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# VISUAL COMMUNICATION THROUGH PERSPECTIVE

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## ABSTRACT

This paper aims to explore different types of perspectives as systems for graphic communication used in art and in technical sciences throughout history by comparatively analyzing them according to their domination in certain cultures and periods of history. Today, the term "perspective" is often used in a brother sense for expressing the possibilities for development of a person or an action, look into the future, an assumption for the order and the final outcome of an action, a happening or state of things. In the field of optics, perspective stands for apparent decrease in size of the represented objects related to distance increase from the person watching. In visual arts perspective stands for the specific way of space representation on a surface.

It is usual when the term perspective pops up in a conversation to assume that it refers to the renaissance linear geometric construction of perspective and it is usually regarded as the one that represents space on a surface "correctly", exactly the way that we perceive space in reality. That assumption is incorrect on multiple levels. Optical laws of apparent decrease in size of object in space, as further as they are from us. obviously exist. But these laws are not the only relevant factors in space representation. Furthermore, they are not interpreted completely correct in the linear construction of geometric perspective. Perception on a basic physiological level has not changed since ancient times. People build civilizations on top of previous civilizations and start accepting what they have learned as being correct, neglecting their instincts and repressing their senses. History is full of examples in which the apparent is neglected, even rejected, as a result of us being accustomed to certain conventions and rules based on our education, culture and not on our experience based on senses.

A contemporary man perceives what he knows, not what he really sees. That's why it is important to overrule the myth of "correctness" of linear perspective in order to be able to accept the existence of other perspective systems of space representation, and their treatment as equally important.

**Key words:** Perspective, Graphic communication.

## VISUAL COMMUNICATION THROUGH PERSPECTIVE

### 1. INTRODUCTION

The term perspective derives from the Latin verb "**prōspiciō**" meaning "looking at something, seeing something or looking through something". Today this term is often used in a broader sense for expressing the possibilities for development of a person or an action, look into the future, an assumption for the order and the final outcome of an action, a happening or state of thhings. In the field of optics, perspective stands for apparent decrease in size of the represented objects related to the distance increase from the person watching. In visual arts perspective stands for the specific way of space representation on a surface. It is usual when the term perspective pops up in a conversation to

assume that it refers to the renaissance linear geometric construction of perspective and it is usually regarded as the one that represents space on a surface "correctly", exactly the way that we perceive space in reality. That assumption is incorrect on multiple levels. Optical laws of apparent decrease in size of object in space, as further as they are from us, obviously exist. But these laws are not the only relevant factors in space representation. Furthermore, they are not interpreted completely correct in linear construction of geometric perspective. Perception on a basic physiological level has not changed since ancient times. People build civilizations on top of previous civilizations and start accepting what they have learned as being correct, neglecting their instincts and repressing their senses. History is full of examples in which the apparent is neglected, even rejected, as a result of us being accustomed to certain conventions and rules based on our education and not on our experience based on senses.

And indeed, even today only a very few of us perceive the curvatures of parallel lines, which is surely partly due to our habituation – further reinforced by looking at photographs – to linear perspective construction: a construction that is itself comprehensible only for a quite specific, indeed specifically modern, sense of space, or if you will, sense of the world.[1] A modern man perceives what he knows not what he really sees. That's why it is important to overrule the myth of the "correctness" of the linear perspective in order to be able to accept the existence of other perspective systems of space representation, and their treatment as equally important.

## 2. MATERIAL AND METHODS

Each era brings its new perspective. Each era has its dominant perspective, the best one, the most logical one, the only one possible. It reflects the society in which it is being created; at the same time, it is a historical result and a creative artistic expression of the time and space in which it appears. The graphical system of space representation could be classified by different criteria. It is not easy to classify perspective in this manner having in mind that the appearance of a new perspective does not eliminate the previous one. Often two ore more perspectives coexist – not only in the same era but even in the same picture. Classification used in this paper is based on the chronology of the dominant perspectives throughout history:

- Semantic perspective
- Vertical perspective
- Antique perspective
- Inverse perspective
- Geometric perspective
- Modern perspectives (3-D projections).

When speaking of perspective it is very important to mention coloristic perspective, atmospheric perspective and optical-physiological perspective, all three of which remain out of this classification because the first two almost never appear as independent space representational systems and are always a part or addition of another perspective, and the third one is purely theoretical and describes the way we see, and perceive space, at the same time overthrowing the myth that we are able to represent space correctly, exactly the way that we perceive it.

### 2.1. Semantic perspective

*Semantic perspective* does not define size and relation between the represented objects according to their real size, position in space or distance from the observer, but by their importance, meaning, it is a system of space representation in visual arts in which relative size of a character or an object represents its importance. Here the relations closer – further away and bigger – smaller are substituted by the relation more important – less important. This system of space representation does not treat the real dynamic and ever-changing position in space, but the constant position in the hierarchy in life and afterlife - Figure [1].

