UNIVERSITÉ Concordia UNIVERSITY

ACADEMIC YEAR: 2019-2020

PROJECT

Requirements Posted: October 28, 2019

Project Due: November 25, 2019 before 11.59pm

Final Deadline with 20% flat Penalty: November 28, 2019 before 11.59pm

Description:

This is an individual project, which builds upon your previous OpenGL programming assignments. If you have not completed Assignment2, you may still complete the necessary components as part of this project, and we will grade it for 4 out of the 10 marks allotted to assignment 2, provided you do the work yourself. More specifically, in this project you will learn about camera perspectives, and a few other topics. Please recall that your car mesh is composed of different parts and 4 wheels. These should be hierarchically linked to each other through appropriate modelling transformations. The wheels can be rotated about their center line and also moved forward/backward.

Implementation Specifications:

1. Extend your OpenGL Assignment 2 with the following functionality and features:

Mandatory Features:

- Create two camera perspectives, namely first person and third person. You should be able to switch between the two using key C.
- Create headlights/taillights for the car model and assign key L to toggle them.
- Simulate smoke from the exhaust of the car.

Choose any one option from the below mentioned feature set for your project:

Option I: Bumper Cars:

- Create at least 5 cars in random positions on the ground surface. If required, you may uniformly scale the car model.
- Create the following movement for each car: move straight ahead for n_1 (random) steps, rotate right or left (randomly) by 15 degrees. Repeat these in a loop. Set n_1 to lie within reasonable range (10 – 30 steps).
- Implement collision detection *i.e.* after every step check for collision. If the car collides with another car, then randomly decide to hold one car stationary and only move the other car.
- Create bumper car animation and render it continuously (Key H should work as a toggle key).

Option II: Wheels on the Bus:

- Create a predefined piece-wise linear path for the car to trace.
- Place interesting objects around this path by loading various object files.
- Play the audio for the kids song "wheels on the bus go round and round"
- Create an interesting story like experience similar to the video of this song. You may see the song at https://www.youtube.com/watch?v=e_04ZrNroTo
- You are not required to create the interior details or the character animations.

Option III: Car Racer:

- Create a car racing game with at least five cars, one of which must be controlled by the user.
- Create at least two different tracks and each race should last for 3 laps. You may assume both abstraction and automation (*i.e.* no need to worry about refueling a car or about the gear change).
- You should create a bird's eye view for the camera along with the mandatory first person and third person camera. You may use any OBJ models to create a more interesting looking tracks.

2. The application should use OpenGL 3.0 and onwards, and include brief comments explaining each step.

Submission:

Project program(s) must be submitted only through Moodle. No other form of submission will be considered. Please create a zip file containing your C/C++ code, vertex shader, fragment shader, a readme file (.txt). The zip file should be named COMP371_Project_YourStudentID. In the readme file document the features and functionality of the application, and anything else you want the grader to know *i.e.* control keys, keyboard/mouse shortcuts, *etc.* You should also create a video for your project and either upload it to YouTube or on Moodle.

Evaluation Procedure

You MUST demonstrate your program to one of the lab instructors during lab hours or at prearranged times. You must run your submitted code, demonstrate its full functionality and answer questions about the OpenGL programming aspects of your solution. Major marking is done on the spot during demonstration. Your code will be further checked for structure, non-plagiarism, *etc.* However, ONLY demonstrated submissions will receive marks. Other submissions will not be marked.