

Perspective in Renaissance Artwork-Based on the Works of Leonardo da Vinci and Albrecht Durer

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Abstract: The application of perspective has become ubiquitous in the field of art in today's society, yet the role that the knowledge of perspective played while in the field of painting during the Renaissance is rarely talked about. Therefore, the subject of this paper is to analyze the images of famous paintings as a way to demonstrate the application of perspective in Renaissance painting. The methodology of this paper is as follows: the authors chose two famous Renaissance artists, Leonardo da Vinci and Albrecht Dürer, and selected two representative works from each of them to study, which are *The Last Supper*, *Mona Liza*, *Saint Jerome in His Study* and *Feast of the Rosary*. In the study, the authors observe the space, structure and focus of the paintings in order to analyze the relationship between painting techniques and knowledge of perspective. This study attempts to show the reader the application of perspective knowledge in the paintings.

Keywords: Linear perspective, Aerial perspective, Renaissance Artwork, Leonardo da Vinci, Albrecht Dürer

1. Introduction

During the time of the Renaissance, two different areas, science and art, started to be used together in tons of designs, such as Davinci tanks, self-supporting bridges (see Figure 1) [1]. Among a large number of scientific skills, perspective is one of the most widely used skills in ancient time artwork, especially by Leonardo da Vinci, Albrecht Dürer, and so on. It is the way people understand the track of the light, and also comprehend the space. In order to discover more possibilities of perspective using in painting, many masterpieces during the renaissance were created, with the improvements of the knowledge in perspective, the artwork that artists created became more and more realistic. Build skills also increased a lot due to the perspective research. What is more interesting is that, both Leonardo and Dürer tried their best to prove the relationship between science and art in their own way, and they both came out with their own methods using perspective in their painting. As one of the most important aspects of the artwork, many researchers had put a great quantity of love and time

into the research, and the results greatly promoted the growth of modern art. However, the internet doesn't have many resources on the perspective presented in renaissance artwork. Most of the research is on the definition of perspective or the way to use perspective in creating artwork.



Figure 1: Self Supporting Bridge [1].

This research attempts to demonstrate the application of perspective in early modern paintings by looking at several works by renowned Renaissance artists Leonardo Da Vinci and Albrecht Dürer, and by analyzing the relationship between painting techniques and knowledge of perspective. This research will begin with two works by Leonardo Da Vinci: *The Last Supper* and *Mona Lisa*. Also, this research will analyze two works by Albrecht Dürer: *Saint Jerome in His Study* and *Feast of the Rosary*. On one hand, this research focuses on the relationship between the principle of near and far in perspective and picture space, as well as the emphasis of linear perspective on the key points of the picture. On the other hand, this research discusses the influence of perspective on the figure body, and the connection between the painter's use of color and aerial perspective. Through the application of linear perspective and aerial perspective in these paintings, this research hopes to give the reader a sense of the profound influence of scientific knowledge on the field of art.

2. Introduction of the Two Artists

2.1. Leonardo da Vinci

Leonardo da Vinci (1452-1519) is considered to have been a painter, sculptor, scientist, theorist and more. Very distinguished in many ways, he is known as a true genius. Many of his ideas and creations are now seen as being very much ahead of their time compared to their contemporaries. He left an important intellectual legacy not only in the field of art, but also in many other areas such as science and mathematics. In turn, the intellectual knowledge in each field provided the basis for his research in another. As an engineer, he had conceived the basic theory of things like helicopters, calculators, and tanks. Although his inventions were rarely put into practice, many of the theories he developed went a long way to inspiring future generations and improving knowledge in many areas of science, such as anatomy and optics. However, he was better known as a painter. His *Mona Lisa* and *The Last Supper* are two of his most famous works. Of these, *The Last Supper* embodies the obvious idea of linear perspective and is famous for being Leonardo's only surviving fresco and a classic religious scene.

2.2. Albrecht Dürer

Albrecht Dürer (1471-1528) was a German Renaissance painter, printmaker and theorist. He was born in Nuremberg, Germany, and is known for his delicate and careful wood engravings. Apart from his prints, he is also known for his altarpieces, portraits and self-portraits, of which *Saint Jerome in His Study* is one of the most iconic works. His woodcuts explored the possibilities of the medium and

he took the use of the medium to a new level by focusing on the extreme proportions and realism of his paintings. Through his knowledge of the social environment and humanist ideas of Italy and Germany, Dürer used classical motifs in his own artworks and introduced them to northern art. This established him as an important figure in the Northern Renaissance. At the same time, he produced many scholarly treatises, including ideas on mathematics, perspective and proportion. With regard to Dürer's theoretical work on geometry, his four measurement books are well known. The first and second of these books focus on his theory of geometry, including both linear and two-dimensional geometry. In these two books, he cited the theories of many of his predecessors, such as Ptolemy. The third book, meanwhile, presents applications of these geometric principles to architecture, painting and typography. The fourth book expands on the previous three books to include three-dimensional forms and the construction of polyhedra, and introduces several of his inventions.

