

INTEGRITY AND LIFE IN EMERGING ARCHITECTURE - POSITIONING THE ARCHITECT IN CONTINUAL DIGITAL DESIGN

INTEGRITET I VEK U NOVONASTAJUĆOJ ARHITEKTURI - POZICIONIRANJE ARHITEKTE U KONTINUALNOM DIGITALNOM PROJEKTOVANJU

Originalni naučni rad / Original scientific paper

Rad primljen / Paper received: 07.11.2024

<https://doi.org/10.69644/ivk-2024-03-0293>


Adresa autora / Author's address:

¹⁾ University of Belgrade, Faculty of Architecture, SaRa (Sustainable and Resilient Architecture) Lab, Belgrade, Serbia

S. Marković  0000-0001-6882-360X

*email: marsladjana@gmail.com

²⁾ Innovation Centre of the Faculty of Mechanical Engineering, Belgrade, Serbia I. Svetel  0000-0001-7821-1412

³⁾ University of Belgrade, Faculty of Architecture, Belgrade, Serbia V.M. Čolić Damjanović  0000-0003-4896-2375

Keywords

- emerging architecture
- continual digital design
- architect's (design) knowledge
- positioning of architect/architect's discourse
- integrity and life in emerging architecture approach AI

Abstract

Guided by questions of contemporaries, leading to the question of integrity and durability of architecture, and by conclusions from recent conferences which advance architecture through digital approaches to designing and guiding architecture towards Artificial Intelligence (AI), we need to get back to the question on how to design in the future under multi-layered complex conditions and sustainability requirements of emerging architecture. Based on this, we conclude that the topic - Integrity of Architectural Objects is yet highly relevant, and this paper represents a continuation of research/consideration of architectural spatiality as an activity of creativity and structural durability. The sense of careful and complex structural design as an example of a continual digital approach, e.g. a multi-layered network - joint effect of design and realisation of architecture is highlighted.

As digital design in architecture has proven to be elusive and occasionally uncontrollable without the meaningful participation of the architect, this paper highlights positioning of the architect as an important factor in solving integrity and durability challenges of emerging architecture.

Digital approaches in architecture are constantly developed and improved, and structural integrity and durability issues are becoming increasingly complex and serious, especially in relation to geometry/space design and sustainability, so architect's knowledge involvement is inevitable and necessary in future data-driven design processes.

Positioning of the architect is based on expertise - activities and features, crucial in the process with identical characteristics, as the continuous development and improvement of knowledge, linking and anticipating all needs of the architectural process, the integrity and durability of architecture.

Additionally, knowledge will be meaningfully placed and integrated by positioning of the architect in society, in a critical attitude towards new technological achievements and re-examination of integrity and life of the structure in terms of sustainability and resilience of functional and spatial features of architecture.

Ključne reči

- novonastajuća arhitektura
- kontinualni digitalni pristup projektovanju
- projektantsko (sa)znanje arhitekta
- pozicioniranje arhitekta/diskurs arhitekta
- integritet i vek u novonastajućoj arhitekturi ka VI

Izvod

Vođeni pitanjima savremenika, koja usmeravaju ka pitanju integriteta i trajanja arhitekture, kao i zaključcima poslednjih arhitektonskih konferencija, koje unapređuju arhitekturu digitalnim pristupima projektovanju i vođenju arhitekture ka veštačkoj inteligenciji (engl. AI), vraćamo se pitanju kako projektovati u budućnosti pod višeslojno kompleksnim uslovima i zahtevima održivosti novonastajuće arhitekture. Na osnovu toga zaključujemo da je tema Integriteta Arhitektonskih Objekata i dalje vrlo aktuelna, a ovaj rad predstavlja nastavak istraživanja/razmatranja arhitektonske prostornosti kao delatnosti stvaralaštva i trajnosti konstrukcije. Ističe se smisao pažljivog i kompleksnog projektovanja strukture na primeru kontinualnog digitalnog pristupa kao višeslojno umreženog - zajedničkog dejstva projektovanja i realizacije arhitekture pomoću CMC mašina.

Kako se digitalno projektovanje arhitekture pokazalo kao neuhvatljivo i povremeno nekontrolisano bez promišljenog učešća arhitekta, ovaj rad ističe pozicioniranje arhitekta kao važan faktor u rešavanju izazova integriteta i trajanja arhitekture.

Digitalni pristupi u arhitekturi se stalno razvijaju i usavršavaju, a pitanja integriteta i trajnosti konstrukcije su složenija i ozbiljnija, posebno u vezi sa osmišljavanjem geometrije/prostora i održivosti, tako da je učešće znanja arhitekta neminovno i neophodno u budućem procesu projektovanja vođeno digitalnim podacima.

Pozicioniranje arhitekta se bazira na ekspertizi - aktivnostima i karakteristikama, krucijalnim u procesu, sa istim osobinama stalnog razvoja i usavršavanja (sa)znanja, koje umrežava i predviđa sve potrebe arhitektonskog procesa, kao i integriteta i trajanja arhitekture.

