Study on Application of 3D Animation Technology in Films-Television and Advertisement

Yang Yu
School of Artistic Design, Hunan International Economics University, 410205, China
*Corresponding author (E-mail: 8142994@qq.com)

Abstracts
3D animation, also known as 3D animation, has been progressively adopted in films, games, advertisements, constructions and other industries in recent years, and has boomed these industries. As the animation technology tends to be continuously developed, 3D animation shall be more extensively applied. The proficiency in and application of 3D animation is attached progressively rising significance. This paper firstly introduces the domestic and overseas development status of 3D animation technology. Secondly, the core technology of 3D animation is summarized. In the third part of this paper, the application of 3D animation technology in film, television and advertisement is illuminated. Eventually, the production course of 3d animation is presented through an example.

Keywords: 3D animation; special effect in films and television; animation in advertisement

1. INTRODUCTION

3d animation is an emerging technology having been developed in recent years in the developing course of computer hardware and software technology. First and foremost, a virtual world is created in a computer through adopting the 3D animation software. Accordingly the technical personnel build scene and build models in the virtual three-dimensional world in accordance with the shape of the object to be expressed. Additionally, in line with the requirement, the movement track of the model, the virtual camera move and other animation indexes are to be set. Eventually, the specific texture shall be lighted and attached on the model as required. As all these are fulfilled, the rendering can be automatically calculated, the single frame can be generated via the computer. The relevant outcomes shall be edited as the anticipated animation in the post-production phase.

In contrast with the real shooting, the 3D animation has no physical limit. The virtual camera in the 3D animation can be perceived as the ideal film camera. Additionally, the technological producers count as the director, cameraman, lighting engineer, and designer. The eventual image effect is not only determined by the condition, experience and artistic culture of producers, but also dependent on the technological limit of the 3D animation, software and hardware.

The 3D animation refers to the item synthesizing the arts and technology. On the one hand of the course of production, the requirement of the innovation and creation shall be adequately effectuation. And on the other hand, the art recreation shall be conducted in terms of the hue, image composition, lighting condition, shot transition, rhythm mastering and other fields. In contrast with the graphic design, the 3D animation is enriched in the concept of time and space. Several principles shall be abided by from the graphic design, whereas the principle of the film & television art shall be laid the particular stressed on when performing the creation.

2. CHARACTERISTICS OF 3D ANIMATION IN FILM & TELEVISION AND ADVERTISEMENT

2.1. Characteristics of application in advertisement

When some image effects cannot be effectuated via the real shooting, the 3D animation shall be adopted to independently fulfill these effects or supplemented by the real shooting. Some dynamic effects displayed in the advertisement are effectuated through adopting the 3D animation. Currently from the perspective of production, the advertisements that we have seen are basically produced with the supplementation of 3D animation. The 3D animation can be appropriate for several construction advertisements or other projects having not been effectuated or to be effectuated, as to introduce the splendid results after implementation to the audience in advance.

2.2. Characteristics of application in film & television

As the computer has been progressively extended to the field of making film and television, and been dominated in the producing software, the 3D digital image technique has broken the limits of the film & television shooting. The shortcomings of the shooting in the visual effect can be covered by the 3D animation, and to a certain extent, the computer-based production is much lower than the real shooting in the cost. In the meantime, the time for the production crew is remarkably saved, considering the estimated cost, weather
condition of the shooting location and the seasonal changes. First and foremost, from the perspective of 3D animation’s production course, it is pertaining to the post-production phase of film and television. Secondly, in view of the effect of 3D animation, the more abundant materials are provided by the 3D animation for the post-production of the film & television. Accordingly, numerous special effects and rendering elements can be attained in the compound film, which fills up a great deal of limits existing in the film & television. More virtual elements can be introduced to the work, and in the meantime the image and frame can be more beautiful.

