Mario's jump in 2d and 3d, other jumps in video games and what jump parameters can be modified and the effects on the player.

Introduction

Mario is a video game franchise published and produced by Nintendo. He is one of the most popular video game characters ever made and has been in over 200 games of different formats such as platformers, racing and tennis. One of his main mechanics which the franchise is known for is his jumping, and before he was named the name Mario, he was originally called Jump man because he had to jump over barrels to get to Donkey Kong.
This essay will look at how Mario has jumped throughout the years in the same genre of platforming, looking at the 2d and 3d versions. Describing his jump and comparing it with other games of similar and different genres. And what parameters can be modified for a jump in a game and its effects on the player experience.

Mario – jumping 2d vs 3d

In Super Mario Bros. (Nintendo EAD, 1985) the game is set in a 2d world. This limits the jumping to either left, right and or up. You can hold the jump button to add extra height to his jump to reach harder to get to places. Tapping the button will also only make you do a short hop, tall enough just to get you above a goomba. There is a limit on to how high and low he can jump/how long you hold the button for.
You can also increase the jump height by adding momentum. This is done by running in one direction and then jumping. Not only does this increase the distance, he jumped horizontally, but also adds extra height.
His horizontal jump distance can be slowed down mid-air if you move the opposite direction as he is in the air. This allows for more control.
While Mario is jumping, his "gravity is minimal" (Sylvester, 2013) as it's a constant rate upwards. Once he reaches the max height of the jump, he stays at that level vertically for a frame, gravity is then tripled and starts to pull Mario back down to the ground. He has a maximum velocity for go upwards of the jump so that he doesn't instantly get to the apex, and he has a maximum velocity for falling so that it doesn't just immediately fall for him.
His jump can also be activated "a few frames early" (Sylvester, 2013), which makes Mario jump as soon as he lands.
For Mario, jumping is the most common way for him to defeat enemies, by jumping on the top the enemy itself. However, some enemies will not be damage/killed from the jumping alone such as a Koopa Troopa, however, jumping on them stuns them into their shell which can then be kicked away to defeat them.
When jumping, if there is an item block or a brick block above the jump, and Mario will connect with it, he will activate that block which might give Mario a special power, a coin and also might break a brick block. If there's also a moving object above him such as an

Ethan Carter
Ethan2.Carter@live.uwe.ac.uk

enemy or mushroom, and his jump intersects with the brick below it, it will send that item or enemy in the other direction.
Mario's jump allows him to reach places he wouldn't be able to get to otherwise as there are no slopes in the 2d versions of the game.
In Super Mario World (Nintendo EAD, 1990), a new mechanic for jumping was introduced called the spin jump. This allowed Mario to destroy blocks, more durable enemies and "Allows Mario to bounce off of certain enemies" (Anon., 2020). The spin jump also allows Mario to avoid damage when jumping into enemies with spines. However, the spin jump trades the height as a regular jump for offence (Anon., 2020).
A double jump was added in the form of a shell jump, where Mario tosses a Yoshi shell, jumps onto it and can jump off it, all while moving.
In Super Mario 64 (Nintendo EAD, 1996), it had all these features but, due to it being a 3d game instead of 2d, it also had a lot more mechanics added to the jump.
For example, the introduction of the wall jump, where Mario can jump at a wall and depending on the angle, jump off at the opposite angle he landed on. This jump will cause Mario to go higher than just by a standard jump.
Another new mechanic was the triple jump, where Mario could jump and, on each landing, if timed correctly, another jump was added. If the player could chain three jumps together, the third jump would launch Mario into the air, the highest of any jump available to him.
A dive mechanic was added which as well as used by pressing attack when jumping. This caused Mario to immediately start falling towards the ground at a quicker speed than falling.
A side somersault and a backward somersault was also added, and Mario would do these jumps instead of a normal one if the player switched direction right before jumping.
Finally, a long jump was also added to Mario's jumping arsenal, which was activated by crouching while moving and then jumping. This allows Mario to "jump a long horizontal distance". (Anon., 2020)

