

UNIVERSITY OF PÉCS
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Two and a Half Dimensions
Paradoxical Phenomena of Spatial Representation in Visual Art
DLA-Dissertation

Theses

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“The experience of space is not a special talent, but a biological function”

Moholy Nagy

Introduction of the topic:

I have chosen paradoxical phenomena of special representation as the focal point of my practical research, which led to a deeper inquiry into the relationships of geometry and art. It turned out that a definition of space is needed in order to understand special, paradoxical situations in a given system of spatial representation.

One of the constituents of analysing space is the paradigm of non-Euclidian space, which is discussed as a fundamental theme of this dissertation, and the second one is defining the spatial dimension closely related to such space. Expanding these two problems lead to the utilization of scientific methods and technological tools in the creative work of artists.

My activities exemplify this phenomena – although I completed my DLA studies in the framework of a painting programme, I utilized electronic media equipment in practically all my creative work. This has naturally led to the creation of media artworks. In the present dissertation I would like to discuss, in addition to the main theses concerning the problems of dimensions, the process that leads a painter to seemingly unfamiliar territories, quite far removed from painting. What is the path taken that takes him from the paintbrush to the technical equipment of image processing, what is the effect of the change in medium on the creative process, and what is its result in the field of research. Thus, I would like to show the appearance and consequences of post-Euclidian views of space in the visual arts (first of all, in painting), and technical solutions in painting which are clearly identifiable as having an effect on the development of modern space representation technology (e. g. computerized virtual space).

Structure and method of the dissertation:

I have divided the topic into three parts. I approach the problem from the point of view of a practicing artist, thus I rely predominantly on my practical research, but I also find it important to get acquainted with the theoretical background. In the theoretical section I summarize the history of our current perception of space, the road that lead from the

Euclidian paradigm of space to the non- Euclidian paradigm of Bolyai and Lobatchevski. I introduce the possible consistent geometries based on this, and then I give an overview of several mathematical and philosophical interpretations of the concept of dimension. I discuss the *Dimensionalist manifest* of Károly Tamkó Sirató as a fundamental document of studying dimension, which continues to effect the field even today.

In the chapter about non-Euclidian space in visual arts, I shift my focus to the practical research carried out in the course of creative artwork. I analyze the representation of space, and the visualization of spatial dimensions in light of the mathematical, geometrical methods involved, while the content, themes and ideas present in the artworks are given less attention, although they aren't completely discarded. In order not to overstretch the limits of the dissertation, I will avoid trying to find and enumerate the complete taxonomy of possible mathematical research methods of the problem of spatial representation in visual arts. Instead of an endless list, by showing the methods applied by certain selected artists, I would like to introduce possible solutions and strategies.

Possible interpretations of the concept of space:

A changing view of space has necessitated rethinking the concept of dimension, making it a topical research subject in philosophy, science and art. With the discovery of non-Euclidian space required a more subtle approach to perceived space as well.

Euclid strived to give a representation of the space we perceive in the world of our immediate surroundings. His geometry is a sum of basic methods to create an abstraction of the space around us. With the help of abstraction, it concentrates on universally applicable laws and relationships. For two thousand years, his system, built on basic postulates, proved to be the unchallengeable common background for science, technology, philosophy and art.

This system, though far from falling to pieces, has lost its exclusive validity at the beginning of the 19th century. A revolutionary new approach to the much-debated postulate of parallel lines has lead to the emergence of a new paradigm. On the face of it, non-Euclidian spaces concern only specific sub-fields of science which operate with extreme parameters, but it soon proves to be of a more general importance. The conception of possible non-Euclidian spaces has triggered a series of paradigm shifts – among them, rethinking the concept of spatial dimension, in both a theoretical and a practical sense.

Non-Euclidian space in art:

Scientific methods in art:

Just as Euclidian space can no longer be applied without reservations for describing our world, neither can the description of spatial dimensions remain exclusively within the trichotomy of depth-width-height. In spite of the fact that our perceptible reality is confined within the boundaries of these three dimensions, it is to see that the number of dimensions is not always three. Research points in different directions, from less than three dimensions through spaces with fractal dimensions to spaces with theoretically infinite number of dimensions.

The most readily available option is to recruit the dimension of time among the spatial dimensions, thus defining a four-dimensional space. This concept is related to Einstein's space-time theory in physics, where space is inseparable from the dimension of time. While in Einstein's theory time retains its original physical property, and it is interpreted as a parameter changing as a function of movement, the interpretation of time as a spatial dimension identifies the timing of movement in the space as the fourth spatial dimension. In my opinion, this approach equates two radically different qualities. In contrast, the method of dimension analogy (which I favour) looks at the direction, rather than the timing of movement. It transfers the relationships of the three dimensions of our perception to higher number of dimensions. In other words, by increasing the number of the perpendicular axis of Cartesian space, spaces of arbitrary number of dimensions may be imagined, and their projections can be generated.

