Visual Expression in 3D Narrative Animation

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Abstract. According to previous literature references, a large number of researches have been conducted on the expression in animation. However, there is less repetition of attention to visual expression and less literature for animators' operation guidelines in certain types of animation. Therefore, this essay critically explores the impact of specific elements on the visual expression of 3D narrative animation, mainly including the following aspects: characters, the scene, the cinematography and post processing. In addition, A 3D animation called *TeleRadio* has been designing at the same time to support this essay from the perspective of an animation designer.

Keywords: Visual expression · Character · Animation

1 Introduction

The concept of expression or the expressiveness is ubiquitous in the arts, but 'few terms are poorly understood' [1]. Visual expression, an abstract concept, is rarely applied to arts accurately and systematically. Traditionally, animation has been one of the most expressive form of the visual arts, the characteristics of 3D animation are generally in line with this agenda [2]. It can help artists express some abstract creative ideas, and its visual expression are unique compared with other film arts. According to previous literature references, a large number of researches have been conducted on the expression in animation. However, there is less repetition of attention to visual expression and less literature for animators' operation guidelines in certain types of animation.

In order to evaluate the visual expression of some specific aspects and elements in 3D narrative animation, the author began to design a narrative animation called *TeleRadio*. In the development process of this project, technician and artist had to merge into one person due to small number of team members, and the author was mainly responsible for the storyline, models and audio design, as well as programming, character animation and FX composition. Consequently, this essay will use the research methods of systematic and literature review to figure out the research issues from the perspective of an animation designer. Therefore, the research question has been put forward: How to improve the visual expression of 3D narrative animation from the specific aspects of the characters, the scene, the cinematography and post processing.

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2 Brief Illustration of Animation '*TeleRadio*'[1]

TeleRadio is a fantasy and low-poly style 3D narrative animation (see Fig. 1), developed on Unity3D engine, coordinated by Maya in the designing process of models, materials and textures, then adjusted the details and composed by After Effects and Premiere. The whole animation consists of 31 shots and lasts roughly 4 min. In addition, inspired by the TV robot model made by David Zhang in Sketchfab.com, this unrealistic style and lovely outline inspired me to develop an animation about TV robot and radio robot. The story tells that, in the X-Star, a tv robot tried to help a radio robot, with a broken antenna wire to satisfy her desire to listen to music again. However, the process was difficult and funny. Playing the correct music for the third time, the tv robot was urgently called back to the camp. At the end of the story flow, the tv robot took down his antenna wire and gave it to radio robot. This is a simple story, beginning by accident but ending in warmth.

Fig. 1. Short animation *TeleRadio*

[1] The full video of *TeleRadio* can be found at https://youtu.be/utp9fRGnzZ0, The full journal blog can be found at http://www.shiyutong.org/aniblog.html.

3 Character Visual Design

The visual expression of characters in 3D animation is reflected in its vivid expression, personalized movement and the appearance of the characters themselves. Torre [3] proposed several key steps in the process of role development: firstly, a character is modelled – which defines its form – and is then rigged with a skeletal support structure. This form is given a surface, then a colour, finally a texture or material. Atmospheric conditions may be added, such as lights, which can further significantly alter the appearance of the previous layers.

3.1 Modelling

In animation *TeleRadio*, the development of two characters also followed this form. In order to personify the characters, the author designed the TV and the radio as their heads and matched them with robotic bodies. The proportion of the heads was magnified exaggeratively, referring to the Pixar animation, to improve the overall aesthetic of the animation and to make the audience focus on the characters' face (see Fig. 2). After that, the characters were rigged quickly in Mixamo because of the anthropomorphic bodies. Meanwhile, the movements benefited from the motion capture database of Adobe Mixamo and CMU Graphics Lab, which greatly saved creation effort and time.