3. Perspective in Art

Perspective is the spatial relationship seen due to the position of the eye in relation to an object. In painting, parallel lines are often used to reflect the effect of convergence in order to give the illusion of depth and distance. In Renaissance paintings, the two main methods of perspective are linear perspective and air perspective. Linear perspective is characterized by the fact that the further the object is from the viewer, the smaller its size. Air perspective is characterized by the fact that the further away the object is from the viewer, the more indistinct its boundary lines become and the lighter its color.

3.1. Leonardo Da Vinci's Work

3.1.1. The Last Supper



Figure 2: *The Last Supper* [2].

The Last Supper is a very famous fresco work in the Renaissance, which vividly shows Leonardo da Vinci's understanding of perspective.

Firstly, the perspective creates a sense of space in the picture (see Figure 2). Although the mural is just a rectangular flat surface, that is, two-dimensional, Leonardo creates a three-dimensional effect for the viewer. It is worth noting that the mural is located on the wall of the church's refectory. Leonardo uses the principle of linear perspective to make the things that are close to the viewer's eye the largest, while those that are far from the viewer's eye gradually shrink in equal proportion [3]. In other words, the long table at the forefront of the picture undoubtedly becomes the closest thing to the viewers, making the viewers feel that they are watching the dinner up close. It invariably increases the viewers' sense of interaction. At the same time, the four walls and the floor extend into the

distance, following the principle of linear perspective. The rectangle of the background wall is much smaller than the rectangle in the foreground (in real space these two rectangles should be the same size), which makes the room in the painting, which is originally a cuboid, into a quadrilateral room like a trapezoidal structure. This also follows the principle of perspective that the near is large and the far is small, making the space in the painting look more expansive and breathier.

Furthermore, perspective also contributes to highlighting the focus of the scene. Looking at the picture, people can see that the space in the painting consists of four planes: the ceiling, the floor, and the two walls on the left and right. When viewers look at each of these planes, they can find some straight lines that can be connected. For example, if viewers continue the line from the top of the rectangular partitions on the left wall, and correspondingly continue the line from the top of the partitions on the right, these two lines will have an intersection point in the center of the picture. This point of intersection falls exactly on the head of Jesus. More than that, there are quite a number of such straight lines that can be continued in the picture: the straight lines on the frame of the ceiling, the vaguely straight pattern on the floor, and every vertical carving on the ceiling. There are so many hidden straight lines that it is difficult to spot them at first glance, but they provide a guide for people's vision in the first place. All the straight lines can be continued and then intersect at the head of Jesus. This fact means that in this picture, Jesus' head is located exactly at the vanishing point of the linear perspective. These hidden straight lines bring the viewer's gaze to Jesus' face, giving the viewer the first glimpse of him. This fact sets a solemn tone for the painting through the look of Jesus and helps the viewers to enter the emotional atmosphere of the scene. On the other hand, as stated in the definition: the main purpose of linear perspective is to give the illusion of space with depth on a flat surface [4]. Leonardo uses straight lines to make the intervening walls on a straight line shrink in equal proportion, giving the room a three-dimensional feel [3]. At the same time, the other end of these lines seems to extend beyond the frame into our real world. The lines can give the viewers the illusion of being in the scene in the painting. This clever use of linear perspective not only highlights the focus of the picture, but also provides the viewers with an entry point into the story of the painting.

3.1.2. Mona Lisa



Figure 3: Mona Lisa [5].

Mona Lisa is one of the most famous paintings in the world created by Leonardo da Vinci between 1503 and 1519. It can also be called Portrait of Lisa Gherardini, wife of Francesco del Giocondo, Italian La Gioconda, or French La Joconde [6].