Semantic perspective can be found in late antique and early medieval art, as well in Egyptian art. This type of perspective is often recognized in children's drawings in which they represent themselves and the members of their families bigger than the other people or objects in the drawing.

[1] Panofsky E., Perspective as a simbolic form, New York, Zone Books, 1993: 34

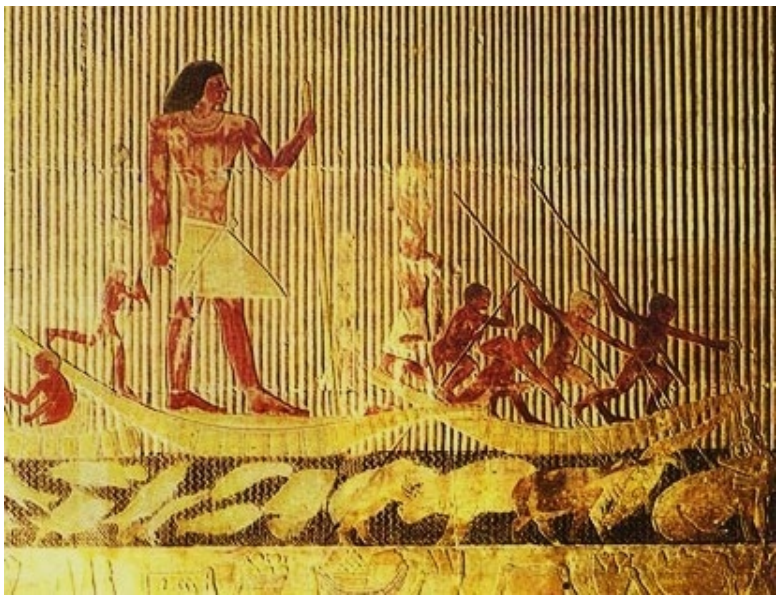

***Figure 1.*** *Ti Watching a Hippopotamus Hunt c.2400 B.C, (Painted limestone). Tomb of Ti, Sahara*

## 2.2. Vertical perspective

*Vertical perspective* is a way of representing space in visual arts where laws of flatness rule. Here, one behind another in depth, becomes one over another vertically. So, instead of plans partially overlapping in depth (as it appears in reality) they transform in flat stripes positioned vertically one over another - Figure [2] and Figure [3].

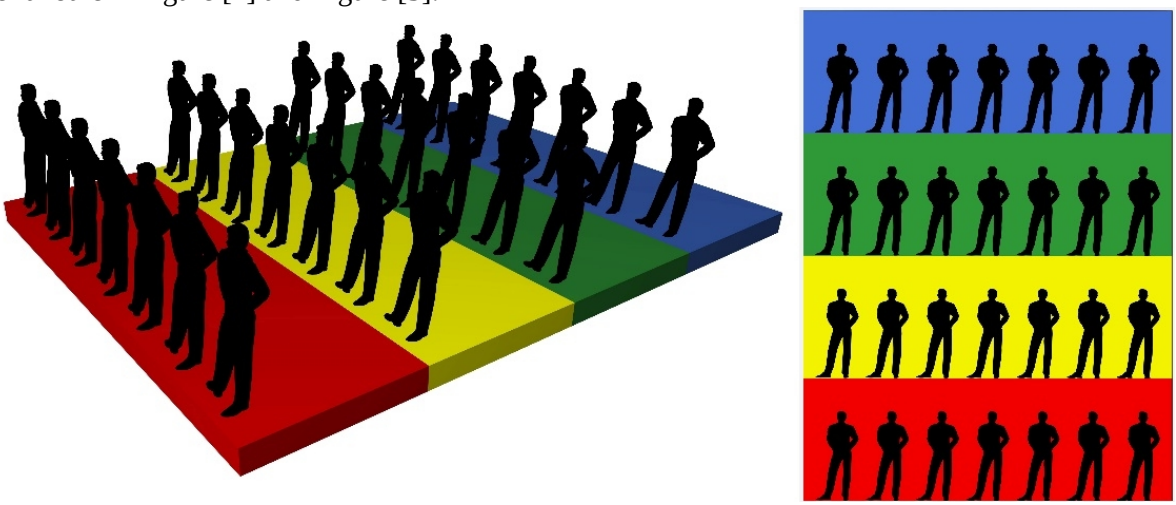

***Figure 2.*** *Transformation of plans - one behind another horizontally transforms into one over another vertically*

Similar to the semantic, vertical perspective as a method of space representation often appears in early stages of a persons or societies artistic expression (naive art). In these stages of artistic expression, the one representing space is relaxed of the theoretical aspects of art and perspective gained and piled up trough history, and is completely guided by his personal perception and comprehension of space. “Realistic” representations of space tend to create an illusion of depth which neglects the 2-D character of the painting and deceive the observers’ eyes. Vertical perspective emphasizes the 2-D character of the artistic surface not even trying to create an illusion of reality. That’s why the represented characters and objects are without signs of volumenousity and are not modeled; rather, they are represented as surfaces reminding of paper cut-outs.

