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DEVELOPING CHARACTER ANIMATION WITH AUTODESK MAYA

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Abstract. *This thesis delves into the process of character animation development using Autodesk Maya software. It examines the techniques and tools involved in creating believable and expressive character movements, focusing on the key principles of animation such as timing, spacing, and weight, and the use of rigs. The objective of this thesis is to provide insight into the process of creating compelling character animations using Autodesk Maya.*

Keywords: CHARACTER ANIMATION, AUTODESK MAYA, POSES, RIGGING

Character animation is a captivating and rewarding field that involves the creation of lifelike and engaging characters for various media. Autodesk Maya, one of the most popular and powerful software applications for character animation, offers a wide range of tools and features that make the animation process both creative and technically challenging. This thesis explores the development of character animation with Autodesk Maya, focusing on key stages of animation preparation, the theoretical basis of animation, and its practical and technical aspects. To facilitate understanding, we will break down the entire animation process using a specific shot as an example.

Preparing for Animation

Before beginning the animation process in Autodesk Maya, it is crucial to have a clear understanding of the story, characters' moods, strong character traits, and the locations to be used. This stage involves brainstorming ideas and concepts, sketching characters, and creating storyboards to serve as visual guides for the animation process. Shooting a reference of our idea from the front and side will be useful as it forms the basis of our animation. Moreover, the animator must prepare the cameras to capture the scenes, setting up angles and perspectives, or export previously prepared camera settings and location.

However, the most significant aspect of animation preparation is a properly rigged character (fig.1). A good rig, a skeleton that moves the bones to create the animation, is essential. Not only the character but also the objects that the character interacts with, such as weapons, cars, pieces of clothing, etc., need a Rig. You can develop the rig yourself in Maya, but typically, it's the job of the rigger to build the skeleton and set up the scales correctly. There are plenty of free rigs available for non-commercial use on specialized websites.

Initially, it's important to understand where the animation will be used - there are two main areas: games and cinematography. Each has unique characteristics. In game animation, it's vital that the animation looks flawless from all sides, while in cinematography, the view from the camera is all that matters.



Figure 1 – Properly rigged character

In our case, we're considering a shot from a character animator's portfolio, where the famous Marvel character Thor grabs his hammer. The shot, done in cartoon canon, focuses solely on the animation. Hence, there's only one camera, and no location is involved.

Theoretical Basis of Animation.

The theoretical foundation of animation is paramount for developing character animation using Autodesk Maya. This understanding encompasses the principles of spacing and timing, the twelve basic principles of animation (fig. 2) formulated by Disney animators Ollie Johnston and Frank Thomas, the distinction between Inverse Kinematics (IK) and Forward Kinematics (FK), as well as concepts like ease-in and ease-out.

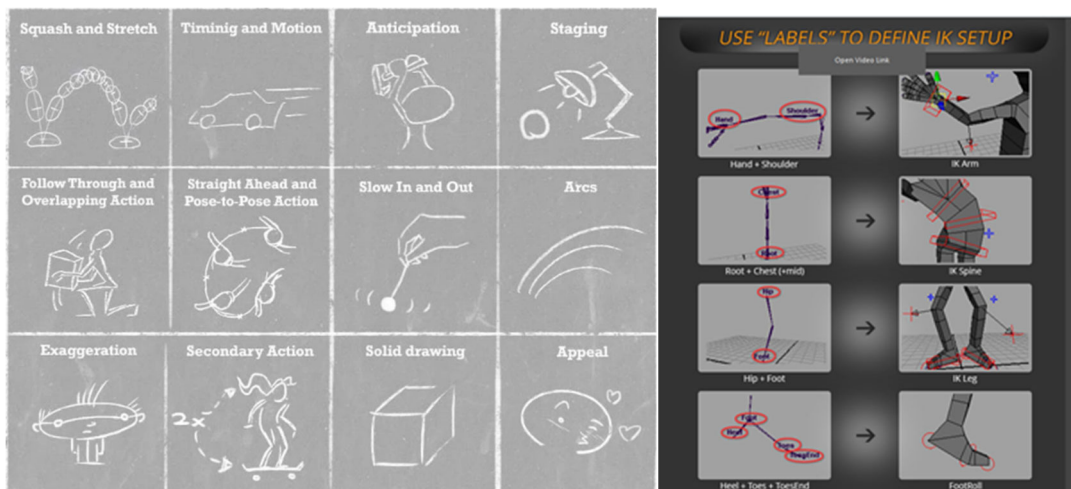


Figure 2 – The twelve basic principles of animation

Spacing and timing pertain to the arrangement and duration of keyframes, which influence the character's movement and pace.

