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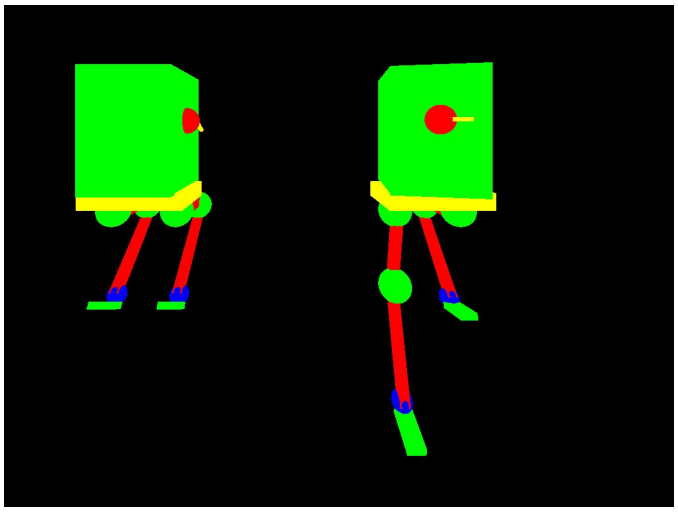
Assignment 3 Writeup
Due: 10/25/16

Scene Description:
The model we have created is a “chicken walker” from the Star Wars universe. These machines were used by the Empire to seek out and destroy the Rebel resistance - most notably on the snow planet Hoth and the forest moon, Endor. Our original plan was to create a scene of two of these walkers racing each other around a track. However, this didn’t seem to fit the spirit of the machine so we’ve since shifted our idea to include a walker firing upon another creature (a human or an Ewok). The walker will employ its walk animation to get into position, it will then crouch, rotate it’s head-mounted blasters towards the target and fire. The projectile will be a simple rectangular prism that will travel along the projected trajectory until it reaches the target. Once a collision with the target is detected, the human or Ewok will burst into pieces. The explosion of the target will be accomplished by grouping each individual piece, attaching a transform node and then applying a series of randomized translations and rotations to create a realistic effect. The creation of this scene will test our ability to string animations together, as well as play around with collision mechanics. We think it is a manageable goal for Assignment 4.

Model Description:
The walker model was fairly simple. We start with a flattened rectangular prism connected to a sphere to create the foot/ankle. An elongated rectangular prism along with another sphere are connected to the foot/ankle to produce the lower leg and knee. The thigh is another elongated rectangular prism that extends from the knee and connects to the hip - a sphere. On top of the hips sits a flattened rectangular prism that represents the pelvis, or base of the walker head. The head of the walker is approximately a cube that sits on top of the pelvis. On each side of the head lies a sphere connected to a rectangular prism, representing the walker turrets.



Animation Production:

The animations were produced by combining references to the nodes of the scene graph with time based transformations. First, we selected the part of the body that needed to move during the animation. As a simple example, we will look at head-mounted turret rotation, specifically the left side turret. The components of the turret (bearing, barrel) were located in a group called “leftgun” (line 208 of “walker.xml”). This group had a transform node called “leftgun-transform” attached to it. In order to to animate this group, we had to perform transformations on leftgun-transform. To do a simple rotation we would have to perform three steps: 1. Translate group to origin in order to have correct axis of rotation. 2. Perform rotation. 3. Translate back to correct position. Once these transformations were complete, we could take that transformation matrix and apply it to our leftgun-transform node which yielded the rotation we sought. The actual c++ code to perform this task is below:

```
leftgun_rotation = leftgun_rotation *
                        glm::translate(glm::mat4(1.0f), glm::vec3(0.0f,23.0f,0.0f)) *

glm::rotate(glm::mat4(1.0),glm::radians(time),glm::vec3(-1.0f,0.0f,0.0f)) *
                        glm::translate(glm::mat4(1.0f),glm::vec3(0.0f, -23.0f, 0.0f));
        nodes[object+"-leftgun-transform"]->setAnimationTransform(leftgun_rotation);
```

The four animations we produced were: crouch, gun rotate, walk in place, torso rotation. In order to produce the crouch, we rotated the upper leg in the positive x direction and the lower leg in the negative x direction with a higher angle of rotation. The result was the legs folding in on themselves, yielding a crouch. The walk was similarly executed, but instead of rotating the lower leg in the -X direction, the positive X direction was used, swinging the legs as they reached back. The torso rotation was accomplished by grouping the upper-body (head,guns) together, and rotating the entire group about the Y axis. Finally, the gun rotation was accomplished using the above code. These basic animations will be used in conjunction with full body translations in the next assignment to create the scene described in the first section of this writeup.