

Animation and rigging

In this TD, you will implement a squash and stretch animation with a few 3D meshes. Roughly following this tutorial: https://www.youtube.com/watch?v=1LIH_T3irRY

I. Create checkerboard meshes

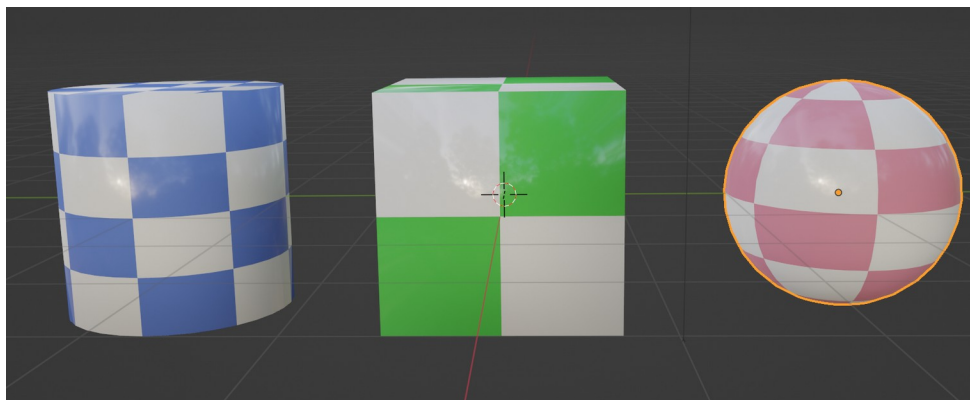
I.1 Let's first setup the scene with a few different meshes. Instead of doing it manually, let's try out the scripting interface in python.

- Create a new scene with the default cube. In the timeline window, click on the upper-left corner button and select "Python console" (or just use the quick key: Shift + F5)
- Type in the console `bpy.context.visible_objects`. What is the result?
- Select the cube, then type in the console `bpy.context.active_object`. What is the result?
- Now type `bpy.context.active_object.location.z = 1`. What happened in the viewport?
- Finally, type `bpy.ops.mesh.primitive_cylinder_add(location=(0,3,0))`. Check the result.

Now using the console, place a cube, a cylinder, and a sphere 3 meters apart.

I.2 Now we will play a bit with materials and textures. You can give them each a checkerboard texture of a different color by following the steps listed below:

- go to shading menu → add new material → add checker texture → link texture color to material base color
- add input > texture coordinate then link UV to checker texture vector
- change the secondary color of the checker texture
- RMB in the viewport and select shade smoother
- adjust the roughness in the material to make it shiny
- repeat for each mesh
- you should roughly have the following result

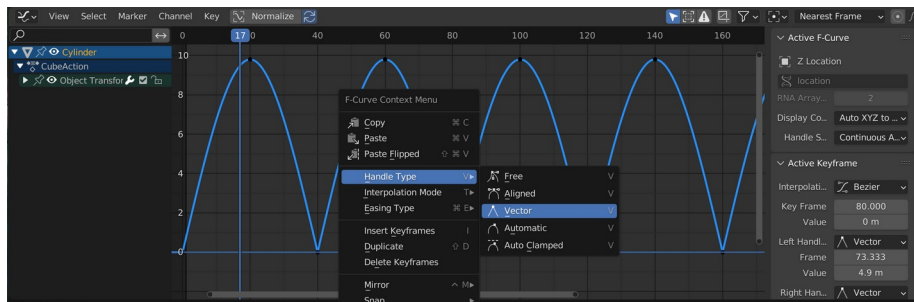


II. Animating gravity

We are now going to implement a few animations. Currently the framerate should be around 24 fps, but you can check by looking at the output properties.

Go back to the timeline window.

- set the end time to 48 (or whatever frame rate you are working with x2)
- select one of your meshes, and open the transform properties window
- RMB on the z position field > select Insert single keyframe.
- Move the timeline cursor to 24, change the value of z location to 9.8, then RMB > insert single keyframe
- Now play the result (by selecting the play button (or hitting space bar). Your mesh should be moving up and down, but not ver realistically.
- Go to the graph editor window. Right click on the keyframes where the ball is at 0, and select vector for handle type as shown below



- Now your object should jump a bit more realistically

At this point, you can do the same for the remaining two meshes. Either redo the process manually, or if you are in for a bit of automation, check out [how to duplicate the animation of one object to another](#) to save some time!

Be warned though: if you duplicate an animation that keyframed not just the z-axis, but the entire location, your object will go to the exact same location. Not to worry though: an easy fix is simply to clear the keyframes on the x and y axis (by RMB on the properties)

III. Squash and stretch

III.1 Basic squash and stretch: Using the knowledge above, you can now try to create the squash and stretch by keyframing the z-scale value every time the mesh hits the ground. Attention: squash and stretch usually happens right before and after the lowest point. You may need to play around with the parameters a bit to see what looks most realistic. Try and squash and stretch your cylinder during jumps

III.2 Squash and stretch with a rig: Note that the animation of the cylinder is still not very realistic, because the total volume of the object changes. To preserve the volume of a squished and stretched mesh, you can use a “rig” to your object. As demonstrated in the tutorial video, the steps to do this are:

- Add an armature (Shift+A > Armature) and align it to the sphere (you can select in the menu on the right Object properties >Viewport display, the option “Show In Front” such that the object does not occlude the armature).
- Set the sphere as the parent (click the sphere then Shift click the armature and press Ctrl+P and select armature deform with automatic weights)
- Go to the menu on the right Object Constraint Properties > Add Bone Constraint > Maintain volume
- If you now play with the z-axis scale of the armature, you should see the sphere squash and stretch
- Now keyframe the z-axis scale of the armature to create a squish and stretch animation for the sphere

III.3 Bouncing along: Now animate your sphere to jump along the x axis towards the viewer. Try to also give it a little spin (hint: y axis rotation).

Your result should look somewhat like the tutorial video.