The twelve basic principles of animation provide a framework for creating believable and engaging character movements, including principles such as squash and stretch, anticipation, and follow-through. Nevertheless, you will need to read at least two books to fully understand the theory, namely “The Illusion of Life: Disney Animation” by Frank Thomas and Ollie Johnston and “The Animator's Survival Kit” by Richard Williams. These two books will lay a theoretical foundation, but without practice it's worthless.

Inverse Kinematics and Forward Kinematics are characteristic, which exists only in computer animation, unlike the traditional. IK, Inverse Kinematics, refers to a process utilized in

3D computer graphic animation. In this process, the parameters of each articulation, in a jointed flexible object (a kinematic chain), will be automatically calculated to achieve a desired pose, especially when the end point moves. Basically speaking, IK is how the child node, as it moves, effects all the parents' position and orientation values. FK, Forward Kinematics, is how the positions of particular parts of a model at a specified time are calculated from the position and orientation, together with any information on them, of an articulated model. To sum up, FK refers to the effect on the child nodes as the parent moves or rotates.

Ease in is starting the animation slowly and then speeding up the movement as it comes to a halt. Ease out is starting off quickly and slowing down at the end.

Practical Part of Animation

Once the basic principles of animation are understood and all necessary preparations are in place, we can proceed to the most fascinating part-character animation. Before diving in, some technicalities need to be addressed. For instance, the Animbot plugin for Maya will be needed. This plugin contains numerous features that significantly expedite and facilitate the animation process. It's also essential to set up the Workspace for animation and adjust it to fit personal preferences, such as the number of displays and the diagonal size. In addition to this, if you have a reference, you should upload it now to the project as a plane. Also recommended to disable all selections, open the controller so as not to accidentally break the character. And to set the desired number of staff, because it will be difficult to change this value later and continue working on the project.

In this example, there is a drawn hammer that needs to be linked to the hand so that the hand follows it, the best way to do this is to use a parent constraint. With a parent constraint, you can relate the position – translation and rotation – of one object to another, so that they behave as if part of a parent-child relationship that has multiple target parents. An object's movement can also be constrained by the average position of multiple objects. Select one or more target objects, followed by the object you want to constrain. In either the Animation or Rigging menu sets, select Constrain > Parent >. Set the constraint options or select Edit > Reset Settings. Click Apply to create a parent constraint.

Now everything is ready to start the animation. Any animation begins with blogging key poses – these are the most important poses for us to understand what is happening in the animation. Poses create when we change the rotation, position, or size of controller (fig. 3).

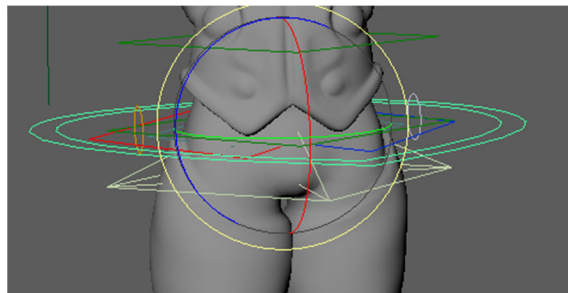


Figure 3 – Example of controller

Tip: when you create a pose, start from the main controller, like root, and gradually move towards details like fingers. The shot we took as an example has 4 key poses. Important: After the key pose is ready, you need to select all the controllers and press “s” –

a hotkey that makes keys on the timeline. Small life hack to understand how good a pose is, just look at the silhouette of the pose without textures, light, and shadows. In Maya, you can do this by turning on the camera's light reflection, provided there was no light in the scene before. If the meaning of the pose is preserved, it's good.

