Image, Imagination, Innovation: How Can We Overcome the Common Ground in the Processes of Visual Design?

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Abstract. This paper presents the analysis of two poles in the spectrum of image creation: the primal drawing process and the coding process in the field of generative design. The reflection upon these design processes is conducted in order to answer the question of how it is possible to overcome individually, socially and culturally determined visual schemata.

Keywords: Innovation, Graphic Design, Design Process, Visual Communication, Iconic Research, Practice Led Iconic Research, Generative Design, Interface Design, User Experience, Cognition, Anthropology.

1 Introduction

Mankind is described as a cultural being, which specifies the pronounced human ability to develop new achievements relevant for a society and its' prosperous further development over generations. The phylogenetic development of language has often been referred to as proof of the unique capabilities of the human being to develop beyond genetically determined capabilities. Therefore it is not surprising, that we find a wide range of recent publications presenting research results about the origin and the development of human language. [1] [2]

In contrast to the anthropological and linguistic studies, we find little reflection about innovation processes involved in the creation of images. If we refer to their history we find a few indications. Plinius the elder, a Roman writer from the first century AD, describes for example how the painter Zeuxis was commissioned by the people of Agrigentum to create a picture of the goddess Juno and therefore chose the most beautiful women in the town to combine their most beautiful features in his painting [3]. This report is proof that already in the first centuries AD the artist was described as a responsible individual able to determine analytically an aesthetic quality.

In the Renaissance, Federico Zuccari describes the artist as an individual following the divine processes of creation by imitating nature and moves the process of imagination and creation beyond human abilities. [4]

Summarized under the term creativity, some references with the aim to induce creative behavior in Management, Art, Advertising or the scientific context can be found

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in the middle of the 20th Century[1]. Most of these authors summarize their results in simplified formulas applicable to practical situations.

More recent publications in the Theory of Sciences show that there is not a simple pattern which we can apply to a field of scientific innovation. [5] The study of modern art history confirms that we can only look back at innovative developments after they were achieved.

It is the focus of the research presented here to discover the implicit (or tacit) knowledge involved in the process of generating unseen visual constellations for our daily communication. This research is situated in the context of *Iconic Research*[2] with the specific purpose of gaining knowledge for those who create images and are confronted with the lack of scientific reflection about the potential of images to generate meaning. The key question stays the same in the context of language, of science, of technology or visual communication, design and art. Mark Johnson describes the general direction of this inquiry as follows:

"Our ability to make new meaning, to enlarge our concepts, and to arrive at new ways of making sense of things must be explained without reference to miracles, irrational leaps of thought, or blind impulse. We have to explain how our experience can grow and how the new can emerge from the old, yet without merely replicating what has gone before. As it turns out, this may be one of the most difficult problems in all of philosophy, psychology, and science: how is novelty possible?" [6]

If we try to define the question more precisely for the context of visual communication, we can refer again to the anthropological studies concerned with the development of human communication. They describe the *common ground* as a pre-requisite for the most basic occurrences of gestural communication. [7] Even a simple *pointing gesture,* executed by a person to guide the attention of another individual to an object or event in the context of communication, can only generate meaning if both individuals know from each other what they know. As described by Tomasello, if I am in a room and point at the door, addressing another person, it can mean different things. If I have spent hours in the room in a meeting, the gesture could mean: "Lets go outside, I have been in here long enough." If we just arrived it could mean: "Lets close the door and start the meeting." Depending on the situation the pointing could also demand from the addressed person to leave the room.

For sharpening our questions of innovation in the context of images we can derive from the anthropological studies a similar necessity of a *common ground* to understand images. We need to know what a house is and how it looks like in order to be able to recognize it in an image. How is it possible, under these circumstances, to arrive at an image of a house which goes beyond the five lines of the pictogram culturally embossed in our mind? What are the processes to generate a new visual form of a house, which is recognized, accepted and understood in our daily communication with images? In order to analyze the processes of image generation it makes sense to start with the basic methods of image generation – the drawing process.

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[1] For example: Alex F. Osborne, Creative Education Foundation, University of Buffalo.

[2] Iconic Research is a research field, which developed out of the observation of the *Pictorial Turn* (Mitchell 1994) and *Iconic Turn* (Boehm 1995).

