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Project C: A Lens into an Interesting Galaxy

Users Guide

W, A, S, D (forward, left, back, right) can be used to move the camera around the scene. The I, J, K, L keys change where the camera is pointing towards. The Q and E keys will fly the camera up and down, respectively depending on where the camera is pointing.

Using F, the world light can be turned off; using G, the lighting method is changed – by default it is Blinn-Phong lighting; using H will change the shading method. More information about the materials for the objects can be found in the console, which can be accessed through the shortcut "Ctrl + Shift + i" on PC or by "Command + Option + i" on Mac.

By changing the inputs in the editable boxes, the corresponding values will be changed and thus change the appearance of the lighting.

Goals

A) Create a large, animated 3D 'world' that users view and explore with an interactive movable 3D camera. One simple set of GUI controls (keyboard, possibly mouse) will aim the camera in any direction by adjusting compass-heading (rotate left/right) and the camera's up/down rotation or 'tilt'. Another set of GUI controls (probably arrow keys or WASD keys or similar set of 4) will move the camera forward or backward in the camera's aiming direction, and will 'strafe' horizontally, moving side-to-side without changing the camera's aiming direction or height above the ground-plane.

B) Unlike Projects A and B, this 'virtual world' will no longer use cartoonish fixed colors at each vertex. It will instead compute colors in your vertex and fragment shader programs by simulating how a light source illuminates an oriented surface whose material reflects some fraction of that light towards the camera.

C) The rigid 3D parts now MUST include a surface-normal attribute for each vertex, and a material descriptor that chooses a set of RGB reflectance values. Your GLSL shader programs will combine these reflectance values with RGB illumination values from 3D light sources in the virtual world to compute colors displayed on-screen.

D) The program must use several vertex/fragment shader pairs (instead of one giant shader pair cluttered with conditionals) to compute the Phong and Blinn-Phong lighting model with both
    a. 'Gouraud' shading (yields faceted appearance) and
    b. 'Phong' shading (for smooth-looking, facet-free surfaces with nicely rounded specular highlights).

Results

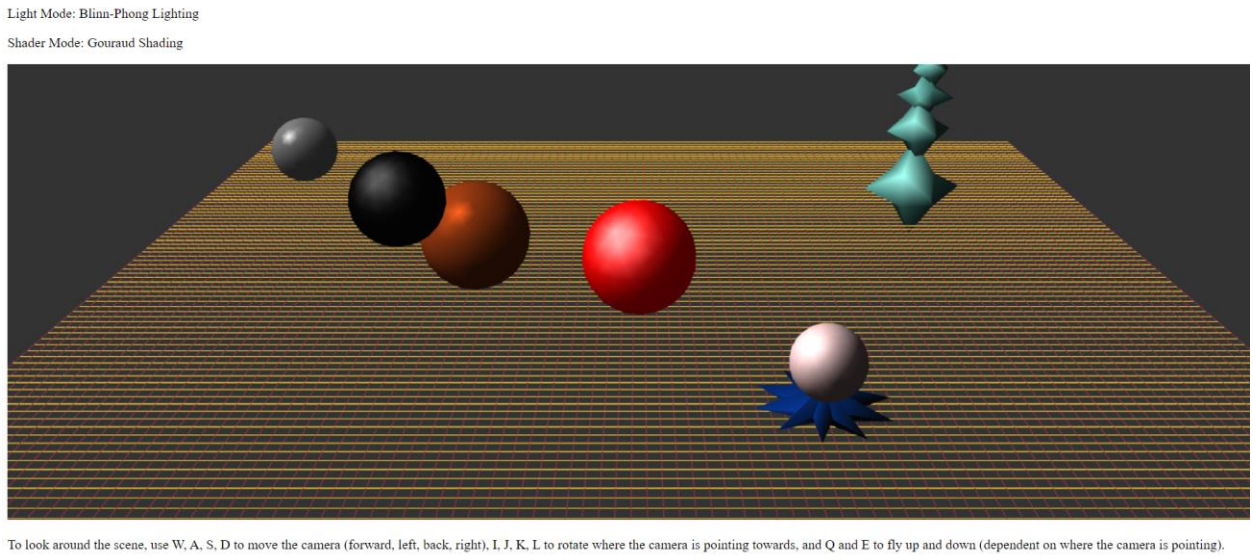


Figure 1

Figure 1 represents what the webpage looks like without any adjustments, i.e., the default state. It has Blinn-Phong lighting coupled with Gouraud shading as can be seen from the faceted appearance on the objects.