3. COURSE OF PRODUCING FILM & TELEVISION AND ADVERTISEMENT THROUGH ADOPTING 3D ANIMATION

This chapter primarily illuminates the general knowledge, and thereupon adopts the learned knowledge in the work.

3.1. Design of story

The script of story board is deemed as the significant part in the short film & television and advertisement. To some extent, well designed story is half done. For this reason, the story of this animation is specifically designed.

Scene 1: Two doors are slowly opened. It is dark inside, and the light outside the door is dazzling. The roles appear (backlight), the scene inside the door is projected (major scene). The shooting shall be carried out from multi-dimensions, as to manifest the shocking effect when the characters show up.

Scene 2: When the characters walk into the door and stands in there. The top lamplight is suddenly turned on, and the entire site is lighted. The basketball stands are placed at a short distance. The scene shall be transited as the characters move. Finally, the entire scene is overlooked.

Scene 3: The characters are warming up and stretching their bodies. They sprint and jump. They make the difficult moves in the air and make the slam dunk.

Scene 4: Ending

3.2. Modeling

The general method of modeling is explicated first, and then the basketball in the animation is modeled. Furthermore, the relatively complex characters are modeled. Lastly, the scenarios required are modeled.

3.2.1. Method to establish the standard geometrical model

The order of 3d animation production is usually comprised by establishing geometric models, material setting, environment setting, animation setting and post-rendering. Among these 5 steps, modeling lays the basis for all other work. Without a valid model, all other Settings shall be meaningless.

In 3ds Max, standard geometric model of creation method is very simple. Select the corresponding order in the order panel of Create. Afterwards, the operation can be operated in the vision. The parameters of the model can be adjusted. A sphere shall be created to illuminate the procedures of establish the basic geometrical model.

1. In the command pane, click create tag to enter the create command panel
2. Click on the in figure 4.1 to entry geometry panel.
3. Select the standard primitives in the drop-down list and open the standard geometry panel.
4. Click the sphere button, and the selected button becomes yellow.
5. Thereupon click the left mouse button at any point in the view, and release it in any one position. A sphere shall appear in the view.

3.2.2. Edition of sphere and modeling of basketball

In 3ds Max, a sphere can be determined through confirming the radius of the sphere and the center of the sphere. To effectuate other effects, other parameters can be used to deform the sphere.

The creation of a sphere is to be selected in the creation method volume display. Primarily two main options are offered, which are edges and centers. The edge refers to the creation initiated from the edge of the sphere, and the center represents the creation initiated from the center of the sphere. The creation of the sphere is mainly used to locate the sphere, and the shape of the sphere is not affected.

In the sphere, the parameters in the command panel are created, and these parameters can be adjusted to achieve different spheroidal effects.

There are other parameters in the parameter bar, which can be used to create various hemispheres. The hemisphere option is used to set the size of the crown, as shown in figure 1. The effect shall be created different with the value.
The basketball required is created through drawing on the foregoing knowledge.

1. Create a sphere and set the size of the ball.
2. Draw the mapping, as shown in Figure 2.

3. Through the material editor, the sphere is mapped, to form a model for the basketball.

3.2.3. Scene modeling
The court and basketball stands are respectively modeled, and the design sketch is exhibited in Figure 3.
3.3. Animation making for characters

In the process of making character animation, it is attained the key frame animation shall be most frequently adopted. The knowledge of key frame animation shall be briefly introduced.

Key frame animation is a set of key frames set by the animation designer to automatically generate the intermediate drawing. There are two ways to realize the key frames: one way is to get the intermediate frames through the key frames of three-dimensional shape interpolation calculation, and the other method is the parameter interpolation calculation of the object. The first method is more frequently adopted.

3.3.1. Bone making

In 3dx Max, a skeleton can be easily created through adopting Biped. The process of creating an appropriate skeleton is introduced as follows.

The Biped button is selected to create the skeleton, after which, it is evident that the bone can be properly created in the body type setting. Hereto, the spine is set as 2, and the leg link is set as 3. Accordingly, the operation of the mouse is carried out in the view to realize the creation of human skeleton.

