

# Analysis on the production technology innovation and artistic style expression of the animated film "Spider-Man: The Universe"

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**Abstract:** The animated film Spider-Man: Into the Universe is the sequel to Spider-Man: Into the Parallel Universe and the second installment of the Spider-Verse series. IMDb beyond the previous work, the film evaluation score as high as 9.1, Rotten Tomatoes total number of media praise accounted for 97%, MTC total score 86, all kinds of high score data nothing but to confirm it in the upgrade, and is beyond our imagination of the degree of evolution, so cool multiple mix and unprecedented vision, must be inseparable from excellent technical support. In the context of different kinds of artistic styles, this paper analyzes and explores the production technology used and innovated by the animated film "Spider-Man: The Universe".

**Key words:** animated film; Production technology; Artistic style

The creators of the animated film Spider-Man: The Universe shared a behind-the-scenes approach to its production at the just-concluded graphics conference SIGGRAPH. "Spider-man: The animation software used in Criss-Cross Universe is Maya, Katana is used for visual development, After Effects is used for dynamic story version, Mari is used for mapping, Houdini is used for figure drawing, NUKE is used for post-composition, and the final output renderer is Arnold, which comes with Maya. Photoshop was used for frame-by-frame rendering. For 3D animation, this process is very standard, but the reason why "Spider-Man: Into the Universe" and "Spider-Man: Into the Universe" can do different visual effects from other superhero films on the market, SONY Animation studios must have some "very different" creative ideas and technical innovations.

## 1. The innovation of film production technology

The universe where Miles lives in 1610 is the inheritance of the previous one, which is also the creator's greatest love for the classic comics of the last century. This world still has a large number of cartoon onomatopoeia, the lines of drawing characters' faces, the presentation of cartoon frames in the narrative, and the most widely used and familiar technology in the first step film -- half-tone technology. Initially, Many people speculate that this unique half-tone line material is achieved by a special shader shader, but SONY has put this half-tone stylization step into the late synthesis software to achieve. Through the NUKE developer suite, SONY used BlinkScript and C to write a set of plugins to achieve the comic effect, named Thrasher and Hatcher, such as Spider-Man: The bright side of the picture is represented by the boca chart points, and the dark side is represented by the line. The threshold value of the interval can be easily adjusted (as shown in Figure 1). Through this exclusive plug-in, the texture of the bright and dark side of the 3D object in the picture can be adjusted. Compared with the cartoon effect in the middle rendering end, the stylization in the late NUKE allows SONY to have more free space, and it can adjust the screen style at any time, improving the efficiency of the work.



Figure 1- Interval threshold adjustment

Miles' hand in the air is completely 3D, and the number of frames the camera moves is different from the number of frames the character animates, which is already 12 frames per second in the 3D software (see Figure 2). To match this animation, SONY has developed an interpolate Maya plugin that interpolate adjacent stitches to interpolate fabric simulations smoothly. In other words, the animator could raise or lower Miles' frame count according to mood, but the fabric was always working at 24 frames per second.



Figure 2- Schematic of Miles' hand

In terms of the online draft, the creator said that the first line draft was too simple, only appearing on the faces and hands of the characters, and by the second step, the lines needed to appear on the buildings, the character's surface, and even the character's outline. They decided to use two types of lines, one procedurally generated according to certain rules, and the other hand-drawn by the artist himself. For the procedurally generated lines, they developed the Houdini plugin Kismet. Kismet will stroke the outer outline of the character, and the artist can also customize the thickness and dispersion of the strokes. Kismet uses dual rest redraw technology, which means that as one line is erased, another line is seamlessly generated so that even as the character rotates, their outline does not break. The team performed UV-space-based machine learning on 14 character lines, so the software could better predict the character's contours and where the comic-style features should appear. With Kismet in charge of the procedurally-generated lines, SONY also developed the curve system to facilitate artists to draw lines directly within the 3D space. Similar to Blender's crayons, these lines automatically track the character and inherit the character's own line style. SONY has since developed an interpolate hand-drawn plugin that automatically generates interpolated frames from two hand-drawn keyframes. In other words, SONY has developed a 2D hand-drawn animation artifact for use in 3D software.

## 2. The realization of the style of picture art

The overall style of Spider-Man: Vertical and Horizontal Universe is to "reproduce conceptual art", which needs to realize the unique visual style of several different universes. In addition to the comic-book main universe, there's also the watercolor Gwen Universe, the clip-art punk Spider-Man Universe, the Gekko Universe, and sid meid's sketchlike 2099 universe to name a few, with different universes representing different art styles and no doubt requiring different techniques to achieve the cinematic images.

### 1. The Gwen Watercolor Universe

In Gwen's Watercolor Universe, all the 3D models have been painted with watercolor strokes in the diffuse reflection channel. After experimenting with many original watercolor techniques, Rebelle, a third-party painting software, was the ideal one. It did a good job of simulating the physics of the spread of the watercolor inks, as anyone would expect from Gwen's universe (see Figure 3). But the painting software can't move, it can only draw. To solve this problem, Technical Art created a plugin in Python, a keyspriter-like hijack, that "hijacks" Rebelle's Pointers, so that by drawing a Spline in maya, Rebelle can draw the same pattern at the same time.