The main part of the painting, of course, the person called Mona Lisa, showed perspective through hiding relations and the changing of the object's scale. As Leonardo said in his notes "of which the first deals only with the line-drawing of bodies" [6], the lines in the oil painting clearly shaped Mona Lisa's body, different parts of body have different sizes, the closer it is to the viewer, the bigger it will be. One of the clearest parts of the "line-drawing" perspective is Mona Lisa. Since Mona Lisa sits at an angle toward viewers, the left shoulder looks bigger and the right one seems smaller. For the same reason, the left arm is bigger than the right one in the picture visually. If people move their vision down a little bit more, they could see Mona Lisa's left hand overlapping the right hand laying on her leg. The hiding relations also follow the perspective that Leonardo defined.

Additionally, if viewers put their eye on the whole picture, rather than a little part of the painting, they will find another special thing about the Mona Lisa – the painting used both warm color and cold color. This might be very common to all the artwork at that time, however, the way that Leonardo used these colors are very different. Carefully check the painting, it is easy to find that the further the object is, the bluer it will appear. Also, the background seems very moist, in another word, it is less clear than the main part, the closer object. This technique is known as aerial perspective. Also, Leonardo said the same thing in his notes: "the third with the loss of distinctness of bodies at various distances" [6, 7]. Surprisingly, as a genius, Leonardo was one of the first painters to use it, and this skill makes his artwork have more depth.

3.2. Dürer

3.2.1. Saint Jerome in His Study



Figure 4: *Saint Jerome in His Study* [8].

Saint Jerome in His Study (see Figure 4) is a famous print by Dürer, depicting Saint Jerome, a famous Christian scholar, sitting at his desk and working hard. The crucifix in the corner of his desk is a classic Renaissance symbol; the lion and dog slumped over the desk are symbols of loyalty and represent the taming of human impulses; and the sunlight that pours down along the engraved lines of the print makes the room seem to be covered in sunlight [9].

The feature of this painting is that the position of the figure is not in the centre of the picture. However, Dürer drew the viewer's eye to the saint. He depicts the interior according to the law of

central perspective, with the converging lines terminating in the space to the right of the saintly figure. He uses multiple structural lines in the picture and makes them end at the same point, allowing the viewer's eye to be directed to the point where the structural lines converge [10]. In addition, Dürer emphasises the differences in the materials of the different objects [11].

As the painting is a print, the lines in the painting are straight and hard. Therefore, linear perspective is more suitable to be used to show the effect of perspective. Linear perspective is a system of creating an illusion of depth on a flat surface [12]. This method of perspective is more suited to images that emphasise lines and place more emphasis on the presence and direction of the lines, rather than on spatial hierarchy through the effect of reality. The painting is therefore more suited to linear perspective.

One of the characteristics of linear perspective is that part of the space may be distorted to some extent in order to achieve perspective. The closer the object is to the vanishing point from the edge of the frame, the shorter the object will be [13]. However, as can be seen in the painting, the distortion effect that should be present in the perspective is not apparent. This may be a distortion of the picture made by Dürer to achieve artistic effect.

3.2.2. Feast of the Rosary



Figure 5: *Feast of the Rosary* [14].

In Albrecht Dürer painting *Feast of the Rosary* (see Figure 5), the knowledge of aerial perspective was used. In this painting, he mainly uses the change of color depth to express the use of spatial perspective, and at the same time, he also expresses the distant and near objects through the conversion of the clarity of lines.

The painting was installed in the San Bartolomeo Church that it was initially commissioned for and hung there until 1606. This was the year that Rudolf II (1552-1612) bought it and brought it to Prague [15]. According to Czechoslovakian art historian Jaroslav Pešina, it is "probably the most superb painting that a German master has ever created." The work also relates to a series of artworks commissioned by Maximilian I.

In the *Feast of the Rosary*, trees are clearly visible in the background of the painting. There are some contrasting details in this painting that are worth exploring. Albrecht Dürer used oil on panels as a medium to create the *Feast of the Rosary*, and it was easy to control the distribution and direction of the lines. As a result, Albrecht Dürer used the aerial perspective to convey this painting by highlighting the clarity of the lines. The lines of the trees in the distance are more blurred than those in the near distance. We can see the lines of leaves and their shape. There are some leaves that we

can feel the dynamics brought by their lines as if they were blown by the wind. but we can't see the specific shape of the tree far away from us.