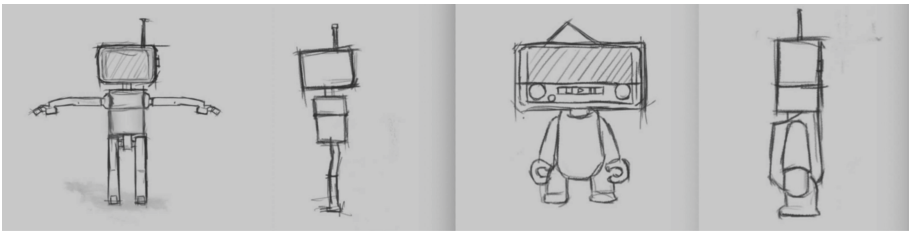

Fig. 2. Character draft

The design of colour and textures needs to be based on the story plot and the character itself. Of course, it also needs to form a harmonious and consistent aesthetic feeling with the scene art. The tv robot, a male character, uses light green as his main colour and uses dark grey in some necessary line drawing to make the outline more obvious. The radio robot, a female character, uses light pink which is the complementary colour of green to create the feeling of a little, cute and caring girl. Both displays are orange, a bold colour, allowing the audience focus on the vivid facial expression of the characters- after all, the displays are crucial to the plots (see Fig. 3).

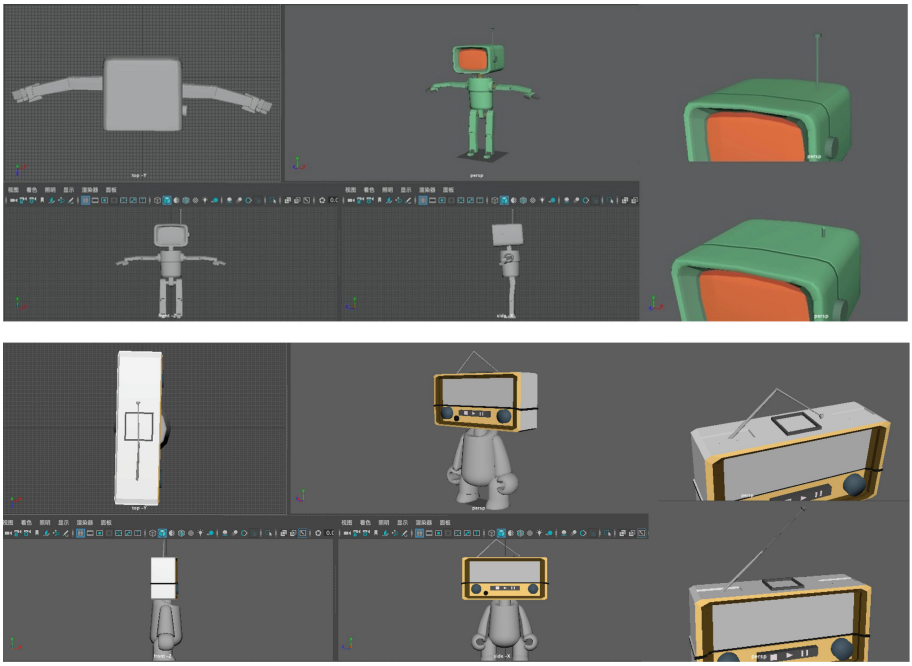

Fig. 3. Modelling and painting of tv robot

3.2 Movement

In addition, movement can add important epistemological dimension to animation – it can give life to the character [3], and audience is therefore able to identify with the world view and the narrative significance of the characters themselves in the animation. Jacobs [4] wrote in his book Framing Pictures: at a specific moment of the development of the storytelling, movement is frozen at a point of heightened meaning, at which the actor's actions are especially capable of expressing the full significance and all the implications of the story. In human experience, we have to admit that language expression through sound alone is more boring than visual expression combining movements and emotions, which is also the main reason why televisions can replace radios. Benefited from Adobe Mixamo and CMU's motion capture database, some of the action animations were suitably complemented at specific moments in the narrative development. For instance, with the relationship warming up, the tv robot performed Michael Jackson's moonwalk while playing the music video of Billie Jean (see Fig. 4), which is the radio robot's favourite song. Movement adds meaning to these abstract plots, increasing or even completely changing our interpretation of the animation [3]. During more than 20 s of camera motion on tv robot's dance, the attitudes of the characters were changed and the plots of the storytelling were subtly advanced.

