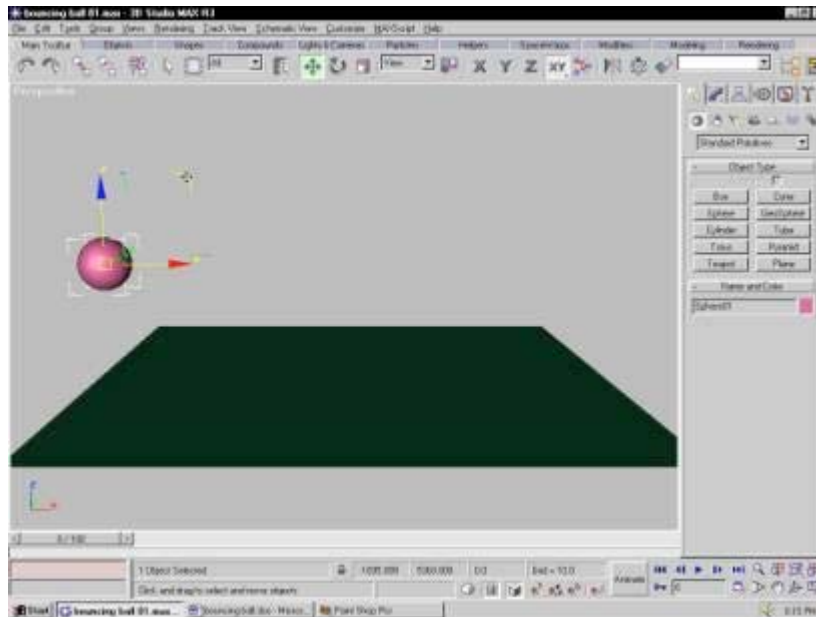


3d max Tutorial – Keyframing a Bouncing Ball

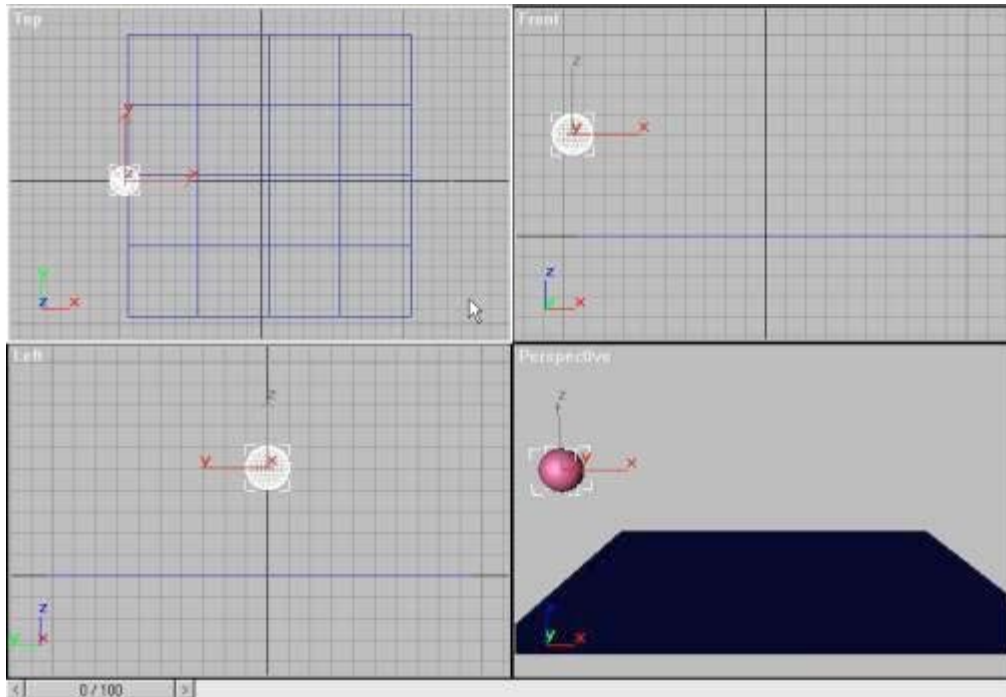
1. Open 3D Studio MAX, or select File | Reset. Maximize the Top viewport and create a Sphere with a radius of about 10 units.
2. Still in the Top viewport, create a Plane (in Create Panel | Standard Primitives). Make it approx 200 x 200 units in size. Center it on the world coordinate system. This will be the ground plane.
3. Switch to the Perspective viewport and click Zoom Extents. This zooms the viewport out to make all scene geometry visible.



