

Interactive Graphics HW2

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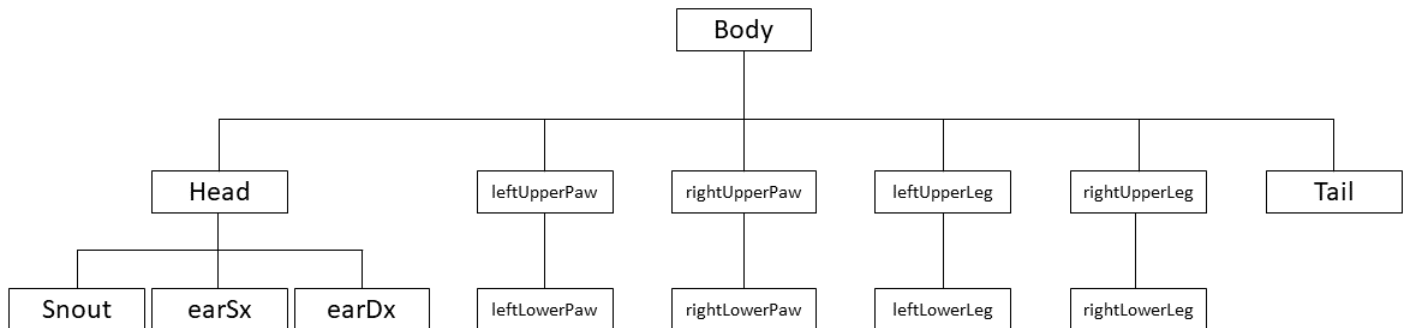
1 Introduction

This report will describe the process of building a simple 3D application using HTML, Javascript and WebGL library. This work aims to create a simplified version of a grizzly that starts walking towards a tree and, once arrived, stands up and start scratching its back against the tree.

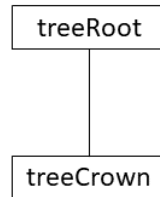
2 Models

In the scene are present two different models, the grizzly and the tree. Both these models are created as a hierarchical model composed of different parts. Each model is described by a tree data structure composed by root, childs and sibilings. Three important functions are implemented: an *initNodes* function is used to initialize the position of each part (through translations and rotations) and two *traverse* recursive function (one for each model) in order to visit the tree in the right order and render each part of it. Let see the details of the models:

Grizzly The Grizzly model is composed of 14 parts: body, head, snout, ears, tail and four legs (these are divided in two paws, that represents the front legs, and two legs that are the back ones) each one divided in two parts, upper and lower part. The tree structure of the grizzly is shown below:



Tree The tree model is composed of two simple parts: the root and the crown. The tree structure of the tree is shown below:



3 Texture

In order to apply the texture to all the faces of the two models have been used four images, two for the grizzly and two for the tree. For the grizzly, an image of bear's fur is applied on the body, the paws, the legs and the tail while another image of fur (with darker brown color) is applied on the head, the snout and the ears. For the tree, an image of tree's trunk is applied on the root while an image composed of leaves is applied on the crown. A *configureTexture* function is implemented to set parameters of the textures that are applied in the fragment shader as the color of each fragment of a single part. An *objectIndicator* int variable passed from the application to the fragment shader is used to apply the correct texture to each part (i.e. head, snout and ears have an *objectIndicator* equal to 4, the rest of grizzly's parts have an *objectIndicator* equal to 3 and so on).

The final effect of the two models with applied textures is shown in the image below:



4 Animation

The animation of the bear is triggered by a button in the page that allows to start/reset it. There is also an automatic timer that reset the animation after a fixed amount of times. The animation is implemented in a function *animation* that is called multiple times and allow the bear to move towards the tree, stand up and scratch its back through translation and rotation operations on the grizzly's model parts.

The animation is divided in 5 steps:

Step 1 The bear starts walking towards the tree in an orthogonal direction with an alternate movement of front paws and back legs, after some time the bear keep walking changing direction with a rotation of the body to reach a lateral position respect to the tree.

Step 2 The bear begins to stand up with a rotation of the body around the axes in order to reach a straight position.

Step 3 The bear stats rotating its body around the axes to reach a position where its back is parallel to the trunk of the tree. There is also a rotation of the legs that allows to better simulate the movement of the body.

Step 4 The bear starts walking backwards to reach a position where its back is attached to the trunk of the tree. It is done with a translation of the body along the z axis and a rotation of the left leg.

Step 5 In this last step the bear starts moving its back up and down to simulate the scratching against the tree with a series of translations along the y axis. The legs "support" the up and down movement of the body to better simulate the animation: when the body is in the lower value of the range the legs are bent (different rotation of the upper and the lower part of each leg), when the body is in the higher part, so the bear is standing, the legs are stretched.

5 Viewer position

There is the possibility to change the viewer position (exploiting the three slider at the top of the page) to better observe the animation from different angles.