



## Improving the Combat 'Impact' Of Action Games

By Jiesang Song

The core game element of many action games ranging from two-player-duel games such as *Street Fighter* to third person action games such as *Ninja Gaiden* is the combat. Although there may be other components like puzzle solving, much of the game is spent on attacking another player or NPCs. In some games the impact of these attacks look and feel more powerful than in others.

In this article I will list observations of techniques used in several action games including: *Ninja Gaiden*, *Soul Calibur 2*, *Prince of Persia: Warrior Within* (POP:WW), *Lord of the Rings: Return of the King* (LOTR: ROTK), *Devil May Cry 2*, *Dynasty Warriors*, and the classic *Street Fighter 2*. I will also make remarks based on my development experience on *Kingdom Under Fire: The Crusaders* (KUF: TC). As the list of games suggests, this article is mainly about action games that involve hand-to-hand combat, usually involving swords, and excludes discussions about the "impact feel" of FPS shooters for the most part. The techniques involve animations, camera work, special effects, game controller rumble, and sound effects.

### 1. Animation

#### Attack Motion

The most obvious and most important factor is creating powerful looking attack animations. A weak motion is not going to look painful no matter how it is decorated with fancy effects. In this aspect, games that run at 60 fps have an advantage over games at 30 fps. There are simply more frames to show the motion in less time, which makes the attack look speedier. For example in Tecmo's *Ninja Gaiden*, the basic attack is extremely quick and responsive. Figure 1 shows the first impact occurring on the 7th frame of a 29.97 fps movie clip; equivalent to 0.23 seconds to strike an enemy.

Figure 2 shows about every fourth frame (1, 4, 9, 13, 17, 21, 25, 29, and 33) of the full basic combo. The second impact occurs on the 16th frame and the third impact on the 29th frame. That's three impacts in less than one second.

For 30 fps games such as Phantagram's *Kingdom Under Fire: The Crusaders*, it is hard to tell exactly what the attack motion is for impacts occurring in less than 8 frames. Individual frames become too disjointed (Figure 3). Additionally, in a 30 fps situation, a consecutive impact in less than about 5 frames does not look like separate impact, but rather one long impact. However multiple consecutive impacts 2 to 4 frames apart are distinguishable with the help of other effects discussed below. Still with lower frame rates there are limitations to creating fast attacks. So high frame rates allow quicker first and consecutive attacks, which in turns reduces limitations in creating good animation for better impact feel.



Figure 1



**Figure 2****Figure 3 . Lucretia is a fast character but her attack animations have a speed limit.**

While *Ninja Gaiden*'s attacks are fast, the heavier weapons in the game such as the "Dibilharo" in Figure 4 still feel heavy to wield. The heavy sword is indeed slower for the first two motions, but attack times accelerate for the next three impacts. The five combo impacts occur on frames 11, 27, 38, 46, and 54 of a 29.97 fps movie clip. This impact schedule makes the heavy sword useless against quick enemies that strike fast, but powerful against larger foes that require much beating to defeat. So heavy weapons can be fast and still appear heavy by making the latter combo attacks fast. Other techniques described in following sections also allow for quicker heavy attacks.





Figure 4. The monstrous 'Dibilharo' sword

### Damage Motion

When a player hits an enemy a certain way, the player expects the enemy to behave a certain way. Painful damage motions are just as necessary as good attack motions in creating impact feel. The ideal damage motions are ones specifically tailored to particular attacks. Fighting games such as Namco's *Soul Caliber 2*, with only two characters on screen have the capacity for getting pretty close to this ideal situation. In Figure 5, a stab on the foot causes a limping damage motion. A grab move folds the opponent in half and stakes him through the sword (Figure 6).



Figure 5



Figure 6

For other action games, such as EA's *Lord of the Rings: Return of the King*, with many enemy characters and many varying player characters, it is difficult to create the exact damage response for each unique attack. For RTS hybrid games, such as *KUF: TC*, where all those characters could be in one level, fitting such variety of animation data in memory is difficult as well. However, by categorizing the attacks by direction and power, matching damage motions can be used to somewhat cover this limitation. Figure 7 shows generic yet, effectively categorized damage motions caused by Aragorn and Gandalf in *LOTR: ROTK*.

Another aspect of damage motions is matching the attacker's distance and direction to the target. If the two are not correctly placed relative to each other, the attack appears to be skewing the target and thus seem weaker than they could be. There are many ways to approach this issue. Some games use target locking and automatically align the player to the target. Others adjust the attacker's position slightly to match the distance. To avoid the problem some games mainly use horizontal swing attacks that do not require the player to be exactly aligned to the target.

For every attack action, there must be a damage or defend reaction. If the player hits an enemy and there is no response then the game will feel less responsive and attacks feel empty. In *Soul Caliber 2* after a round is over, the winner is given a short period to continue hitting the opponent. If the opponent did not respond to the attacks at that point, the game would seem a lot less natural. This unfortunately happens in with *KUF:TC* due to a bug that shipped, where dying enemies do not get hit further. An exception to this case would be the large red dinosaur-like creatures in *Ninja Gaiden* that ignore player attacks when they have taken some beating in order to counter attack (Figure 8).

