Computer Animation I

Assignment 3: Bouncing balls two ways

In this assignment, you are to animate two 2-D bouncing balls using two different methods. The first ball's transformations must be controlled by expressions (see assignment 2), and the second ball's transformations must be controlled by keyframed animation curves. For this project, there is a new project folder available in the course handouts folder (and on the course website).

This assignment is intended to give you experience with:

- using the graph editor (setting keyframes and controlling interpolation),
- creating more complex expressions in the expression editor,
- the animation principles of squash and stretch and timing, and
- making a playblast to preview (and hand-in) your motion

The scene file you are starting with has two balls ready to go in the "side" view. Please keep the balls on-screen through the entire animation and do not animate the camera. Each ball has two translation channels for moving it around and one scaling control to squash and stretch it. It also has a rotation control if you need it, but I would begin using just translation and scaling.

The ball named eBall is to be controlled by expressions, the one named kBall is to be controlled by keyframes.

The relevant sections of the Maya PDF manual for this assignment are in the book "Animation," chapter 2 (Keyframe Animation) and chapter 7 (Animation Tools).

Step 1: get everything you need to do the assignment, run Maya, load the scene file

- The project folder on the shared disk is called "assignment3"
- Follow the instructions from the last assignments to copy this folder to your local machine's desktop, rename it, run Maya, set the project appropriately, and load the scene. You should see two balls sitting on a simple ground plane, waiting to move.

Step 2: planning

- Figure out what you want to do on paper before you start animating the balls. What should the interpolated curves look like for y-translation and scale? Why? Sketch out a graph of each channel you intend to modify.
- For the expression-driven ball, what mathematical functions do you know that can create the appropriate curves? How can you string those together to get the shape you want?
- For the keyframe-driven ball, where will you put your translational keyframes? Your scale keyframes? What kind of interpolation controls do you need to shape the curves appropriately?

Step 3: practice making a PLAYBLAST

- Make sure you're looking through the orthographic **side** camera.
- Under **Window** in the main Maya menu bar is **Playblast**. Choose this to do a quick and dirty render of each frame so that you can watch your animation in real-time. In this case, real-time is 24 frames per second.
- If QuickTime Player doesn't pop up automatically when the playblast is completed, find it in the dock and click on it to bring it to the foreground. Then hit play to watch the animation. Quit it when you're done.
- The current scene file has 24 frames (1 second). The balls aren't animated, so your playblast will show them just sitting there.

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Step 4: animate (keyframes) **PLEASE DO THE KEYFRAME BALL FIRST!**

- You can choose the ball just by clicking on it. It is the one on the right. You shouldn't need the outliner window.
- Do your translational motion first. Get the timing of the bounces right before you mess with squash and stretch. To select the translation tool, hit "w". To set a translational keyframe at the current frame, hit Shift-w. If you move the ball and hit Shift-w again without changing the current frame, you will overwrite the previous keyframe for that frame.
- This assignment is ALL ABOUT learning how to change interpolation in the graph editor. If you can't control how the computer interpolates the keys you set, you won't get your ball to bounce well. Setting keys is only part 1: part 2 is going to the graph editor (**Window->Animation Editors->Graph Editor**) and changing the tangents at those keys to fit the motion you want.
- You can find the location of the existing keyframes by selecting the ball and looking for the red tick marks in the time slider. You can also find them in the graph editor.
- You can right-click in the time slider and select **Keys->Add Inbetween** or **Keys->Remove Inbetween** to change the number of inbetweens between two keys. This is a convenient way to re-time when you like the location of the ball but not the timing.
- If you want to see how your motion looks, go ahead and make another playblast. You can try just hitting the play button to the right of the time slider but DON'T TRUST the results you get! Even if Maya is trying to play back at 24fps (check in **Maya->Preferences->Timeline**), it may have to drop frames to achieve this rate. So playblasts are the most reliable.
- Save your work often!! I suggest using incremental file names so you can always go back to an earlier step if you want to (chrisPerry.2.mb, chrisPerry.3.mb, and so on). Maya can also do this for you if you look under the options for **File->Save Scene []** (click and drag to the little box on the right of Save and turn on incremental saves).
- To properly squash and stretch, you'll probably be setting scale keyframes more frequently than you set translation keyframes. If you set scale keys at the same time you have translation keys, your ball probably won't look right.
- Be sure to study the image of a squashing and stretching ball in the Lasseter reading.
- If you want to change the duration of your scene from 24 frames to accommodate your bouncing ball, set the start and end frames explicitly in the boxes just below the time slider.

Step 5: animate (expressions)

- If you've studied physics, you probably know that parabolic motion is generally what we're looking for here. But the impact with the ground makes things messy, doesn't it? If you're comfortable with algebra and function graphs, go ahead and try to solve this problem using physics. But keep in mind that animation is about getting the final images to look the way you want them to look, regardless of method.
- Trig functions like sin or cos may help you get the approximate curve you want, which you can then try re-shaping a bit using other functions. Two that could very well be useful are **pow** and **abs**. pow is defined as this: pow(a, b) = a^b, and abs(a) returns the absolute value of a.

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Step 6: hand in your scene file and playblast

- When you like the motions you have, go to the Playblast option box (**Window->Playblast []**) and tell Maya to render the next playblast to a file. Use this format: **PerryA3.mov**. Save the file on the Desktop, and double-click on it to make sure it opens in QuickTime Player and looks the way you want it to look.
- Save your scene file with the same conventions: **PerryA3.mb**.
- Connect to the shared network disk and drop both your .mb and .mov file into the handin folder.

DUE Monday February 18th at the beginning of class