# A NOTE ON GRAPHICAL REPRESENTATIONS IN ARCHITECTURE – DIAGRAMS OVER SKETCHES

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***Summary:*** *The core activity of the architect's work is handling of space that corresponds to a social dynamic, which is defined by phenomenological relations between man and his surroundings. In the field of architectural design, spatial explorations are carried out through graphical representations and architectural drawings as primary means of expression. The research presented in this paper deals with the modes of graphical representations, namely sketches and diagrams, as two closely related categories. This paper indirectly starts an exploration of the differences between representational forms, but more importantly, it highlights the most important characteristics of both sketches and diagrams. It is conjectured that diagrams dominate the procedure of contemporary architectural design, as they help architects think about relationships between abstract design concepts and architectural space. Furthermore, the presented research covers the implementation of diagrams in architectural practice shown through examples. This paper concludes that a diagram, as a visual/spatial arrangement, represents the core of a design conceptualization and highlights the structure of the design conceptualization through its spatial configuration.*

***Keywords:*** *architectural representation, diagrams, sketches, design process*

## 1. INTRODUCTION: SOME REMARKS ON THE DESIGN PROCESS AND ARCHITECTURAL DRAWINGS

To begin the research of graphical representations in architecture, one must take a stand on the architectural design as a process in general, and on the primary outcome of that procedure, or on architectural drawing as a medium for formation of the discipline.
The actual design process of architecture includes unnoticeable research and work culminating into a short time of intense action. By developing specific visualising techniques, architects re-think the virtual and material organisational structures, and engage public forces in the embodiment of their ideas [1]. The architect collects information that is potentially structuring, co-ordinates it, transforms it and offers ideas and images for the organisation of public life in an endless seamless system.

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The core activity of the architect's work is handling of space that corresponds to a social dynamic, which is defined by phenomenological relations between man and space. Architectural design is an element that gives the architect ground for operation on any material or immaterial reality. The production of space is a continuous action of transformation of imagination, a virtual construction in actual construction, which creates a base for the praxis of space formed by actions of interpretation, signification and perception [2]. Starting from the updating of the space of experience, the architectural "being", virtualised in design, is actualised in its process of production. Architectural design tasks often imply both conceptually and spatially challenging tasks and require a coordinated exploration of the two [3].

On the other hand, architectural drawing has always been marginal with respect to major arts. Because of the fact that it precedes the building, that it is produced without reference to an already constituted object in the world, as stated by A. Vidler, it has never conformed to the traditional formulations of imitation. The drawing was inevitably regarded as a supplement, part of the evolutionary procedure of a building's production, and never valued as art *per se* [4]. However, the drawing is the natural language of architecture; every language should be perfectly in harmony with the ideas of which is the expression, thus architectural drawing needs to be essentially simple, free from any kind of difficulty, pretension, and luxury; so it can contribute to the development of ideas [5]. Hewitt [6] claims that architectural drawings are secondary representations by their nature, as well as works of art in themselves, which presents a dual problem for the researcher, who cannot study it similar to that of paintings. Research presented in this paper will discuss specific modes of drawing, i.e., diagrams and sketches, that have the capability to construct and expose an idea; while, at the same time, they simplify and idealize the facts and events from its surroundings.

## 2. MODES OF REPRESENTATION IN ARCHITECTURAL DESIGN

Diagrams, sketches and other types of external graphic representations facilitate and constrain inference, problem-solving and understanding. As stated by authors Suwa and Tversky [7], facilitation by external representation derives not just from its external existence, but from the interaction between the representation and the cognitive processes of interpreting it. Sketches are a good medium for reflective conversation with one's own ideas and imagery, as they are "dense" and "ambiguous" in the early design process, which allows them to work well for exploring design ideas. As an instrument of thought, sketches, diagrams and drawings have a prominent influence not only on the early phases of the architect's design process, but also on the next phases concerning construction [8]. To articulate architectural elements means to clearly distinguish the parts that constitute a whole. Imagination generates a spatial concept, which is seen in the architect's mind as non-dimensional image.

