Design: Analogue, Digital, and Somewhere in Between

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Abstract. The problem considered in this paper is: “In what way do we design?” This paper concentrates on the early creative stages of the design process during which the designer gradually gathers the information about the problem, applying appropriate rules, tools and media. If the tools are chosen as a starting point of consideration, designing may be analysed as manual or digital. If we chose the medium - design may be considered as physical or virtual. The main thesis of this paper is that designing proceeds somewhere in between. “Somewhere in between” means the space where manual, digital, virtual are mixing, overlapping, and transforming one into the other. As a case study the process of designing of blurred function object is presented. In this experimental design studio we paid particular attention to the design process and we searched for the answer to the following questions: how to find an idea (what tools/media are helpful), how to express, fix and transform that idea? In the paper the examples of students’ work will be presented and discussed.

Keywords. Creativity; digital design methods; mixed methods of design.

INTRODUCTION

The problem considered in this paper is: “In what way do we design, what tools/means/medium do we use? How do we search for and fix the design idea?” The starting point for this discussion is the statement that searching of a design solution is strictly associated with the act of communication of an idea. The way in which the designer communicates their idea is deeply linked with the design. Their particular method of communication is a statement made in their own personal way. The way of communication expresses the designer’s creative thinking. The art of communication is inseparable from the design.

As shown in the above questions, this paper concentrates on the early creative stages of the design process. Considerations concern the information generated by the designer during the process of searching. Gathering and processing such information is crucial to the design process. During the process of creation the designer gradually gathers the information about the problem, applying appropriate rules, tools and media.

During the analysis of design information – the processing system, its three basic attributes should be discussed:

- Information generation – This takes place on the basis of long-term memory resources. If the resources are insufficient the designer refers to books, drawings, surveys, standards, etc. When both internal and external sources of information are inadequate, the designer is forced to generate new information.

- Information representation – From the point of view of information processing there are two forms of representation: verbal-conceptual and visual. Verbalisation of an idea by means of text
plays an important role at the early conceptual stages of designs. Graphics, however, are used for spatial description of objects.

- Information transformation – Having a set of representations (images), the architect transforms them in order to reach the final form (Akin, 1986). In designing, if it is understood as a process of information transformation, new information emerging in consecutive steps of the design process requires visualisation and linking it with the information created in the earlier steps. The first stage of creative thinking is formulating an idea determined by the information possessed by the designer. Usually a couple of competitive ideas can be formulated. As a result of preliminary ideas can be formulated. As a result of preliminary browsing from the point of view of compliance with the conditions of the task, one idea is selected. The next steps lead to the detailing of the idea and the transformation into its final form.

**TRADITIONAL DESIGN - SKETCHES**

In this part of the paper the sketch-based design will be discussed. Analysis of architectural design shows that the main aspects of creativity consist in creation in the mind of ideas which have not existed before and pictures which do not have any prototypes. New forms came into existence immediately and intuitively, or as a result of a long process of searching. Each design activity is connected with a self-contained visual form: drawing, sketch, comments and mock up. In the architectural creation process a designer uses specific graphical vocabulary. In the process of communication precision, as well as richness of graphic images content, is especially important. Each symbol, each line corresponds a particular meaning. The essence of creativity is in the intuitive sense of the line.

According to Faruque (1984), graphic presentation of the ideas is a solution of the problem. “It is the way in which the idea is communicated. The act of communication, its nature, its style, and the very level of its involvement, are deeply linked with design. Such a design solution is a statement made by the architect in this own personal way of communicating. It is an expression of the designer’s creative communication. The art of communication is inseparable from design.”

In traditional design sketch was not only a tool in professional communication, but also an essential heart of creativity. Ideas may be visualised only by graphic symbols. This thesis becomes a general paradigm of architectural design. Visual information is non-linear, graphic and spatial, i.e. multidimensional, as opposed to verbal information, which is linear. It is a natural and obvious medium for expressing oneself. Since it is a direct transfer of a mental picture or image, very little information is lost during such a transfer process.

Traditional designing was limited to a two-dimensional plane of the drawing. In the 20th century opinions on insufficiency of plane representations of the three-dimensional world began to appear. K. Melnikov claimed that what the author of a project sees and feels, cannot be transferred onto the architectural drawing. The author’s idea can be understood up to a point, only to be perceived completely in the completed building. K. Melnikov considered that even the author of the project cannot predict all. His dream was to see how people will perceive the unusual form of internal space created by him in his design of a Columbus monument. It was a trimmed cone, in which immersed another similar, but the turned cone at the top. K. Melnikov admitted that even he could not have had imagined what impression would be made by this interior (Khan-Magomedov, 1990).

