Computer Animation I **CS/HACU 174, Fall 2001**
Assignment 4: Bouncing ball cycle

Your goal in this assignment is to animate a bouncing ball in such a way that your final rendered movie can be looped (played end-to-end) seamlessly. This is often called ***animating a cycle***.

When animating your bounce cycle, you need to pay close attention to some of the principles of animation we have been discussing in class. In particular:

- **squash and stretch**: how does your ball's shape change during periods of high speed motion or rapid acceleration/deceleration?
- **timing**: how many in-betweens exist between your key poses?
- **slow in/slow out (interpolation control)**: how should you control the interpolation of the motion curves to communicate a bounce to your audience?

To complete this project, you will need to build a ball model and a room model (the ball must bounce on a floor, and a wall or walls must be visible behind the ball). Don't spend too much time on these models, just build them and give them appropriate surfaces.

DUE Monday, October 29th at the beginning of class

Hand in (to the standard place) a lit*, rendered Quicktime movie, 320x240 pixels per frame, 30 frames per second, compressed with the **animation** compressor. Your movie should consist of exactly the number of frames required so that it will loop properly in the QuickTime player application. MAKE SURE YOUR MOVIE WORKS ON THE CLASSROOM MACS before handing it in.

* If you're having trouble getting the animation right, don't worry about the lighting.

This project is difficult on a number of levels, but primarily because it uses a previously unseen part of Lightwave: the graph editor. Because of this, a good portion of **Wednesday's class** is reserved for questions and answers on this assignment. Spend an hour working on this assignment before Wednesday (don't forget to write down the questions you have) and you'll reap the rewards later.

I recommend keeping the online LW manual nearby when you work on this assignment. The sections assigned for today on the graph editor will give you a fighting chance at controlling keyframes and interpolation in the way you need to for this assignment.

Here's a very rough checklist.

1. Build your models.
2. Create a scene in Lightwave with your room and ball, staged so that the ball bounce is the clear focus of attention.
3. Set the frames per second to 30 in the general options window.

(over)

4. Set the frame range of the scene to something appropriate for a ball bounce. You can and should change this later when you've determined exactly how long your bounce should take.
5. Use a layered approach to getting the motion right, and work on one channel or set of channels at a time. For example, start with translation. A bouncing ball clearly starts up, goes down, then goes back up. Create the keyframe for the top of the bounce and then create the keyframe for the bottom. Copy the keyframe for the top to the appropriate place later in the timeline to make the ball bounce up to the same height. You will probably find it useful to look through an orthographic window for setting the height of the ball properly.
6. NEVER TRUST THE REAL-TIME PLAYBACK OF YOUR MOTION. To see accurate timings, you need to RENDER PREVIEWS (the bottom right of the Lightwave interface).
7. Save often and render previews to see your motion. If it doesn't look right, try to figure out why! Render a preview after every change you make until you understand how those changes affect the object's motion.
8. Get the timing of the bounce right even if the motion between the keyframes looks wrong.
9. Then worry about the interpolation. What should the motion curve look like for a ball bouncing? How can you change the interpolation being used to make it look like it's supposed to? NOTE: THIS IS THE HARDEST PART OF THE ASSIGNMENT. IT REQUIRES NOT ONLY CAREFUL CONSIDERATION OF WHAT MAKES A BALL LOOK LIKE IT'S BOUNCING, BUT ALSO A BETTER-THAN-BASIC UNDERSTANDING OF THE GRAPH EDITOR. You will have to create a very specific kind of motion curve to get a proper bounce.
10. Move onto scale (squash and stretch) only after you have the translation looking right. Be sure to preserve visual volume!
11. When you're happy with your ball, add some lights to the scene (don't forget our work on lighting for guidance on how to light the scene well).
12. In the camera properties panel, set the spatial resolution to 320x240 pixels (1/2 the resolution we've been working at).
13. Ray-trace to make sure the lighting looks good.
14. Prepare for rendering the scene by opening the render options window. Be sure to output animation, set the type to QuickTime (.mov), and use the options box to set the codec to ANIMATION.
15. Render the entire sequence using Render Scene.
16. Find your rendered movie and make sure it looks right on the classroom Macs.
17. Hand it in (named appropriately).

Other avenues for help:

the class mailing list, cs174@lists.hampshire.edu
Dan (dhayes@hampshire.edu)
Me (perry@hampshire.edu)
My office hours (Weds 1-2:30, Thurs 9:30-11:00).

Good luck!