Fig. 4. Dancing animation of character

3.3 Expression and Emotion

Similarly, more important aspect of supporting the emotions of characters than the movement is the expression on their face [2], and the expressive qualities of artwork are ultimately 'qualities that can be grasped through the emotions they arouse' [1]. As an important part of three-dimensional animation, facial expression animation affects the character and personality performance of animated characters [5]. Each character's external expression of emotions is mainly achieved through physical movements and facial expressions. Through the subtle changes in the character's expression, the audience can measure her emotions, even personality, values, world view and so on. In the *TeleRadio*, both of characters have their own emotional change, which I call flow. For example, the tv robot, from the confusion at the beginning, to the confidence to help the radio robot, to the embarrassment caused by the mistakes, to the joy when he played the right song, to the sadness and helplessness when he had to leave, all these emotions were dynamically pixelated as the 2D animations into the display of his head (see Fig. 5). These are not only designed for the world outlook or the flow of the animation, but also the real reflection of human life.

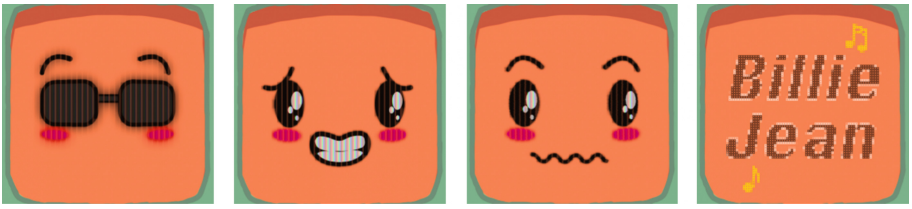

Fig. 5. Emotional animation design in after effects

As an important part of three-dimensional animation, facial expression animation affects the character and personality performance of animated characters [6]. Each character's external expression of emotions is mainly achieved through physical movements and facial expression. Through the subtle changes in the character's expression, the audience can measure her emotions, even personality, values, world view and so on. In order to show the style of a real television screen, The author added some special effect plug-ins such as TVPixel, Dot Pixels, Bad TV and Glow in After Effect. The final look is more pixelated and grainier, with occasionally shaking to emulate the effect of bad signal.

These 2D expression and effects were designed by AfterEffects, and exported in the form of 2D image sequences. In the process of practice, a more convenient application method of expression animation had been found, which made it easier for designers to make expression move on characters' faces. Rather than applying facial expression animation in Maya, 3DMax and so on, then editing and composing in Unity3D in the traditional process, designers can directly compose 2D animation in Unity3D. This is done by giving the character's face texture a render script in Unity3D:

```
{
    public Texture[] textures;
    public float changeInterval = 0.33F;
    public Renderer rend;

    void Start()
    {
        rend = GetComponent();
    }

    void Update()
    {
        if (textures.Length == 0)
            return;

        int index = Mathf.FloorToInt(Time.time / change-
Interval);
        index = index % textures.Length;
        rend.material.mainTexture = textures[index];
    }
}
```

However, this will lead to the uncontrolled playing time of the characters' facial expression. The actions of animated characters are interactive, and the designers need to accurately arrange the appearance time of each expression of the characters, which often requires the coordination of body movements and words. Therefore, a script to start playing was also added to the facial texture component, and the designer can control the functions of playing and stopping of different 2D expression with one or more buttons.

```
{
    private textureS_TEST Switcher;

    void Start()
    {
        Switcher = GetComponent();
    }

     void Update()
    {
        if (Input .GetKeyUp (KeyCode.Space))
        {
            Switcher.enabled = !Switcher.enabled;
        }
    }
}
```