The difference between diagrams and sketches is imprecise, but we can consider *diagram* as drawing that uses geometric elements to abstractly represent natural and artificial phenomena, building components and territorial boundaries of spaces. On contrary, the *sketch* mainly defines spatial arrangements of physical elements [9]. A diagram represents abstractly, without giving detailed descriptions of scale or realistic pictorial elements; it indicates spatial relationships using indefinite shapes [10]. As

opposed to diagrams, sketches usually provide three-dimensional information about a specific scene, specifying the shape of physical elements and their spatial relationship [10]. It is important to point out that, drawn to scale, sketches are more precise than diagrams, yet they do not attempt the accuracy and precision of a technical drawing.
As distinct to drawing, the diagram is a continuously evolving form of visual work, which has the potential to organize spatial and architectural thinking to incorporate larger fields of abstract information flow, and acts as a form of design research work in its own right, in such way as to offer significant advantage to any innovation agenda [11]. As stated by A. Vidler [12], a diagram is not a sketch – therefore it evokes nothing; it is not a plan – therefore it cannot be built. It is a kind of delineation, a neutral zone, where certain relations are mapped precisely but without qualitative information. Finally, it is important to distinguish that diagrams are generic abstractions and not simplified spatial schemes.

## 2.1 Diagrams over sketches in contemporary architectural design

Architectural design process requires visualization of initial ideas, recalling of historical examples, synthesis of complex systems into manageable wholes, testing and comparison of multiple solutions. All of these procedures require diagrams and diagramming operations, which are the part of highly developed visual language that architects use in design development. Diagramming facilitates the extraction of discreet information or issues from a complex, multifaceted environment [13]. Further, diagramming process allows the architect to identify and visually explain distinct characteristic of an artefact, while retaining an overview of the whole. Reference to both part and whole within the same drawing is one of the key qualities, which makes diagramming such a valuable method for analysing the physical environment.
Architectural building can be understood only through a series of abstractions, reduction, series fragments, boundaries and characteristics with a tendency to constantly expand and contract, requiring constant revision by observers. Diagram, as a means of interpretation of architecture, serves to simultaneously negotiate a series of opposing propositions; a typology that identifies the program and typology that identifies the form; between the specific qualities of the object and general quality of architecture; between the process of learning and the process of perception; between dynamic operations and static configurations [14]. The distinctive diagrams are developed through the aspects of conflicting dualisms. Through constant dialogue, diagram reveals a weakness, insecurity, and originality, thereby acquiring audit role in the interpretation of architecture.
As stated by Allen in his seminal work on diagrams [15], the diagram is not a thing in itself, but a description of potential relationships among elements; not only an abstract model of the way the things behave, but a map of possible worlds. Diagrams do not map or represent already existing objects or systems, yet anticipate new organizations and specify new relationships. They are exploited not only to solve, but also to invent and frame problems; therefore, architecture becomes a language to be learned through diagrammatic exercises [16]. The diagram is not simply a reduction from an existing order, simplified and highly graphic, it supports multiple interpretation. A diagram is a graphic assemblage that specifies relationships between activity and form, organizing the

structure and distribution of functions. As such, they are architecture's best means to engage the complexity of the real.
An example of the diagram as a generator of real space is Le Corbusier's *Modulor*, which is, as a diagram, invisible in the building, yet it reappears as a repetitive element at a scale of his *Petit Cabanon* (Figure 1). It shows that there is not necessarily a one-to-one correspondence between the diagram and the resultant form, and that the diagram does not have to be shown in the final building as an explicit form.

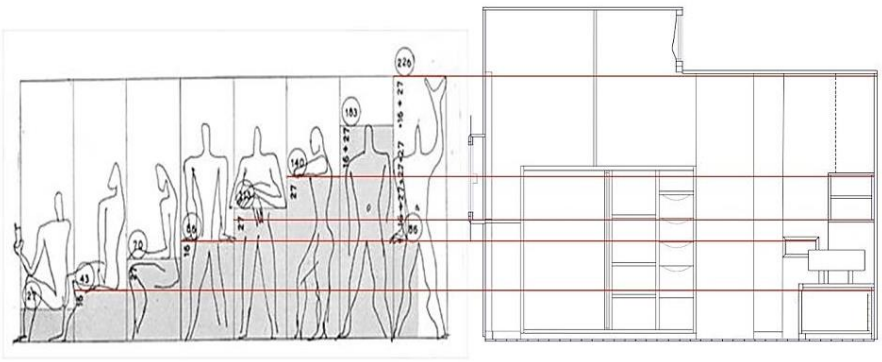

*Figure 1. Use of the Modulor in the design of Petit Cabanon by Le Corbusier, 1951 – 52* (source: [17])