2 Drawing as an Exemplary Methodology to Create Unseen Images

2.1 Cognitive Linguistics as a Foundation for the Analysis of Innovation Processes in the Context of Drawing

To draw, is a physical process where the movement of the hand holding a tool leaves a mark on a surface. If we try to describe the process of drawing precisely, we discover that there are parts of the process which we can address easily with words. For example we can describe the conscious definition of criteria which makes it possible to judge the final drawing in the preparation phase. We can say why we choose charcoal instead of a pencil. If we go more in detail, we will discover, that the decisions made in the main motor activity of the process, the drawing of the line, are not describable through our language. In other words the experiment of describing the drawing process in detail shows the interaction between decisions made consciously and those executed under the level of consciousness. [8]

The theories of cognitive linguistics, especially the theories of the embodiment, are describing a continuum between unconscious reactions of an organism and the ability to think in abstract symbolic systems such as language or math. Recent studies have drawn attention to the relevance of the fact that all the human abilities to think in abstract concepts such as language or mathematics have a direct relationship to the physical constitution of the human being and to our mobility in space. The constant reaction of our organism to new events in the environment creates a flow of unconscious emotional activity in our body. These reactions are the foundation of feelings, which we can define as distinguishable qualities of emotions. Feelings are also participating in the creation of image schemas, which are described as multi-modal records of experiences including feelings and sensory aspects of an event as well as basic structural qualities. The ability to recognize the qualities of emotions, observe their patterns, and develop image schemas, is leading to a next level of abstraction through basic metaphors. These metaphors connect two different types of experiences in the form of image schematic objects, perceived through the human body. For example, the experience of passing time is directly related to the human body moving through space. The past is perceived in western cultures as objects we have in back of us. The future is perceived as objects in front of us. The present is where we currently are on the path. A closer look at language shows already in this example that our expressions are reflecting these basic metaphoric ideas and prove their importance in the way we are forming complex concepts. In the context of the basic metaphor we formulate in English: I look forward to see you, he left his past behind him, let's move on, etc… What has been described here as a basic theory, relevant for linguistics, raises the question about the status of images in the continuum from emotional thinking (unconscious cognition) to thinking in abstract symbols. [9]

This simplified summary allows us to analyze the drawing processes based on basic principles outlined above. The decisions made under the level of consciousness, which are not accessible through words, can be addressed in experimental settings and we can try to make the influences on these decisions visible with practical experiments.

2.2 Drawing Experiments I; Drawing an Ellipse

If we look at the drawing process with the aim to understand influences on the unconscious decisions made continuously in the process of this specific method of image generation, we can refer to one of the known academic drawing approaches developed in the French academies in the 19th century. The large format analytical drawings are based on the understanding of the two-dimensional representation of three-dimensional geometric objects such as the cube, the cylinder, the conus or the sphere. Investigating the way these shapes are generated we can pick one basic form and analyze its possibilities to be generated. The form of the ellipse can be generated geometrically by calculating every point of the line or it can be drawn today as one definite line in a digital drawing program. In this context unconscious decisions are not intended and we avoid them as much as possible.

Already the tracing of an existing ellipse by hand through a semi-transparent paper, allows us to examine the behavior of the sensorimotor apparatus. The aim of the movement is to keep the tip of the pen as close as possible on top of the existing line. The loop of movement, setting the mark, perception of the mark, and feedback resulting in the adaption to the movement, leads to the line with a specific quality. We would describe the quality of a traced line as shaky, insecure or tentative.

If we draw an ellipse free hand by developing a definite form through the accumulation of many tentative lines, we are employing the motor abilities of the arm. The resulting line can be described as continuous, showing an aesthetic appeal through its tension. In this very specific drawing technique of an ellipse emerging "out of the paper" through the layering of many lines, we can understand the interdependence of form with the abilities of the sensorimotor system of the human body. We can conclude from this simple observation about the ellipse drawing, that the physical constitution of our arms has a significant influence on form in the drawing process.

2.3 Drawing Experiment II; Mirrored Lines

The following experiment shows a more intricate characteristic of our sensorimotor apparatus. If we create a freely drawn line with the writing hand and try afterwards to draw the same line mirrored with the other hand, we will experience the difficulty to recreate a line with a similar quality as the original.