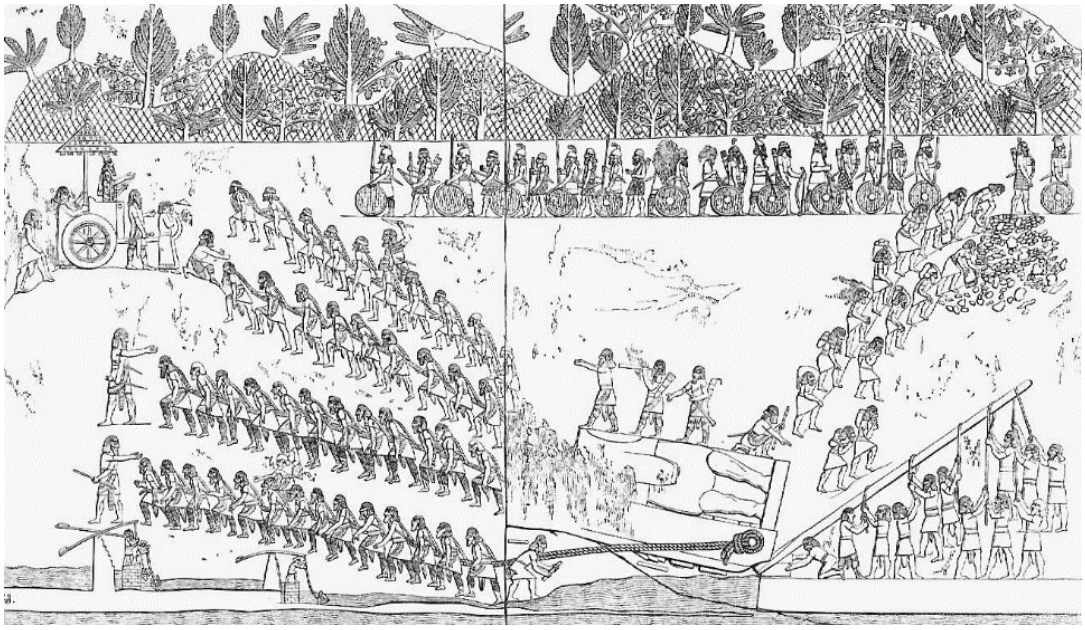

***Figure 3.*** *A human-headed winged bull for the palace of Sennacherib being dragged on a sledge, as depicted on a relief from his palace at Nineveh.*

## 2.3. Antique perspective

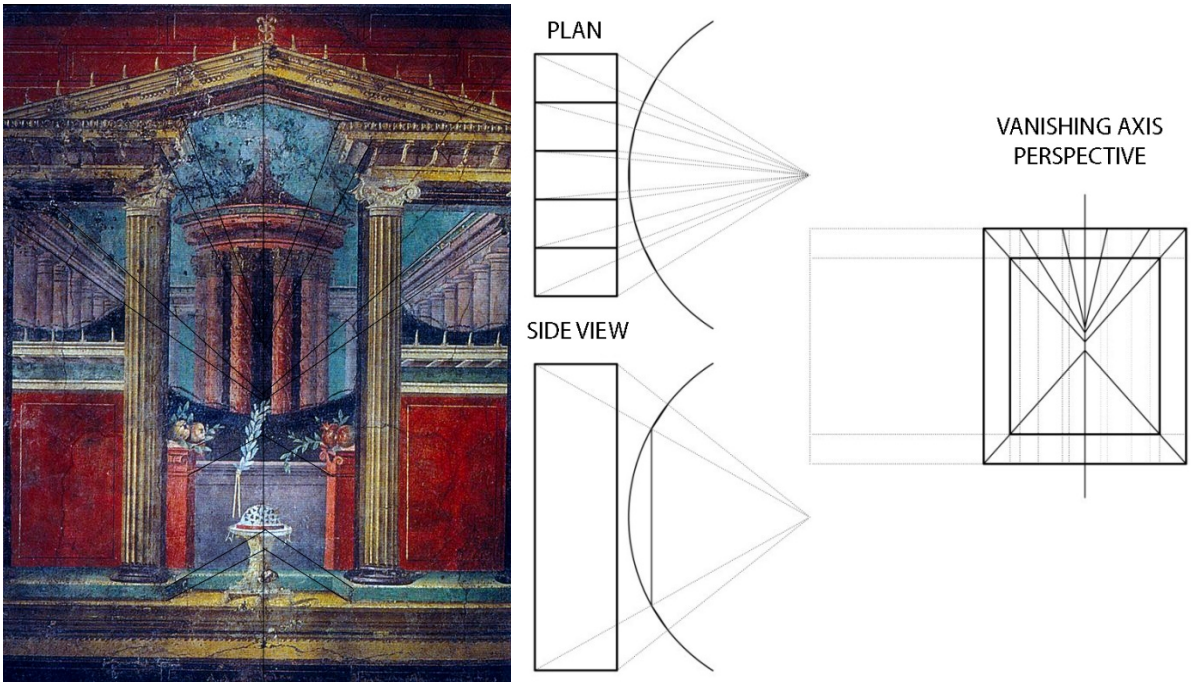


***Figure 4.*** *Wall decoration (fragment) 1st century AD, Villa Boscoreale, Italy*

Helenic and Roman civilizations were not just well aware of the laws of optics, but they had mastered the manipulation of architecture and sculpture according to human perception and objective beauty. This statement is supported by the numerous optical corrections in the architecture of the temples which survived to this day, and had been well analized, documented and published in numerous researches. Yet, they were unable to consistantly and coherently represent complex structures in artistic compositions - Figure [4].