Figure 3- Gwen's Watercolor universe

For watercolor, the creators developed the Patchy bomby plugin in NUKE to uniformly adjust the lines and fill effects in the image. Gwen's bedroom used a lot of layering, the background watercolor effects were created separately, and the sunlight on the furniture and walls was painted on the material, which did not block the sunlight on the walls when the film passed through the heat.

### 2. Punk clip-art Universe

Punk Spider-Man's clip art style is one of the highlights of the film. There are three key steps to achieving this effect, mask texture and framerate control. The feature of the cut painting is that the outline of the character has irregular white edges. The mask can be obtained by expanding the Alpha channel of the character, and the rough edges of the mask can be treated as a rough edge, which can quickly produce a similar effect. Textures are paper lines that are superimposed onto the decision layer using a multiply overlay mode, with additional post-processing, such as monotoned black and white, where the textures can be adjusted at any time. Finally, there is the framerate control, which is the nature of clip art animation or stop-motion animation, so the framerate should be kept low. In the Spider-Man Universe, Punk Spider-Man's frame count is 8 frames per second, which is slightly more awkward than Miles' 12 frames per second. Not to mention in some static scenes, the Punk Spider-Man simply stays as still as a sticker and doesn't even breathe animation. It's worth noting that Punk Spider-Man's guitar and his frame count are misaligned, highlighting the cut-and-paste action. In addition to the traditional clip art animation process, SONY Animation Studios also added three-dimensional brush strokes and two-dimensional paint over draft lines to strengthen the sense of handwork, which makes the artistic effect of Punk Spider-Man more intense.

### 3. Lego Universe

The Lego pieces were created in Blender by a 14-year-old boy from Minnesota named Preston, and the short Lego pieces took him nearly a semester to complete. First, Preston downloaded the full set of Spider-Man models, LEGO bone bindings, and most of the more general scenes from Mecabricks. For some special Spider-Man designs, the UV maps had to be manually redrawn. For facial expressions,

the facial maps had to be replaced by blender's Macaface plugin. The seemingly complicated frame-by-frame animations were also dumbfied, which could be done by clicking in the pose library or manually adding keyframes.

Because of the simplified Lego joints, there are no fingers, knees or elbows, so whether walking, running or fighting, the animation is significantly simplified. The human eye is not as sensitive to whether the Lego is in the right position as it is to a real person, as long as it follows the logic of the toy placement. The realistic colors benefit from a modern workflow. The Lego PBR material that comes with you when you download it, plus the free HDRI, gives you this realistic effect straight out, without the need for a lot of synthesis and post-production.

It takes a lot of hard work for Preston to achieve this beautiful effect. Adding hand-drawn, intercalated frames, fingerprint roughness maps, and other scenes that had to be made by hand, such as the multiverse's circular passage, required a lot of talent and effort to pull off such animations.

#### 4. Glitch art

In the Spider-Man movies, glitch art is used in two particularly obvious scenes. One is that when the traveler travels to other universes, his body becomes deformed, distorted, and incomplete without warning, and special devices are needed to eliminate this. The other scenario is that when the crossing door is opened, the surrounding space becomes distorted, discolored, and misaligned. The film uses glitch art to show that these characters are outliers in this world. Common types of fault art can be roughly divided into 10 types, including RGB color separation fault, misaligned line fault, scanner line jitter fault, and so on. The fault effect in the film has also added this generation of candlelight frames, hand-painted and other effects to deepen the degree and richness of the fault. Vertical and Horizontal Universes continue the challenge of the first Parallel Universes to different visual styles. They are different from the traditional three-dimensional model which is mainly simulated or smooth, but take comics as the theme, add a variety of different styles, and merge a unique aesthetic system. Pollock's action painting is a challenge to the traditional way of painting. Pop style democratized art and rebelled against the cultural authorities of the time. There was also the world of punk collage that didn't fit in with its surroundings, and glitch art that was born out of mistakes and became popular. These aesthetic styles were born with a lot of controversies and challenges. Instead of the traditional stable form of 3D animation, this film chooses a different and risky path of challenge.

### 3. Conclusion

We are in a rapidly developing digital age, the progress of science and technology, the progress of artificial intelligence technology has changed everything, including the expression of artistic style, which allows us to see the rich and colorful artistic creativity and infinite possibilities. In order to achieve different artistic effects, Spiderman: The Vertical and Horizontal Universe team developed a large number of plug-ins patchy Bomby, Brush bomby, Strokriker and so on, and even the artists under their control were dazzled by the production technology, which undoubtedly enhanced the artistic level of the whole category of superhero films and the depth of technical research and development of animated films. Every Spider-Man universe in the movie has a unique aesthetic style and artistic temperament, presenting a beautiful visual feast for us.

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