SCIT

School of Computing & Information Technology

CSCI336 – Interactive Computer Graphics
Spring 2023

Assignment 1

Due on Friday, 8ᵗʰ September 2023 at 5:00pm

Write an OpenGL program to create a simple 2D scene with a dump truck. The image in Figure 1 shows an example of the scene (a working program will be demonstrated in one of the lectures).

Figure 1: Dump truck.

- 2D scene (4 marks)

  o Construct a 2D scene like the one shown in Figure 1 (does not have to be identical). The scene should consist of the following objects:

    ▪ A ground

    ▪ Two tires and their hubcaps

    ▪ The truck's chassis, which consists of a base, a driver compartment and a window

▪ The dump box on the back of the truck

Note: the rendering order affects the final image. The "Painter's Algorithm" – things drawn later will overwrite the previous contents.

- Transformations and keyboard input (4 marks)

  o Allow the user to

    ▪ Move (translate) the truck left and right using left and right arrow keys, respectively.

      • Rotate the tires when the truck moves.

    ▪ Lift and lower the angle of the dump box between 0 degrees and 45 degrees.

To maintain consistent movement speed regardless of frame rate, all transformations should be based on frame time.

The images in Figure 2 below show these. The two images show the truck at different locations with the dump box at different angles. Also, note that the tires of the truck have rotated.
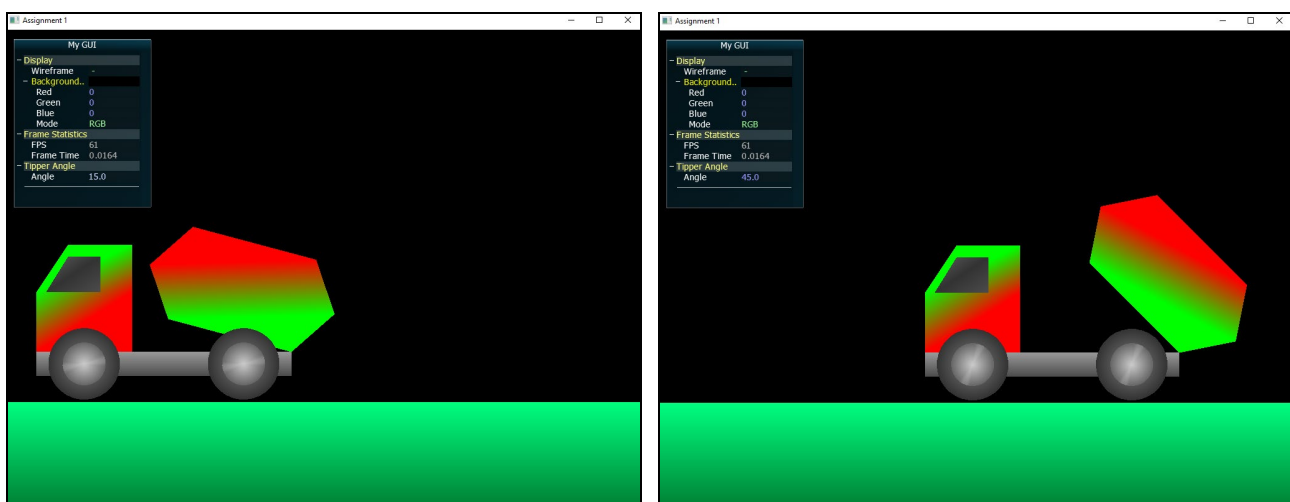

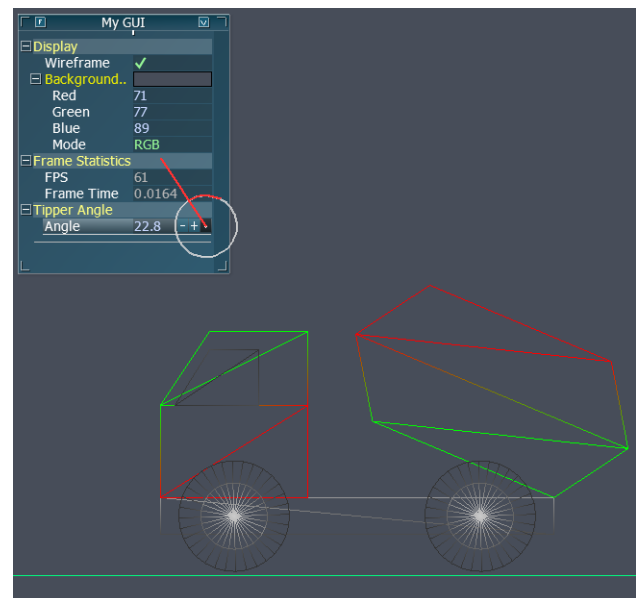(a) Dump box angle – 15 degrees. (b) Dump box angle – 45 degrees.

Figure 2: Illustrates the transformations.

- User interface (2 marks)

  o Create a graphical user interface with the following components:

    ▪ A button to toggle between wireframe and solid polygon rendering mode.

    ▪ An interface to allow the user to change the background colour.

    ▪ Display the frames per second and frame time.

    ▪ An interface that shows the dump box angle and allows the user to change the angle using the mouse.

The images in Figure 3 below show the user interface. The user can toggle between wireframe and solid mode, change the background colour, and change the rotation angle of the dump box.
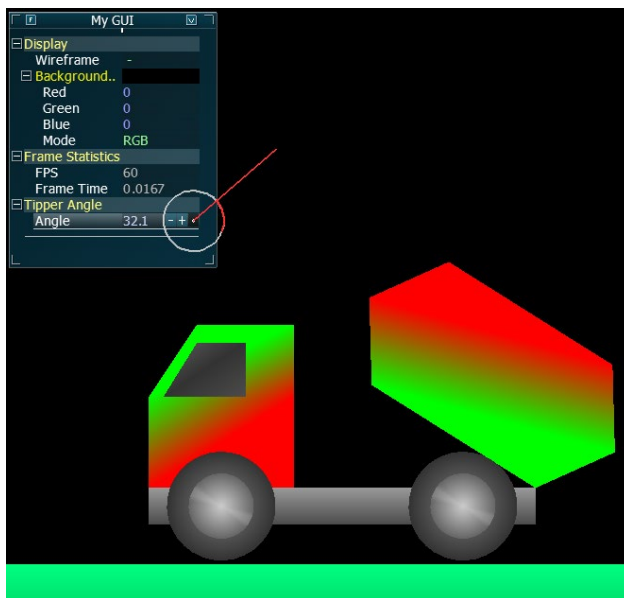
| (a) Solid rendering mode. | (b) Wireframe rendering mode. |

Figure 3: User interface.

Screenshots

In your submission, include screenshots demonstrating your working program and the features that were implemented. Save the screenshots using one of the common image formats, i.e. bmp/jpg/png.

Instructions and Assessment

Zip all your **source files** (.cpp, .h, .vert and .frag) and the **screenshots** (.bmp/.jpg/.png) into a single file and submit this via Moodle by the due date and time (do **NOT** zip your entire project file as this can be very large, and do **NOT** use rar). If not submitted on Moodle, the assessment will not be marked.

The assessment must be your own work. If asked, you must be able to explain what you did and how you did it. Marks will be deducted if you cannot correctly explain your code.

NOTE: The mark allocations shown above are merely a guide. Marks will be awarded based on the overall quality of your work. Marks may be deducted for other reasons, e.g., if your code is too messy or inefficient, if you cannot correctly explain your code, etc.

For code that does not compile, does not work or for programs that crash, the most you can get is half the marks (i.e., 5 marks or less). It is better to comment out sections of your code that do not work and include a note for the marker.