Osim toga, znanje će biti smisljeno plasirano i integrisano kroz pozicioniranje arhitekta u društvu, sa kritičkim stavom prema novim tehnološkim dostignućima i preispitivanju integriteta i životnog veka konstrukcije u smislu održivosti i rezilijentnosti funkcionalnih i prostornih osobina arhitekture.

The aim of the work is to show that knowledge as the main characteristic of the architect's positioning in future design and realisation, is also the foundation for integrity and life in emerging architecture.

INTRODUCTION

Emerging architecture is a new approach to architecture, marked by complex architectural requirements and innovative approach to architecture based on sustainability and circularity. As a current topic, this approach takes into account that resilience of architectural objects arises through the process of designing and organising architectural space and structure, /1/.

This research is a continuation of previous research on the integrity and life of architectural objects. Traditionally, the term implies that the function and construction of objects are designed to prevent possible failures, that all elements requiring special control in exploitation are defined during the design phase, and that design documentation includes all data necessary for the realisation of the object and its management during the predicted exploitation life, /2/. Over time it has become clear that in addition to these conditions, new technological developments, whether large or nanoscale, require functionality and reliability to be taken into account in addition to security, /3/. It has also been shown that the functional life, the time a structure is in use until it becomes functionally obsolete due to changing of requirements (changing use of space, need for different access ...), is the most common type of building failure, /4/. Furthermore, considering complexity of architectural requirements and general issues of design and realisation, sustainability, maintenance, durability and recycling in emerging architecture, the topic of the integrity and life of architectural objects becomes highly actual. Architectural spaciousness as a creative activity and the durability of construction in terms of careful and complex design of the structure have a multi-layered networked - common effect, /1/.

Guided by the questions of contemporaries /5/ and the conclusions of recent conferences on architecture /6/, which advance architecture through digital approaches to designing and creating architecture, we need to return to the question on how to design in the future.

Digital transformation in architectural design and realisation implies a break with traditional paper documentation and a transition to solutions based on information and communication technologies, /7/.

Multi-layered complex conditions and sustainability requirements of emerging architecture require the architect to constantly follow the current state in these fields. In this sense, knowledge is going to play an important role in the future positioning of the architect, /8/, (Fig. 1).

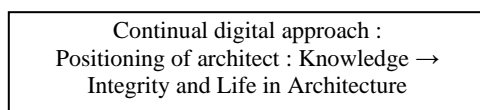


Figure 1. Concept of research.

As we move towards a society where artificial intelligence (AI) and datafication will be used as part of everyday

Cilj rada je da pokaže da je znanje, kao glavna karakteristika pozicioniranja arhitekta u budućem projektovanju i realizaciji, ujedno i temelj integriteta i života u arhitekturi u nastajanju.

life /5/, it is important to rethink the new technological change. When thinking about digital design /9, 10/, the advantages and disadvantages shown in current digital approaches /11, 12/ are considered based on the needs for the integrity and life of architectural solutions in which architectural knowledge is the key answer.

DIGITAL DESIGN APPROACH IN EMERGING ARCHITECTURE - ARCHITECT'S (DESIGN) KNOWLEDGE

Current trends in design and architectural realisation cannot be considered separately from emerging architecture based on digital technology that offers a digital approach to solve architectural problems.

The digital approach is used as a way of reviewing and explaining current phenomena of the complexity consideration of architectural demands and responses. Methods are ways of organising data applications. They are offered as procedures, techniques, aids and tools for design.

Emerging architecture places in front of the architects a large number of requirements that are now digital, interrelated and conditioned by varying, more or less acceptable results. Architecture as a science and art of designing and forming space, setting on usual starting points, is determined by context and space /13/. The emerging architecture, along with digital technology, pushes boundaries of future architectural activity, but also sets high standards for future treatment of existing architectural objects - structures and buildings. Function is the basis for integrity and life in architecture, not just the structure - construction.

Traditional philosophical division of knowledge is based on the distinction between knowledge by acquaintance and knowledge by description /14/. Knowledge by acquaintance implies knowledge gained through experience, either through direct contact with things or through human labour. Knowledge by description or propositional knowledge is formally true knowledge of verifiable facts. In simpler terms, it is a division into practical and theoretical understanding of a subject. The peculiarity of design knowledge is reflected in the fact that knowledge through acquaintance is not achieved through contact with physical objects in the world, but through their representations. Once drawings and paper documents, and today digital models are objects through which designers realise their knowledge.

Often experiencing the lack of building knowledge, the (design) knowledge considered as *knowing in action* /15/, is setting as a qualitative basis for the positioning of architects /12/ in future continual digital design and fabrication to support resilience of integrity and life in emerging architecture.