3.3.2. Skin covering of skeleton

To make a realistic 3d animation, bones are not enough, but the skin shall be added to the bones.

1. Create a skeleton as high as the model in the view, as shown in Figure 4.

2. Modify the parameters in the sports section according to the view, the number of joints in the neck, chest, fingers, legs and toes are primarily to be adjusted to make the number of bones and joints suitable.

3. As the bone quantity is set, move and rotate tools are adopted to adjust the position of the bone and zoom of skeletal size, as to make one side of bones matched with model. The other side can be copied and pasted.

4. Select all the spines and zoom along the X axis to make Biped shoulder into the shoulder of the model. Adjust all body parts as well.

5. Next, continue to fine-tune the bone parts of the fingers, such as toes, as to let them be geared into the model.

6. The position adjustment is complete, add the physique modifier and attach to the node, so that the skeleton can be geared into the model.

7. The final work, the muscle gravity shall be adjusted, allowing each joint to coordinate the muscles of each part.

8. The skin-covered skeleton is successfully attained, as exhibited in Figure 5.
3.3.3. Establish basic moves of Biped

In the process of producing short video, the character animation is primarily controlled through the bones of the characters. For this reason, the basic movements of the Biped are explicated below. Afterwards, the movements are effectuated to display in the animation.

1. Establish a Biped in the scene
2. Select any part of Biped, enter the motion panel, and open the footprint mode in the scroll bar; Select to walk in the footprint creation column. Create multiple footprint buttons on the edge, and accordingly multiple tracks shall be popped: walking dialog box.
3. In the creation of multiple tracks: in the walking dialog box, the footprint number is 10, so that Biped will produce 10 tracks numbered 0-9. Notice that the time slider is automatically set to 153 frames, as shown in figure 6.

4. Click the button of creating footprint in the column (in the current frame), then select a footprint in the view, in the footprint column operation and press a key button to inactive footprint, then has successfully created a Biped walking the basic action, according to the play button to see the effect.

Similarly, with the running and jumping of 3DS MAX, the running and jumping of Biped can be
established. The anticipated movements can be achieved through the adjustment of the footprint and the adjustment of the bones in the movement.

The adjusted character’s animation, skipping grid, is presented in Figure 7 as below:

![Biped skipping grid](image)

**Figure 7. Biped skipping grid**

### 3.3.4. Creating route animation

In the process of animation design, sometimes it is easy to determine the motion route of the object, and its key position fails to be effectively set. Accordingly, the specified route is of necessity to set the animation.

Setting an object along a certain route counts as a very important function in 3ds Max. In general, there are several steps below:

1. Create a spline as the movement route
2. Create a virtual object and link the movement of moving object with the virtual object
3. Equip an animation route controller for virtual object, and click the spline to be adopted as the route.

Accordingly, the virtual object can move along the route. As it is moving, the moving object can be put in motion.

While producing the animation, this technique is also adopted. The course of producing the route animation is to be specified in the following paragraphs, through the case illumination of the route of thrown basketball.

1. In the create panel, select the NURBS surface to create a curve that conforms to the shooting path, and in the meantime create a sphere and paste the image above to make it look like a basketball.
2. Click the assistor button in the create panel, click the virtual body button in the open panel, and then drag and create a virtual object in the Top view.
3. Select the ball in Front view, move the ball to the end of the curve, open the Settings in the Settings area and then click animation keyframe button, open the manual set animation mode. At this time, the time course turns red, click set keyframes, and record the current ball state.
4. Select the virtual object in the Top view, then select the motion TAB, and open the motion panel. Select the route constraint option as the controller, and then click OK in the dialog box to close the dialog box.
5. Add a moving route for the virtual object below. In motion command panel the route parameters rollout, click add route of button, then select the curve in the Front view, the curve will be the route to the virtual object, and move to the curve of a point.
6. Select and move tools in the toolbar. Move the ball to the center of the virtual object in the Top view.
7. Select the selection and link tool button in the main toolbar, then the cursor becomes the shape of the two cubes linked together. Move the cursor to the ball in Front view, hold down the mouse and drag, until the ball link to virtual objects, when two objects are linked together, will be highlighted, the link has been established, the movement of the virtual object can drive the ball to move.
8. Activate the Perspective view, and then click on the play button to achieve the basketball’s motion curve. The following screenshot is the entire exercise process, as shown in figure 8.
3.3.5. Realization of character’s movement