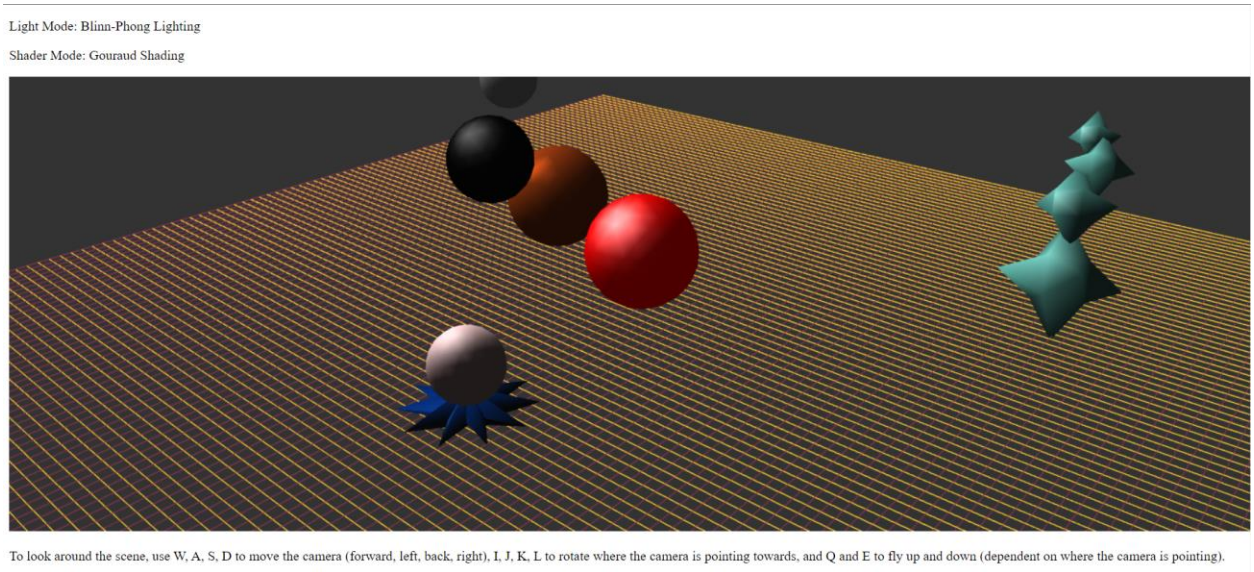


Figure 2

Figure 2 shows an example of the camera movement aspect, it also shows the animation aspect of the program.

