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Assignment on Virtual Reality and Physically-Based-Simulation - Sheet 1

Due Date November 11, 2024

Exercise 1 (Virtual Reality, *4 Credits*)

(a) Try to define the following in your own words. Use no more than 2 sentences per concept: Virtual Reality, Virtual Environment, Immersion, Presence, Fidelity and Suspension of Disbelief.

(b) Imagine the following scenario: You are standing on a glass floor, from beneath that glass floor a virtual skyscraper is being projected, so that you can see your own body standing on the virtual building. Is that AR or VR? Provide some arguments for your position.

Exercise 2 (Unreal Engine: Scenegraphs, Components & Basic Inputs, *4 + 4 Credits*)

Please make yourself familiar with Unreal Engine 5 (UE5), and its editor. Also take a look at the Unreal Engine 5 Documentation.

In this exercise, the goal is to create an actor constructed from different parts arranged in a scene graph and to make it move on a simple user input.

(a) Create a new Unreal project. Please start from a blank project and do not include the starter content to keep the project size small.

(b) In the project, create a new actor that looks similar to the character in Figure 1. You can model the individual parts with transformed *Sphere Mesh Components* or use external 3D models.

(c) Make sure that rotating the head also rotates the nose and the eyes by defining them in a hierarchy.

(d) The arms and legs should have a joint at their rotation origin which rotates the respective limbs. Consider *Scene Components* for this.

(e) Place the actor into a level that is loaded when the game starts. You can check this in Unreal Project Settings → Project → Maps & Modes → Default Map → Editor Start Map... Please make sure the correct map is loaded when the game starts in future exercises as well.

(f) Draw the scene graph of your actor by hand or in a computer program.

Until now, we only have a static scene. Let's add some movement to the legs and let the user toggle it on or off. Here is an example of how the movement can look like: `http://cgvr.cs.uni-bremen.de/teaching/vr/uebungen/assignment01_example.mp4`

(g) Place a camera facing the actor into the level and set up the game to use this camera after the game starts. Consider the *Event BeginPlay* event in the *Level Blueprint* for this.

(h) Rotate the legs with a looping run animation.

(i) Make the animation speed configurable with a variable in the blueprint that is Instance Editable.

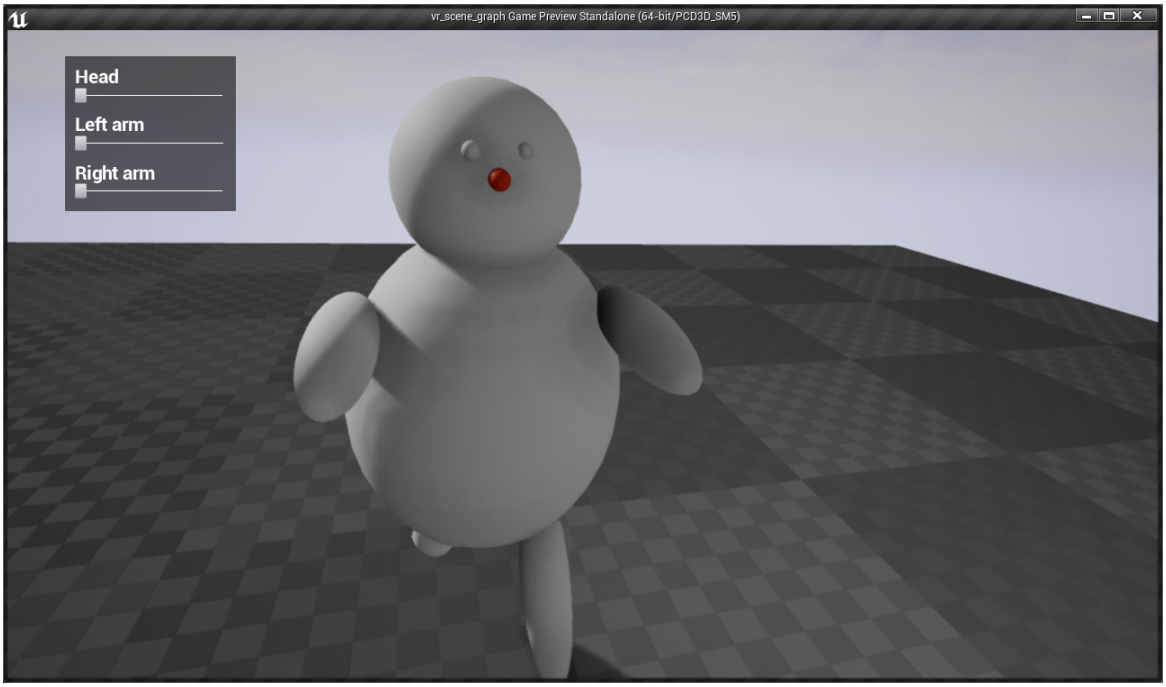

Figure 1: Here is how the character could look like. Disregard the UI for this exercise.

(j) Place at least two instances of your actor in the scene. Both actors should have different walking speeds, as you can see in the video.

(k) Using an input of your choosing (e.g. a specific button press, mouse click, etc.), implement a toggle that turns the animation on or off.