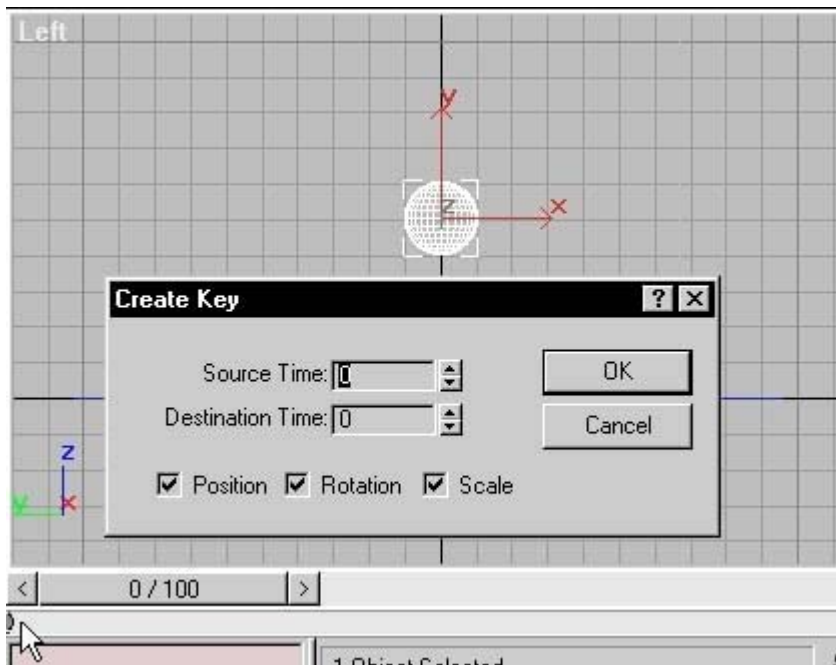
Move the sphere so that it hovers over the left side of the ground plane. The absolute position of the sphere in world coordinates should be approx (-100, 0, 50).



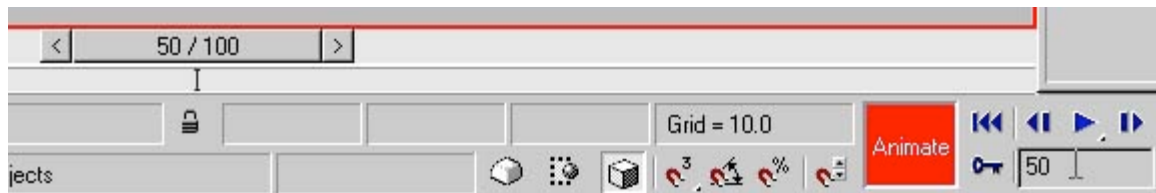
Make sure the ball is correctly positioned over the ground plane by checking the Top viewport.



4. With the Current Time field displaying frame zero, and the sphere selected, right-click on the Time Slider. The Create Key dialog box comes up; it should say "Source Time: 0, Destination Time: 0." Click OK to create a keyframe for the position, rotation, and scale of the sphere at frame zero. Notice the small grey egg icon on the far left, just below the Time Slider. This is the key you just created, being displayed in the Track Bar.

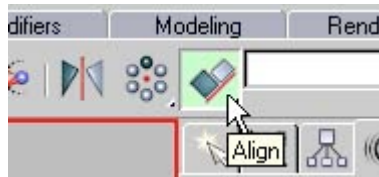


5. Click the Animate button; it turns red. (The Animate button remains on for the rest of the exercise.) In the Current Time field, type in frame 50. The Time Slider moves to frame 50.



Move the sphere so it hovers over the center of the ground plane by selecting the X axis of the sphere's Transform Gizmo.

