TÉCNICO LISBOA

AVT 2019/20

Assignment 1

The evaluation of this assignment's tasks as well as the tasks of Exercise 3 and Exercise 4 will be held in the lab class **23th October** and corresponds to **4 points (20%)** of the total grade.

Tasks

The tasks of this assignment are:

1. Collision detection. Detect the frog's collision with the limits of the road and river and with other elements of the game by using surrounding boxes aligned with the axis (axis aligned bounding boxes - AABB). When the frog reaches the limits of the game, it should stop, even if the user continues to press the key. When collided by cars or by buses in the road, the frog dies. If the frog is in the river, it should be on top of a turtle or of a wood trunk; otherwise it will die. In case of a life loss, the frog should be placed at the start line.

2. Apply simultaneously at least two textures to the road and one to the river. These textures should react to the lighting. Take the example of the multitexturing demo attached to this assignment, which uses texture maps in TGA format.

3. Allow to pause the game when the user presses a key ('S' key), showing a message while paused. Implement the counting mechanism of lives, points and the endgame. We suggest the following game play: at the beginning the player has five lives and lose a life each time the frog is hit in the road or falls to the water in the river. Implement a HUD (Head-up Display) to show the remaining lives as well as the number of won points. When the player loses all lives, you should see a game over message and it should be possible to start a new game by pressing a button ('R' key).

Grading

1 – Graphic modelling **[2.5 points]**

2 – Cameras **[2.5 points]**

3 - Game elements' movement **[3 points]**

4 - Lighting of the scene **[5 points]**

a. Directional light **[1 point]**
b. Six point lights **[2.5 points]**
c. Spot light **[1.5 points]**

5 – Collision detection **[3 points]**

6 – Texture mapping **[2 points]**

7 – HUD (lives, score, reset, pause) **[1 point]**

7 – Graphic quality and gameplay **[1 point]**

Tips and Notes

1. To load images with other formats, you can use one of the following libraries:

   - **DevIL**: http://www.lighthouse3d.com/cg-topics/code-samples/loading-an-image-and-creating-a-texture/
   - Libpng: http://www.libpng.org/pub/png/libpng.html
   - Libjpg: http://www.ijg.org/
   - SOIL: http://www.lonesock.net/soil.html
   - GLI: http://gli.g-truc.net/
   - FreeImage: http://freeimage.sourceforge.net/

2. Displaying text messages to play and pause may be implemented through an application of a texture to an object. Remember that the use of freeglut's functions that manipulate strings, strokes and bitmaps are deprecated from the OpenGL version 3.1. So you must use other alternatives that can be found in the following links:

http://spacesimulator.net/tutorials/OpenGL_bitmapped_fonts_tutorial_3_3.html

http://www.wildfiregames.com/forum/index.php?showtopic=17365 http://www.mbsoftworks.sk/index.php?page=tutorials&series=1&tutorial=12

http://www.lighthouse3d.com/very-simple-libs/vsfl/

3. It is intended that the display information of points and lives is carried out through a Head-Up Display (HUD) which involves the use of a second orthogonal projection to the drawing. This projection will be independent of the active camera. In this case it may be worth doing push and pop the stack projection matrices.

4. If the implementation of the HUD is not possible it is suggested that students display that information to the header of the graphics window. In this case, students will evaluated with 75% of the respective grade.