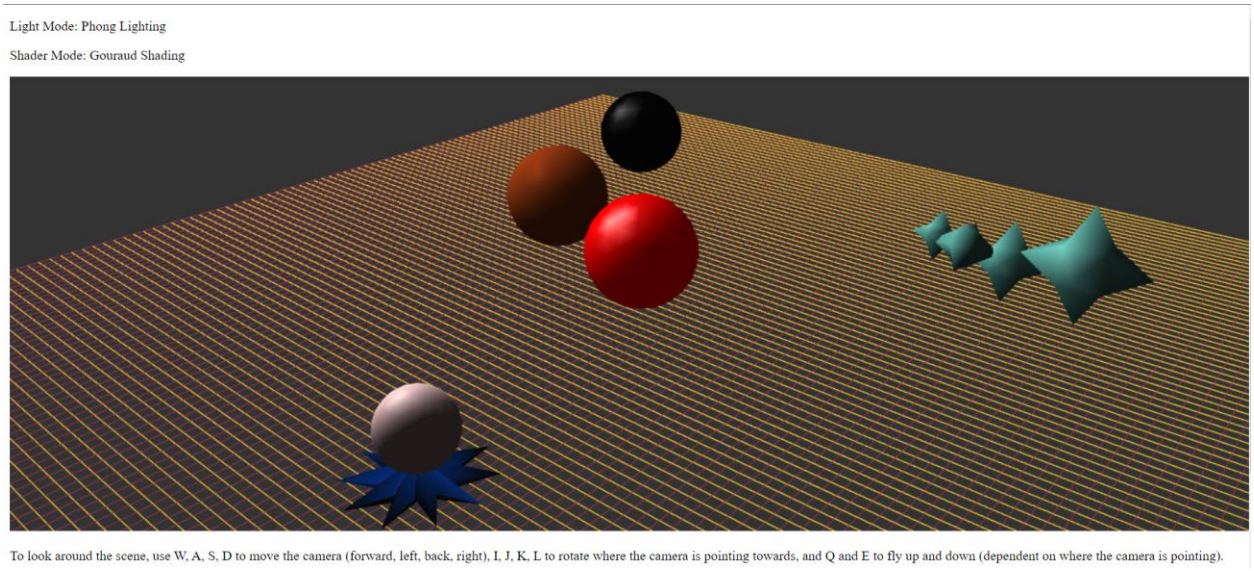


Figure 3

Figure 3 shows an example of Gouraud shading with Phong lighting. This can be seen from the still faceted appearance of the objects.

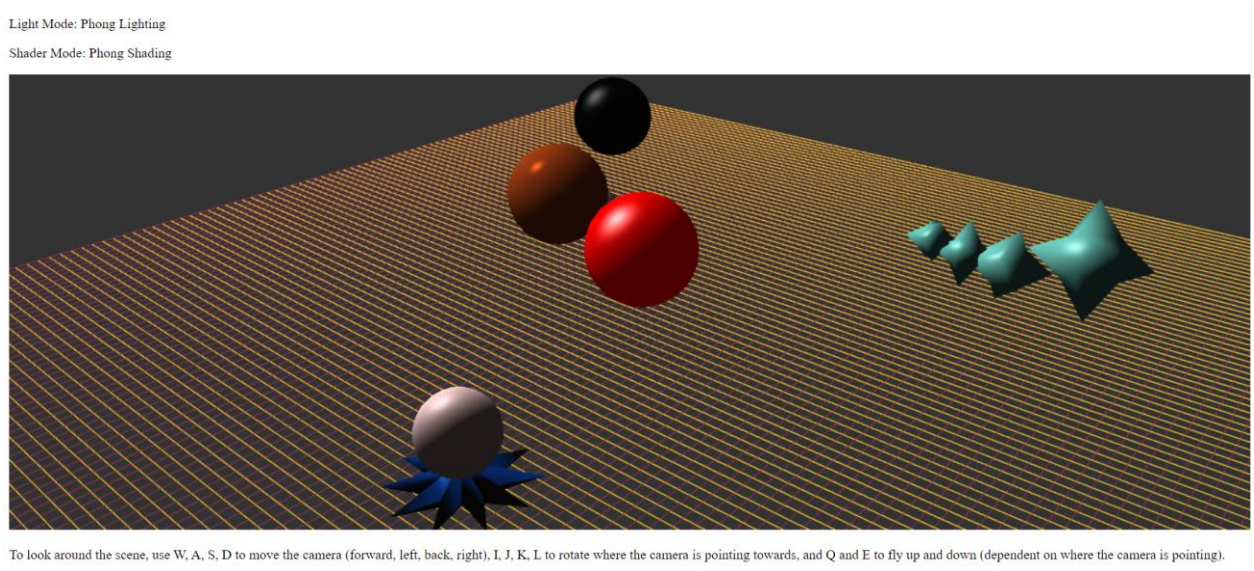


Figure 4

Figure 4 shows an example of Phong shading with Phong lighting. This can be seen from the "smooth-looking, facet-free surfaces with nicely rounded specular highlights."