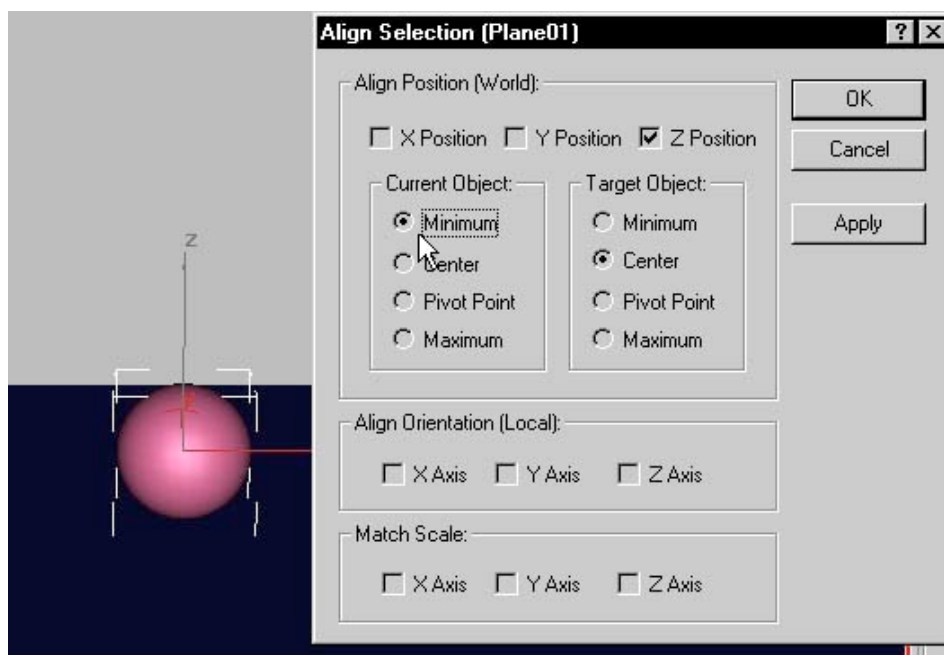
6. With the sphere still selected, click the Align icon.



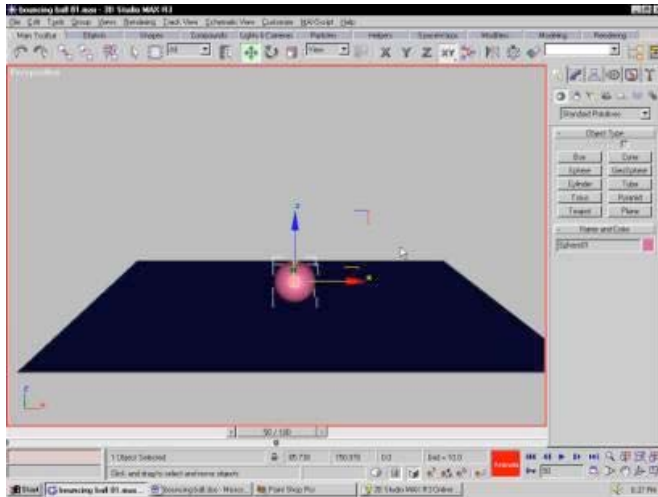
The cursor changes to an Align icon; select the ground plane.



The Align dialog comes up. Under Align Position (World), check the Z Position box; the sphere moves to intersect the ground plane. In the Align dialog, look under Current Object and select Minimum. The bottom of the sphere should be aligned with the ground plane. Click OK to exit the Align dialog.



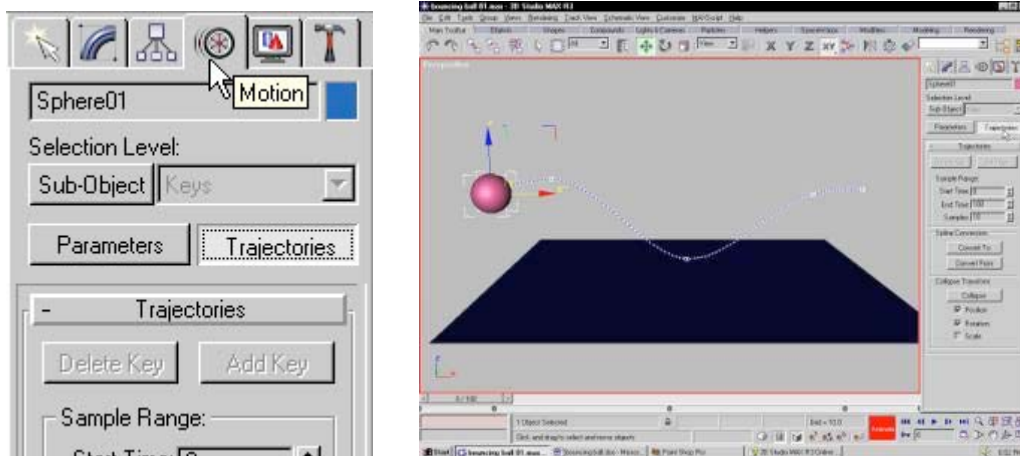
7. Rewind the animation to frame zero and play it. The sphere should fly from its initial position on the upper left, to land on the ground plane at frame 50.



