The Visual Illusion of the Game Interface*—Take Monument Valley as an example

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Abstract. As a novel and unique visual form, visual illusion enriches the visual perception of the audience with its vivid and interesting visual charm from beginning to end. “Monument Valley” uses a large number of the use of visual illusion principle, in which perspective illusion, geometric illusion and light and dark illusion for players to bring a different visual experience, combined with the game picture of the unit object scattered reconstruction, the application of visual illusion in this game has jumped.

1 Introduction

Monument Valley, a puzzle-solving mobile game developed and produced by USTWO, was released in 2014. The game applies the principle of visual illusion to create a variety of incredible game interfaces, and won three awards at the 2015 Global Game Developers Conference for best visual art, best innovation, and best handheld / mobile games. As one of the forms of visual communication design, visual illusion itself has a unique way of thinking. When it is used to express the content, the original meaning of the content plus the “character” of the visual illusion itself will make the work more stereoscopic and plentiful.

2 Perspective Illusion of Hierarchical Confusion

“Under normal circumstances, the individual’s perception of the same object at different distances remains relatively constant because of the constancy of perception, although the size of the retinal image changes.” Because of the selectivity of the visual center, the brain summarizes the visually perceivable picture into a perspective or a plane in order to understand the content, but once some parts of the picture are changed, the whole picture overturns the visual perception of perspective and forms a new perspective relationship. Many pictures in Monument Valley deceive the audience’s vision, bring the illusion of perspective to the audience and open up the audience’s thinking.

2.1 Interface Effects from an Isometric Perspective

“Monument Valley” uses a completely isometric perspective, the extension lines of each line do not cross (Figure 1), such perspective enhances the illusion of the entire game world, it is convenient for players to break the perspective thinking originally formed in the game interface during the later game operation process, so that the player’s vision is more easily “deceived”, and has a visual illusion.

Figure 1: Game Screen

In the game interface, all the plane extension lines are parallel, so the whole picture is very stable, such perspective help the player not be distracted by “big perspective” in puzzle-solving games. At the same time, it also lays the foundation for the next perspective breaking.
2.2 Dismantling and Reorganization of Perspective Habits

The first perception of perspective formed by the player before the operation will be broken during the operation. In a completely parallel perspective game interface, everything that seems to be on a different plane may become the same plane relationship due to a change in a certain detail.

As shown in Figure 2, the blue rectangular block was originally on the beige plane, the top surface of the rectangular block is in a high-low relationship with the beige plane underground, but after the player’s operation, the blue rectangular block moved its position and became the same height as the previous beige plane, breaking the previous perspective and forming a new perspective relationship. The clues of the game appear in the new perspective relationship. The player pushes the plot through the new perspective relationship and breaks through the level.

3 Geometric Illusions of Space Disorder

“In Gestalt psychology, the illusion that the visual size, length, area, direction, angle and other geometric structures are obviously different from the actual measured numbers. It is called the geometric illusion.” The geometric illusion has been widely used in the game interface of “Monument Valley”, and combined with geometric dispersal and reconstruction, it has deepened the applicability of the optical illusion, greatly improved the interactivity of the game, and increases the visual effect of the animation interface.

3.1 Impossible Graphical Interface Applications

The impossible figure is an optical illusion, formed by the human visual system’s instantaneous and conscious three-dimensional projection of a two-dimensional figure, which can not exist in the three-dimensional world. The process of people’s perception of impossible graphics shows that perception is a process in which people actively seek explanations for things based on the information obtained by the senses. Among the impossible figures, the Penrose ladder (Figure 3) and the Penrose triangle (Figure 4) are the most representative, so these figures inspired the game interface design of “Monument Valley”.

3.2 Geometric Reconstruction Resulting from Angular Rotation

The various geometric structures existing in the game interface are scattered and reconstructed under the action of the rotating tool, which presents the player with a completely different spatial image from the previous interface. In the process of perceiving interface information, the visual interpretation formed gradually has to re-perceive interface information under the destruction of rotating tools. In the process of visual perception, formation, breaking, re-perception and re-formation (Figure 6), the interface information is infinitely magnified in a limited space, the player experience is gradually improved, and the playability of the game is also improved.