However, the “sketchy” way of searching also has its limitations. This is because the image of the form is a result of the free “wandering” of thought which the determinism of drawing frequently hinders by imposing graphically feasible solutions, even though, the mind rejects these solutions. In this situation, it is necessary to extend the methods of searching by other means of expression, such as mock-ups. The use of mock-ups in the design shows that architectural model is an extremely effective means of designing, developing spatial thinking capacity. This was one reason of searching for new tools that
would allow to replace the traditional “sketch-based” tools in the design method.

**TRADITIONAL DIGITAL DESIGN – 3D MODELLING**

Thanks to the development of CAD software the effectiveness of tools for drawing, writing specifications of building materials and performs photorealistic visualization has increased. This has been achieved in two ways. The first is the development of “conventional” CAD programs. The second is associated with a new philosophy of a designer’s work, who develops a “virtual model” of the object on the basis of computer generated plans, sections, elevations and visualisations. The designer models a process of construction in the digital space. It should result in freeing the designer from the “computer” way of communicating. The analysis shows that this way of working is the main direction in the implementation of software to help develop technical documentation.

Regardless of the fact that computer technology has enriched our arsenal of design tools with one that does not have analogy in all of history of designing, this did not significantly change the process of designing. The development of CAD programs concentrated on their ability to work out of a presentation drawing. The whole creation process was sketch-based, as in traditional architectural design. Sketch made on the tablet is the same as one done on a piece of paper. But at the same time we may use computer not only as a simple tool but also as a media. One of the major aspects of creative search is the ability of metaphorical thinking. Therefore, it becomes clear that computers can play a role of the intermediary in the creation of spatial metaphors of the form. In these methods the designer may use graphic transformations and mathematical programming, shape grammar, cellular automata and genetic algorithms. Design becomes digital, but what still remains a problem is whether this is a new digital or the traditional way of designing?

**TRADITIONAL DIGITAL DESIGN IN VIRTUAL ENVIRONMENT**

Appearance of Virtual Reality technology resulted in a hope to change the way of design. The eCAADe conference in 1994 had a very optimistic title: “The Virtual Studio”. Two years later Engeli (1996, p. 132) has written: “New technological achievements and research results allow for the creation of innovative design tools for architects that do not originate from paper-based paradigms but instead make optimised use of the present technology and programming concepts”. Undoubtedly, we are dealing here with a revolution in the area of the technology of man’s communication with the computer. It allows one to enter through the monitor screen into the “computer world”, where an interaction with the forms present there is taking place. It turns out that apart from these virtual forms, nothing else exists. Designers and users of the world which they have created, by receiving new experiences and new means of interaction, become a new generation of the inhabitants of virtual worlds. But in current days it is only theoretical speculations. Implementation of this technology at the early design stages is quite problematic.

**DIRECT DESIGN**

Over the last years there was a discussion about the possibility of use of virtual reality technology as a design environment where “direct designing” will be possible. This idea was based on full immersing of the architect in the environment projected by him. Creation and visualization of design solutions follows directly in virtual space. The architect is in the projected space, defines a direction of changes and in an interactive mode realises these changes, moving forms in virtual space.

Virtual reality has caused implosion of space, eliminated the boundaries between the space of realization and the space of perception. Everything is done in one and the same interactive space. This creates the conditions for the perception of the metamorphosis of forms, non-physical objects, paradoxical images, the reality of the illusion, and above all the perception of the invisible aspects of our world.
The development of a virtual reality in which interacting with representations of virtual objects can take place, allows the use of new perceptual, cognitive and interactive capabilities of man. As Gann (Whyte, 2002, p.7) has written in the preface to the J. Whyte book Virtual Reality and the Built Environment: “... designers no longer need to be temporally and spatially constrained by previous limitations of sequential decision making processes. They make it possible to create virtual prototypes, to model attributes and to simulate performance characteristics without having to build full-scale mock-ups. By adding another dimension to the ways in which space can be configured over time, they complement and enhance the value of using face-to-face communications and physical models.”

The condition for the effective functioning of the virtual space should be using the full semantic spectrum of communications capabilities, including measures of verbal communication. Unfortunately, regardless of the potential of VR, past experience does not acknowledge the usefulness of this technology in the early stages of the design process. VR is usually used as a presentation space, not as a design environment. Concluding, design remains a traditional design.

