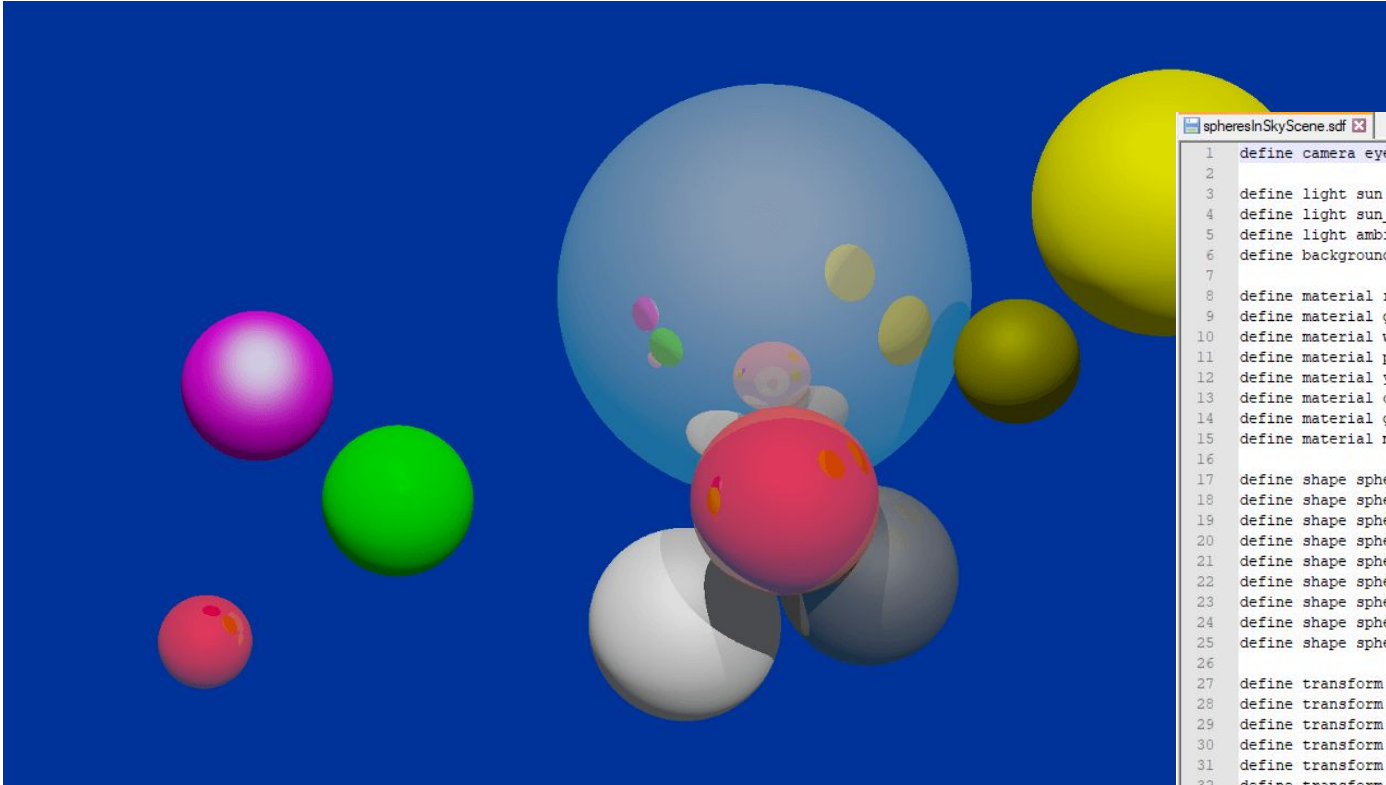# Raytracer

Mini Project

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```
spheresInSkyScene.sdf

 1    define camera eye 40.0 0 200 140 0 -1 -0.8 0 1 0
 2
 3    define light sun 200 1000 200 0.2 0.2 0.2 0.2
 4    define light sun_2 -20 200 -40 0.2 0.2 0.2 0.2
 5    define light ambient1 0 0.03 0.1 0.1
 6    define background 0 0.2 .6
 7
 8    define material red 1 0 0 1 0 0 1 0 0 16 0.2 0 0
 9    define material green 0 1 0 0 1 0 0 1 0 248 0 0 0
10    define material white 1 1 1 1 1 1 1 1 1 16 0 0 0
11    define material pink 1 0 1 1 0 1 1 0 1 16 0 0 0
12    define material yellow 1 1 0 1 1 0 1 1 0 16 0 0 0
13    define material ocker 0.3 0.3 0 0.3 0.3 0 0.3 0.3 0 16 0 0 0
14    define material gray 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 16 0.1 0 0
15    define material mirror 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 8 0.9 0 0
16
17    define shape sphere sphere1 0 0 0 10 red
18    define shape sphere sphere2 0 0 0 8 green
19    define shape sphere sphere3 0 0 0 11 white
20    define shape sphere sphere4 0 0 0 10 gray
21    define shape sphere sphere5 0 0 0 25 mirror