Figure 2: Game Screens

Figure 3: Penrose ladder

Figure 4: Penrose triangle

Figure 5: Game Screens

Figure 6: Interface Information Reconstruction
As shown in Figure 7, in the game interface, the originally unconnected parts are connected because due to the rotation of the entire space. Similarly, parts that are originally in a vertical relationship are broken and spatially dislocated because of the player’s rotation operation. The changes of each widget form a drastic change in the overall space of the game interface, and players can make the content of the same space richer through operations.

4 Three-dimensional Misjudgment of Light and Dark Illusion

“The more symmetrical the rhombus is, the closer the composition is to an isometric view, which can cause confusion in the perception of plane and three-dimensional, and the front and back of the shape.” In the game interface of “Monument Valley”, the illusion of light and shade of vision is repeatedly practiced on the geometric structure of the game, and then through the character hint, the perception of light and shade of visual perception begins to confused, and the player has a visual perception of the three-dimensional picture. The misjudgment formed the illusion of uneven light and dark. So the visual effect of the game has been raised to a higher level.

4.1 Visual Inertia of Shape Recognition

When visually perceiving graphics, it will restore the two-dimensional graphics in the brain to a three-dimensional image according to the light-dark relationship and visual inertia of the graphics. “Convex and Concave” is a lithographic work created by Escher in 1956(Figure 8). The combination of looking up and looking down at the complementary angle of the far vision distance was chosen. By using the light and dark illusion in visual illusion, it shows the three-dimensional shape of convex and concave. This work as a whole presents a dreamy feeling to the audience.

“Monument Valley” combined the light and dark illusion in the optical illusion to design a game interface similar to “Convex and Concave” (Figure 9). The light-dark relationship of the green geometric structure is clear. Through the suggestion of the character’s standing angle, the player can combine the light and dark contrast of the picture to easily form a two-dimensional graphic into a visual three-dimensional perception.

4.2 Inertial Breaks of Character Implication

In retinal projection, the projection image of an object depends on both the physical object itself and the environment in which the object is located. Two-dimensional graphics are perceived by visual perception and then three-dimensional images are formed in the brain. As for whether the spatial relationship formed in the brain is convex or concave, this is formed with the cues of the environment after visual perception. In “Monument Valley”, the movement of the characters in the game is used to break the spatial inertia formed by the player’s vision, and once again complete the reorganization of the visual space. As shown in Figure
10, on the basis of the original 3D visual perception, players create visual confusion by manipulating the movement of characters. The three-dimensional relationships implied by the characters have completely different effects in different positions. As a result, the visual three-dimensional relationship between light and dark is broken, the plane and the elevation are freely switched, and the game interface relies on the hints of the characters to achieve the effect of three-dimensional light and dark vision disorder.

Figure 10: Game Screens

5 Conclusion

Cognitive illusions can use the basic principles of optical illusions and present wonderful visual effects through the interaction between the viewer and the object. The cognitive process of the brain is one of the important ways for us to understand the world, allowing us to more subjectively recognize and change the images we see. "Monument Valley" combines the basic principles of optical illusion to give players the illusion of perspective, geometry, and light and dark illusion through the game interface and player operations. In this world, players need to look for possibilities in various impossible situations created by optical illusions. By moving or rotating the movable device in the interface, different planes can be staggered and switched to create new connections. In this way, the player gains visual and thinking enjoyment and fun in the process of operating the game.

The reason for the success of "Monument Valley" is that they cleverly combined the principles of visual perception to design a fantastic three-dimensional interface on a two-dimensional plane. Through the interaction between the player and the game, the advancement of the plot and the breakthrough of levels are completed. It is true that the interface and sense of interaction of organic games are very important. Starting from the optical illusion, "Monument Valley" created a new operation process and gameplay, and designed a lovely character image and exquisite painting style. It makes sense that "Monument Valley" highlights from many puzzle games.

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