

Research on Expression Methods of Hit Sensation in 2D Games

Mengdi Huang¹, Yanrong Cui²

1.School of Electronic Information and Electrical Engineering, Yangtze University, Jingzhou 434023, Hubei Province, China;

2. School of Computer Science, Yangtze University, Jingzhou 434023, Hubei Province , China

Abstract

A large number of 2D games include action combat elements. Whether it is horizontal platform jumping games, Metroidvania-style games, or top-down operation games, action and combat are important components of the games. The quality of combat hit sensation largely exerts a significant impact on the gaming experience. Accurate or even exaggerated combat feedback can well stimulate players' interest. This paper discussed methods to enhance the hit sensation in 2D games from aspects such as special effects, sound effects, collision feedback, and camera effects, hoping to provide an assistance for the creation of future games in terms of combat performance.

Key words: Game Special Effects; Hit Sensation Design; Physical Collision

1. Overview of Game Hit Sensation Implementation Schemes

For action games or games that include action combat, to achieve a good hit sensation, it is usually necessary to combine multiple schemes to achieve the best performance. In terms of screen effects, special effects can be added and the smoothness of character movements can be adjusted; in terms of interactive feedback, collision performances that are more in line with expectations can be simulated, and different camera shake effects can be used; in addition, more appropriate sound effects can be adopted to enhance the combat experience during battles. For 2D games, since they cannot rely on complex model collisions, physical calculations, and spatial sound effects to create a sense of reality like 3D games, the shaping of their hit sensation requires more stylized and exaggerated artistic and design methods to enhance players' perception ^[1]. At present, discussions on hit sensation in the game production industry mostly focus on experience sharing, lacking systematic research. Therefore, this study aims to fill this gap, propose a variety of solutions for the hit sensation effect in 2D games, and provide a set of practical design guidelines for game developers, especially independent game teams with limited resources.

2. Schemes to Improve the Hit Sensation Effect

2.1 Adding Special Effects

Special effects in action games generally need to be added in two parts: the first is the special effect that shows the trajectory of the character's attack action when attacking, and the second is the special effect that expresses the intense collision of objects when a hit occurs.

①Trajectory Special Effects

Trajectory special effects usually also play the role of hinting the attack range to players. For example, when performing a slashing or stabbing action, adding a circle of special effects in the direction of the weapon's movement and around the weapon can expand the coverage area of the attack performance. This method not

only allows the weapon size to conform to the character setting but also makes it easy to adjust the weapon's attack range, which is a very practical scheme. In addition, the special effects during an attack can also be used to show the character's extremely fast attack actions. Due to the limited number of game frames (usually maintaining a minimum of 30 frames), 2D games may have a lower frame rate because character movements are displayed through the continuous playback of sprite sheets. At a low frame rate, the maximum speed at which a complete attack action can be played may not fully meet the expectations of the gameplay. In this case, multiple staggered special effects in the same direction can be added to simulate the effect of a fast attack.

②Hit Special Effects

Hit special effects are intended to enhance the intensity of the collision between objects, and they should preferably conform to the material properties of the colliding objects. For example, if a hammer is used to hit a wooden barrel, it is best to play special effects of wooden debris splashing; when breaking glass, special effects of glass shards should be played. For materials that are unlikely to produce splinters, such as when two metal swords collide, some white light can be used to show the intense and dazzling collision effect.

2.2 Enhancing the Smoothness of Character Movements

The smoothness of character movements is an effective factor, but it is often overlooked and difficult to achieve well. Smooth movements that conform to the kinematics of real humans can subtly convey a sense of the power of the actions. For instance, when swinging a light stick, the character can complete the entire swinging action quickly; however, when swinging a heavy hammer, the character may need to first twist the upper body in the opposite direction to build up momentum, and then perform an accelerating movement from slow to fast. Different character movements can show the weight of the weapon in details. When combined with various feedback performances upon hitting, they can greatly enhance the gaming experience.

2.3 Collision Feedback

The previous section mentioned that excellent character movement performance can convey the sense of the weapon's weight and the power of the character's actions. Corresponding to this, reasonable collision feedback when the weapon collides with the hit object will greatly enhance this sense of power. For example, if a relatively heavy hammer is used to attack a vase, the vase should immediately break upon being hit, and special effects of vase fragments should be played along the direction of the attack. However, if the same hammer is used to attack a small stone, the stone should be knocked flying; if the same hammer is used to attack a large stone, the stone should only vibrate or shake in place. Such collision feedback conforms to physical laws such as conservation of momentum. From another perspective, by leveraging people's intuition about physical phenomena such as conservation of momentum and conservation of energy, we can well demonstrate the mass of the colliding objects and the intensity of the collision. This rule is a very important factor in expressing the hit sensation in action games.

2.4 Camera Performance

Camera effects refer to the movement effects of the player's camera (or the viewport screen). During battles or when intense collisions that need to be emphasized occur in the game, the player's camera can be shaken. Different camera shake methods are also used for different effects that need to be emphasized. For heavy and slow impacts, such as a huge rolling stone hitting the gate of a castle, the camera shake may need to be gentle and repeated, similar to the feeling of standing on the ground during an earthquake. For collisions between weapons when players and enemies engage in close combat, a single quick shake is more suitable,

just like when you actually hold an iron rod and hit another iron rod, making your arms numb or even feeling dizzy. In some games, when dealing with scenes where characters attack each other, to show a more intense effect than a short vibration, the entire game screen is paused briefly. Although this does not belong to camera effects, it is still an effective means to improve the hit experience from a visual perspective.

2.5 Sound Effect Performance

The schemes mentioned above all enhance the hit sensation from the visual perspective, while adding appropriate attack sound effects enhances it from the auditory perspective^[2]. During battles, players should experience as many types of sensory stimulation as possible. In addition to visual stimulation, auditory stimulation is also an important part. For example, a dull impact sound can reflect that the colliding objects are heavy and solid, while a crisp sound can show a thin and light texture. Moreover, different materials themselves have different vibration tones, such as metal, wood, stone, and even ice or water surfaces. If vibration sound effects suitable for the corresponding materials are played during battles, players can truly feel the material of the colliding objects, resulting in a stronger sense of immersion.

2.6 Peripheral Support

If sound effects enhance the player's experience from the auditory dimension, then there is another aspect related to the tactile sense. When players use game controllers, they are usually equipped with vibration functions; some controllers, such as Sony's PS5 DualSense controller, even have adaptive and haptic feedback functions. During player battles, using the intensity of the controller vibration to distinguish the severity of the attack is also a very intuitive and excellent way to express the hit sensation. Compared with the visual sense, the tactile sense provides a more realistic experience for actions like combat. However, the drawback is obvious: if players use a keyboard and mouse or devices without vibration feedback to play the game, this form of expression cannot be used to reflect the corresponding hit effect. Nevertheless, if we want the game to have the best possible performance and meet the needs of as many audiences as possible, it is still recommended to add vibration performance to battles.

References

1. Yang Huaqi, Liu Liping. Application of Live2D Image Rendering Technology in Mobile Games [J]. Video Engineering, 2023, 47(3): 173-175.
2. Zhang Jiwen. A Brief Analysis of the Influence of Music and Sound Effects on Game Effects in Games [J]. Science and Technology Innovation Herald, 2018, 15(02): 178+182.