Diagrams are drawings which engage in a self-conscious reductive process, attempting to make clear a specific interpretation through the exclusion of that information which the architect deems irrelevant. However, as we have already pointed out, the differences between diagrams and conventional drawings are subtle and relative, making it difficult to establish a clear boundary. The advantage of diagrams is their ability to simplify the consideration of formal and conceptual qualities by minimizing the elements presented. Their essence is analysis. By isolating specific aspects of a subject, diagram allows one to clarify other features and compare one subject with another or the same subject seen through different filters. Diagrams aim for clarity and conciseness, avoiding ambiguity and focusing on one specific issue in isolation. Discovering the common elements shared by buildings, spaces or cities, diagrams give visual form to a specific issue or aspect. In a sense, they can generalize about seemingly disparate things, rhetorically presenting their specific interpretations and conclusions [18]. Consequently, every drawing can be considered diagrammatic in the sense that it involves a process of abstraction and a corresponding reduction of information.
Diagram in architecture is a specific performative graphic type and essential generative visual vocabulary for contemporary design research and central means for the innovation or the production of new knowledge over drawing in architecture [11]. Unique to diagram is its capacity to integrate non-architectural domains of knowledge into the architectural design process. Ergo, diagrams communicate both to the discipline and to the new extra-disciplinary research fields. During the last decade of the 20th century, the

diagram dominated the architectural discourse [19]. In the context of increasing amount of information in design processes, diagram appeared as an innovative device capable of gathering information from architecture's outside, whilst simultaneously leaving behind the predominant position of representational theories.

## 3. APPLICATION OF DIAGRAMS IN ARCHITECTURAL DESIGN

In the late seventies of the last century, diagram, for the first time, becomes the essence of architecture itself, not just its representational form. According to Somol [20], "diagram appeared as the final means of architectural production and discourse". Contemporary architects use diagram as a starting point in the design process – as a technique for visualization the input data that generates the essence, i.e. the concept [21]. For the purpose of this paper, a closer determination and investigation of diagram application in architecture will be started from Kahn's notion of *form drawing*, as a concept that resembles our interpretation of the diagram.

The design progress from concept to object is rarely linear and straightforward, as we can witness from Louis I. Kahn description of how design proceeds from "form" to "design" [3]. Surely, most famous Kahn's form drawing is the one of the First Unitarian Church for Rochester (Figure 2), which is a simple diagram summing up the architect's intention at the start of a creative process, a phase in which the design has not yet manifested itself as an image [22]. Alongside the drawing, Kahn wrote, "Form drawing, not a design", to prevent his sketch from being taken for the floorplan of the future building. Indeed, this sketch depicts not the building's final appearance but its internal organization and intrinsic nature – *the genesis of its form*.

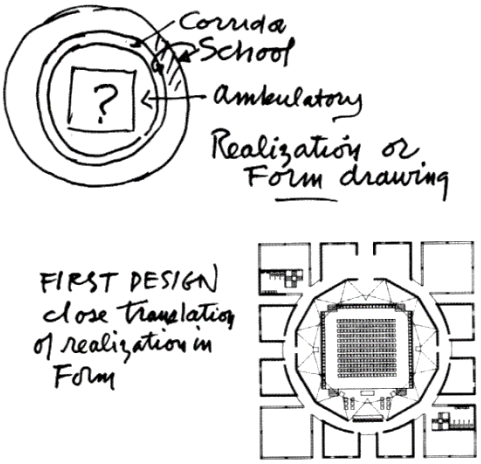


*Figure 2. Realization of form drawing and first design for the First Unitarian Church of Rochester by Louis I. Kahn, 1959 – 69* (source: [22])

With the emergence of software technology, line diagrams of movement became the generators of built form. A key example of such approach may be recognized in the work of Foreign Office Architects who describe the design of Yokohama International Port as "generated from a circulation diagram that aspires to eliminate the linear structure characteristic of piers" [23, p. 325]. Their interpretation corresponds to a diagram as an instrument to determine and explore architectural performance. The project is generated from a functional diagram (Figure 3), which incorporated ergonomic and functional information. Specific diagram for this project does not contain metric or geometric information, but it absorbs increasing levels of complexity and information without altering the nature of this simplified graphical representation.