Due to our physical limits, we can only model spaces with more than three dimensions, which may mean either a two-dimensional or three-dimensional rendering. One of the general rules of rendering is that it is always confined to fulfilling a selected set of criteria, and as such it represents an abstraction of the object of the process. The projection, which is produced in order to grab the essence of something, suffers a partial loss of information compared to the original, thus projections renderings are mostly irreversible, or the reason for their creation in the first place can be the fact that their original space is inaccessible.

My dissertation points out that within the broader field of art, in the field of painting there are many attempts researching the problem of space, and within that, indirectly or directly, the question of dimensions. These painting-related research efforts regularly

approach or cross the borders of different disciplines of art, and practical research is carried out in several different media. Problems induced by theories of space are spelled out in a single plane, which in turn motivates the extension of representation in real space, and the utilization of different media, such as motion picture, laser light or the use of computers.

Art in the field of science and technology:

Art not only utilizes the advances of science and technology for its own research purposes, art also plays a role in furthering those advances. The relationship of science and art is not one sided, it is mutual to varying degree, which is manifested in varying forms. We may find examples of parallel and synchronous researches, co-operations, borrowed and reinterpreted ideas, or rediscovered results on both sides. In many cases, art is far ahead of scientific discoveries or technological advancements, due to its intellectual liberty and special methods.

Scientific interpretation or explanation is not a task of visual arts. The main point of creative work lies in posing questions, articulating problems and finding creative solutions. Still, art cannot disregard the related theories and proofs of science. Incorporating these into artistic creative work, and reflecting on them, art conducts a dialogue, which expands and modifies our conception of the world.

The relationship of art and technology is similar. The technological advancements of the previous two centuries had a huge impact on art, both as inspiration and as new modes of expression. Technical image has progressed from the first photographs to interactive multimedia applications, all of which, one by one, has been incorporated into the set of tools of art. The initial concerns about the technical image have all disappeared by now. Photography, holography, laser and digital pixels are just as legitimate tools in the hands of an artist as paint, brush and canvas. Of course, a media-based differentiation has taken place, creating branches of art like photography, light-painting, and media-art, but the boundaries can be freely crossed. This freedom makes it possible to use the best methods in trying to answer the questions which arise.

In accordance with the subject of my research, I inspect the relationship of art and mathematics/geometry, because I think that artists – consciously or not – use mathematical methods in creating/analyzing works of art.

Artists have a special place in the research of questions that haunt the human mind at a given period. They represent a special mix of theoretical and practical methods of inquiry. They are philosophers, aesthetes, mathematicians or physicists at the same time, or anything else needed at the given moment for the most creative solution of a problem – but maybe in the first place they are creative oracles. Artists don't need to be aware of using scientific methods. Many times, especially at the first stages, they aren't. They use all the different methods in a perfectly natural, intuitive manner. As I see it, this was the case with the research of space in visual art. The appearance of mathematical methods is a direct consequence of the spirit of the historical era. Visual arts were very deeply effected by the discovery of possible non-Euclidian spaces. The new paradigm opened new possibilities in the artistic formation of space, which also meant new challenges and new problems to be solved.

Spatial representation in artworks is mostly and primarily connected to the subject. Use of space in visual arts is never superficial, but it is the vehicle of meaning. The image-structuring power of the geometrical system used in a work becomes evident when subtle relationships acquire a role of their own.

Visual arts are acutely effected by changes in our conception of space, one of its central themes is the representation of space, which is also its medium and substance. It is no chance, that visual art has a significant role in reshaping the concept of dimension. A significant portion of researching spatial dimension is visual representation and interpretation. The nature of the problem, however, is highly interdisciplinary, which means that artists will venture into fields with completely different research methodologies in the course of their work. Since space-dimension research is a fundamental research area, its methods should be selected accordingly. Artists – either consciously, or lead by subconscious instinct – will use various methods of mathematics, such as knot theory, fractal geometry, or dimension analogy.

Just like in science, it is often the case in art that different, mutually exclusive results are produced. That is the case in dimension research as well. Even the definition of the concept is problematic, since its meaning is specific to context and field of inquiry.

In my dissertation I examined the practical research of spatial dimensions in visual art, especially in painting. I represent its results and methods with the presentation and analysis of a number of selected artist and their works.