4 Scene Art Design

Most of the scenes in animation do not exist in the real world and their production depends on the rich imagination of the designer. The animation *TeleRadio* is based on the low poly style (see Fig. 6), which emerged around late 2013 as a specific style [7]. This seeks to highlight the idea that the world can be represented by a composition of shapes, which makes it a self-aware style that is intentionally vague. Hence, in the unrealistic world of X-star, the low poly style is undoubtedly the best choice to achieve the visual expression and easy operation. Thanks to the Unity Assets resource base, after obtaining the license, the author began to consider how to arrange and combine these low-poly models appropriately. In the story, X-star is an unrealistic polar planet. Therefore, snow-capped mountains, crystals and ice rocks were added to the scene. In addition, a large sea was designed outside the characters' acting area to make the scene look less closed and broaden the visual range.

Fig. 6. Low-poly scene and bonfire

All of the above are cool tone, in other words, it will give the audience a cold feeling, but the plots of the story are warm. Consequently, a continuous bonfire was designed in the central area, and the contrast between cold tone and warm tone in the scene is the thematic concept that *TeleRadio* is trying to convey: there is also warmth even in the coldest places.

5 Montage and Cinematography of Animation

Animation is also the same visual art as film. In addition to its own unique artistic expression, it also needs the addition and evolution of cinematography in animation. The cinematography is of great significance for improving visual expression. Some animators only consider composition design rather than cinematographic design, just using plain shots to tell the story, plots or movements, which makes the picture boring. Therefore, in short animation *TeleRadio*, the composition and camera motion were carefully designed and combined together in a rule of montage.

Montage is a major narrative and expression method in movie art. As an artistic technique of connecting the shots and giving new meaning to them, it is also an important way of animation narration. Through the montage method, different scenes and objects of animation shots are connected together to generate different visual expression.

Even though part of the montage theory of traditional films is mature enough and suitable for direct application in the field of animation, the technology of shot switching of animation is completely different form that of traditional films. There is no real shooting scene in the production process of 2D animation. All cameras are put into the virtual scene of animation software as components. In the process of using Unity3D to create 2D animation, the camera movement and the switching between the shots are achieved using C# script. This allows multiple sets of shots to be switched on a timeline:

```
{
    public GameObject Cam1;
    public GameObject Cam2;
    public GameObject Cam3;

    void Start()
    {
       StartCoroutine(TheSequences());
    }

    IEnumerator TheSequences()
    {
       yield return new WaitForSeconds(10);
       Cam2.SetActive(true);
       Cam1.SetActive(false);
       yield return new WaitForSeconds(4);
       Cam3.SetActive(true);
       Cam2.SetActive(false);
    }
}
```

The traditional main shot pattern in Hollywood is composed of 'positioning shot – panoramic shot – medium shot – close shot or close up shot', which is a typical forward montage language. It is usually used at the beginning of a story or narrative passage. The large perspective shot is used to describe the environment or to exaggerate the atmosphere, while a close- up shot is used to describe the process of the characters' action. This is also one of most common opening methods used by animation directors. *TeleRadio* also begins with this theory (see Fig. 7):

Shot 1: distant, describes an empty shot of the polar landscape of X-star;
Shot 2: panorama, the tv robot comes in and sees the radio robot;
Shot 3: close up (insert), describes the expression of tv robot;

Shot 4: close, describes that the radio robot is near the fire;
Shot 5: close up, describes the sad emotion of radio robot;