In the digital architectural approach, knowledge is initially based on *design activities and design rationale* /16/, which also means the addition of material and CNC machine properties experience to the code. Today's expertise is often based just on superficial multifunctional knowledge that follows the trends, and it needs additional critical view as

main part of *digital literacy* /17/ in the architectural domain /18/. Knowledge transfer through communication is its speciality.

The challenge of digital design and fabrication depends on technical knowledge related to the design and ability to create - making through different skills and scales /19/, to demonstrate the meaning of architecture. According to Caneparo settings /20/, digital technology uses languages of information and computer technology. In the context of technological and mathematical advancement, this methodology is employed for the advancement of knowledge. Therefore, it is necessary to consider the perspective of innovation to understand the context and direction of evolution; and to interpret the requirements of development, the challenge and contribution of shaping technological culture in architectural design and fabrication.

The architect's design knowledge is a personal reflection (including skills) of finding possible answers to questions posed. It goes beyond information by involving meaningful understanding through articulation of current and upgraded knowledge. Expertise is the extension of information.

The continual digital approach that combines design and construction in an interconnected chain, implying the addition of structured material and production-by-CNC machines' properties in a unified process without interruption is an example of coding.

The whole package of mentioned requirements needs experienced and expert decisions, which cannot always be fully coded and belong to the architect as a bearer of personal and non-coded data. Offering architectural data to be critically used, improved and developed through open access to all data, represents highest demand that contemporary society places on architects, /21/.

Knowledge in this sense is part of the digital approach that is refined by overlapping the tasks of integrity and life in emerging architecture as the main source of positioning of future architects.

KNOWLEDGE IN POSITIONING OF THE ARCHITECT IN DIGITAL DESIGN APPROACH

When analysing *design activities* /16/, we start from design as the teamwork of architects and close collaborators in the process of creating, manipulating and managing information at the request of, first of all, users and profession. It is also necessary to monitor the recognition of knowledge in terms of *design rationales*, /16/, which according to Lawson and Durst, /22/, are based on items: convention-based design - standards and rules, situation-based design - improvisation and intuition, and strategy-based design.

First and foremost, it is necessary to include digital techniques in the design process from the very beginning. If we look at all types of design separately, we get clear boundaries between disciplines. But the complexity of architecture brings different disciplines together and its breadth of problem consideration and the comprehensiveness represents itself. If we try to position the architect in this complexity, which is now due to technological reasons, the current system management capabilities, as well as the improvement of the system and positions within it, are also transferred.

The architect's role is now greater than ever because, in addition to constant development, it is as well his/her duty to create and protect architecture with professional position.

Considering the role of the architect within the digital process, there are various possibilities to obtain a certain product. The determinants of the digital design process are the concept, tools - techniques, machines and materials (Fig. 2).

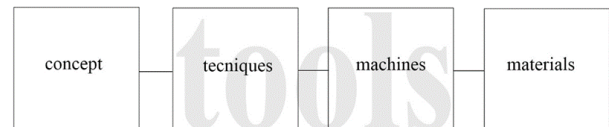


Figure 2. Guidelines of digital design, /33/.

The selection of the working environment, now becoming a computing environment, with the fact that sophisticated computer design tools require tremendous skill and experience does not inevitably produce a great project. This is where we come up with the notion of organising ideas through code and design, with the development of cognitive and creative skills that match the capabilities of the new programmes.

Coding is like writing a script or dialogue according to which the performance is to be played (created). Setting the language, i.e., giving instructions to the computer, after which it does the rest, is programming. The complexity of design results in the complexity of coding.

Programming driving technology is the basis of the process in terms of digital streams as well as the presentation of geometry, structural analysis, performance analysis, fabricated design and engineering components, which is easily manageable, logical and widely accepted by architects with no or very little programming experience. Programming languages, i.e., object-oriented programming, are based on this concept and require the involvement of architects at certain stages to set criteria and make decisions.

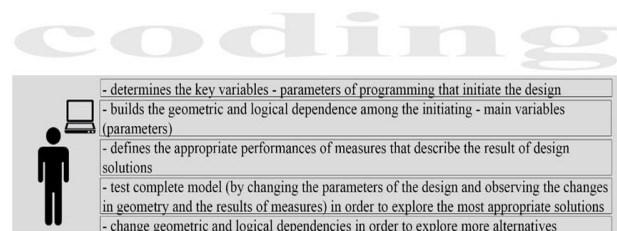


Figure 4. Role and attitude of architect in coding, /33/.

In coded design, the role of architect's (Fig. 3) is to:

- determine key variables - programming parameters that drive the project;
- build geometric and logical dependencies between the driving, key variables – parameters;
- define appropriate performance measures that describe the outcome of design solutions;
- test the complete model (by changing design parameters and observing changes in geometry and the results of measures) to explore the most appropriate solutions;
- modify the geometry and logical dependencies to explore further alternatives.

