

Computer Science 312
Principles of Programming Languages
Fall 2024
Assignment 4

Due: Wednesday, 10/30/2024 11:59 p.m.

For this project, you will extend the basic ray tracer implemented for Assignment 2. Features of this ray tracer include arbitrary aspect ratio, light attenuation, shadows, planes, and code enhancement (object array, function pointers, etc.).

Your ray tracer should fulfill the following requirements:

- arbitrary aspect ratio – e.g., 640x480, 500x500, 1024x768, etc.
- light attenuation – light loses power as distance grows
- shadows
- planes (with checkerboard pattern)
- code enhancement and re-organization –
 - new data type – **SCENE_T**
 - new **OBJ_T** using union
 - dynamically allocated objects array
 - multiple source files – ray.c, vector.c, sphere.c, plane.c, and light.c, with associated header files
 - function pointers
 - static functions
- sample scene that include 1 light source, 2 spheres, a checkerboard ground plane, and a sky (or background)

Your ray tracer must produce the sample image shown below. In addition, you must create another image of your design (be creative!). Your code must be well-structured and commented.

Sample Output

Here's a sample scene:

red sphere: cntr: (0.5, 0.8, 4.0) rad: 0.5 col: (0.8, 0, 0)
green sphere: cntr: (-0.5, 0.15, 4.2) rad: 0.6 col: (0, 0.8, 0)
plane: normal: (0, 1, 0) D: 0.9 colors: (0, 0, 0) and (1, 1, 1)
background color: (0.3, 0.3, 0.5)
light: location: (5, 10, -2)
resolution: 640x480