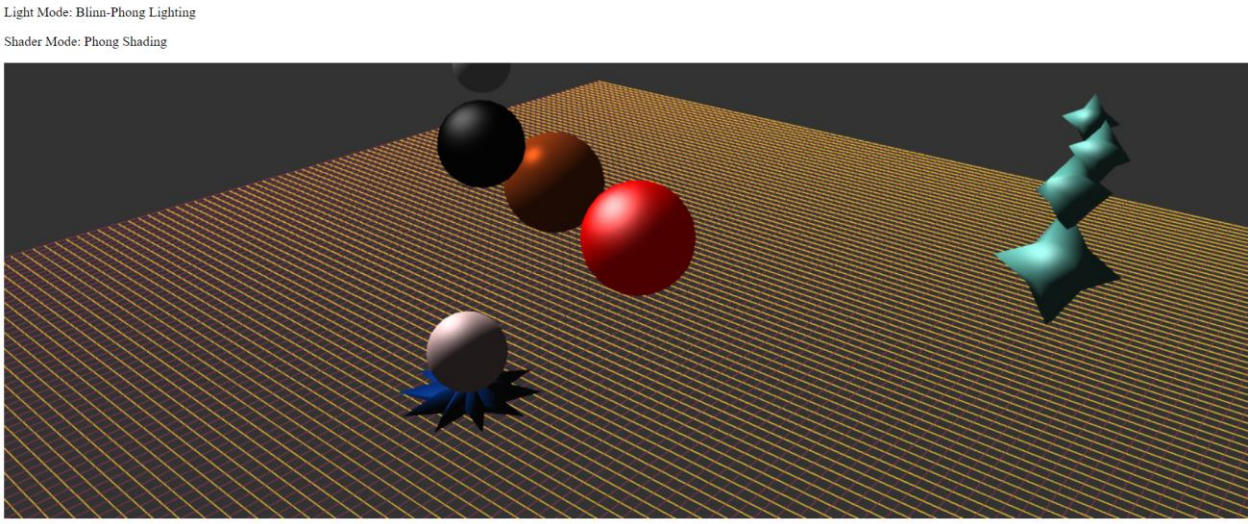


Figure 5

Figure 5 shows an example of Phong shading with Blinn-Phong lighting.