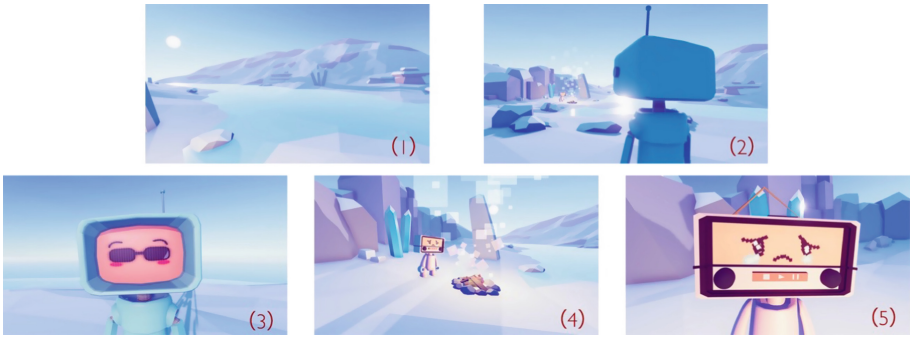

Fig. 7. Forward montage in *TeleRadio*

Obviously, the main characteristic of forward montage is straight and concise. Meanwhile, many animation directors will use a kind of shot switching mode of reversal shooting cycle for dealing with the scene of two-person conversation. This theory was applied in *TeleRadio* while the robots talked to each other, in which the reversal shot alternate to enrich the visual expression of these shots (see Fig. 8).

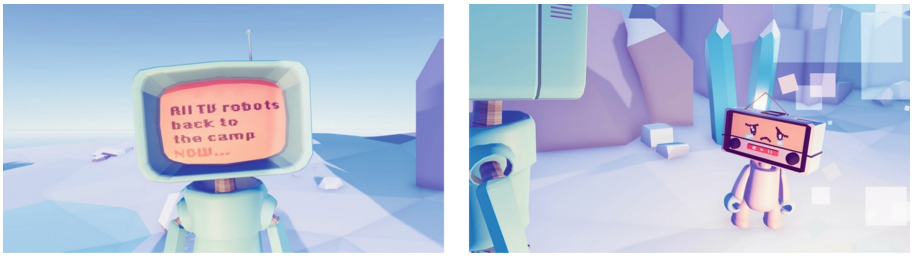

Fig. 8. Reversal shot in conversation scene

6 Post Processing with Diverse Digital Tools

In terms of post-processing of shots and clips, the cooperation of various digital tools has improved visual expression of animation. *TeleRadio* used the Unity Post Processing plug-in to conduct advanced adjustment for image saturation, brightness, hue, shadow as well as depth of field (see Fig. 9), then saved them as LUT for subsequent use and adjustment. In addition, *TeleRadio* used the Unity Recorder plug-in to real-time render each shot of the animation in 4K resolution, then connected with post-processing software such as After Effects (AE) and Premiere (PR), which provided a powerful workflow to create