Based on Euclidean geometry, in the effort to geometrically open the spherical surface of the eye's retina on a 2D painterly surface the vanishing point of a central projection turns into vanishing axis on which the vanishing points are located, which appears as inconsistent and incoherent when compared to our binocular vision.

### 2.4. Inverse perspective

*Inverse perspective* chronologically appears between antique and before geometrical linear perspective. The best way of describing it is to say that it is a method of space representation where size of objects increases the further they are from the observer. The parallel lines, instead of converging towards one vanishing point on the horizon, they diverge. The vanishing points are substituted by focal points which emphasize the conceptual center of the painting - Figure [5]. The earliest beginnings of space representation in inverse perspective can be located in fresco paintings in the Byzantine Christian temples of the XIII century.

Inverse perspective is a graphical system which is not based on objective projective methods. That's why monitoring its evolution is much more difficult than one could imagine. If we analyze it according to modern, strictly defined and objectively understood perspective construction we would, for sure, categorize inverse perspective as being incorrect, unclear, even confusing, graphical system of space representation, as it has been done in some previous superficial observations of this construction. But if you look at the broad picture, bearing in mind the conditions from which it evolved, even if it is an incorrect construction related to the objective treatment of space, inverse perspective is still a completely unique and not accidental system of artistic expressions related to the subjective treatment of space.

The widely acknowledged term "inverse perspective" would probably not withstand a more serious critic. Most probably this term is based on the fact that opposed to the point of view being in front of the projection plain and the parallel lines converging to its vanishing points on the horizon in geometrical perspective construction, the point of view in inverse perspective construction is positioned in the observed space behind the projection plain, which makes the parallel lines converge in opposite direction, resulting into inverse shortenings. It must be pointed out that the crossing of the point of view from one side of the projection plain to the other is only fictitious, because despite the crossing, the objects are still being looked at from the front. Nevertheless, these lines intersect creating focal points used to emphasize the ideological center of the painting (character on action). In that time it was common to paint huge compositions including numbers of different episodes. The different points of view were used as a tool to organize the represented space within these compositions and to form the timeline of the represented actions. In this context simultaneous observation is replaced with successive space experience. The space constructed using Inverse perspective does not treat the artistic phenomenon with strict and mathematically precise rules. The represented space becomes dependent on the people and affects the psychological and physiological state of the visual impression in a very specific subjective way. This space is a message. Here watching and observing is replaced by seeing and comprehending. Inverse perspective makes the miraculous a direct experience of the observer; the supernatural events arise from that seemingly unnatural visual space in a way that offers the observer a firsthand experience of the transcendental. Inverse perspective was supposed to be a substitute for the written word in the eyes of the vast number of illiterate believers. A picture constructed in this manner was supposed to include both the historical facts about the characters and actions as well as the deepest liturgical thoughts of the theologists.

Ever since the laws of geometrical linear perspective have been recognized and acknowledged, inverse perspective was referred to as being naive without any scientific support and full of optical irregularities and inconsistencies. Nonetheless, this system of graphic communication has survived to present times as the only adequate method of space representation in the orthodox temples of the eastern world.

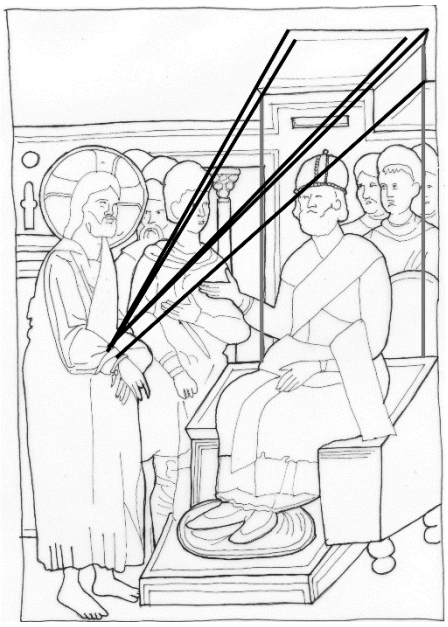

***Figure 5.*** *Christ before Herod, St. George, Staro Nagorichane, Macedonia*

## 2.5. Linear geometric perspective

*Geometric perspective* is a mathematically consistent method of space representation in which objects appear smaller as their distance from the observer increases - Figure [6].