The attempt to create the mirrored constellation of two lines by drawing with both hands simultaneously leads almost automatically to an unexpected resemblance, when we concentrate on the movement of the writing hand. This example shows, that our sensorimotor system is preferring mirrored movements as long as they are executed simultaneously. This constitution has also an influence on the development of form on the level of unconscious decisions. [10]

2.4 Drawing Experiment III; The Influence of Practice on the Unconscious Decisions

Unconscious decisions become very apparent when we try to create a drawing within a short time span. If we have no chance to reflect about the qualities of the drawn lines, the decisions are staying in the unconscious realm.

The following series of drawings (Fig. 1.), created under different time restrictions, show how practice influences the unconscious decisions in the drawing process. The first drawing of a snapdragon was created within ten seconds, with the aim to represent the flower realistically and shows a clear orientation on the silhouette line. There are hardly any indications of the internal structure of the object and we would not recognize the specific flower in the single drawing. The following drawings created in a longer time span of one minute, ten minutes and a half an hour show, as expected, more structural detail and a clearer representation of the three dimensional special situation. The drawing created within a half an hour shows textural information and indications of how light and shadow are supporting the representation of space. The fifth drawing in the series was again conducted under the timely restrictions of 10 seconds. Like in parallel drawing experiments with the described set up, conducted with other individuals, we can clearly see in the fifth drawing of the presented series the influence of the previous drawing experiences reflected in the unconscious decisions. These experiments are evidence for the strong influence of practice and experience on the unconscious decisions made in the drawing process.

Fig. 1. Indre Grumbinaite, drawing series consisting of 5 drawings of the Snapdragon-flower. Left: First drawing created within 10 seconds. Right: Fifth drawing created within 10 seconds. Middle from top to bottom: Second drawing conducted within one minute; Third drawing conducted within 10 minutes and the fourth drawing conducted within 30 minutes. Format of each drawing: A3, 42 x 29.7 cm, Archive the Basel School of Design HGK FHNW.

2.5 Interpretation of the Drawing Experiments

The described experiments in the area of drawing have isolated some influences on the unconscious decisions made in the drawing process such as the physical ability to move a pencil over a sheet of paper, characteristics of the sensorimotor apparatus and

the influence of practice and experience. It is obvious that there are many more factors we can address in this kind of inquiry.

Nevertheless the basic exploration of the drawing process lets us deduce the hypothesis that through the interaction between analytical reflection and emotional reaction, unexpected and unseen images emerge. In this process of interaction, we are able to extend a visual field of options beyond the common ground and beyond the approachable variation accessible through rational extrapolation. Furthermore the examples show that the idea of the accidental in the sense of randomness, is not describing what the drawing process entails. The pre-verbal perception, in the realm of the unconscious, is influenced by the described factors of the human body, its sensorimotor apparatus, the body of society and the cultural context. The processes beyond consciousness are partially addressable in retrospect but can not be anticipated with a symbolic system such as language or math.

3 Generative Design and the Attempt to Create Unseen Images

3.1 Generating Images through Parameters Set by Complex Symbolic Systems

If we look at the opposite spectrum of image generation and turn away from the primal, nonverbal process of drawing to the generation of images through programming code, we can find an early example of images defined by a set of parameters in Laszlo Moholy-Nagy's telephone drawings. He wrote about them:
"Painting by hand may maintain it's historical relevance; sooner or later it will loose it's exclusiveness. […] 1922 I ordered in a street sign factory five pictures out of porcelain-enamel by phone. I had the color samples of the factory in front of me and sketched the images on graph paper. On the other end of the line the head of the department had the same graph paper in front of him which was divided into squares. One of the images was delivered in three different sizes, therefore I was able to study the fine differences in the color relations which were emerging through enlargement and reduction." [11]

We can argue that the innovative image has been generated again in the sketching process on the graph paper and has been "objectified" through a description in coordinate positions transmitted verbally on the phone. We find a similar procedure in Sol Lewitts wall drawing processes which he started in 1968. They consist of a simple set of verbally defined instructions and their execution through a draftsman for a specific situation[3]. The openness of the instruction leads again to an interplay between a seemingly precise verbalized description of the outcome of the wall drawing and the concrete execution of the instructions.