Position switching - the translation of code in the design is one of the key positions (Fig. 4). Also, another action of the architect is to move it to the product's position of the product, which again needs to be controlled (Fig. 5). An important determinant of the new approach are also tools such as new technological tools, so that attitude refers to CNC machines and processes that can be performed by tools of machines.

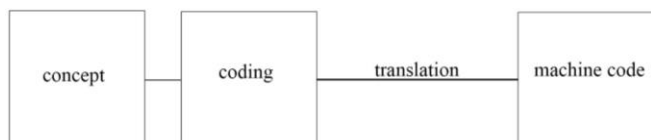


Figure 4. Translation of code - relation concept - coding - machine, /33/.

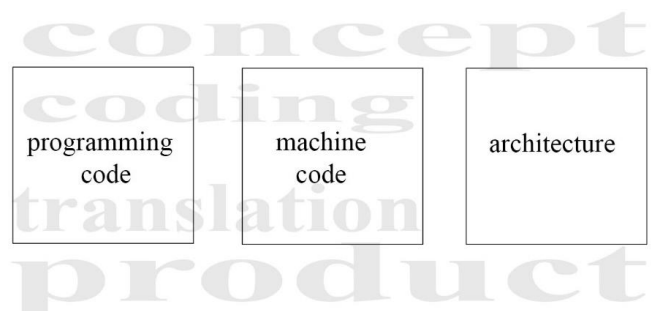


Figure 5. Translation of code - relation concept - coding - product, /33/.

The notion of machine in creative professions refers primarily to automation in the sense reducing creativity, and only then in the sense of a tool that allows reduction of human activity. This is precisely the point at which architects deviate from the unknown in digital processes and, in particular, in relation to the influence of AI. The conclusion of the previous research is that, in the architectural chain, some activities of architects are necessary in the presence of a machine, but with a changed position, scope or meaning.

Different types of materials used in construction have different characteristics, which are entered into the code that provides the ultimate in material concepts. Material properties are involved in finding constructions. It is through these parameters that the architect finds the principles for finding forms, as well as the implications for the machine and code (Fig. 6).

The essence of coding to obtain the design and realisation through the database of identifying variables and parameters, requires running the design and establishing a hierarchy of them linked with the concept of geometry, structure, physical model, or other logical relationships.

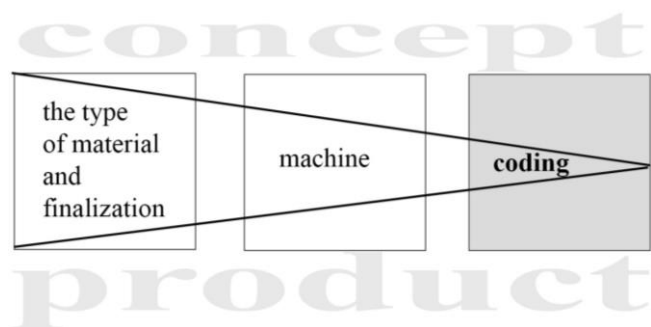


Figure 6. Material in choice of machine and coding, /33/.

In addition, the code is formed on the development of an information system knowledge database. This database could be added with new cases in terms of defining general principles and the relationship between them, as intelligent services, /23/, with subprograms.

In comparison with physical modelling, digital modelling is the prototyping of outputs - results with the realistic scale of building characteristics and their relationships with possible iterative changes related to inputs, /24/.

Together they can form complex long chains and definitions of their appropriate behaviour, i.e., performances and dimensions, leading to design solutions. The necessary adjustment of parameters and connections is done through a comprehensive model to observe the changes on the most appropriate solution, and therefore also the changes in geometry and logic, depending on the purpose of research and other alternatives. It is a desired combination of techniques for better solutions.

The digital design environment can be a design partner for this simulation of architecture. By adopting new technologies, creating design techniques, coding custom design tools and gaining critical performance feedback, the architect's capabilities are extended.

Nowadays, the architect increasingly needs to be a Vitruvian type, covering different layers of architecture, but also other disciplines - a fully integrated artist and engineer. It is an acceptance of experience and skills of architects in practice united with computing, geometry, and alternative interfaces of programming (visual and textual), and therefore, supported with different levels of computer skills.

The context of emerging architecture is itself complex, composed of several layers - differently interlocking disciplines organised in a multidisciplinary way. The breadth of architecture is also reflected in its interdisciplinary work and is by definition a social and technical science on one hand, and an artistic on the other, with a substantial admixture of psychology - cognitive science, as well as aesthetics and mathematics.

New refinement of the digital design approach requires continuous learning with the coding creativity of the architect. It is necessary to establish the expertise as value in terms of digital design knowledge for the positioning of the architect in accomplishment of future architecture.