The laws of geometrical perspective were discovered by the architect Philippo Brunelleschki around 1415, and then the period of its absolute dominance and complete neglecting of all previous methods of space representation began. The fact is that geometric perspective is based on strict mathematical and geometrical principles that allow correct and complete reading of the interrelations and distances of the represented space and the elements in it. The great artists of Italian Renaissance focused on the use of special techniques in order to fool the human eye by simulating depth on two-dimensional surface. This illusion is based on multiple geometrical rules which date back to the antique. Up till then artists used art to present ideas. Besides, Renaissance artists started using art as a tool for simulating reality. Renaissance artists understood perspective and 3-D painting techniques as a philosophical thought in which the order of things corresponds with the mathematics of the form, resulting in an exact, precise and correct measure of the real world. This “correct” construction could be described as a section through the visual pyramid in which the pick of the pyramid is the point of view which is connected with the specific represented points in space.

However, in order to obtain a completely rational (endless and homogenous) space, this central projection contains two essential assumptions. The first one is that we perceive space with one eye which is not moving, and the second one is that the flat planar section through the visual pyramid (projection plain) could be accepted as appropriate reproduction of our optical picture (Cyclops peeking though a keyhole and looking at a mirror reflection of space). In reality these two premises are extremely daring abstractions from reality, if we understand reality as true subjective optical impression. The structure of an endless, homogeneous and constant space – a purely mathematical space, is completely different from the structure of the philosophical space. The perspective construction is a systematic abstraction of the structure of the psycho – physiological space. It transforms this psycho – physiological space into a mathematical space, completely neglecting the fact that we are binocular creatures with constantly moving eyes and a spherical field of vision. Specific stabilizing tendency of human mind comes as a result of cooperation between vision and our other senses, and it gives the perceived objects precisely defined size and shape and tends to neglect the deformations that these sizes and shapes undertake while being projected on the retina. At the end the projection in our eyes it is on a concave surface opposed to the projection plain on which we usually represent space.

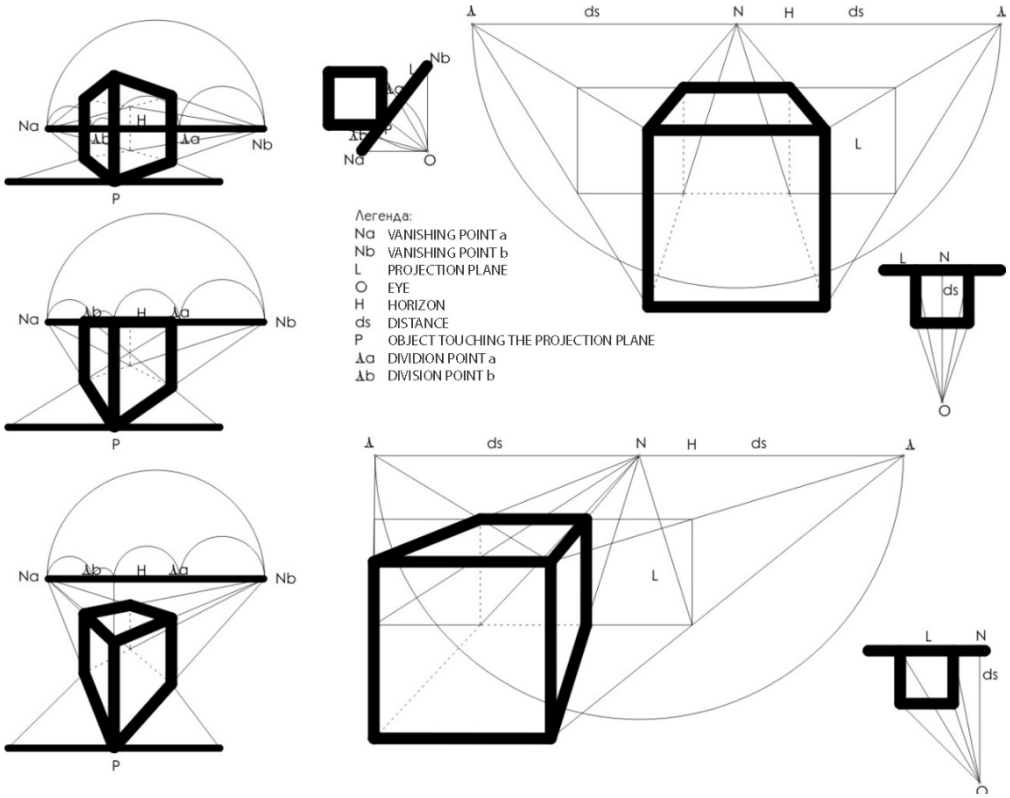


***Figure 6.*** *Linear Geometric Perspective constructions of a cube*

### 2.5.1. Atmospheric perspective

In order to complete the illusion of reality, many other graphic tools were used as an addition to geometric perspective. One of these tools is *Atmospheric perspective*. Atmospheric perspective (sfumato) does not mean change in the object size; instead, it means change in their color, tonality and contour depending on the distance of the observer. The transformation of the objects color goes from warm towards cold colors; its tonality goes from intensive contrast towards complementary pale and the contour from sharp to soft and blurry, depending on the distance of the observer. This perspective is a result of the particles in the atmosphere between the observer and the observed objects. It cannot exist as an independent perspective and always coexists with another perspective. This addition to linear perspective appears for the first time in renaissance, especially in the landscape backgrounds of the paintings - Figure [7].