Comparing to other games

Compared to Ratchet and Clank (Games, 2002), they both have similar mechanics when it comes to jumping (Anon., n.d.). They both have a variety of jumps for a multitude of situations, such as a wall jump, high jump, long jump and a crouch flip. This is because they are both platformers.
Comparing this to a different game of a different genre, Dark Souls (FromSoftware, 2011) has a jump which is only used to cross small gaps, and not to get higher. In order to jump, you must be sprinting, press the jump button and the character would jump straight ahead of the player's movement direction. This is because jumping isn't the main mechanic as it's not a platformer.
However games such as Counter-Strike Global Offensive (Valve, Hidden Path Entertainment, 2012), Quake (id Software, 1996)and Titanfall (Respawn Entertainment, 2014) are all first-person shooters however they don't feature different types of jumps; instead, they have just a normal jump which can be used to keep the momentum of a player up, so that it is harder for an enemy to shoot the player. The jumping doesn't get vertically larger, but due to the momentum of the player, they travel further each jump. And because they are jumping, there's no friction between the character and the ground, so the speed rises until it hits a momentum cap.

Parameters

These parameters can be changed to affect a jump mechanic within a game which in turn would lead to a different player experience depending on what combination of effects a designer was to add to a game.
For a start, momentum can be used to increase the horizontal distance of a jump. The player would then be able to try and make a meaningful choice, which is one of 5 divisions of a framework (Ferrara, 2011), by trying to calculate a better route or a way to get to a hidden spot by using momentum to get extra height on a jump.
Another parameter which could be changed is height. Probably the most obvious one, but height could be changed to allow the player to jump higher. However, allowing the player to jump higher with just a basic jump may make the game imbalanced (Ferrara, 2011). Increasing the jump height in other ways, such as performing a more advanced jump like Mario's triple jump, could be a suitable alternative as its rewards players for their skill.
Gravity is another parameter which would affect the player experience. If the gravity is low, then the player would float upwards and downwards compared to if gravity is high. Depending on the game style, this could affect the player experience, for example if the game was set in space, or featured levels/areas with low gravity such as Super Mario Galaxy then the player would enjoy it. In contrast, if a game like "SpongeBob SquarePants: battle for bikini bottom" (Heavy Iron Studios, 2003) had low gravity and the jumps were floaty, it wouldn't suit the aesthetic (Ferrara, 2011) and could ruin the players experience.
With my gameplay programming project, I decided to implement a forced jump where when the player presses jump, they have no choice but to move horizontally forwards and vertically up a set amount. The player has no choice in how far they can jump. I did this because I think that even though similar games such as Super Mario Odyssey or SpongeBob SquarePants: Battle for Bikini Bottom (Heavy Iron Studios, 2003) allow freedom with the jumping; I find them too easy because of it. By restricting the players jumps I believed it could change the way they approach platforming. However, after playtesting it myself I'm not sure if it was a successful experiment as it did not feel natural but instead clunky and difficult.

Conclusion

To conclude, Mario has a lot of mechanics involving jumping which utilise different skills for a variety of different situations such as when to use the normal jump, triple jump, long jump or a side somersault but depending on the genre of game, this could take away from the player experience. Platformers are the perfect example of these jump mechanics working but if these were applied to a first person shooter or a souls like game, the player might not be able to see the effect of these different jumps in first person, or might accidently trigger these jumps in a tough game like Dark Souls (FromSoftware, 2011). However, games like Quake (id Software, 1996) and Titanfall (Respawn Entertainment, 2014) have managed to implement some parameters on jumping to not only create a more enjoyable player experience, but to provide a unique experience. Overall, the player experience is different for each genre and certain parameters should be changed according to the genre and the aesthetic in order to allow a positive player experience.

Ethan Carter
Ethan2.Carter@live.uwe.ac.uk

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Ethan Carter
Ethan2.Carter@live.uwe.ac.uk

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Ethan2.Carter@live.uwe.ac.uk

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