POSITIONING THE ARCHITECT AS A KNOWLEDGE CARRIER OF INTEGRITY AND LIFE IN EMERGING ARCHITECTURE

Conversation/communication is the beginning of architecture - terms of reference and information, generally created in cooperation with the architect, never stops at the beginning, but continues throughout the process, creating the client confidence in the architect, the architect's understanding of client's wishes - a direct line in communication. The role of conversation is important as a verbal description of the idea because design thinking begins with discussion. True creativity begins where language ends, /25/.

The oldest surviving architectural plan drawn on paper and in relative scale dates from the 9th century. The first architectural plans in the modern sense are preserved in the

'sketchbook' of Villard de Honnecourt, /26/. The Renaissance period provided the opportunity to develop architectural documentation using precise geometric techniques. It was an introduction to the further development of architecture as an independent discipline separate from construction, and later to the development of conventional architectural drawings as a medium of information transmission, both conceptual and creative, /7/.

Architecture can be thought of as a drawing, but it should also be thought of as a simulation experience. It is the act of imagining a building removed from its construction, and then communicating this concept to others to build. To date, much of the imagining and communicating has been through drawing. However, it is not necessarily the drawing that defines architecture, but the ability to create an abstraction of the building in some way. Drawing allows the architect to imagine how light, space and material relate to the creation of architecture. Although largely in the mind of the architect, this simulation of effect and experience is a necessary part of architectural design. Knowledge about existing buildings and pragmatic aspects of performance can also be simulated in the creative coding of the design.

The development of architectural design as code is about connecting and grounding all parts of knowledge - design, building information and future tasks, to support the integrity and life of the emerging architecture.

Important factors are learning and increasing knowledge - expertise, and today this is linked to technological change. Another important factor is the power of influence, primarily based on conversations, i.e., cooperation within the project team - with colleagues, clients, public administration and others. The connecting factor is the drawing, which is the main representative agency of the architectural idea, but also a communication tool. Therefore, the connection of the architect with the computer in every aspect is the improvement of both factors that determine the position of the architect and the architecture that emerges in the business and the process. The architect of the future who does not know how to use digital tools is in the same position as the architect of the past who did not know how to draw.

CAD/CAM's interactive design features are conditioned by a creative approach to design, as the idea is no longer just about modelling and presentation. The strategic role of the architect is based primarily on the interdisciplinary nature of his characteristics and the interactivity of his activities. Creativity is now the property of the architect as a combination of existing elements and programmes with the possibility of introducing flexibility into the controlled system. Parts of the controlled system are also the architectural space organisation and structure in terms of following its integrity and life requirements.

Building on Lawson's framework of architecture, the design process, depends on the expansion of the knowledge of the architect implemented in the project. The initial stage that underlies the concept is information - briefing, analysis, synthesis and evaluation. The design process is further based on the problem of structuring, problem solutions, preliminary design, realisation and details /25/. It returns us firstly to the experience of the past and restores more steps backwards to

make it possible to go one step forward. Complexity in the process created by complex requirements also means complexity in the decision, but not necessarily the complexity in the form. In any case, complexity is not accidental. The point is not that more is more valuable than less (on the contrary), but in the fact that architecture must once again become the work of an architect who builds, who thinks about his work and who stands behind his work.

Lawson's answer to all of these questions is that the integrity of architect's knowledge makes the designer's expertise inevitable and considering it as a complex collection of skills. This fact leads to the conclusion that only the architect possesses expert interdisciplinary knowledge with teamwork and collaborative values for all participants in the mutual process.

The continuity of the peculiarities of architects, like any other professions, is also a continuous learning. However, the distance of architects from digital tools is still based on the existence of products of confusing architecture, which is a consequence of insufficient engagement of architects precisely in the use of these tools in the design. If we look at the aim of using digital tools in the educational system as a playground for small-scale, open-function facilities such as pavilions or sculptures, etc., with the use of the system fabrication, whose tools are automatically linked to design - coding, it is clear that the most important thing for the architect is to know the process and can easily learn to organise and coordinate it, /22/.

The relationship between design and fabrication, and above all, the relationship between thinking and making, must now be redefined today as a key challenge, particularly in relation to Semper's /27/ fundamental lesson about the link between thinking, creating, and culture. Caneparo associated the possibility of culture with the knowledge and understanding of completion and the diversity of skills, as the intersection of scientific and technical disciplines of the moment, and each research has a personal interpretation with the interdisciplinary reflection that contributes to a culture of building.

The first step in this process is related to the education of architects in terms of cognitive understanding of the technological part of the process - from the initial idea, through digital design, to the realisation of the prototype and the finished product, and then the organisation and control of the process, in order to contribute and value architecture as a discipline needs to show, /20/. An important part of architectural design is also the prediction of behaviour of the building in reality and its maintenance afterwards.

The new architectural context represents an environment of digital design-coding, where selected parameters have the role of all factors and are determined in the form of an artificial environment, /28/. The positioning of the architect in the digital approach to architecture with parameter settings of a new context has recently become more and more provocative in terms of the simultaneous occurrence of its reduced need and necessity, /29/.