***Figure 7.*** *Atmospheric perspective, Photo, Mavrovo landscape; Mona Lisa, Leonardo da Vinci, Louvre, Paris*

### 2.5.2. Coloristic perspective

*Coloristic perspective* is specific for modern abstract art, even though it could be recognized as a fragment of all the previously mentioned perspectives. Coloristic perspective means that we perceive some colors in nature and art as being closer to us than other colors, although they are all on the same artistic surface at the same distance from the observer. Warm colors are perceived as being closer to the observer and cold colors as more distant - Figure [8]. This phenomenon is directly related to the capacity of different wavelengths (colours) to travel through space. The shorter wavelengths (part of the spectrum with cold colour) could travel further through space than the longer wavelengths (part of the spectrum with warm colors), which is why warm colours are perceived as closer than the cold ones.

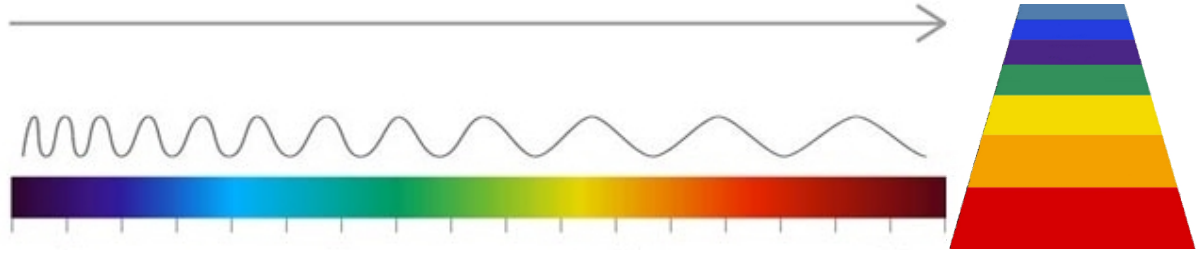

***Figure 8.*** *Wavelength of the colors in the spectrum*

### 2.5.3. Optical-physiological (perceptive) perspective

Optical-physiological (perceptive) perspective is a theoretical review of the way we see and perceive space and the elements in it. It focuses on the physiology of perception and their dependence on the laws of optics - Figure [9]. The key role that this theoretical review played in the evolution of perspectives is that it overruled the myth that the mathematically correct linear construction of the geometric perspective is equivalent to the way people perceive space in reality, opening the possibilities for further development and evolution of the systems for graphic representation of space.

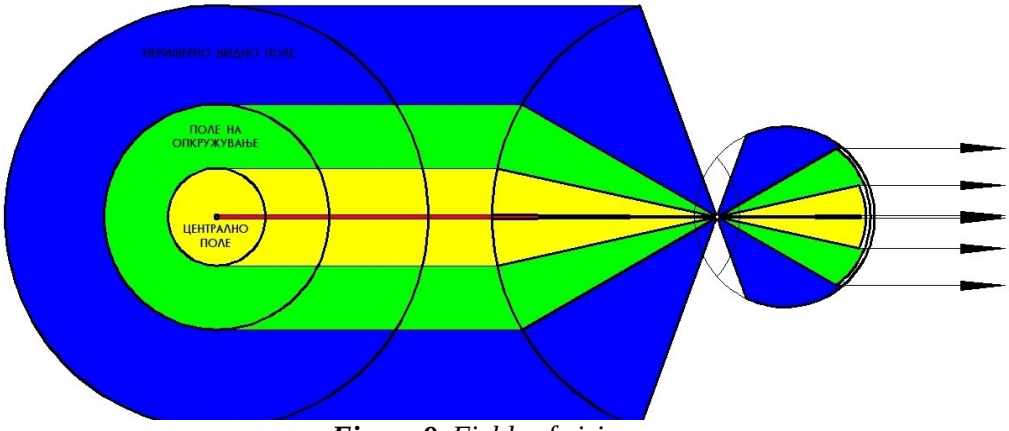


***Figure 9.*** *Fields of vision*

### 2.6. Modern Perspectives

In this context *Modern perspectives* refers to anamorphic projections, 3-D stereoscopic pictures and computer-generated perspectives. The deformed projection which only under unusual circumstances can be perceived in its true form and proportion is known as anamorphic projection.
There are two forms of anamorphic projections one of which is the oblique anamorphic projection which needs an unusually positioned point of view (very sharp angle) in order to perceive the picture in its cognizable proportions. This type of perspective is among the favorite themes of street painters painting on the sidewalks of the world's metropoles - Figure [10].