In addition to the leaves reflecting the principle of spatial perspective, in the upper right corner of the painting, the mountains near and far away also reflect the principle of aerial perspective. The outline of the snow mountain near is clearly visible, the color of the mountains has layers and changes, and the mountains have a solid texture. There are shadows and contrasts of light and dark to show the characteristics of the snow mountain. The whole extends radially outward. However, Albrecht Dürer only uses a simple pen and ink to describe the mountain in the distance. People can't see the real shape of the mountain. Only light blue and a little white are used in the outline and the color is more blurred. If people look at a distant object, it would appear hazy to the audience. What's more, looking at the color in the figure, they become lighter and lighter. The color of the mountains in the distance is deeper blue. However, the mountain in the near is translucent, and a large amount of white is added the further away the object is. Sometimes they will be very faint. They are almost translucent.

4. Conclusions

Through research, this paper found that the Renaissance artists Leonardo da Vinci and Dürer applied the knowledge of linear perspective and aerial perspective to their works, respectively. Therefore, linear perspective gives people a sense of space. Through the three-dimensional spatial effect produced by the principle of linear perspective in *The Last Supper* and *Saint Jerome in His Study*, people are guided to pay more attention to the focus of the characters and the distortion of the space caused by linear perspective, which makes the picture more vivid. However, Leonardo Da Vinci used the control of color to express the clarity of objects near and far in *Mona Lisa*. At the same time, the aerial perspective paid more attention to expressing the picture with the clarity of lines in *Feast of the Rosary*. This linear perspective and aerial perspective helped Renaissance artists achieve realistic and accurate paintings, precise production, and the role of displaying perfect proportions and harmonious proportions. These perspective principles can also help people to create artistic works and innovate from different perspectives or definitions more effectively. What's more, the combination of science and art can have a wide impact on the Renaissance period, and promoted the change of artists' psychological culture with scientific thinking methods, thus promoting the reforming of artistic creation concepts and methods and the development of artistic forms. At the same time, it has also changed modern art methods and applied them to various art forms, such as architecture, sculpture, painting and music to show people more artistic possibilities. In the future, the authors hope to analyze more examples of how artists created these paintings and how to correctly use the perspective principle to complete their works of art, so as to ensure that the researchers can conduct more in-depth research on this topic.

References

- [1] Rain Noe. (2017) Retrieved from <https://www.core77.com/posts/65043/Leonardo-da-Vincis-Ingenious-Design-for-a-Self-Supporting-Bridge>.
- [2] Retrieved from [https://en.wikipedia.org/wiki/The_Last_Supper_\(Leonardo\)](https://en.wikipedia.org/wiki/The_Last_Supper_(Leonardo)).
- [3] Leonardo Da Vinci. (2014) *Linear Perspective in A Treatise on Painting*. Project Gutenberg. 37-44.
- [4] Naomi Blumberg. (2020) *Linear Perspective*. Encyclopædia Britannica. Retrieved from <https://www.britannica.com/art/linear-perspective>.
- [5] Leonardo da Vinci. (1503) *Mona Lisa (Oil on Wood Panel)*. Louvre, Paris. 19.
- [6] Leonardo, Martin Kemp, Margaret Walker. (2001) *Leonardo on Painting: An Anthology of Writings*. Yale University Press.
- [7] The Mona Lisa. (2014) Retrieved from <https://www.bbc.co.uk/science/leonardo/gallery/monalisa.shtml#:~:text=It%20is%20this%20technique%20that,give%20his%20paintings%20more%20depth>.

- [8] Albrecht Dürer. (1514) *Saint Jerome in His Study*. British Museum Galleries.
- [9] Retrieved from <https://www.metmuseum.org/art/collection/search/336229>.
- [10] Couzin, Dennis. (2018) *Abstract of: A Geometric Surprise in Dürer's Engraving of St. Jerome in His Study*. *Leonardo* 51, 5, 505-506.
- [11] Parshall, Peter W. (1971) *Albrecht Durer's St. Jerome In His Study: A Philological Reference*. *The Art Bulletin* 53 (3): 303.
- [12] Linear Perspective/Definition, Examples, & Facts. (2022) *Encyclopedia Britannica*. Retrieved from <https://www.britannica.com/art/linear-perspective>.
- [13] Retrieved from <https://www.britannica.com/art/aerial-perspective>.
- [14] Tara Lloyd. (2019) *Feast of the Rosary: Albrecht Dürer's Masterpiece*. *Singularart Magazine*.
- [15] Trace Bradley. (2022) *Feast of the Rosary by Albrecht Dürer – Top 8 Facts*. Retrieved from [https:// art-facts.com/feast-of-the-rosary-albrecht-durer/](https://art-facts.com/feast-of-the-rosary-albrecht-durer/)