

# Application of Perspective Science in Paintings

## Take the Battle of San Romano as an Example

Dongying Dou

Zhuhai College of Jilin University  
Zhuhai, China 519041

**Abstract**—Application of perspective science in the painting of the Battle of San Romano, innovation and effects of the perspective principle and its influence on later generations are analyzed. The appreciation of classic artistic work better makes students understand the perspective principle, grasp and use corresponding skills and deepens their understanding on it.

**Keywords**—*perspective science; painting; application; the Battle of San Romano*

### I. INTRODUCTION

Perspective science is the visual phenomenon reappearing third dimension or sense of space in the plan known according to corresponding perspective principles and methods as well as related science. In broad sense, perspective science is method of space expression; in narrow sense, established in the 14th century, it is linear perspective and other scientific perspective methods that depict objects and space. Perspective method in broad sense had appeared before 30,000 years. Before the appearance of linear perspective, there are many perspective methods such as longitudinal perspective, oblique perspective, reduction of close shot, foreshortening method, overlap method and color perspective that makes objects with the same color produce bright or grey phenomenon because of the distance and air blocking.

### II. WHAT IS PERSPECTIVE SCIENCE?

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### III. FUNDAMENTALS OF PERSPECTIVE SCIENCE

In theoretical analysis of perspective science, we often rationally recognize objective space instead of resting on overall phenomenon according to three most basic theoretical origins, in order to effectively train and strengthen ability in spatial observation and analysis. They are parallel perspective, angular perspective and oblique perspective.

1. In parallel perspective, centre point determines perspective direction while distance point determines perspective depth.

2. In angular perspective, complement point determines perspective direction while measuring point determines perspective depth.

3. In oblique perspective, complement point and top (bottom) vanishing point determine perspective direction while measuring point determines perspective depth.

### IV. APPLICATION OF PERSPECTIVE SCIENCE IN LIFE

Perspective science researches how to project objects we see and form it on plane. In life, perspective phenomenon is divided into two perspective systems. The first is moving-point perspective, such as the shooting of camera. Roller and full-length shot on the camera fix on one point and mix multiple pictures together through adjusting the distance and height of shot and rolling it. The second is fixed-point perspective such as effects of photos. The application of fixed-point perspective determines spatial effects of paintings. Many painters use it in works. For example, the School of Athens created by Raphael and the Battle of San Romano use parallel perspective; Angle 1 created by Naranjo uses angular perspective; Madrid Seen from the Whiting Building created by Spanish painter Lopez uses oblique perspective.

### V. THE BATTLE OF SAN ROMANO CREATED BY UCCELLO

To better understand perspective principles, corresponding contents in the Battle of San Romano created by Uccello are analyzed.

### *A. Background of the Story in the Work*

In the battle happened in 1432, the number of cavalry of both sides at war exceeds 12,000. The battle near Arno River 30 li away from Florence was only one of the battles in turbulent Italy at that time. We remember the dramatic battle because it is recorded by the painter. The work has grand and magnificent contents and advanced drawing skills at that time when perspective method is quite prevailing, to which many painters are addicted. In that period, painting resembles magic. The work of the Battle of San Romano is not an exception. The painter uses accurate perspective principle. Because the work completed in 1438 is created on three drawing boards, to see the complete work, we must visit three galleries in three cities (although it is hanged in the same room, the three parts drift apart. The first picture depicts two militaries engage in a battle for the first time and contains the core contents of the background of the story. Now it is collected by National Gallery in London. The second picture depicts both sides are engaged in a fierce battle and is collected by Uffizi Gallery. It is the only part with signature of the painter (on the shield at bottom left). The third picture depicts the approval of reinforcement, referring to the last part of the work, and now is collected by Louvre Museum in Paris. The work depicts three periods of a day, so appreciating separately can also understand the meaning of each part.

People in the Renaissance Period will exclaim in great surprise when they first see paintings using perspective, just like we see hologram images presented by optical technology. Although the work of Uccello is highly stylized, we can see the creative spirit of him. Because artistic works with profound religious thought in Middle Ages lack depth and most protagonists do not belong to this world, they are easily replaced by new works. People at that time pay attention to people with flesh and blood and their vitality and world outlook. In art movement of this period, linear perspective found by Filippo Brunelleschi (he is the architect of the great dome of the main church in London is very important. When creating the Battle of San Romano, Uccello amends and overturns these principles. Perspective at early stage is to use accurate system to create space behind the drawing. A painting can be regarded as a window. We stare at the world outside the window. If we paint on the window, the scenery is smaller with the increasing distance. Therefore, people suddenly are enlightened after he concludes the mathematical rule of foreshortening. A corner on the painting created by Uccello and collected in Florence depicts factotum in barracks takes water for tired knight. It uses cavalier perspective with oriental style. The dense people are disorderly and unsystematic. Although it lacks the accuracy of focus perspective, it shows layering.