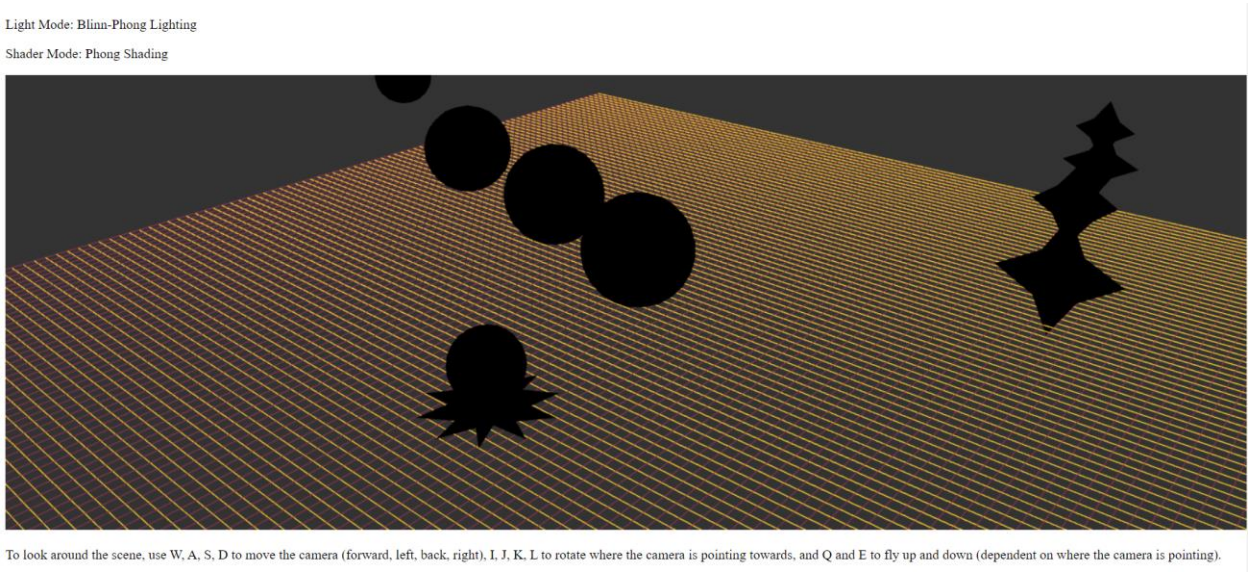
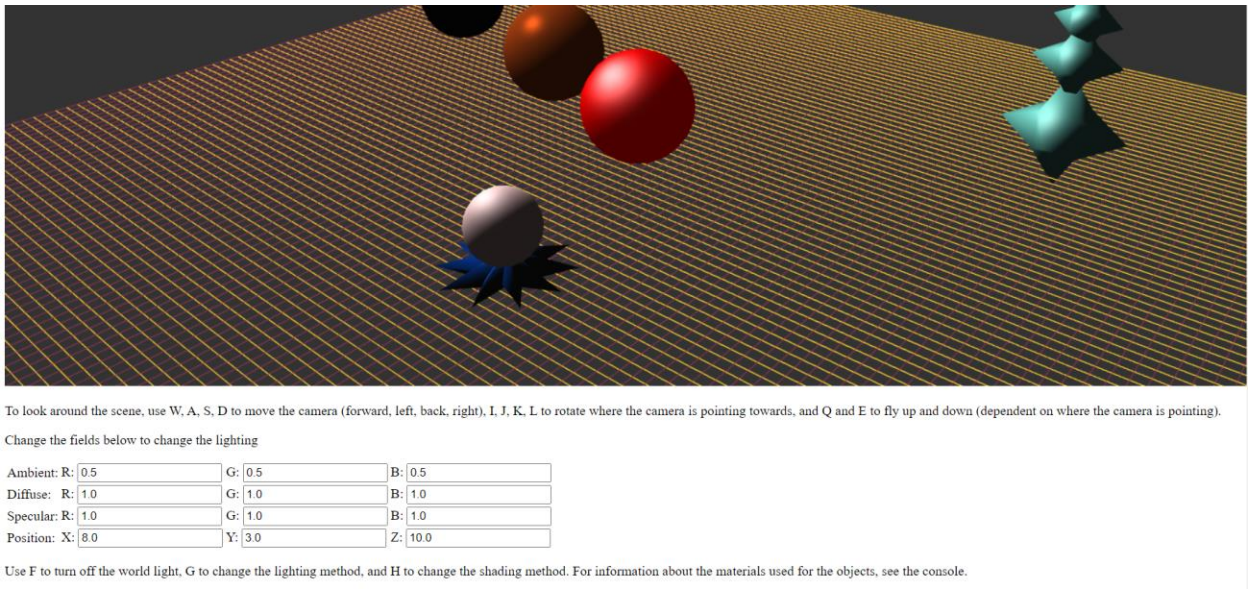


Figure 6

Figure 6 shows what the scene looks like when the world light is turned off.



To look around the scene, use W, A, S, D to move the camera (forward, left, back, right), I, J, K, L to rotate where the camera is pointing towards, and Q and E to fly up and down (dependent on where the camera is pointing).

Change the fields below to change the lighting

Ambient:	R:	0.5	G:	0.5	B: 0.5
Diffuse:	R:	1.0	G:	1.0	B: 1.0
Specular:	R:	1.0	G:	1.0	B: 1.0
Position:	X:	8.0	Y:	3.0	Z: 10.0

Use F to turn off the world light, G to change the lighting method, and H to change the shading method. For information about the materials used for the objects, see the console.

Figure 7

Figure 7 shows the controls, the editable values for the ambient, diffuse, and specular lighting, and the editable values for the position of the light source.