***Figure 10**. Oblique anamorphic projection*

The second form of anamorphic projection is the catoptrical anamorphic projection. This means that the picture must be perceived as a reflection in a mirror that deforms the already deformed projection, bringing back its real form and proportion. The mirrors and the projections could be conical, cylindrical - Figure [11], spherical....

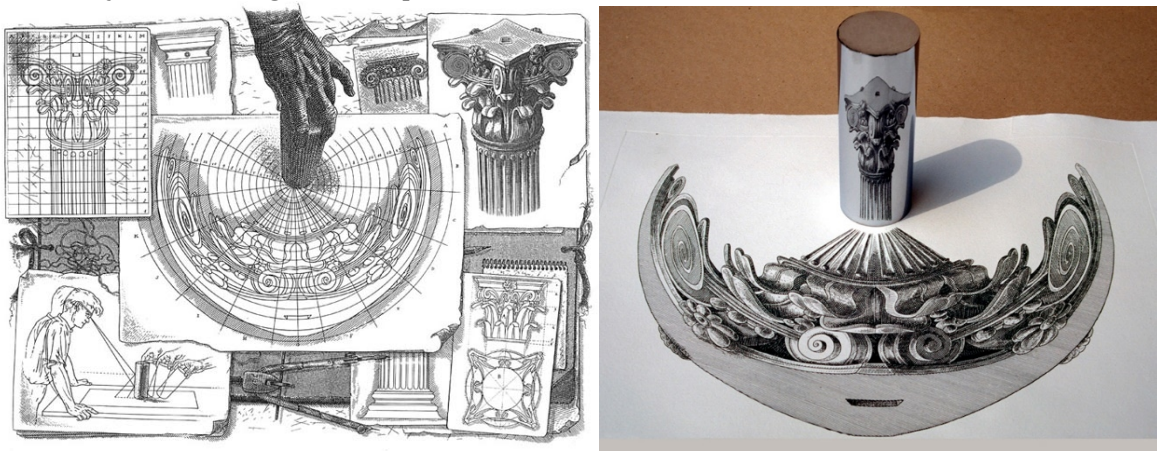

***Figure 11.** Catoptrical anamorphic projection*

3-D stereoscopic projections or anaglyphs are space representation methods that can present even its depth in a way similar to the way humans percept depth in reality. Special glasses are needed for looking at this type of space representations. In its beginnings, differently colored glass was used for each eye, red and blue or green. The picture consists of two independent overlapping pictures, one in red and the other in blue or green color.

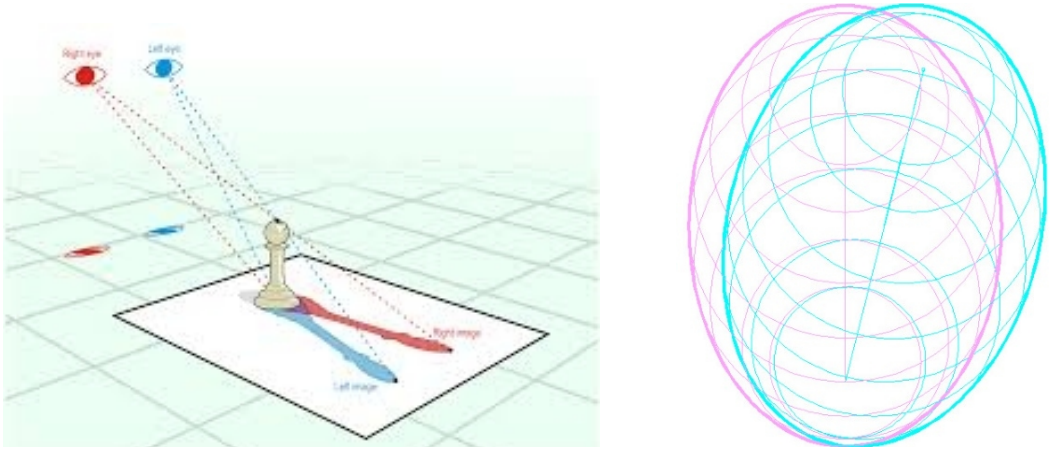

***Figure 12.** Anaglyph*

These two pictures are drawn from a point of view of both eyes independently. Through the red colored glass, the observer perceives the green or blue colored picture as black, and through the green or blue colored glass the red picture as black. By merging the two independent pictures in our perception of the painting and focusing on its different elements we have an illusion of depth in the painting - Figure [12]. The initial lack of color in this space representation was overcome by use of specific film on the projection plain and glasses that allow the observer to see exactly what he is supposed to see in full color. One in ten people does not have the ability to perceive depth on a two-dimensional plain using this and even other more sophisticated method of space representation, as a result of a genetic limitation of the left side of the brain which controls perception.