THE BLURRED FUNCTION OBJECT CASE STUDY

The goal of the exercise
• Education for creative use of all available tools and media in architectural design and teach the methods for creative explorations.
• The integration of computer technology with the creative design process.
• Focusing on the PROCESS of design.
• Creation of a multifunctional space. Multifunction means the ability to implement multiple functions within a given space. The function of the space may be the space itself.

The exercise description
Ordinary space is characterized by having boundaries that have arisen as a result of the materialization of our ideas about the space. When we think about space, it is usually defined by physical elements. The goal of the presented project is the creation of space that goes beyond that defined framework. Space may be defined not only by the geometry, but also for example by motion and time. The boundaries of space can also be defined by the sensibility/perceptibility of space. Architectural space becomes a space of feeling. A recently created space may include a lot of subspaces. As Marcos Novak say, we experience many of spaces in one. The new space may be created through physical or computer modelling. However, in both cases, the initial information is obtained through various methods of analysis and representation of space. The resulting diagrams are used to define the transformations of the space.

Explanation of the choice of subject
The case study has been carried out on the basis of the process of designing of a blurred function object, the process in which different methods of idea searching were used. The idea of the design subject is a result of reading the “Species of Spaces” by G. Perec, in which he has written: “I have several times tried to think of an apartment in which there would be a useless room, absolutely and intentionally useless. It wouldn’t be a junkroom, it wouldn’t be an extra bedroom, or a corridor, or a cubby-hole, or a corner. It would be a functionless space, it would serve for nothing, relate to nothing. (...) A space without function. Not ‘without any precise function’ but precisely without any function; not pluri-functional (everyone knows how to do that), but a-functional. It wouldn’t obviously be a space intended solely to ‘release’ the others (...) but a space, I repeat that would serve no purpose at all”. (1997, p. 33)

We decided on this subject because we think that only a non-trivial problem determines a non-trivial approach to solve it. The non-trivial building allows a change in the way of designing. With this approach, students were forced to “design without
prototypes’. At the beginning they had to define the concept of blurred functions, because they could not find an equivalent in completed architectural objects. If the objects with a fuzzy function do not exist, while designing such objects the students were not able to use standard procedures.

This was the reason for which in the design studio we paid particular attention to the design process and we searched for the answer to the following questions: how to find an idea (what methods/tools/media are helpful); how to express, fix and transform the idea?

**The process**

Eight groups of two students took part in the design studio. Students have used very different creative methods, ranging from sketching, through generative algorithms, and ending with a pantomime performance.

While evaluating the project we tried to summarize the results and analyse the design process and specify which tools/medium were used at each stage. However, we could not do it precisely, because all tools/media were used simultaneously. Students moved from one tool/medium to another several times during each stage. During the site analysis, they sketched or created diagrams based on Google maps. Several made a cardboard mock-up. When students began looking for inspiration, we expected that in most cases, this information will be obtained from the web. In fact, we do not guess that right. But one group used the abstract painting as an inspiration, another - a view through kaleidoscope, and yet another just broke a mirror. In one case, inspiration was transformed into a way of form creating, because the group was inspired by grasshopper as such. We found a similar situation at the stage of expression of the idea. Students have used both analogue and digital tools and in many cases it was impossible to precisely specify whether a given mode of expression is digital or analogue. Even when they started working from a sketch or a mock-up, in the next step, that sketch was scanned or photographed and transformed in graphic software. Just as often, this was done in the opposite direction. Student began with a digital image, and then sketched on it.

During the entire design process we were looking for the possibility of expanding the spectrum of ways of expression. Traditionally, creativity cannot be realised out of material structures. It was always realised as gesture, colloquial or written speech, a picture, a sculpture, a building. A person thinks and

*Figure 1*

*Students work. From digital inspiration through sketch to digital model.*
Figure 2
Students work. From digital searching through mock-up to digital model.

Figure 3
Students work. From sketch to Grasshopper.

Figure 4
Students work. From broken mirror through pantomime to digital model.
feels with the help and through the world created by them. This world is a reflexion of human experiences. Language, dance, architecture are material displays of human life.

We asked the students to find music, text and gesture that are most suitable to their project. This resulted in fragments of poems, a quotation from Henry Kuttner science fiction short stories “Gallagher Plus” or the created by student pantomime “Broken mirror” with music by Clint Mansell “A swan song (for Ninja)”.