Professional design knowledge is the basis for future experience and expertise data for the necessary architect's decision in terms of actual space requirements, not only inter-

active in the technological sense, but also in social correspondence to the specific location with meaningful process (following the idea, internal and external influences, modelling and carrying the prototype to the final product - the building), /1/.

Mark Burry interpreted this consideration, following Gaudi's idea of Sagrada Familia and enhancing it with new tools and materials, as a great example of improving knowledge in a digital way to solve the architectural issue. Since 1979, he has used the associated standard and digital education as an example of good practice and tools in architecture, but also brought himself personally into Gaudi's natural forms designed by analysing existing parameters realised by robots - 3D printers. Facilitating today's execution gives importance to the already existing data of ideas and the digital design method with contemporary increasing information and knowledge.



Figure 7. Sagrada Familia - example of integrity and life of architecture - data, information, knowledge. (Source: Sladjana Marković - private archive, February 2024)

The continual digital approach made it possible to decode the standard code and the current completion of the architecture. Its continued existence and maintenance are part of the digital code as well as the integrity and life of the cathedral, Fig. 7.

The integration of the digitally translated concept design and mock-ups at different scales with consultation and review feedback as information on successful project outcomes /30/ of the architect who creates both a process and a product. At the same time architecture is changing its trajectory with a return to the origins and sources, but with the possibility of expansion and definition by new architectural activities in the future, /31/.

It is the collection of all standard information as architectural parameters and practical experience with the step

further, predictions about future human needs - micro scale and urban development and location economy - macro scale, including interdisciplinary design thinking, /1/.

The micro-scale should be reconsidered as the connection between the urban, human and everyday culture of living /32/ in the sense of the quality of life - comfort, but also considering relational data, information and knowledge, as an approach and foundation.

The position of the architect, connecting information and communication through a personal characteristic - clear intention, choice and decision, instinct, intuition and emotion, is in the places of ideas and organisation. The control of the development of the digital approach in terms of the realisation of the designed architectural product, as well as the inherent creativity and flexibility of projects and processes is very complex. Other positions are the control of the process, as well as team members, user input and manifestations of influence of developing materials and machines. The positioning of the architect is created by expertise and training towards the digital approach and multidisciplinary orientation. In principle, the positioning of the architect in the process of progress and influence is changing the way of design and realisation through position and cooperation /33/.

CONCLUSION

Technology is the active agent that drives culture and society according to the causal principle. It has always occurred independently of society, but society has subsequently had to find its way in the new situations it has created. In the overall understanding of digital culture, it is necessary to examine the changes and emergence of transformation of cultural forms - a phenomenon that is already a serious part of the media culture, /34/.

A specific task of the information society and the use of digital media in terms of architecture and exploring ways of its growth, positioned the new challenges and transformation of old socio-cultural issues and relationships, all of which are major determinants: inequality, power, identity, team and belonging.

This expansion of communication in the sense of information is linked to Foucault's work as a philosopher of technology. He is relevant to new media as a tool in terms of the power of knowledge through disciplined mechanisms and the desire for control, which can be transferred to architectural guidelines. This applies in particular to the changes in communication between people in terms of connectivity-networking, finding and influencing the jobs they do and the social circles they belong to, /33/.

The digital approach, in context and process, includes communication with the present moment in terms of technological advancement. Furthermore, the new context is the communication of programming parameters, i.e., coding.

Accordingly, architects must follow the development and improvement of digital and AI literacy /19/ with continuous personal learning and adjusting.

Emerging architecture is an overlapping product of technological tools and context with their connections to various complex requirements, approaches and actions by the expert,

who has skills of a meaningful connection to the product, i.e., space. The spaciousness of architecture is defined by the architect's parameters of functionality and form. The emerging architecture of today's architectural reality includes a wide range of different types of architectural products, created in parallel processes of design and realisation using conventional, digital or combined tools. In response to today's complex context and requirements, emerging architecture itself is the experimental process, based on a digital approach to continuous rehearsal and modification, which is necessary to pass through the prototype phase, but in most cases also to test the process of design and realisation, materials and machines.

The conditionality of the digital approach in architecture is based in the technological sense, on the interactive design and realisation of architecture which, in the sociological sense, requires interactivity of the actors in the architectural process within ideas, external and internal influences, modelling and implementation of a prototype to the final product - architecture. The essence of this process is the production in terms of implementation of creative solutions to problems based on structural integrity and life in architecture, as well as knowledge collection of building information.

In relation to integrity and life, the position of the architect gives more importance to the subjective character of the expression of the context and materials than to the adaptation to CNC machines. Taking a step back, the essential link between materials and the machine is the aid and the tool, the choice and characteristics defining the process, and not the product. Without claiming to establish the exact position, but rather to point out new challenges of the current state of technology in architecture and the exclusion of architects from a conscious choice of solutions.