Computer-generated perspectives, as a result of the character and the computer calculations include all the laws of optic and perception known to science. The latest rendering engines calculate the reflections, shines, transparency, the diffuse light, the level of fog, shadows... which means that as a final result we have a picture that corresponds to a mirror reflection represented on the picture.

*Panoramic projections, computer generated animations and virtual reality* start dealing with the movement of the point of view in space representation. Panoramic projections originated in the late XVIII century and became extremely popular in the mid XIX century through public display of landscapes and historical events. This allowed the public to enter the observed space and was overwhelmed by the illusionism provided by this type of curved half cylindrical panorama. Since then panoramic projections have switched media first analog, then digital photography and finally computer-generated panoramic projections. Virtual panoramic projections can be cylindrical - Figure [13], cubic - Figure [14], or spherical - Figure [14].


***Figure 13.*** *Scheme of a cylindrical panoramic picture*

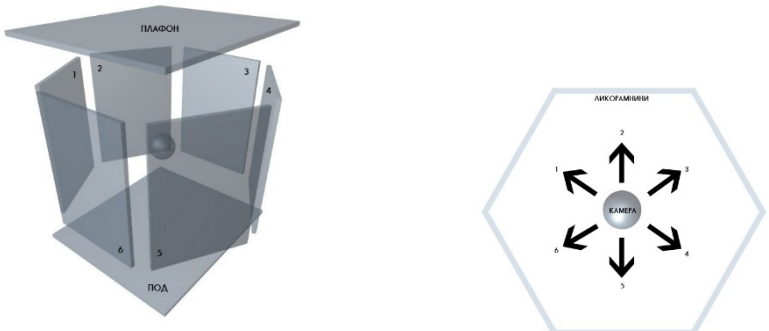


***Figure 14.*** *Scheme of a cubic panoramic picture*

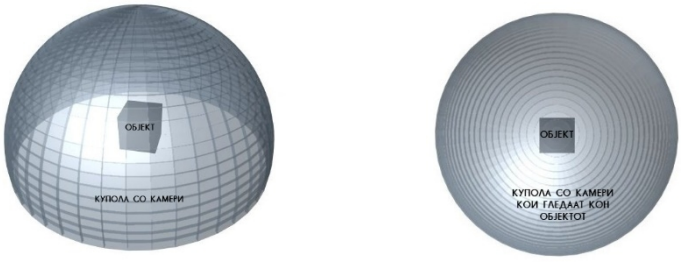


***Figure 15.*** *Scheme of a spherical construction of a VR object*

The latest achievements in space representation allow the user to interact with the computer simulated space. More advanced simulations of virtual reality involve all the senses in the space experience such as sound and smell. The advanced haptic systems include tactile information known as force feedback most commonly used in medicine and the computer gaming industry.

*Augmented reality* (AR) is the integration of digital information with the user's environment in real time. Augmented reality is an interactive experience of a real-world environment where the objects that reside in the real world are enhanced by computer-generated perceptual information, sometimes across multiple sensory modalities, including visual, auditory, haptic, somatosensory and olfactory. AR can be defined as a system that incorporates three basic features: a combination of real and virtual worlds, real-time interaction, and accurate 3D registration of virtual and real objects

Unlike virtual reality (VR), which creates a totally artificial environment, AR users experience a real-world environment with generated perceptual information overlaid on top of it. For example, in architecture, VR can be used to create a walk-through simulation of the inside of a new building; and AR can be used to show a building's structures and systems super-imposed on a real-life view - Figure [16].

***Figure 16.*** *Virtual Reality (VR) and Augmented Reality (AR)*

## 3. DISCUSSION AND CONCLUSION

Esthetic space and theoretical space are space experiences that derive from the same physiological stimulation but in one case the stimulation is visually symbolic and in the other case it is a logical form. This means that when perspective stops being a technical and mathematical problem it becomes an artistic problem and vice versa. It is understandable why Renaissance interprets perspective as completely different from medieval times and the west completely different from the east. If we generalize, we can say that earlier phases of space representation methods were more interested in the subjective meaning. whereas in later phases of space representation objective aspects became more important. All cultures in which dominant perspective was dealing with subjective aspects of space representation more or less completely rejected the geometrical perspective and the laws of optic in order to represent space in a way that those cultures understood it. These perspectives were not a result of lack of knowledge in the field of optics, nor of the incapability to construct a photorealistic space. They were a result of the lack of need for such illusionism. Relative imperfections, even complete absence of a precise geometrical perspective construction does not in any way affect the artistic value of a piece, and a completely mathematically correct geometrical perspective does not in any way lead to an artistic freedom and value of the picture.

The importance of all the perspective systems of space representation in history can be recognized by reaffirmation of the questions asked by art through history. The question of kinetic point of view is a guideline of Cubism. The Expressionists reject geometric perspective construction as a result of its affirmation of objectivity.

As a conclusion, we must acknowledge that it is naive to refer to any perspective as something naive. Every era has its own way of understanding space and therefore a unique method of space representation that can be referred to as the best one, the most logical one and the only one possible for that culture, time and place.

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