22    define shape sphere sphere6 0 0 0 8 pink
23    define shape sphere sphere7 0 0 0 13 yellow
24    define shape sphere sphere8 0 0 0 7 ocker
25    define shape sphere sphere9 0 0 0 5 red
26
27    define transform sphere1 translate 18 7 0
28    define transform sphere2 translate -23 7 0
29    define transform sphere3 translate 8 -17 0
30    define transform sphere4 translate 28 -7 0
31    define transform sphere5 translate 18 -5 -40
32    define transform sphere6 translate -38 14 -10
33    define transform sphere7 translate 54 40 -12
34    define transform sphere8 translate 45 6 -20
35    define transform sphere9 translate -44 -5 10
36
37    define shape composite root sphere1 sphere2 sphere3 sphere4 sphere5 sphe
38
39    render eye spheres-in-sky.ppm 1920 1080
```

Starting the Application

command line parameters

- --file   define path to sdf file

- --frames   define the amount of images to be generated

- --aa   enables anti-aliasing

- --recursion   define the maximum recursion depth per ray

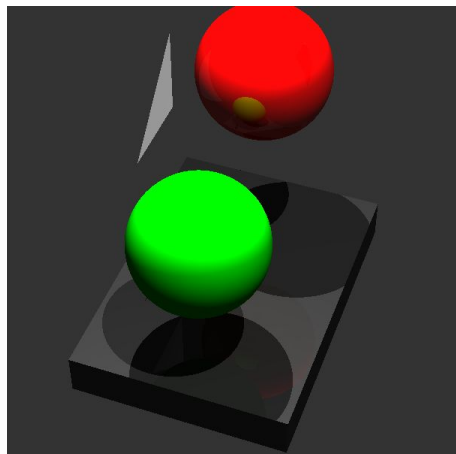- --help   display the help menu

Extended SDF-Parser

define

- **background** <color>

- **camera** <name> <fov> <pos> <front> <up>