The core purpose of architecture remains the same, but the process is changing significantly. There is a need for digital thinking, critical thinking, attitudes and actions by architects. As well as the involvement of architects in the development (learning) and dissemination (teaching) of architectural technology tools and approaches.

The digital approach opens up possibilities for adding integrity and life-relevant information in terms of decision-making mechanisms in the planning and designing process, such as the three pillars of sustainability (social, economic and environmental), selected for their circumstantiality, impact and benefits for users, the neighbourhood and even the wider community, /35-37/.

Passing and being familiar with the coding process continuing the improvement of AI architectural tools and being able to follow the coding developer's action /37, 38/ are necessary activities for future architects. Positioning of architects /33/ indicates the characteristics and necessity of qualities in the process inherited in human - an expert with the refinement of digital design approach unconditionally improving integrity and life for resilient and sustainable emerging architecture.

ACKNOWLEDGEMENT

Results presented here are the result of research supported by the Ministry of Science, Technological Development and Innovation of the Republic of Serbia under Contract 451-03-66/2024-03/200213, dated 05.02.2024.

REFERENCES

1. Marković, S. (2020), *Integrity and Life in process of design and realization in emerging architecture - Digital Chain case*, Struct. Integr. Life, 20(1): 3-10.
2. Svetel, I. (2005), *Application of information technology in architectural - civil engineering design for object integrity realization*, Struct. Integr. Life, 5(2): 77-86.
3. Sedmak, S., Radaković, Z., Milović, Lj., Svetel, I. (2012), *Significance and applicability of structural integrity assessment*, Struct. Integr. Life, 12(1): 3-30.
4. Marinković S., Ignjatović I. (2008), *Savremeni koncept projektovanja i građenja betonskih konstrukcija (Modern concept of design and construction of concrete structures)*, Građevinski kalendar: 181-233. (in Serbian)
5. Vrachliotis, G., TU Delft Professor of Theory of Architecture and Digital Culture - Department of Architecture, (last accessed Nov. 14, 2024), <https://www.tudelft.nl/en/architecture-and-the-built-environment/about-the-faculty/professors/profdr-g-vrachliotis>
6. Ayres, P., Thomsen, M.R., Sheil, B., Skavara, M. (Eds.), *Fabricate 2024*, London: UCL Press, 2024. doi: 10.14324/111.9781800086340
7. Svetel, I. (2022), *Information in architecture in the digital age*, Conf. on Architecture Philosophy of Architecture, 2022. <https://www.researchgate.net/publication/366290598> *Information on in Architecture in the Digital Age* (last accessed Nov. 14, 2024)
8. Marković, S., Svetel I., Lazović, Z. (2017), *Redefinition of the process of design and realization in emerging architecture on the principle of 'digital chain'*, Facta Universitatis, Ser. Archit. Civ. Eng. 15(3): 295-306. doi: 10.2298/FUACE160526026M
9. Cross, N., *Design Thinking - Understanding How Designers Think and Work*, 2nd Ed., London: Bloomsbury Publ., 2023. ISBN 978135030506
10. Lawson, B., *How Designers Think*, 4th Ed., New York: Routledge, Taylor & Francis Group, 2005. ISBN 9780750660778
11. Hovestadt, L., *On Digital Architecture*, Vol. I, II, Books I-III, Books IV-VI, ETH Zurich: Birkhäuser, 2023. ISBN: 978-3-0356-2601-8
12. Johns, J.C., *Design Methods*, 2nd Ed., New Jersey: Wiley, 1992. ISBN: 978-0-471-28496-3
13. Cvetić, M., (2017), *Experience and theory in architectural design: Digital chain case*, AM J Art Media Studies, 2017(12): 121-134. doi: 10.25038/am.v0i12.172
14. Russell, B., (1911), V. - *Knowledge by acquaintance and knowledge by description*, In: Proc. Aristotelian Society, 1911, 11 (1): 108-128. doi: 10.1093/aristotelian/11.1.108
15. Schön, D.A. (1992), *Designing as reflective conversation with the materials of a design situation*, Knowledge-Based Syst. 5 (1): 3-14. doi: 10.1016/0950-7051(92)90020-G
16. Zha, X.F., Sriram, R.D., *Knowledge-intensive collaborative decision support for design process*, In: Intelligent Decision-making Support Systems. Decision Engineering, Springer, London, 2008, pp.301-320. doi: 10.1007/1-84628-231-4_16
17. Bawden, D., *Origins and Concepts of Digital Literacy*, In: Lankshear, C. & Knobel, M. (Eds.), *Digital Literacies: Concepts, Policies and Practices*, Peter Lang Publ., Inc., New York, 2008, pp.17-32. ISBN: 978-1-4331-0168-7