In his statement "Sentences on Conceptual Art" (1969) Sol Lewitt contradicts the description of his method of creating images as a predictable and rationally accessible process of innovation in the first three of his 35 statements.

[3] Sol Lewitt; Wall Drawing #69; 1971; „Lines not long, not strait, not touching, drawn at random using four colors, uniformly dispersed with maximum density, covering the entire surface of the wall."

"1. Conceptual Artists are mystics rather than rationalists. They leap to conclusions that logic cannot reach.
2. Rational judgements repeat rational judgements.
3. Irrational judgements lead to new experience." [12]

In these sentences Sol Lewitt declares his way to escape common ground. The leap to conclusions that logic cannot reach is achieved by irrational thought influenced by emotional judgment in both parts of the process, the formulation of the parameters with language, and the interpretation of the instructions by the person executing the drawing.

Since the first images produced through a programming language, we find the debate about their status. Max Bense called programmed images "artificial art" when he saw the exhibition of Georg Nees at the Technical University in Stuttgart showing programmed images in 1965 [13].

"Overall we can maybe formulate, that the 'artificial' production category distinguishes itself from the 'natural' one through the introduction of an intermediation schema between designer (creator) and image (opus) consisting of program and programming code. With this closely connected is an unusual separation of the work in the aesthetic process." [14]

Like Sol Lewitt has separated the instructions and the execution of the single variation of the wall drawing, generative design (Generative Computergrafik) splits the creative process in the creation of the program and its execution through the computer. Even though both processes are showing this comparable separation, the execution through the computer can hardly be seen as equivalent to the manual execution of an image as described in the wall drawings of Sol Lewitt.

3.2 Analyzing a Generative Design Process

The described split of the creative process in setting the parameters and executing them can be differentiated further if we analyze a concrete example. I will refer to a generative design experiment from 1997, conducted at the Basel School of Design HGK FHNW using Macromedia Director and Lingo[4] [15]. In the first part of the creative process the designer chose the programming environment. This already entails advantages and disadvantages for realizing specific procedures to generate the visual outcome. Usually the languages manageable by visually oriented people are on the level of scripting languages. This lets us deduce that the influences on the design process are divided up even more than Max Bense has declared. The Designer coding his image in a scripting language is already setting his options within a given framework of the more abstract programming language.

In the concrete example a program has been written to generate a sequence of forty circles rotating around the center of a square background (Fig. 2.). The writing of the code is obviously not comparable to the drawing process and its interaction between conscious and unconscious decisions. When we are programming, we are forced to use a highly abstracted vocabulary of the specific language describing procedures

[4] I am fully aware that since 1997 the possibilities of creating generative design have evolved and improved. The principles have not changed since the George Nees has coined the term "Generative Computergrafik" in the 1960's.

based on precise mathematical operations the computer is able to execute. In this situation the programming language is more restricted to a convention than in our natural language where new combinations of words can generate new meaning. New visual constellations appear in the programming context through the programming structure itself as well as through the alterations of variables in the program structure defining the visual outcome. We could argue that the program structure is on a level of abstraction before the actual script has to be written, allowing us to generate unseen constellations, by altering the structural parts. But we do not see any visual outcome just conceptualizing a program structure. The achievement of unexpected visual constellations is often hindered in the phase of realization when the absolute need of mathematical precision occurs. [16]

After the script is running, we can focus in a next phase of the process on the execution under varying conditions by changing the variables influencing the visual outcome. In order to produce new visual constellations on this level, we can generate arrays of numbers with diverse criteria. In the example presented here, the script was set up as an interactive application in which the user generates the variables through the movement of the mouse. Position and distance of the mouse to the center of the circular movement, as well as acceleration and deceleration of the mouse movement, have been used to generate variables. These are employed in the execution of the script to generate variations within the framework of the circular movement script. On this third level of the creative process, we operate at least within the third set of frameworks generated beforehand through other people.

It is remarkable in the presented experiment what meaning the translation of the physical mouse movement and its visual interpretation causes in the beholder. The natural behavior of the elements in this simple experiment and its imitation of a living organism became the springboard for further experiments in 1998[5].