Without this mechanism, the slow creatures would never get a chance to attack the fast main character. However, even in this case, the large particles and sound effects give feedback to the player of the damage inflicted. In games where enemies dissolve, fade, or explode into pieces, this can be less of a problem.



**Figure 7**



**Figure 8** After taking some hits, the red dragon is about to bite the ninja's head.

### Frame freezing

In Capcom's 2D fighting game *Street Fighter*, impacts are emphasized by freezing the game for a few frames. In Capcom's *Devil May Cry 2*, Lucia's attack impact freezes the attacker's and target's animation for a couple of frames, allowing the players to see for sure what caused the damage. In *KUF:TC*, impacts caused by smaller blades and quick attacks cause the attacker's animation to freeze momentarily. For heavier weapons, it seemed more appropriate for the attack swing to run through continuously than get stuck by impact of the enemy armor.

Frame freezing gives a moment for a player to see the attack motion which may be rather quick to see otherwise (for Lucia in *Devil May Cry 2*) and also creates a feeling of resistance caused by the impact. To make the impact feel more powerful, it is better for the freeze to happen on the "best looking" frame that represents the attack. However, some games allow the freeze to occur on multiple frames and use this as a game element. In *Street Fighter*, the dragon punch is more powerful at the best looking pose but does less damage in the after motion. The red part of the hit points gauge in Figure 9 show the damage caused by different impact points of the dragon punch. Better players can time the dragon punch to hit at the peak damage.



**Figure 9**

### After Attack Delay

In many games including *Devil May Cry*, *POP:WW*, and *Ninja Gaiden*, after an attack motion, the character animation lingers before ending so the player can continue the next attack even after missing the button press timing. Although not strictly related to the impact feel, this method improves responsiveness and the overall combat experience.

## 2. Camera

### Camera Shake

A method commonly used by games in almost every genre is randomly shaking the camera for a short period. In fighting games camera shaking may accompany powerful or explosive attacks. On a few occasions during development of *KUF:TC*, animations that looked a bit frail were transformed into powerful attacks by a slight camera shake. So if an impact feels flat, a quick and easy thing to try is shaking the camera before taking time to modify the animation. Almost every attack in Sony's *God of War* is accompanied by a camera shaking (Figure 10)



**Figure 10**

### Camera Shift

A more specific manipulation of the camera is shifting the camera in a specific direction for just a few frames. This technique is used to amplify the power of huge sword swings in *Soul Caliber 2* and *Ninja Gaiden*. When the character swings the large sword horizontally, the camera is shifted left or right for a couple of frames at the peak of the swing (Figure 11). A vertical slam in Figure 12 causes the camera to be shifted down. A vertical lift attack causes the camera to be shifted up. Diagonal shifts can also be used.

**Figure 11****Figure 12**

A heavy sword swing should be much slower than a light sword swing. However, at the realistically slow speed, the heavy sword would be much less useful in a game setting. So the swing is artificially made a bit faster but augmented with a camera shift that allows it to maintain its weight.

### **Slow Motion**

In *POP:WW* right before executing a two-sword beheading, the game slows down and zooms to show the attack (Figure 13). Although the prince is not the fastest action game character, he is one of the more acrobatic characters. The slow motion sequences make the climactic finishing attacks clearer to the viewer. In *God of War*, before some heavy attacks and mid-air grabs the game goes into slow motion to make the attacks look more powerful.

**Figure 13**

### **Instant Replay**

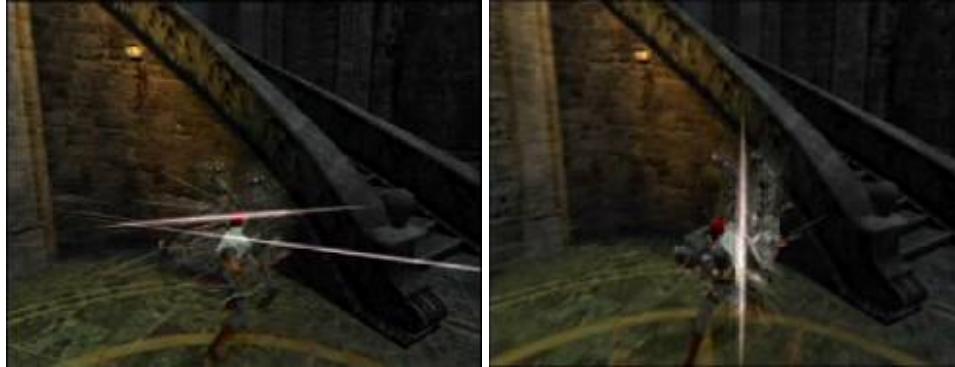
Instant replays are more prevalent in sports games which often use them to show highlight moments. Fighting games do show the replay of the last moments of the battle after a round is over. In third person action games that have limited camera angles but numerous opponents, it could be beneficial to show the attack in different angles through instant replays. If an attack has a wide area of effect this would allow the player to see the attack motion close up and also view the damage caused on enemies further away.