18. Hudert, M., Marković, S. (2024), *Revisiting digital literacy: deep learning and generative AI in AEC education*, ATUT 2024, 16th Annual Symp. Architectural Res., Otaniemi, Espoo, Finland, 2024.
19. Marković, S. (2020), *Size in the process of design and realization in emerging architecture - the Digital Chain approach*, SAJ (Serb. Arch. J), 12(1): 21-35. doi: 10.5937/saj2001021M
20. Caneparo, L., *Digital Fabrication in Architecture*, Engineering and Construction. Springer, Dordrecht, 2014. doi: 10.1007/978-94-007-7137-6
21. TU Delft, *The New Open Design*, TU Delft Faculty of Architecture and the Built Environment, Curated by the Design, Data and Society Group © 2024 (last accessed 8.8.2024) <https://www.newopen.design/>
22. Lawson, B., Doorst, K., *Design Expertise*, 1st Ed., Routledge, Taylor & Francis Group, New York, 2009. ISBN 9781856176705
23. Svetel, I., (1994), *Distributed design system: A paradigm for modeling conceptual architectural design*, In: Pohl, J. (ed.), *Advances in Computer-Based Design Systems*, The Int. Instit. for Adv. Studies in Systems Research and Cybernetics, 1994: 79-88.
24. Marković, S., Svetel, I. (2018), *The model in coded digital design process: Digital Chain Case*, In: Proc. GOING DIGITAL 2018, Belgrade: STRAND, 2018: 135-145.
25. Lawson, B., *What Designer Know*, 1st Ed., Routledge, Taylor & Francis Group, New York, 2004, pp.13-15. ISBN 9780750664486
26. Philipp, K.J., *Architecture - Drawn: From the Middle Ages to the Present*, Birkhäuser, Basel, 2020. ISBN 9783038215738
27. Semper, G., *Style in the Technical and Tectonic Arts; or Practical Aesthetics*, Getty Research Institute, Los Angeles, 2004. ISBN 9780892365975
28. Marković, S., *The guide through the process of the 'digital chain' in architecture*, (bilingual: Serbian/English), Belgrade: Endowment Andrejević, 2013. ISBN 978-86-525-0105-2
29. Marković, S., Miodragović Vella, I., Hovestadt, L. (2024), *A conceptual framework for positioning the architect within a continual digital approach to designing architecture: The 'digital chain' case*, Facta Universitatis – Ser. Archit. Civ. Eng. doi: 10.2298/FUACE240713002M
30. Schodek, D., Bechthold, M., Griggs, J.K., et al., *Digital Design and Manufacturing: CAD/CAM Applications in Architecture and Design*, John Wiley & Sons, Inc., Hoboken, 2005. ISBN 0471456365
31. Gramazio, F., Kohler, M., Langenberg, S. (Eds.), *Fabricate 2014: Negotiating Design & Making*, UCL Press, London, 2014. doi: 10.14324/111.9781787352148
32. Nikezić, A., *Scene urbanog života - Porodična kuća u savremenom gradu* (Scenes of urban life - Family house in the modern city), University of Belgrade, Faculty of Architecture, 2022. (in Serbian) ISBN 978-86-7924-261-7
33. Marković, S., *Dnevnik izazova u savremenom pozicioniranju arhitekta - princip 'digitalnog lanca' i dalje ...*, (Logbook of challenges in contemporary positioning of architect - the principle of 'digital chain' and beyond ...), University of Belgrade, Faculty of Architecture, 2024. (in Serbian)
34. Carpo, M. (2023). *A short but believable history of the digital turn in architecture. e-flux Architecture*. (last accessed Nov. 14, 2024) <https://www.e-flux.com/architecture/chronograms/528659/a-short-but-believable-history-of-the-digital-turn-in-architecture/>
35. Đokić, V., Gligorijević, Ž., Čolić-Damjanović, V.M. (2015), *Towards sustainable development of social housing model in Serbia - case study of Belgrade*, Spatum, 34: 18-26. doi: 10.2298/SPAT1534018D
36. Vuja, A., Lečić, M., Čolić-Damjanović, V.M. (2016), *Conducting architectural experiments: Some new approaches in architectural design*, In: 2016 Int. Conf. Multidisciplinary Eng. Design Optimization (MEDO), Belgrade, Serbia, IEEE, 2016, pp.1-4. doi: 10.1109/MEDO.2016.7746542
37. Miodragovic Vella, I., Markovic, S. (2024), *Topological interlocking assembly: Introduction to computational architecture*, Appl. Sci., 14(15): 6409. doi: 10.3390/app14156409
38. Burry, M., *Scripting Cultures: Architectural Design and Programming*, Chichester: John Wiley & Sons, Inc., 2011. ISBN 978-0-470-74642-4

© 2024 The Author. Structural Integrity and Life. Published by DIVK (The Society for Structural Integrity and Life 'Prof. Dr Stojan Sedmak') (<http://divk.inovacionicentar.rs/ivk/home.html>). This is an open access article distributed under the terms and conditions of the [Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International License](https://creativecommons.org/licenses/by-nc-nd/4.0/)