conscious control of the process of coming into existence of forms and optimisation of their parameters, stimulating rational thinking. Digital technologies have revolutionized the tools of architectural design by introducing spatial simulations, information, and the time factor to the process of creation.

Digital architecture has reformulated the classical principles of the creation of architectural forms, well-known from Vitruvius[29], relating to the concepts of structure, function and spatial attractiveness of forms. The principle of firmness (*firmitas*) has been replaced by the unsteadiness and changeability of the spatial structures (forms follow forces). The principle of utility (*utilitas*) was displaced by the intelligence of structures (forms follow information). And the principle of beauty (*venustas*) was subordinated to the concept of form as the

[26] M. Gołaszewska, *Estetyka współczesności*, Wydawnictwo Uniwersytetu Jagiellońskiego, Kraków 2001.
[27] *Ibidem*, p. 261.
[28] *Ibidem*, p. 258.
[29] Witruwiusz, *O architekturze ksiąg dziesięć*, *op.cit.*

substance of thinking (forms follows fiction). Based on the analysis of the process of creation of intelligent, evolving and liberated forms, it becomes clear that a new specific language of creation is coming into existence; a language that George Lakoff and Mark Johnson have defined as imaginative rationality. Digital technologies, the new tools of architectural design, have united intuitive thinking with rational in a close marriage, in which the use of metaphors and categorizing of events are of the same importance.

Regarding the temporary transformation of digital forms and their polymorphism, appearing during the process of creation, the manner forms are evaluated has also changed, and nowadays the fundamental features of forms are defined otherwise than before from the logical, ethical and aesthetic points of view. According to logical criteria, form is true if it is characterized by discursive features and it maintains intelligent interactions with the context or users; while form is false when it is semantically empty, in other words, there is an absence of references to different layers of the discourse in the cultural scenery. From the ethical point of view, form is good if it shows that the world is better with it than without; while form is bad if it carries threats to the freedom of expression. According to aesthetic criteria, form is beautiful if it is subject to the process of continuous becoming as the substance of thinking; while form is ugly when it decays and does not generate new creative substance.

Digital architecture tends towards originality and surprising associations, and opens up to randomness, variability and the space-time continuum. It causes the necessity for the rejection of former criteria of valuation connected with the durability and invariability of spatial structures as generally understood. However, it is important to remember that every process of creation and evaluation of an architectural form occurs in relation to the creator's personality and system of values. It is the architect who decides what kind of thinking he would like to engage in the creative process, intuitive, rational thinking or imaginative rationality, or what kind of criteria he would like to use for the choice between different variants of form. The creative process is a mystery that is accompanied by the enigma connected with the impenetrable phenomenon of the human mind and the wonderful revelation of form in the process of creation.

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