Uccello faithfully records the development of the battle meanwhile skillfully turns the battle into beautiful artwork. Artistic skill and naturalism supplement each other. Armors in the painting have amazing delicate details. It is commonly seen that horses and knights wear armors, but Uccello neglects aesthetic feeling of horses, so horses don't wear armors. Even so, Uccello still faithfully and boldly presents the battle. Details in the painting are not imaginary. Uccello

maybe inquiry some people personally on the scene (In the depiction of this battle, nobody falls in battle except for a soldier falls down from the horse) and refer to manual of battle and testimony of eyewitness, so he creates cruel and accurate details. The kind or scale of this work is unprecedented magnificent feat. It is a superb painting with complete elements. Details in the work link with one another. Overall design is full of sense of beauty and weird. He presents the reality with parallel existence.

### *B. Innovation of Perspective Principle in the Work*

In paintings related to battle at early stage lack sense of depth and space. Horses and soldiers overlap. Towns for defense are situated on mountains like spaceship dropping from the skies. Artists like Uccello can skillfully use geometrical shape and create three dimensional sense of space of indoor scene. Although the skill is not applicable to present scenes in battle, the painter face the challenge of how to apply organized perspective principle to chaotic scenes. Therefore, in all probability, Uccello may be the first artist in western art history that uses perspective method to present all things, even including unimportant scenes of forest and grassland.

At first glance of the Battle of San Romano, it seems difficult to arrange the scenes in battle in order because the contents are chaotic including people falling down from the horse and scattered weapons, when observing carefully, we will find it is orderly. The painter regularizes the scenes. Many piques falling behind present order. At the initial period of the painting, the painter determines the horizon line (namely the visual horizon) and draws straight lines with vanishing point in the center of the painting as the center. Then he draws a diagonal line (determine distance point first) on the painting and draw transverse line along the dots after cross. The grid-like structure called "Guimei pavement" makes Uccello paint all people in the painting accurately. It resembles calculating scale that pull things with clear dimensions back to make them increasingly small. The painter uses the grid-like structure to determine height of characters in the painting. Tarantino (main character) in the foreground has the height of four grids. If the painter wants to move the character backwards, the height should remain the same. We find the size of characters reduces with the reduction of grids, so there is no need to speculate size of characters in the rear. Under normal conditions, the "Guimei pavement" will be covered by pigment after it is applied, but Uccello uses cracked spear and fur to imply the existence of grid-like structure. The self-reminding contributes to sense of achievement with successful application of perspective. A small round cap in his work is formed by staggered geometrical shapes counted by the hundreds. There are six small round caps like this in the Battle of San Romano.

### *C. Effects of Perspective Principle and Its Influence on Later Generations*

Contents of the Battle of San Romano have no big historical significance because it is only a scene of battle between Florence and its neighbor. The artist is to show the complicated perspective relationship researched by him, such

as the longitudinal separation of soldiers at war, perspective position of armors and spears, connection of characters on horseback, foreshortened image of soldiers falling to the ground, perspective distance between background and close shot, even spear of soldiers. In the three parts of the Battle of San Romano, perspective relation is shown through inclination of spears. The perspective scale of rump of horses and its body is depicted, in order to ceaselessly pursue and create perspective.

The work of Uccello is excellent with skillful skills. In the center of the painting, the horses are depicted exquisitely and characters are lifelike. The work completed in the 15th century has modern artistic style, even influence Picasso, a Spanish genius. In this work, Uccello decomposes many spaces and shapes as if organically cutting the images. His art concept echoes with Guernica, the master work of Picasso after 500 years.

## VI. CONCLUSION

Uccello pays special attentions to depiction of material objects and is adept in researching perspective principle. To better express real things and scenes, he nearly spends his lifetime in researching unsystematic perspective science of painting at that time. The diligent inquiring spirit is the most prominent among painters in the same contemporary. Uccello prudentially researches how to use two-dimensional plane to show the three-dimensional space and the distance between characters and carries out measurement and calculation. He often spends the whole night in researching different perspective principles and observing the state of characters and things when it forms different angles with the sight of observer. Although he measures shortened lines in the work related to perspective, he signs with emotion that the perspective method is confusing.

The analysis on the Battle of San Romano helps students to have new understanding of the traditional perspective science and understand the importance of it. Appreciation and analysis on classic artistic works preferably makes students understand perspective principle, grasp and use corresponding theoretical skills, in order to learn the course of perspective science well.

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