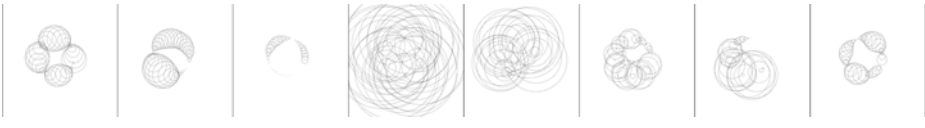

Fig. 2. Roland John: One example from a series of generative design sketches which led to the idea of the "Living Interface"; 1997, Basel School of Design HGK FHNW

3.3 Applying the Generation of Variables through the Mouse Movement to Interface Design

The procedural findings described above in the program structure and the involvement of the user input to generate variations on movement and appearance of the visual elements, were extended in a series of studies towards the design of menu structures for an interface.

[5] For further reference on the theme of cognition and interactive images: Renner M.: Some Thoughts on the Interactive Image, in: Neshan, Iranian Design Magazine Number 22, 2010, Spring/Summer, E: 18 - 22 S. Farsi: 49 - 55 S.

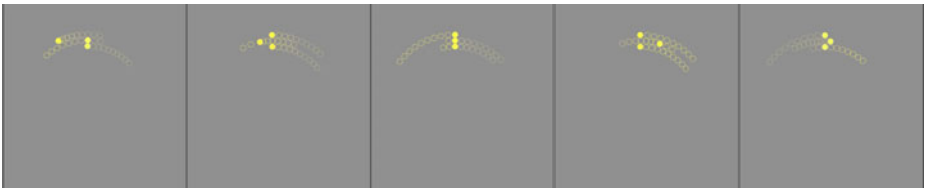

Fig. 3. Roland John: Preliminary interface study for "The Living Interface"; 1998, The Basel School of Design HGK FHNW

From these preliminary experiments with moving interface elements, an interface was designed which allows the access to complex data (Fig. 4.).

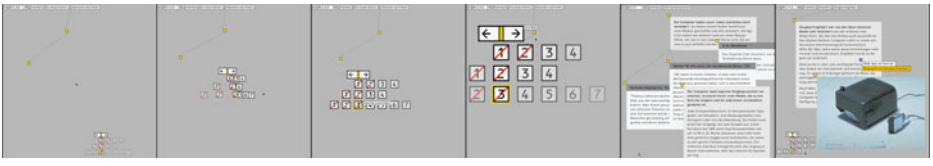

Fig. 4. Roland John: Interface Study "The Living Interface"; 1998, The Basel School of Design HGK FHNW

The study shows an exemplary process. In the first investigation on generating visual constellations the analysis led to a set of variations presenting a strong impact on the user, through the natural reaction of the graphic elements on the actions of the user. This analysis has been transposed and overlapped with the informational requirements of an interface. We can find in the combination of two diverse seemingly incompatible schemes, another method of generating innovative functional and visual constellations.

4 Preliminary Conclusion

The comparison of the drawing process with the process of generative design can be analyzed from the perspective of cognitive linguistics as summarized under 2.1.

The unconscious processes of drawing are handled to a large extent on a nonverbal, emotional and sensorimotor level and generate innovative constellations through its conscious employment before the analytical thinking in complex symbolic systems takes over. In opposition, generative design has to employ the complex symbolic system from the beginning in the form of a programming language. These are removed, but derived from the primary sensory experience and are used to generate once again a visual stimuli. This detour from the sensory perception to the metaphoric system of language and back to a visually perceivable stimulus generates visual innovation. The innovative step happens through the abstraction in the verbally described program structures and their openness to derive from them a concrete image by the draftsman (Sol Lewitt) or the programming designer (generative design). [17] Another principal of innovation can be found in the combination of unexpected

metaphorical concepts. The overlapping of the two concepts natural movement and informational requirements of an interface can be used quasi as collage to generate new visual meaning.

To refer back to the beginning of this paper and it's title, we can conclude that we can leave preconceived conventions – the common ground – by making use of the blurred border between unconscious and conscious thinking or through the diffusion of translating descriptions of a complex symbolic system to the level of a visually perceivable stimulus.

Because research about the design process has just begun, it is too early to draw any conclusions in this field of inquiry. Nevertheless we can expect that the practice-oriented direction of design research in the form of a Practice Led Iconic Research will contribute to generate a better foundation for the practical field of visual communication. This will allow us to eventually call this field of practice a discipline with its own knowledge base.

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