ESCOLA DE NOVES TECNOLOGIES INTERACTIVES
centre adscrit a:
UNIVERSITAT DE BARCELONA

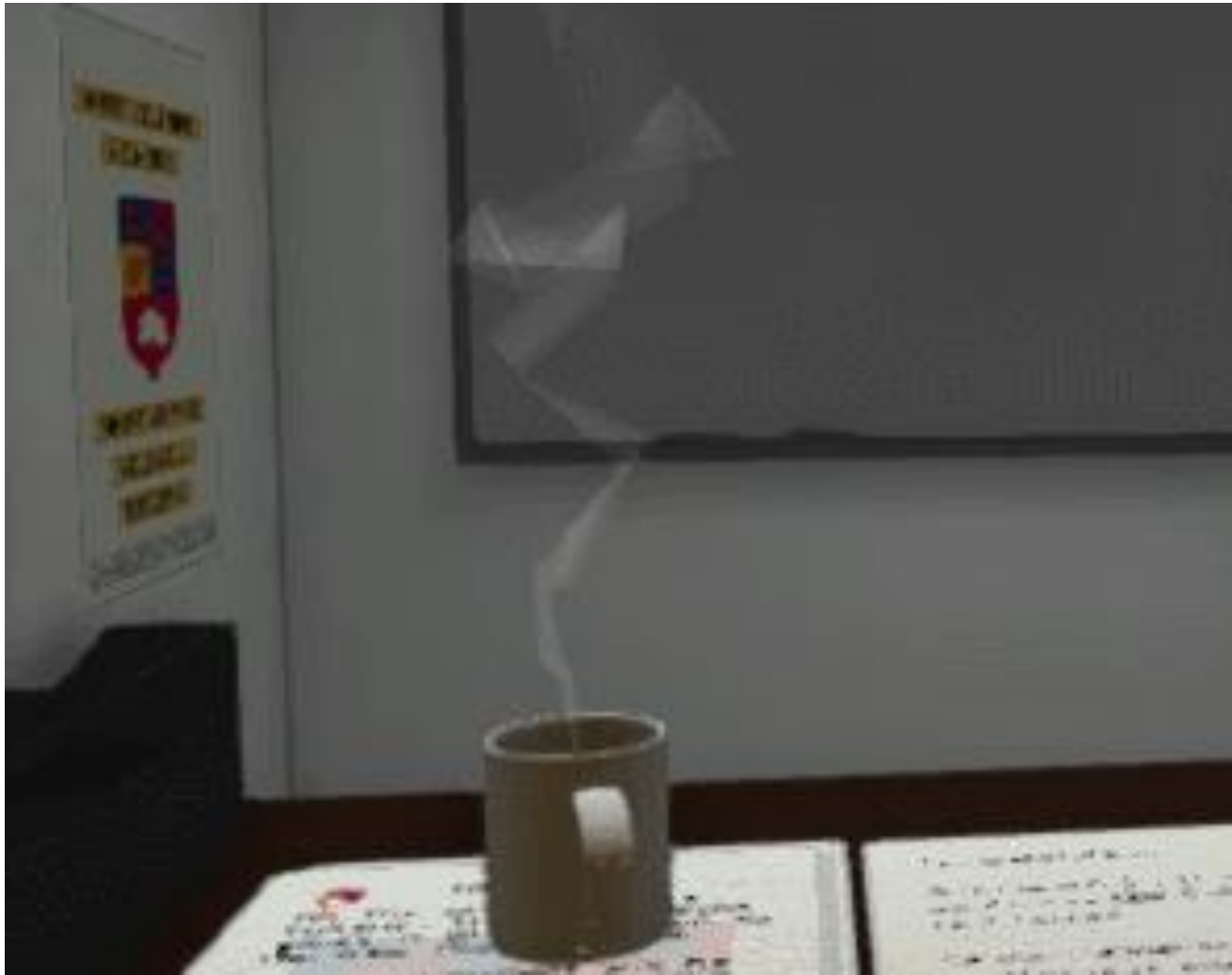
Animation Foundations

05. Introduction to procedural animations

+ Exercises on rotations

