SWS3005: Real-Time Graphics Rendering (2023)

Assignment #5 (Group Work)

Release Date: 19 July 2023, Wednesday

Submission Deadline: 24 July 2023, Monday, 12:00 PM

(Deadline to submit poster for printing: 23 July 2023, Sunday, 2:00 PM)

TASK 1: Whitted Ray Tracing

You are to complete a Shadertoy GLSL fragment shader that implements the Whitted Ray Tracing algorithm. Your completed shader is to be run at https://www.shadertoy.com/new. The following images show sample views of the result that your program is expected to produce:

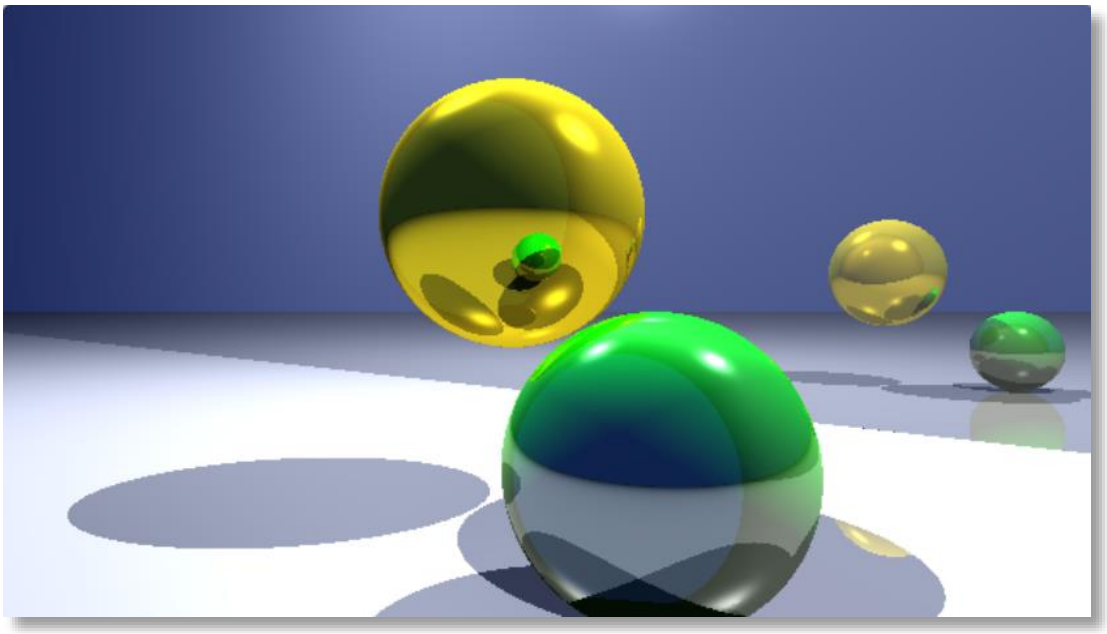

Figure 1

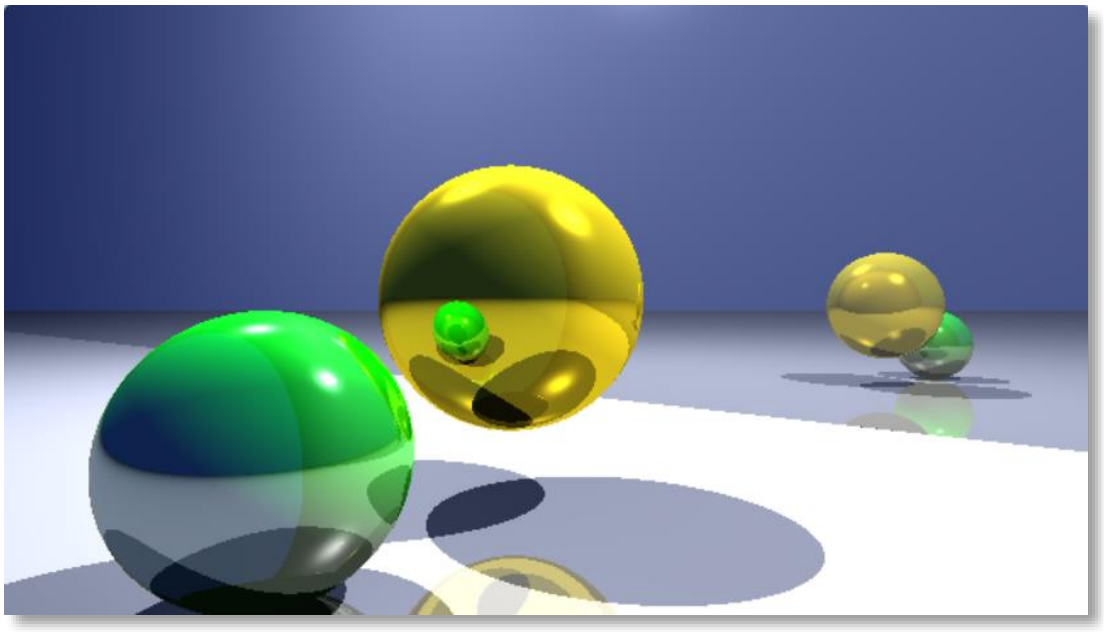

Figure 2

The scene consists of a silvery horizontal plane, a silvery vertical plane (in the background), a bouncing golden yellow ball, and a revolving shiny green ball. There are two point light sources. The images above were produced using 2 levels of ray tracing (recursion level = 2).

