Creating Perfect Animation Cycles:
The Best Methods and Biggest Pitfalls

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Everything from walking and running to quadrupeds and bipeds relies on a few basic principles. Many artists get these principles wrong! In this class, I speed through the different cycle types and demonstrate the proper use of timing, posing, and space to get your cycles pixel-perfect and frame accurate.

Learning Objectives

At the end of this class, you will be able to:

- Explain what a cycle is and how cycles are used

- Determine the frame count of your cycle and time it accurately

- Pose your character in a cycle so that it loops correctly

Check your cycles to make sure they work ad infinitum

About the Speaker

Kenny Roy started in the animation industry in 1997 as a dustbuster on a children's animated feature. Since then, he's gone on to animate some of the most memorable characters on screen, from Scooby Doo to King Kong. In 2007 he founded Arconyx Animation Studios in Los Angeles, CA where he directs projects ranging from TV commercials to short films to visual FX. An animation teacher for almost 8 years, Kenny is also a multiple-published author in animation and a world-traveling lecturer and runs an animation training portal through ww.kennyroy.com. kennyroy@gmail.com

Identifying Uses and Types of Cycles

World Space

A world space cycle is one that the character progresses through world space throughout the cycle. This is commonly used in film and television. The advantages of a world space cycles are that your character is firmly planted on the ground and it can be easily edited for your scenes.

Looping World Space Cycles

Looping a World Space cycle is achieved by baking the channel, copying and pasting the keys manually, or copying the keys using a script.

Treadmill

When a character moves in place, it is called a treadmill cycle.

Both walking and flying cycles can be any type, world space or treadmill. All that matters is whether your character is using world space controllers to move through the scene or a master controller above all to do so.

Looping Treadmill Cycles

Looping a treadmill cycle is as simple as applying "infinity" or "out of range curve" types for your animation curves. The character will continuously cycle within its rig and you can move the master controller around. Baking curves or copying animation for a treadmill cycle is not normally advised due to the fact you are working in conjunction with the master controller.

Flying

Understanding the different flight types is important to making accurate cycles.

In general, wings down = body up.

Offsetting this effect will determine the weight as perceived by the audience.

Considering World-Space or Treadmill

In general, most flight cycles are done "treadmill".

If you are already animating the body up and down using the character rig, then progression through the scene is simple to create using the master controller. Using the master controller for the up and down motion serves no other purpose than to take away a layer of controller and offset from you. With flight cycles, we want as many offset layers as possible.

Timing Cycles

When Timing Cycles, bear in mind that the speed is very cumbersome to change when you have a lot of keys applied. In is really advantageous to make sure your timing is perfect before adding too many keys.

Using a helper object to try your timing choices before committing to them is a good method for getting good timing.

Losing A Frame

A cycle always loses a frame from its total length. So a "12 frame" cycle is actually 13 frames long due to the fact that frame 1 and 13 are the exact same frame and when looping, one will not be played.

Count out your frames by advancing the timeline one frame at a time, and be sure you make it symmetrical. Using this method, you will not mess up the frame count of your cycles.

One Frame Down

A common mistake is to make it so that the character's foot is not down for a frame before the other foot lifts. This is visually odd.

Make sure your character's feet are down for at least a frame together with any walk, and for 2 or more frames with a comfortable or slow walk.

Fast Ins and Impacts

Foot falls should have a fast-in to the ground, as should all impacts.

Break your tangents and make sure there is a hard impact on the ground.

Another consideration is that there is not necessarily going to be a frame when we see the moment of impact perfectly.

Creating this frame makes the timing of the walk look very contrived.

Loosen up and just make sure the visual arc of the feet have a fast-in. Do not worry as much about an imaginary "set" of perfect poses you need to have in a walk cycle, as that will mess up your timing.

Exceptions to these timing rules

Interesting effects can be had by changing the timing of a walk. For instance, a zombie walk would not have symmetrical posing or timing.

Posing Cycles

Pose your cycle on the first frame on an impact frame.

Stride Length
Stride length is the distance that your world controls move in one cycle. In the case of a biped it is the distance between your two feet on your start pose (considering your cycles starts on an impact frame) multiplied by two.

Record your stride length because you will be using this number over and over when creating a cycle.

In the case of creating treadmill cycles, copying the first frame to the last frame will give you the result of a perfectly posed cycle but you still have to fix the tangents of the controllers.

With a world space cycle, copying the first frame to the last frame means you still have to offset all of the world space controllers by the stride length.

Posing and Offsetting
Another easy way to create good poses without the hassle of figuring out what pose should go on a certain frame is to pose the motion, then offset the keys.

> Simply create the motion during the frame range that you have, set your infinity curve types, and offset the curves to move the poses to the correct frames.

> This is especially simple a workflow for flying cycles, but also applicable for the arms, spine, head of a walk cycle.

Uniqueness VS Loopability
Much consideration goes into finding the right balance between a unique cycle and one that loops nicely.

Large gestures should be toned down to make sure the audience doesn't pick out a loop too easily.

Consider a longer cycle
If you absolutely must have some customization, consider creating a longer cycle and mixing in some interesting unique touches in the middle. This is especially true to very unique/asymmetrical cycles like an injured walk, zombie walk, etc.

Checking Cycles
When you are finished with your cycles, you must check them for accuracy and compatibility.

With World Space cycles, this means checking a very high frame number to make sure the controls are behaving in a predictable way.   If you have implemented the stride length correctly, even frame 10,000 should look the same as the first loop.

Letting World Space Cycles Loop

Select your master controller and make sure the master controller is working "against" the progress of your world space controllers and is looping correctly. Advance to frame 10,000 and see if the cycle still looks correct.

If all seems correct, delete the animation on the master controller and find the character on frame 10,000. Double check that controllers are not being left behind. If so, there could also be a problem with the rig (if nested groups or constraints have offsets, rotations, or scaling).

Make a Treadmill Cycle work with a Master Controller Movement

To check the accuracy of your treadmill cycle, add Master Controller movement according to your stride length. Check to make sure the feet are not sliding. If they are, you can fix it by creating a locator and snapping the feet to the locator on each frame the foot is planted, or by creating a simple constraint.

Paths and Flying Cycles

Flying cycles can be attached to paths to give them movement through the scene.

This is the primary reason we like to put the up and down movement on the root controller, and leave the master controller for progress through the scene.

Simply attach the master controller to the path, or use an offset group if you are planning on doing some more animation with the master controller.

Birds and Butterflies – Getting away with different effects.

With flying cycles, the amount of offset of the body and the wings gives the sense of weight. The greater the offset, the heavier the animal. For instance, a butterfly has no offset between wings down = body up, but a pterodactyl has a large amount of offset.