The main movements of characters in our animated short films: walking, running, jumping, dunking, shooting. The movements of the characters must be effectuated through the adjustment to the skeleton and setting of key frame, whereas there is an important issue, viz. the technical difficulty, that it is difficult to achieve high simulation in 3 ds MAX. For this problem, the key frame is set via 3 ds MAX. Accordingly the key frame is adopted to effectuate the transiting frame, which simplifies the immediate course and multiple details, whereas the actions of the characters are in conformity with reality.

Because there are so many characters in the animation, the author selects to introduce the realization of the action by taking walking as an example.

Generally in reality, human walking can be divided into four steps: 1.stepping out the front foot; 2. Landing on the forward foot, both feet on the ground; 3. Backward foot keeps pace with the forward foot; 4. Stepping out the backward foot to complete the step-by-step movement.

How to effectuate the walking movement in 3DS Max is introduced as follows:
1. Set the first key frame in the static state
2. Adjust the centroid and skeletons of all parts at the next key frame. The forward foot is stepping out and down to the floor, as shown in Figure 9.
3. Land the forward foot, and the backward foot keeps pace with the forward foot.
4. Step out the backward foot to fulfill the move of step-by-step walking
5. Achieve a series of walking moves.
3.4. rendering output

After modeling, using materials, placing lights and cameras and animated scenes, the final step is to prepare rendering output. Other renderers can be selected by the plug-in feature of 3ds Max for use. In our animation video production, the v-ray renderer is selected.

When rendering the character’s dunk, the reflection effect is set on the backboard through the texture editor, and a fuzzy feeling is rendered in the render parameters to make the whole animation more realistic. The effectuated final effect is shown in figure 10.

![Figure 10. Rendering design sketch of slam dunk](image)

3.5. Post-production

After the rendering of the various scenes, the work to be conducted later is the composition of film. The After Effects (AE) software is adopted to do the post-video processing.

After Effects refers to the special Effects synthetic software for high-end video special Effects systems, owned by Adobe Corporation of America. The successful features of multiple software are referenced, and the video special effects are elevated to the new stage:

The introduction of the middle layer of Photoshop enables AE to control the multi-layer image composition and perfect the synthesis effect. Key frames and the introduction of route enable us to control advanced 2d animation easily; efficient video processing system ensures high quality video output; the dazzling special effects system enables AE to effectuate the creativity of all users.

The opening of animation is produced through adopting AE, as shown in Figure 11.

![Figure 11. Title](image)

The next step is to combine the various shots to make it the coherent animation with narrative story. Import all the materials into the synthetic project (including the sound, video, etc.). In the time axis, assign the position and effect of each segment of the editing, and finally video is output. The dunk effect is shown in figure 12.
4. CONCLUSION

The image of animation and the use of special effects shall endow TV and television advertising with unique artistic charm. The phenomenon that people do not or cannot see in real life, can all be achieved in the three dimensional animation, enhancing the audience's curiosity and desire, making the film and television advertising become more attractive and more value to be appreciated. Through 3d animation design, the cycle can be shortened greatly, thus saving a lot of time and money. In the meantime, computer-based three-dimensional art also extends the capability of the advertising producer, that the potential is only limited by the imagination is effectuated. Accordingly, today's advertising products are becoming diverse, lively, and strong in visual impact characteristics, as shown to the public.

References