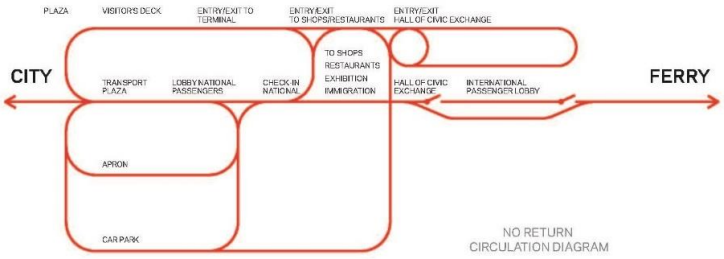


*Figure 3. Circulation diagram for Yokohama International Passenger Terminal by FOA (Foreign Office Architects), 2002* (source: [24])

Another example of diagram application in architectural design is a new neighbourhood project *Silodam* by MVRDV (Figure 4). The aim of the project was to include different typologies and diverse series of housing types in a single volume. In order to accommodate this process in time, a series of neighbourhoods of 8 to 12 apartments were created. Optimal division of functions was achieved through the application of Gaussian curve diagram, which served to prevent processes out of economical control.

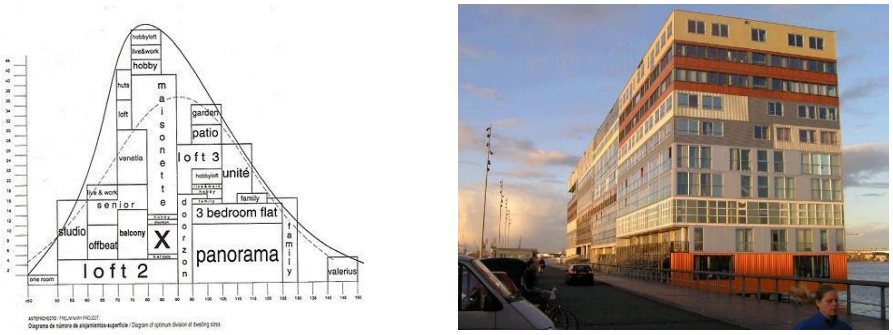


*Figure 4. Silodam, MVRDV: Diagram of division (left), realization of the final form (right), 1995 – 2002* (source: [19])

*Seattle Central Library* by OMA is the concluding example of diagrammatic approach in architectural design. This project redefines the library as an institution no longer exclusively dedicated to the book, but as an information store where all potent forms of media, new and old, are presented equally and legibly. In an age where information can be accessed anywhere, it is the simultaneity of all media and, more importantly, the curatorship of their content that will make the library vital. The form of the building was directly generated from the iconic diagrams of proliferating functions (Figure 5). The library's various programs are arranged, through the diagram, across five platforms and four flowing "in between" planes, which together dictate the building's distinctive faceted form.

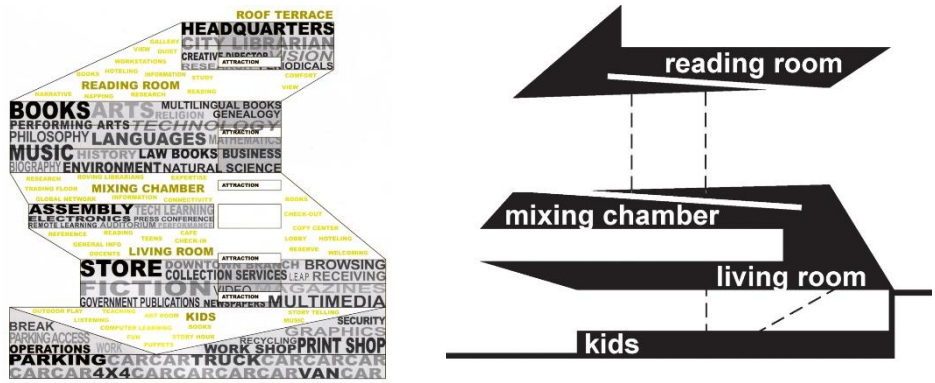


*Figure 5. Seattle Central Library, OMA: Diagrams of function are at the same time form generators, 2002 – 2004* (source: [25])