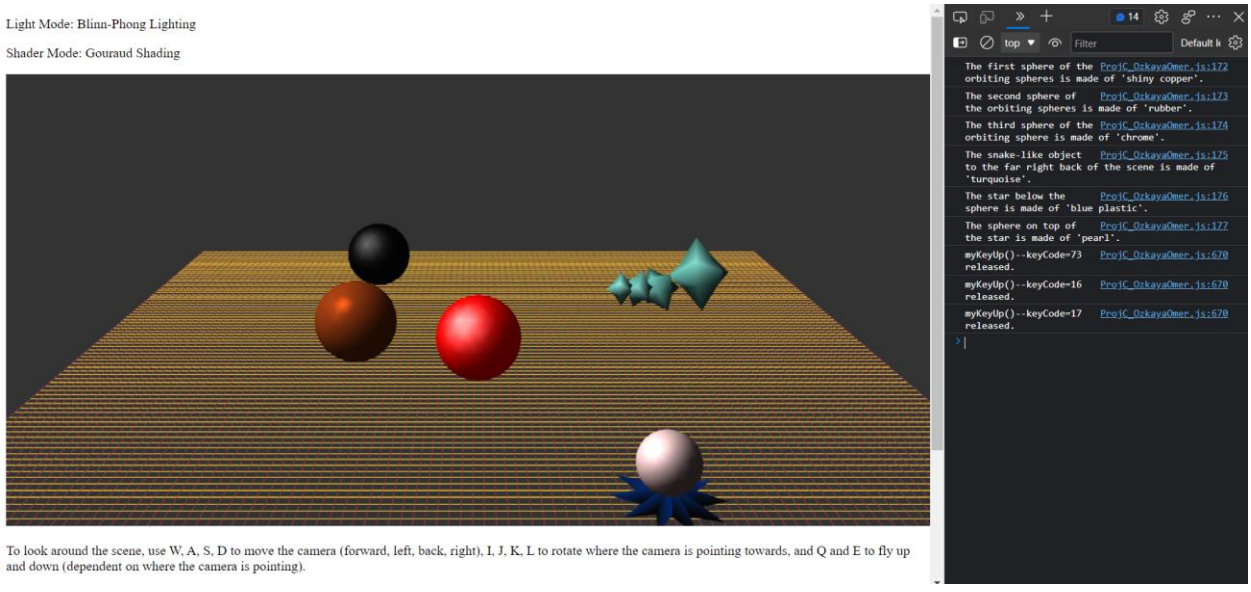
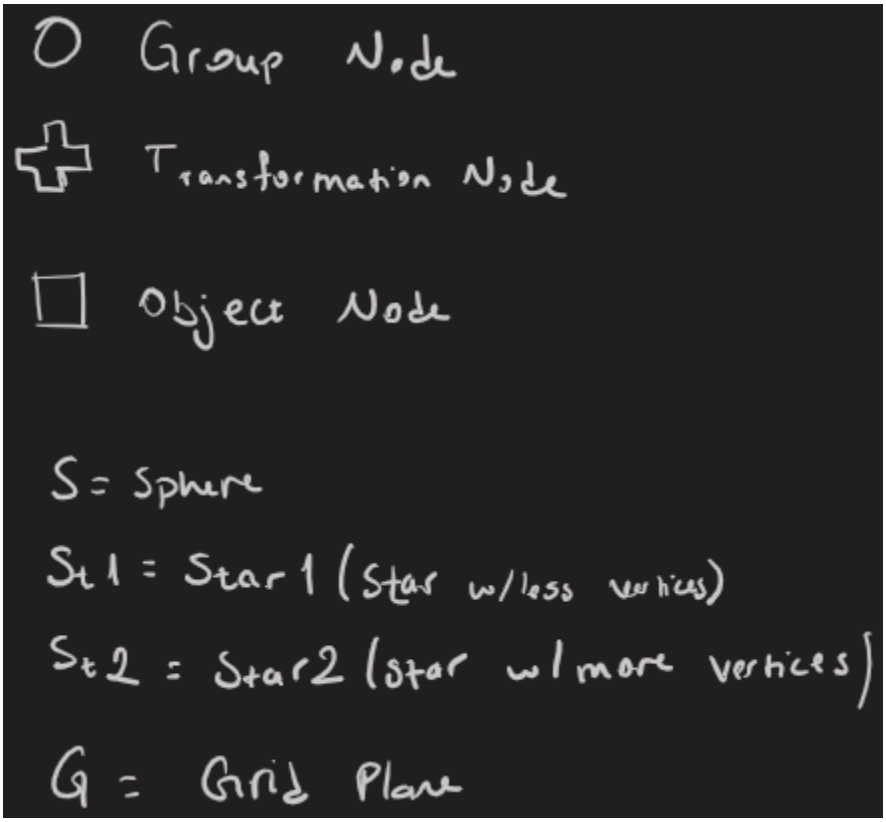
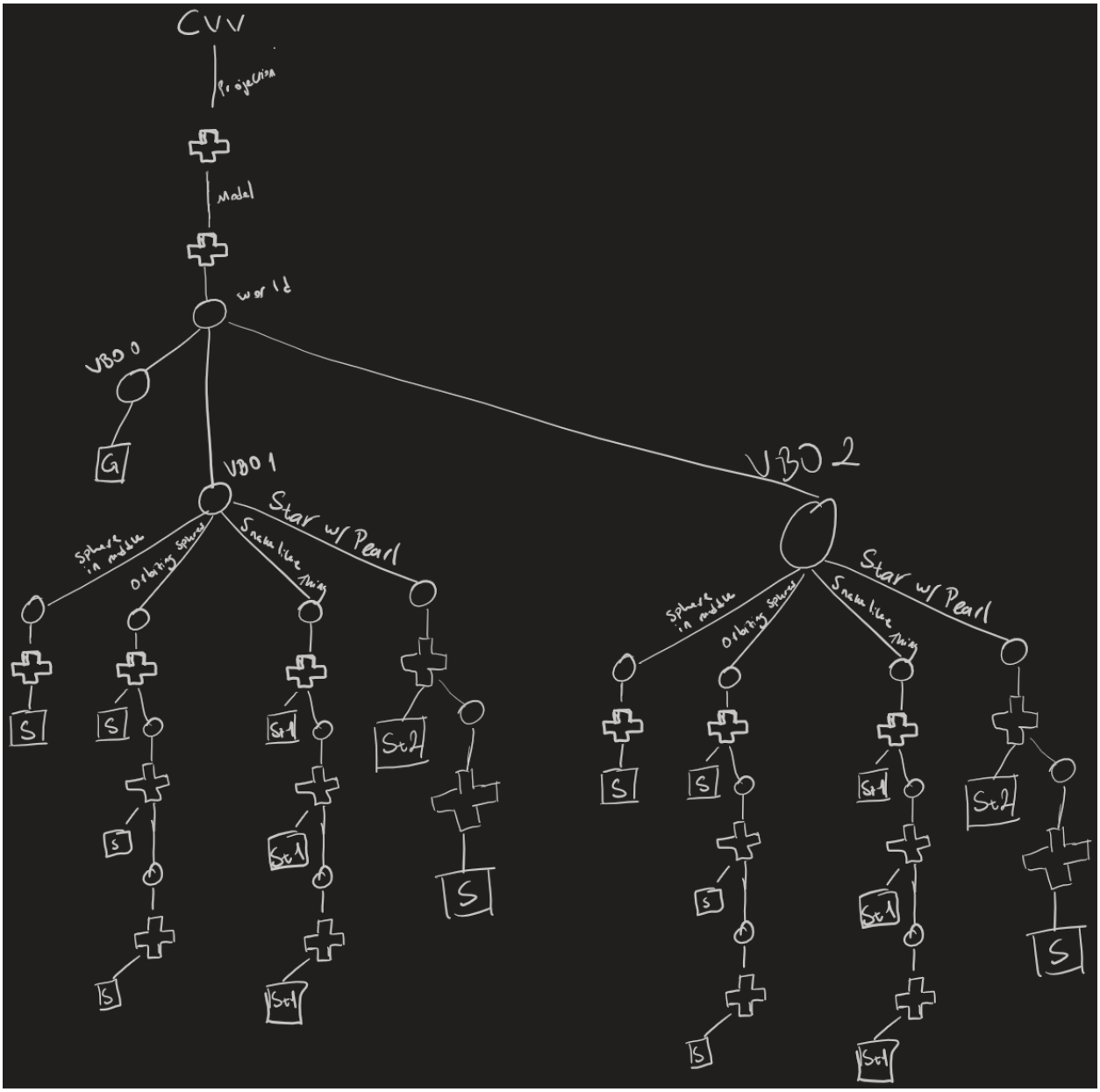


Figure 8

Figure 8 shows the console output for the program. The material specifications can be found here.

Scene Graph (continued on next page)




CVV
Projection
Model
world
VBO 0
G
VBO 1
Star w/ Pearl
Sphere in middle
Orbiting Spheres
Snake like thing
VBO 2
Star w/ Pearl
Sphere in middle
Orbiting Spheres
Snake like thing
S
St1
St2