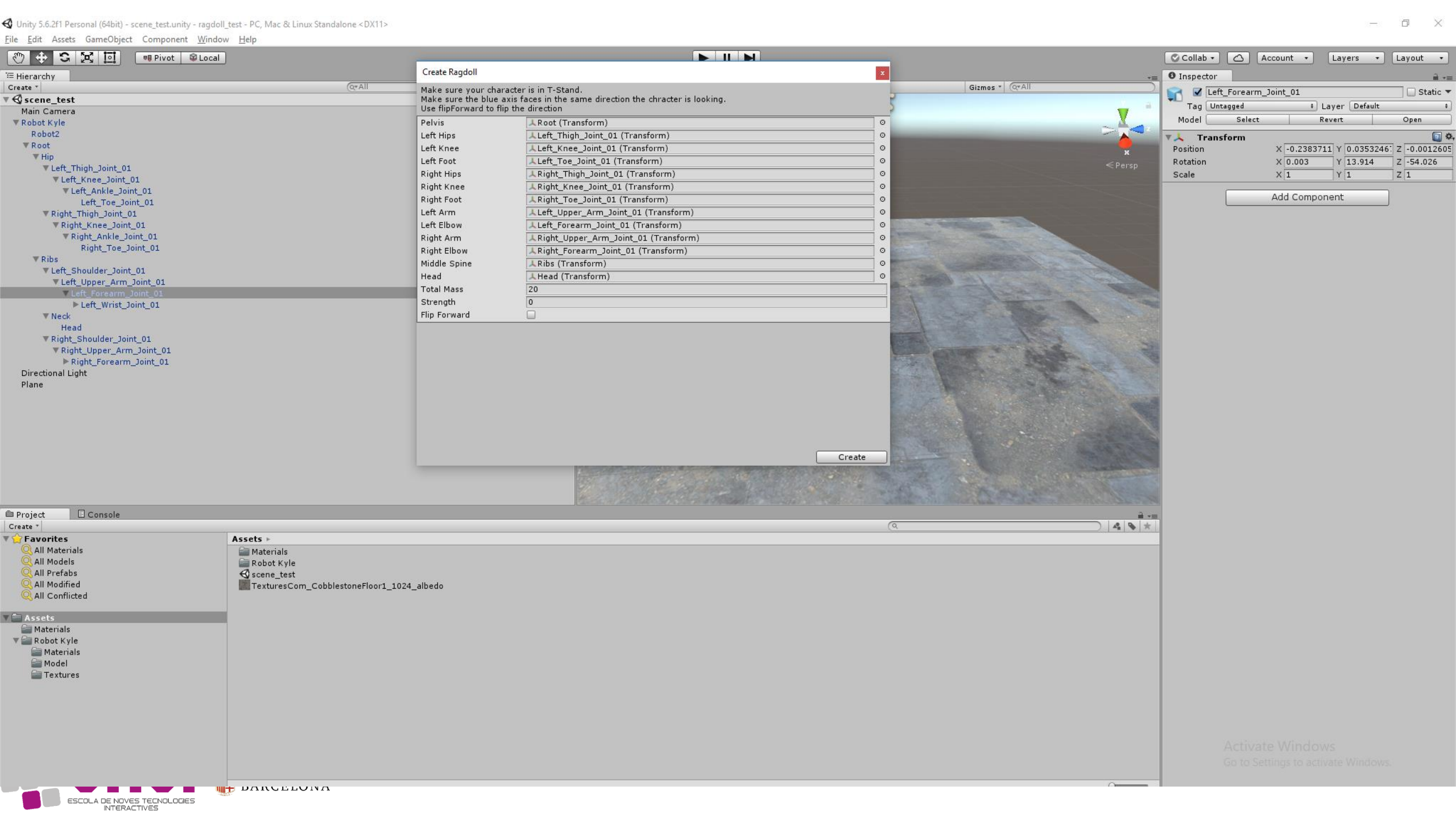
Kinds of animations

- Physically-based Animations
  - Tissue
  - Water
  - Smoke
  - …
- Ragdoll physics
  - Ragdolls
  - Physics-based character animation
- IK