At the end stage of design– documentation – all students used digital techniques such as renderings and animations. We also asked them to prepare traditional mock-ups. We wanted to check whether it makes sense to create mock-ups when we prepare a digital presentation. We received models of varying degrees of accuracy. As it might be expect, making models of organic / liquid forms was the most difficult. On the other hand, most students found that the model helped them better understand what they have achieved. (Fig. 1, 2, 3, 4)

BETWEEN
Traditionally, design is analysed as a “manually” traditional or as a “digitally” based process. If the tools are chosen as a starting point of the consideration, designing may be analysed as manual or digital. If we chose the medium - the design may be considered as physical or virtual.

The main thesis of this paper is that designing proceeds somewhere in between. “Somewhere in between” means the space where manual, digital, virtual are mixing, overlapping, and transforming one into the other.

The creation of an environment of architectural designing is based on the synthesis of diverse ways of images transfer, the use of real objects and traditional means. As a result of any use of these elements, it is received not as the “intermedia” or “multimedia” environment, but as the complete “unimedia” environment.

Currently, we often meet the opinion that the project completed using traditional tools is much more virtual than the project completed in virtual space. Nowadays, the Virtual is much more Real than the old Real ever was. Traditional drawings present the ideas that arise in our mind, in a very simplified form. It shows only a very approximate appearance of a future object. The forms created in virtual space are much more realistic than the traditional reality. We create and at the same time we see the result of our creative actions. Such way of working also causes a number of serious problems. If we use digital models obtained by three-dimensional scanning of physical forms in the design, is it a digital or analogue way of designing? Direct design in virtual space can be considered as a real (physical) process of construction of an architectural object. Can we assume that the virtual is unreal? What is the difference between Virtual and Digital, Real and Physical?

When considering this issue we must note the difference between computer and human brain. The computer is discrete; the mind - analogue. It causes a problem with their connection. We need something “in between”. The basic thesis of research on creation of the architectural designing environment is that process of creation and perception of architecture passes between Real and Virtual, Analogue and Digital. Or maybe, as Pallasmaa (1986, p. 452) claims: “Architecture exists in another reality from our everyday life and pursuits. (…) The quality of architecture does not lie in the sense of reality that it expresses, but quite reverse, in its capacity for awakening imagination.”

We can formulate the thesis that architecture exists “in between”. Architecture is created by analogue and/or digital tools. In the process of creation we are dealing simultaneously with the multiplicity of space and tools to create them. As a result, designing should be considered as an integrated process connecting the analogue and the digital, the real and the virtual. Architectural space, which until this day was considered as a physical environment, is complemented by digital space. In a simulation of physical, architectural and virtual spaces similar parameters are used. In virtual models the border between the representation of physical places and the imagined virtual worlds disappears, leading to a new reality (Schmitt, 1999).
CONCLUSION
The design process is an expression of abstract ideas through images and its transformation in a design of the building. Designing is considered a multilevel activity in which there is no universal tool to solve all design problems. Therefore an environment in which communication between various design tools will be possible is needed. It is necessary to create such conditions of work where the possibilities of the chosen tool will not limit the creative potential of the architect. Working space should allow drawing, writing, modelling and searching for information in a natural and intuitive way. Intuitiveness of work in the new space is extremely important as it allows the designer to concentrate on design problems, instead of on how to use the tool. On the other hand, tools should provide maximum flexibility, due to the lack of determined rules and indefiniteness of the early stages of design. The difficulty also consists in the fact that it is not possible a priori to specify work of the tools. The problem of the tools is directly connected to a problem of design media. If, as McLuhan claims, all media are an extension of human abilities, the computer may be considered as an extension of traditional tools, and, hence, does not have a significant impact on the process of creation in which these tools are used. It follows that on the process of creation the change of the method of work has a greater impact than the change of tools which were used.

People everyday uses a “non-physical” cognitive space as an environment for their thoughts. In a similar way architects, designing, do it in the “non-physical” environment. It allows reflecting ideas, models, plans and abstract concepts. The digital space becomes electronic expansion of cognitive space. Creative capabilities of the computer can be seen only now that computers’ presence in culture becomes imperceptible as it is a ubiquitous, subconscious element of our lifestyle. Now, considering the design as traditional, digital, or hybrid becomes meaningless.

During the process of searching for an idea a student used different visual methods (sketches, mock-up), verbal methods (text), acoustic sources (music, sounds of the city), and performance as means of expression. Our experiment has showed that digital techniques create new possibilities of producing design information thanks to both the new tools and the new software.

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