- **transform** <shape> scale|rotate|translate <parameters>

- **animation** <shape> scale|rotate|translate <axes> <speed> <start frame> <last frame>

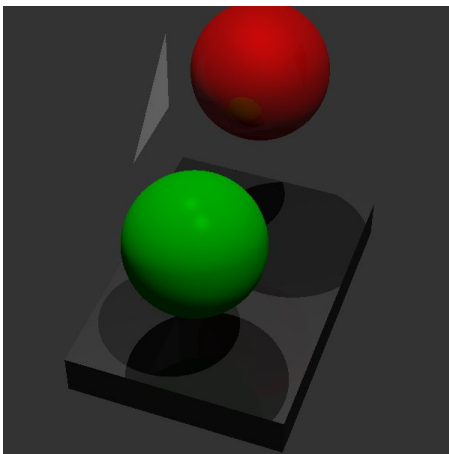- **shape** composite <name> <1st shape> <2nd shape> . . . <nth shape>

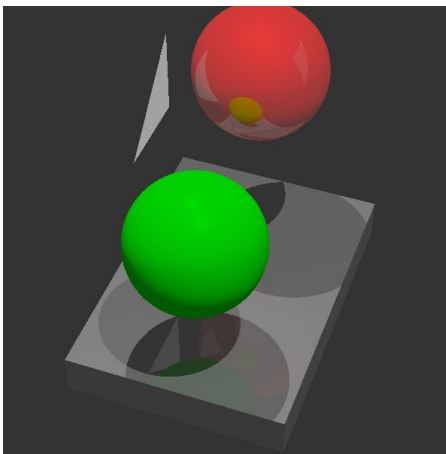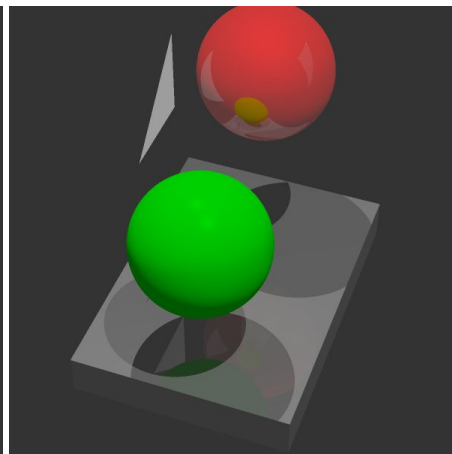 (requires one shape to be defined as root)

Renderer

blinn phong
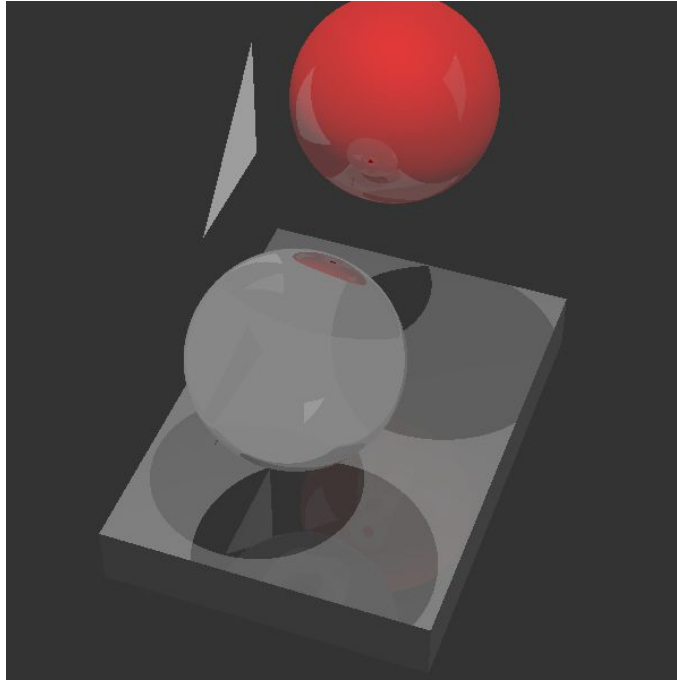+ reflections

tone mapping

gamma correction
+ light attenuation

anti-aliasing (x4)

Renderer

refraction / opacity

Issues during Development

- compatibility issues (Windows vs. Linux)

- render on Windows a lot slower (~25 sec vs. ~8 sec)

- very long render times overall
  (although using the Release build instead of the Debug build reduces it greatly to ~1 sec)

- forgot to transform rays to object's local space

- transforming pixel positions before calculating camera ray

- forgot to normalize vectors

Yet to be implemented

- **intersection** methods for cone and cylinder

- **multi threading** (to display render progress & for parallel processing on the animation)

- **video support** (update window after every new frame)