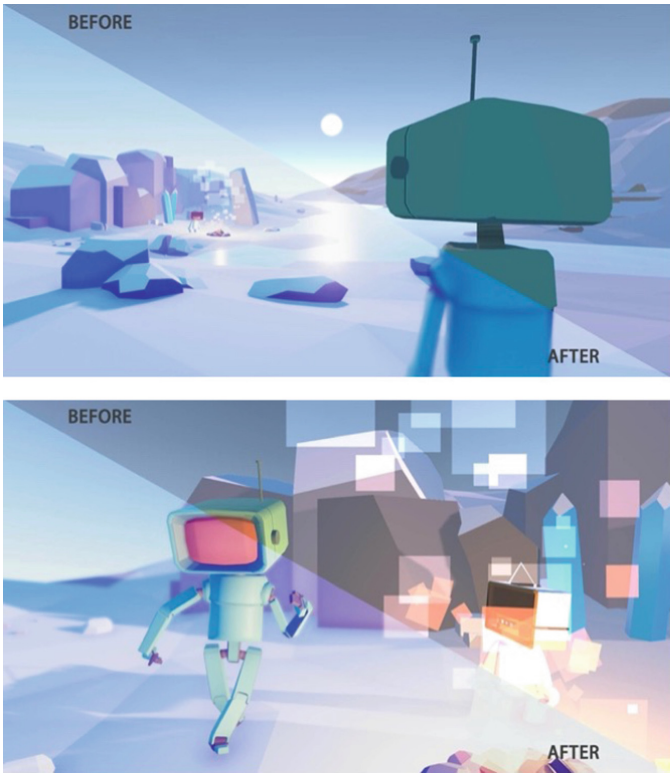

Fig. 9. Contrast between BEFORE and AFTER

animated videos for a high visual effect. The powerful processing functions of AE for 2D graphic animation helped me complete the high frame rate output of characters' 2D facial animation, which were rendered on the character's face as a sequence of PNG images. In addition, the opening title animation was also developed and rendered in AE.

Thus, the development of diverse digital tools provides a platform for animators to achieve their creative ideas and plays a crucial role in the improvement of visual expression of animation (see Fig. 10).

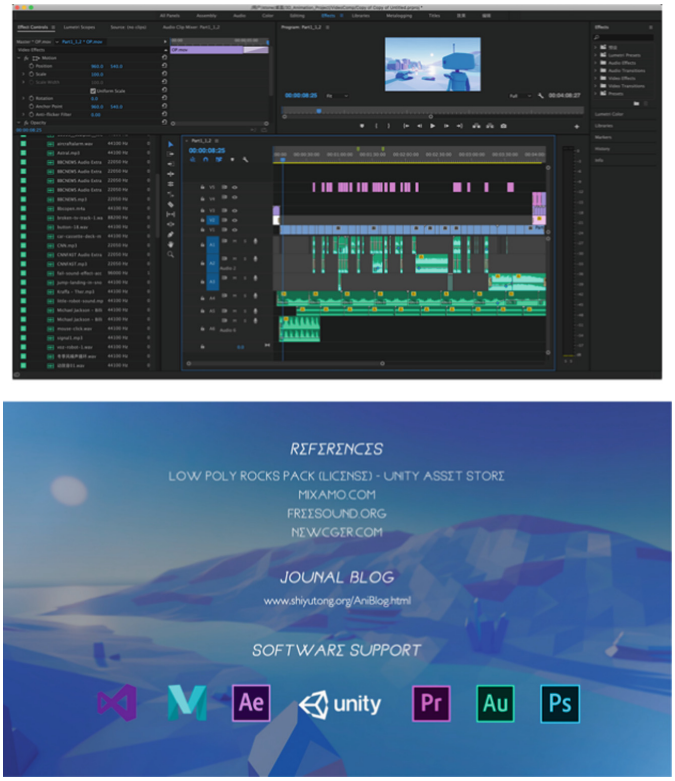

Fig. 10. Diverse digital tools supported the production of *TeleRadio*

7 Conclusion

In this research, the author found that the visual expression of 3D animation requires the coordination of various elements, including but not limited to the visual design of characters, scenes art, cinematography of animation and post processing. As an animator, if the animation is designed from the perspective of visual expression, the quality will be improved. Next, we hope to improve and enhance this animation content in the future work, and actively explore other valuable research topics.

References

1. Robinson, J.: Deeper than Reason: Emotion and its Role in Literature, Music, and Art. Oxford University Press on Demand, Oxford (2007)
2. Power, P.: Animated expressions: expressive style in 3D computer graphic narrative animation. Animation **4**(2), 107–129 (2009)
3. Torre, D.: Cognitive animation theory: a process-based reading of animation and human cognition. Animation **9**(1), 47–64 (2014)
4. Jacobs, S.: Framing Pictures: Film and the Visual Arts: Film and the Visual Arts. Edinburgh University Press, Edinburgh (2011)

5. Butler, M., Joschko, L.: Final fantasy or the incredibles. Animation Stud. **4**(55), 9780429450716-1 (2009)
6. Terzidis, K.: Expressive form: a conceptual approach to computational design. Spon Press, London (2003)
7. Ng, J.: Seeing movement: on motion capture animation and James Cameron's Avatar. Animation **7**(3), 273–286 (2012)