## **3. Special Effects**

### **Particles**

Adding spewing blood or large exaggerated particles improve the impact feel. 2D particles sometimes signify the direction of the attack as in Capcom's *Devil May Cry 2* (Figure 14). In some games simply swinging the sword causes dirt particles to lift off the ground.

In *KUFTC*, rapid multiple attacks appear as separate impacts because of the flashing particle effects for each impact. Koei's *Dynasty Warriors* series relies heavily on particle effects. Every attack and especially the special moves cause small fireworks (Figure 15) in the game.



**Figure 14**



**Figure 15**

### Hit lighting

Temporarily altering the lighting of the target being hit is one of the best ways to show an impact. In Sammy Studio's *Berserk* the monsters being chopped into pieces are highlighted as in Figure 16.



**Figure 16**

In *Soul Caliber 2*, a light from the point of impact is applied to both the attacker and target (Figure 17).

**Figure 17**

Hit lighting also works with multiple targets as shown in Figure 18 of *KUF:TC*. Directional hit lights originate from the attacker and point toward each of the individual targets. Since the number of lights applied does not increase, there is little performance penalty other than the small overhead of keeping track of the different directions.

**Figure 18**

### White or Black Screen

In *Ninja Gaiden* certain kicks during combo and the sliding kick causes the screen to flash white (Figure 19). In *Dynasty Warriors*, before a special move the screen becomes black except for the main character and particles. In both cases the screen effect indicates impact or impending impact caused by a non staple attack move.

**Figure 19. A few frames after a white screen caused by a kick.**

### Trail Effects

Virtually all sword fighting games have trail effects. With quick attack animations, even at 60 fps, it can be hard to tell where the sword has gone through. In reality the sword movement is continuous, but in a game it is composed of discrete frames of different sword positions. The quicker the motion is, the more disjointed the frames become. A trail connects these frames and lasts longer than attack frames to show the full effect area of the attack. Trails vary from simple colored-trails (*Soul Caliber*), to particle effects trails (*Regnier* of *KUF:TC*), to distortion effect trails (*Ninja Gaiden*,

Figure 1).

#### 4. Game Controller Rumble

Various game hardware have different motors to create rumble effects. Modern console controllers have two motors; one for large pulses and one for smaller rumbles. Combining the two at different speeds and durations creates widely different effects. *Ninja Gaiden* provides an excellent example of this. Hitting the ground with a large sword generates a strong but short thump. Scraping a sword against a wall causes an irregular rumble with both motors. Sliding on the ground generates a different rumble representing friction. Rumbles change depending on whether an opponent is hit or missed. Perhaps because of porting to multiple platforms in including the PC, a counter example for good use of motors is *LOTR: ROTK*. Most motions cause a similar monotonous rumble. In Figure 20, sticking the sword into the ground causes a lengthy rumble of even intensity although the impact is a single thrust. Again, being a platform exclusive title, can make it easier to implement controller rumble effects, such as *Ninja Gaiden* for the Xbox.



**Figure 20**

#### 5. Sound effects

Sound effects contribute tremendously to improving impact feel. Mute the sound while playing Capcom's samurai action game *Onimusha: Warlords* and you might even say it feels a bit flat. However, turn the volume up and once you hear the samurai sword slashing through flesh the attack animation may suddenly seem more painful.

There are several components to the sound effects. On the attacker's side there is a sword swinging "whoosh" sound and a grunting "hee-yap" sound. The victim provides the damage scream. Then there is an impact sound depending on the weapon and the surface or armor that the impact occurs on.



**Figure 21**

In FPS shooting games where guns are the main weapon, opponents are usually far away so sound effects are more important. In *Quake 3* 2D sound effects (irrelevant of the listener's position) indicate when a bullet or rocket hits an opponent even when the opponent is not visible on screen. Some players have said that for games with only 3D impact sounds, such as *Unreal Tournament 2004*, it can be difficult to tell if a shot hit the opponent. Fortunately for

sword fighting games, the opponents are usually nearby so sound effects can be heard quite well whether they are 2D or 3D.

Additionally, all of the visual effects discussed above can be applied to increase impact feel. For opponents far away, some of these effects would be inappropriate or look really small. On the other hand, a disadvantage sword fighting games have, compared to shooting games, is that most sword swings sound alike. There are heavy swing sounds, light swings and so on, but they are much less memorable than distinctive and powerful gunshot sounds. In FPS games famous for great sound effects, such as *Counter-Strike* and *Call of Duty*, players can tell what type of gun is being fired by listening to the sound. Perhaps the battle cries and grunts of the various main characters in sword fighting games are more distinguishable.

## Conclusion

In sword fighting action games, to make the combat exciting, the impact feel of it must be good enough to compel the player to continue hacking and slashing at the opponents for hours and hours of gameplay.

One of the common patterns in many of the games is to make the attack motions as quick as possible. Then to help the player see how the incredibly fast attack is done, several techniques are employed. First is to maintain the highest possible frame rate (60 fps for some). Then manipulate the camera to make the quick attack look heavy and powerful. Add particles and weapon trails to show where and what is being hit. Finally use the controller motors and sound effects to give tactile and auditory feed back of the impact.

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