Through shown cases of diagram application in the process of architectural design one can witness a wide variety of interpretations of diagram in the field of architectural design. However, one has to be very careful with diagrammatic and other modes of representations in architecture. Many theories of representation and expression have tended to privilege the concept over the building [26], causing the possibility that concept may be understood separately from its manifestation, making the buildings unnecessary. It must be emphasized that concepts and buildings cannot be made equal, or even similar, because architectural concepts may only exist fully in their realization, as discoveries through the process called design.

## 4. CONCLUSIONS

Research presented in this paper has shown some main traits of both sketches and diagrams as particular modes of architectural drawing, i.e. as primary means of expression in the field of architectural design. It has been concluded that differences between sketches and diagrams cannot be clearly defined, because of many disparate interpretations of their features. Nonetheless, this paper favours diagrams as a form of graphic interpretation, and as a very important factor in the process in contemporary

architectural design. Although mainly used for generating initial ideas and concepts at an early design stage, diagrams may also serve for analysis of existing architectural structures. Due to the fact that diagram allows access to specific parts of an object, while preserving the concept of the whole, it stands out in comparison to other representational forms in architecture – drawings and sketches.

The multidisciplinary nature of the research in the field architectural diagrams can enable the originating of theories and innovations that have, and will continue to be of great importance in all areas of research where the pursuit for new knowledge about the design and the future of space is needed. Through mapping and new information technologies, that will increase the amount of information available for processing, it will undoubtedly come to a greater need for the diagrammatic organization and synthesis of spatial systems in architecture.

## REFERENCES

[1] Van Berkel, B., Bos, C.: The new concept of the architects. *Move: Imagination*, **1999**, vol. 1, pp. 27-28
[2] Sperling, D.: Architecture as a digital diagram. *International Journal of Architectural Computing*, **2004**, Vol. 2, No. 3, pp. 371-387.
[3] Dogan, F.: Architectural Design Students' Explorations through Conceptual Diagrams. *The Design Journal*, **2013**, Vol. 16, No. 1, pp. 103-124.
[4] Vidler, A.: Diagrams of diagrams: architectural abstraction and modern representation. *Representations*, **2000**, No. 72, pp- 1-20.
[5] Žan Nikolas, L. D.: *Pregled predavanja iz arhitekture (original title: Précis des leçons d'architecture donnérs a l'Ecole royale polytechnique*), Građevinska knjiga, Beograd, **2005.**
[6] Hewitt, M.: Representational Forms and Modes of Conception; an Approach to the History of Architectural Drawing. *Journal of Architectural Education*, **1985**, Vol. 39, No. 2, pp 2-9.
[7] Suwa, M., Tversky, B.: What do architects and students perceive in their design sketches? A protocol analysis. *Design Studies*, **1997**, Vol. 18, No. 4, pp. 385-403.
[8] Vrachliotis, G.: Articulating Space through Architectural Diagrams. In: *AAAI Spring Symposium: Reasoning with Mental and External Diagrams: Computational Modeling and Spatial Assistance*. **2005**, pp. 127-133
[9] Do, E.Y.L., Gross, M.D., Neiman, B. and Zimring, C.: Intentions in and relations among design drawings. *Design Studies*, **2000**, Vol. 21, No.5, pp.483-503.
[10] Do, E.Y.L., Gross, M.D.: Thinking with diagrams in architectural design. *Artificial Intellingence Review*, **2001**, No. 15, pp. 135-149.
[11] Burke, A.: Considering the diagram and design research. *Lusofona Journal of Architecture and Education*, **2014**, No. 11, pp. 345-355.
[12] Vidler, A.: Diagrams of Utopia. In *The Activist Drawing: Retracing Situationist Architectures from Constant's New Babylon to Beyond* (edited by de Zegher, C., Wigley, M.), **2001**, pp. 83-91. The Drawing Center, New York.
[13] Downing, F., Hubka, T. C.: Diagramming: A Visual Language. *Perspectives in Vernacular Architecture*, **1986**, Vol. 2, pp. 44-52

