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Splines in Maya

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An animator in the modern computer animation industry needs to have a strong understanding of splines and be able to edit tangent handles and curves using the graph editor. One of the final stages of creating an animation is the spline pass in which the animator smoothens the animation by changing the tangents to spline and using the graph editor to edit them. This technique is very important to animators since it allows animators to polish their work and fix any issues caused by the automatic interpolation in animation software.

In modern computer animation animators set keyframes and the in-betweens are calculated by the computer using interpolation. Maya uses various types of interpolation based on the tangent type selected by the animator. (Luhta 41) For example, linear tangents will create interpolation in straight lines whereas spline tangents will create interpolation in curves. (Luhta

41) Interpolation is very helpful and can save animators a lot of time, however, spline tangents can cause some issues with overshoots, popping joints, and embedded geometry. For example, when I animate a walk cycle the joints in the knees may pop out or the foot may embed with the ground. These issues can often be corrected most easily by using the graph editor and editing the curves for various controls.

When I am animating a scene I often try to start off by blocking in keyframes using the principle of pose to pose along with a stepped tangent preview in Maya. A stepped preview has no interpolation and is very helpful when trying to create strong poses. (Luhta 41) After I have the basic keyframes I turn off the stepped preview and edit the animation with the smooth interpolation and polish with spline tangents. This is a good way to use the different types of tangents across the various stages of creating an animation. The graph editor in Maya uses an x-axis that represents time and a y-axis that represents value. (Luhta 30) With this information, I can use the graph editor to change the values of specific motions in animation. For example, when I animate a bouncing ball I can set keys based on time and then pull the keys up as needed in the graph editor. This can often make animating more efficient since I don't have to set all of the keyframes by moving objects in the viewport of Maya.

In conjunction with using various types of tangents for the blocking of animation I also edit the tangents in order to apply the principles of animation. For example, to apply ease in and ease out I pull some tangents apart and squeeze some in to make the curve that is ideal for the motion I am creating. This can make the motion slow down at the end and makes the motion look more believable than the automatic interpolation which has the motion speed up at the end. (Luhta 35) However, the application of arcs to my animation is one of the most important since

the graph editor shows all of the arcs in an animation. Ideally, the arc should be very wide at the top and should be sharp at the bottom to make a smooth arc and have ideal timing for the animation. (Luhta 44) To achieve this I break the tangents at the bottom and drag them in to make sharp entrances into curves and sharp exits out of curves. Additionally, at the peaks of an arc, I pull them to slow the motion down and to widen the arc. These are some of the many reasons curves in the graph editor are so important.

This in-depth information on arcs will help me in my future work since I will be able to use more types of tangents. Previously I have mainly used stepped, linear, clamped and spline, however, after reading this chapter on splines I will try to incorporate more types of tangents. Incorporating more types of tangents will make my workflow more efficient since I will be able to see many types of interpolation along with how they affect various facets of my animation. I will likely be working in stepped more than I have in the past so that I can push my poses to be even stronger. Overall, this chapter was very helpful and should allow me to make my animation more polished and presentable.

Notes Chapter 2 Splines

- Splines can be edited in the graph editor of Maya which is one of the many animation editors.
 - The graph editor is set up with an x-axis that represents time and a y-axis that represents a value. (34)
- In the graph editor the value of keys can be altered directly. Additionally the tangent handles of a curve can be edited to make the curve smoother and to also alter the timing of an action.
- Various types of tangents will use various types of interpolation and can be used for different things. (41)
 - Spline: This is often a tangent that is good for polishing. (Spline pass) However, this can create overshoots at the extremes of an animation.
 - Clamped: Smooth interpolation without overshoots. First and last keys are splined making it useful for transition to stepped tangents.
 - Linear: Direct line from key to key with perfectly even spacing. Will stop computer created eases and is also good for contact poses.
 - Flat :Creates plateaus at keys that are perfectly flat. Good for extreme keys since they will never overshoot.
 - Stepped: This has no interpolation and is mainly used for blocking in strong poses early on in an animation.
 - Plateau: Same as clamped except first and last keys are flat.
- When editing tangents the handles should fit around the curve and should not have major overshoots. (38)
- Creating arcs that are wide at top and sharp at bottom as seen in ball bounces. (43)
- Weighted tangents have various lengths depending on the distance between keys. (44)
- Ease in and out references. (48-49)