The advantage of the computer animation is that, unlike the traditional animation, you do not have to draw each frame manually, because Maya calculates the movements between the two keys. When the key poses are ready, you can proceed to breakdown poses, intermediate poses between the key poses. Breakdown poses are staged. In the picture we took as an example, Thor makes a step between the first and he second key poses. So, the breakdown pose will be when Thor raises his leg so that Maya can calculate the frames between the two key poses correctly. Or when Thor is just touching his hammer, it is important to set a breakdown pose because it is an important and complicated enough action, which Maya cannot calculate correctly. But in general, that shoot has more than 20 break down poses (fig. 4).

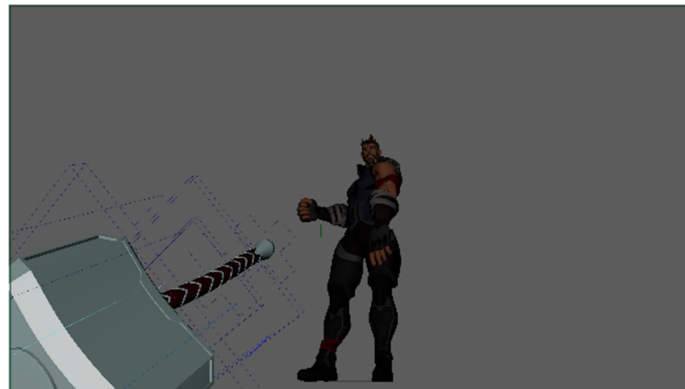


Figure 4 – Example of key pose

In this stage, poses start to view like animation, but real it is only blocking of animation, and now we can add more details. Choose any important move in animation and turn on Motion trail-function from animBot which the trajectory of move. In example Tor shoot it can be Hammer's trajectory, it should be always smooth. Also, important to check arm's, leg's, root's trajectory. At this moment of working out the trajectory. We need to bring the animation almost to perfection, but for this we need to use not only the controller keys, but also spline – a keyframe's angel that represents a point from keyframe to keyframe.

The next step is optional - deformation, the shot we took as an example in the cartoon style, and this style is very characterised by all sorts of deformations, let's add a deformation to the hammer when it flies. Here you need to give free rein to your imagination, but the main thing is not to forget about the twelve basic principles of animation (fig. 5).

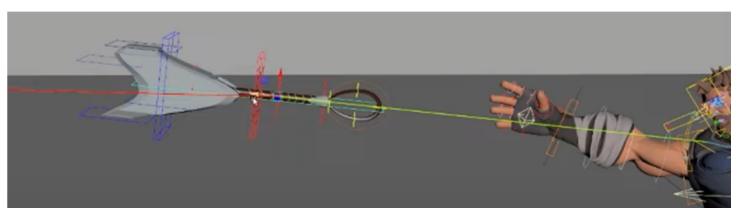


Figure 5 – Example of deformation

The last stage of body is cleanup. We made a lot of keyframes during the whole process, but there are cases when a keyframe repeats the spline between other keyframes, it is better to remove such a keyframe because it can repeat unnecessary micro-movements, which will not be noticeable at first glance, but will significantly worsen the impression of the animation.

Face animation is usually done after the body is finished (fig. 6). It's the last but the most important stage, because it's the face animation that gives the character life. Emotions are harder to show than movement, so it's very important to find or shoot a good reference so that the animation doesn't look forced or contrived. But the sequence of actions in face animation is the same as in body animation.



Figure 6 – Example of face controller

Of course, the pipelines of different studios, projects within the same studio, and even each individual animator are slightly different. But in one order or another, all the stages described above are performed.

In conclusion, developing character animation with Autodesk Maya requires a combination of creativity, technical skill, and an understanding of the theoretical principles that underpin the art of animation. By working through the key stages of preparing for animation, understanding the theoretical basis of animation, and mastering the practical and technical aspects of animation with Autodesk Maya, animators can create engaging and immersive character animations that captivate audiences and tell powerful stories.

Literature.

1. Williams, R. (2001). The Animator's Survival Kit. Faber & Faber.
2. Thomas, F., & Johnston, O. (1981). The Illusion of Life: Disney Animation. Abbeville Press.
3. Autodesk, Inc. <https://autodesk.com/>.