8. Fast forward the animation to frame 100 and move the sphere to the upper right of the screen, automatically creating another key at frame 100. Playing the animation shows that the sphere floats across the screen in an arc. To make it bounce, we must add more keyframes.

9. Go to frame 15 by typing it in the Current Time. Move the ball up in the world Z axis, about as high as it was at frame zero. Repeat this process to create another key at frame 85. Play the animation again; you should have more of a bouncing motion now.

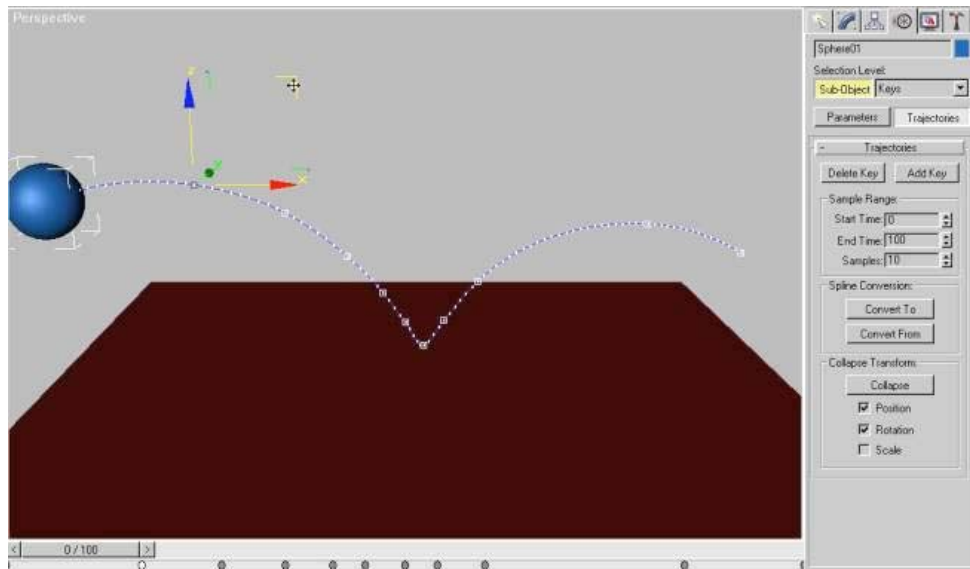
10. With the sphere still selected, open the Motion panel and click Trajectories. Now you can see the path of the ball.



11. In the Motion Panel, select Sub-Object Keys. Under Trajectories, click Add Key. Position your cursor over the sphere's blue trajectory. Your cursor turns to a plus sign. Add two more keyframes close to the bounce point, one on either side of the impact at frame 50.

12. Turn Add Key off. With the Select and Move command, adjust your new keyframes. To make sure the ball bounces in a straight line, take care to only move the keys in the XZ axis. Select the red and blue corner icon of the Transform Gizmo and move the keys to positions that look good to you.

13. Play the animation. Adjust the keys more to get a better bouncing motion. The keys can be moved through space by using the Transform Gizmo, or moved in time by dragging the key's egg icon in the Track Bar. Tweak the animation until it looks more convincing, adding additional keyframes where necessary. The small white dots on the Trajectory represent in-between frames based on your keys. Where the dots are farther apart, the object is moving faster. See below.



14. The ball needs a little squash and stretch to make it look rubbery. We will come back to this in the next tutorial. We will also use Function Curves to make the bounce more naturalistic, while using fewer keyframes.