[14] Graf, D.: Diagrams. *Perspecta*, **1986**, Vol. 22, pp. 42-71.
[15] Allen, S.: Diagrams matter. *ANY: Architecture New York*, **1998**, No. 23, pp. 16-19.
[16] Lueder, C.: Diagram ecologies-diagrams as science and game board. In *Diagrammatic Representation and Inference* (edited by Cox, P. T., Plimmer B., Rogers P.) **2012**, pp. 214-232. Springer-Verlag, Berlin Heidelberg
[17] http://2.bp.blogspot.com/-iPwtaPV1VAA/UMUH_7jT3pI/AAAAAAAAAQw/hhCOoKlqit8/s1600/Section+A+Modulor.jpg, downloaded on 20th March, 2016.
[18] Fraser, I., Henmi, R.: *Envisioning architecture: an analysis of drawing*, John Wiley & Sons, New York, **1993.**
[19] Van der Maas, S.: El diagrama en la arquitectura. *DEARQ: Revista de Arquitectura de la Universidad de los Andes*, **2011**, No. 8, pp. 32-43.
[20] Somol, R. E.: The Diagrams of Matter. *ANY: Architecture New York*, **1998**, No. 23, pp. 23-26
[21] Dulić, O., Aladžić, V.: Primena dijagrama u procesu arhitektonskog projektovanja. *Zbornik radova Građevinskog fakulteta Subotica*, **2014**, No. 26, pp. 159-164.
[22] Castellanos Gomez, R., Domingo Calabuig, D.: The value and aim of Louis I. Kahn's form drawing. *EGA-Revista De Expresion Grafica Arquitectonica*, **2013**, Vol. 22, pp. 242-251.
[23] Moulis, A.: Forms and techniques: Le Corbusier, the spiral plan and diagram architecture. *Architectural Research Quarterly*, **2010**, Vol. 14, No. 4, pp. 317-326.
[24] http://www.archdaily.com/554132/ad-classics-yokohama-international-passenger-terminal-foreign-office-architects-foa/542078f1c07a8086fc00000a-ad-classics-yokohama-international-passenger-terminal-foreign-office-architects-foa-circulation-diagram, downloaded on 21st March, 2016.
[25] http://www.archdaily.com/11651/seattle-central-library-oma-lmn, downloaded on 22nd March, 2016.
[26] Braham W., W.: After Typology: The Suffering of Diagrams. In *Contemporary Processes in Architecture (ed. Rahim, A.), **2000**, pp. 3-9. Architectural Design, London.*

# БЕЛЕШКА О ГРАФИЧКИМ ПРИКАЗИМА У АРХИТЕКТУРИ – ДИЈАГРАМИ ИСПРЕД СКИЦА

***Резиме:*** *Основна активност у раду архитекте је бављење простором који одговара друштвеној динамици дефинисаној феноменолошким односима између човека и његове околине. У области архитектонског пројектовања, просторна истраживања врше се путем графичких приказа и архитектонских цртежа као основног средства изражавања. Истраживање представљено у овом раду бави се видовима графичких презентација, односно скицама и дијаграмима као двема тесно повезаним категоријама. Посредно су истражене разлике између типова графичких приказа, те је указано на најважније карактеристике скица и дијаграма. Претпостављено је да дијаграми доминирају у процесу савременог архитектонског пројектовања, јер омогућавају архитектима разматрања о*

*односима између апстрактних пројектантских концепата и архитектонског простора. Осим тога, указано је на примену дијаграма у архитектонској пракси кроз наведене карактеристичне примере. Овим истраживањем је закључено Овај рад закључује да дијаграм, као визуелни приказ просторне конфигурације, представља срж пројектантске концептуализације, те наглашава структуру пројектантске концепције.*

***Кључне речи:*** *архитектонска репрезентација, дијаграми, скице, пројектантски процес*