Please download the ZIP file **`sws3005_2023_assign5_todo.zip`** from the **`Canvas > SWS3005 > Files > Assignments`** folder.

You need to complete the Shadertoy GLSL fragment shader **`task1.frag`**. To run your shader, you need to copy-and-paste the shader source code to the source editing window at https://www.shadertoy.com/new. To run or rerun your shader, you just need to click the small black triangle at the bottom-left corner of the source editing window, and the result will be shown in the rendered image on the left of the page. You can do your coding and editing in the Shadertoy webpage, but make sure you copy the updated source back to the file **`task1.frag`**.

The detailed instructions and requirements for completing the fragment shader can be found in the given source code. A brief introduction to how to write shaders for Shadertoy can be found at https://www.shadertoy.com/howto.

Run your completed shader in Shadertoy and capture two frames of the rendered animation (right-click on the rendered image and choose "Save image as"). The captured images must be at least of size 640x360. Save the images in PNG format as **`task1a.png`** and **`task1b.png`**.

TASK 2: Design Your New Scene

For this task, you are to model and render a **new 3D scene** by modifying the shader you have completed for **Task 1**. Your new scene should not look similar to the original scene in **`task1.frag`**. Moreover, at least one of the objects, at least one of the light sources, and the camera **must be animated**. The animation must be perpetual.

Put your completed shader code in the file **`task2.frag`**. Your work will be assessed by the aesthetics and creativeness of the new scene and the animation.

Run your completed shader in Shadertoy and capture two frames of the rendered animation (right-click on the rendered image and choose "Save image as"). The captured images must be at least of size 640x360. Save the images in PNG format as **`task2a.png`** and **`task2b.png`**.

TASK 3: Make Your Poster

You are required to make a poster to display your work for this assignment. You can make your poster based on one of the given template files given in **`portrait_templates-2.zip`**, and name your completed poster **`SWS3005_`**<***group#***>**`.{pdf,png,pptx,psd}`**. For example, if your group number is **6**, you should name your file **`SWS3005_06.pptx`**. Please add a leading zero to single-digit group numbers to make them double-digit.

In the poster, you should show rendered images of the new scene you have designed for **Task 2**. You must also provide a **weblink** to your **Task 2** shader at Shadertoy. For this, you have to first create a user account at Shadertoy. Then, while logged on, you copy-and-paste your **`task2.frag`** to create a new shader in Shadertoy. Before you submit the new shader at Shadertoy, you should set the privacy level of your shader to "**unlisted**". After you have submitted, please take note of the URL of your shader (which should look like "https://www.shadertoy.com/view/*XXXXXX*"). Anyone with the URL will be able to view your shader running in real-time.

In the poster, you must show the following information:

- The title "Real-Time Ray Tracing on GPU".
- The course code "SWS3005".
- Project ID: **`SWS3005_`**<***group#***> (for example, **`SWS3005_06`**).
- Names of group members.
- Weblink https://www.shadertoy.com/view/*XXXXXX* to your shader at Shadertoy. You can also provide a QR code of the weblink.

GRADING

The maximum marks for this programming assignment is **100**, and it constitutes **20%** of your total marks for the course. The marks are allocated as follows:

- **Task 1 — 50 marks,**
- **Task 2 — 25 marks,**
- **Task 3 — 25 marks.**

Note that marks will be deducted for bad coding style. If your program cannot be compiled and linked, you get 0 (zero) mark.

Good coding style. Comment your code adequately, use meaningful names for functions and variables, and indent your code properly. You must fill in your **Project ID**, **group number**, and every group member's **name** and **NUS User ID** in the **header comment**.

SUBMISSION

For this assignment, you need to **submit only**

- **Task 1** — your completed **`task1.frag`** and captured frames **`task1a.png`** and **`task1b.png`**;
- **Task 2** — your completed **`task2.frag`** and captured frames **`task2a.png`** and **`task2b.png`**;
- **Task 3** — your completed poster **`SWS3005_`**<***group#***>**`.{pdf,png,pptx,psd}`**.

You must put them in a ZIP file and name your ZIP file **`group`**<***group#***>**`_A5.zip`**. For example, if your group number is **6**, you should name your file **`group06_A5.zip`**.

Submit your ZIP file to **`Canvas > SWS3005 > Assignments > Assignment #5`**. **Only one group member should submit the file**. Before the submission deadline (24 July 2023, Monday, 12:00 PM), you may upload your ZIP file as many times as you want. **We will take only your latest submission**.

SUBMISSION OF POSTER FOR PRINTING

Your group will also need to submit your completed poster file for printing.

Name your poster file **`SWS3005_`**<***group#***>**`.{pdf,png,pptx,psd}`** and submit it at **`Canvas > SWS_ALL > Assignments > SWS3005: Real-Time Graphics Rendering`** by the deadline **23 July 2023, Sunday, 2:00 PM**.

Only one group member should submit the file. Note that you may submit the file **only once** at the submission page.

DEADLINE

Late submissions will NOT be accepted. The submission page will automatically close at the deadline.

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