Examples

- Ragdoll example in unity
- Videogames
  - A Bud's life
  - Gang Beasts


Unity 5.6.2f1 Personal (64bit) - scene_test.unity - ragdoll_test - PC, Mac & Linux Standalone <DX11>
File Edit Assets GameObject Component Window Help
Pivot Local
Collab Account Layers Layout
Hierarchy
Create
scene_test
Main Camera
Robot Kyle
Robot2
Root
Hip
Left_Thigh_Joint_01
Left_Knee_Joint_01
Left_Ankle_Joint_01
Left_Toe_Joint_01
Right_Thigh_Joint_01
Right_Knee_Joint_01
Right_Ankle_Joint_01
Right_Toe_Joint_01
Ribs
Left_Shoulder_Joint_01
Left_Upper_Arm_Joint_01
Left_Forearm_Joint_01
Left_Wrist_Joint_01
Neck
Head
Right_Shoulder_Joint_01
Right_Upper_Arm_Joint_01
Right_Forearm_Joint_01
Directional Light
Plane
Create Ragdoll
Make sure your character is in T-Stand.
Make sure the blue axis faces in the same direction the chracter is looking.
Use flipForward to flip the direction
Pelvis Root (Transform)
Left Hips Left_Thigh_Joint_01 (Transform)
Left Knee Left_Knee_Joint_01 (Transform)
Left Foot Left_Toe_Joint_01 (Transform)
Right Hips Right_Thigh_Joint_01 (Transform)
Right Knee Right_Knee_Joint_01 (Transform)
Right Foot Right_Toe_Joint_01 (Transform)
Left Arm Left_Upper_Arm_Joint_01 (Transform)
Left Elbow Left_Forearm_Joint_01 (Transform)
Right Arm Right_Upper_Arm_Joint_01 (Transform)
Right Elbow Right_Forearm_Joint_01 (Transform)
Middle Spine Ribs (Transform)
Head Head (Transform)
Total Mass 20
Strength 0
Flip Forward
Create
Gizmos
Persp
Inspector
Left_Forearm_Joint_01
Static
Tag Untagged
Layer Default
Model Select Revert Open
Transform
Position X -0.2383711 Y 0.0353246 Z -0.0012605
Rotation X 0.003 Y 13.914 Z -54.026
Scale X 1 Y 1 Z 1
Add Component
Project
Console
Create
Favorites
All Materials
All Models
All Prefabs
All Modified
All Conflicted
Assets
Materials
Robot Kyle
Materials
Model
Textures
Assets
Materials
Robot Kyle
scene_test
TexturesCom_CobblestoneFloor1_1024_albedo
Activate Windows
Go to Settings to activate Windows.
ESCOLA DE NOVES TECNOLOGIES INTERACTIVES
BARCELONA

Summary of previous courses on rotations:

- Rotations in 2D
  - Angle
  - Matrix
- Rotations in 3D
  - Euler Angles
  - Yaw-Pitch-Roll
  - Axis Angle
  - 3x3 Matrix

Today, we use the stuff that has imagination:

- Reminder rotations in 2D
  - Angle
  - Matrix
  - Complex Numbers
- Introduce New method for Rotations in 3D
  - Euler Angles
  - Yaw-Pitch-Roll
  - Axis Angle
  - 3x3 Matrix
  - Quaternions

Rotations

- With complex numbers
- With quaternions

We want to have:

- Compact representation
- Simple calculation
- Robust composition
- Robust interpolation

Exercise 1

Find the offset angles between target1 and tracker.

Then make target1 align with tracker.

- Make it with object “tracker” and target1 “rectangle1”
- Use angle axis to find explicitly the angle offsets.

Exercise 2

Make target1 align with tracker.

- Use one ligne of code (use the quaternion that corresponds to the offset rotation)

Then, make it align with tracker, but slowly in time.

- Use method **Quaternion.AngleAxis**
- Use method **Transform.Rotate**

Exercise 3

Make target1 follow tracker while keeping the offset.

1. Make it with object “tracker” and target1 “rectangle1”

Use exercise 2 and apply a quaternion transf. to it

2. Imagine “tracker” is an HMD tracker, and apply it also to the robot’s head

3. Apply it to the robot’s head and to the virtual camera

Exercise 4

Make target2 follow the transformations of target1, but in such a way that it is aligned with the tracker

How can you find the right offset?

Exercise 5

Write your own Quaternion class that:

- Always keeps values normal
- Can multiply quaternions
- Can invert quaternions
- Can convert from axis angle
- Can convert to axis angle
- Optionally, gives a warning if it is rotating more than 180º

- Check that exercise 4 still Works when using it

To design the class, imagine that in the future you might want to encapsulate it in a .dll

- Base it solely on the Mathf library
- Make it independent from gameObject