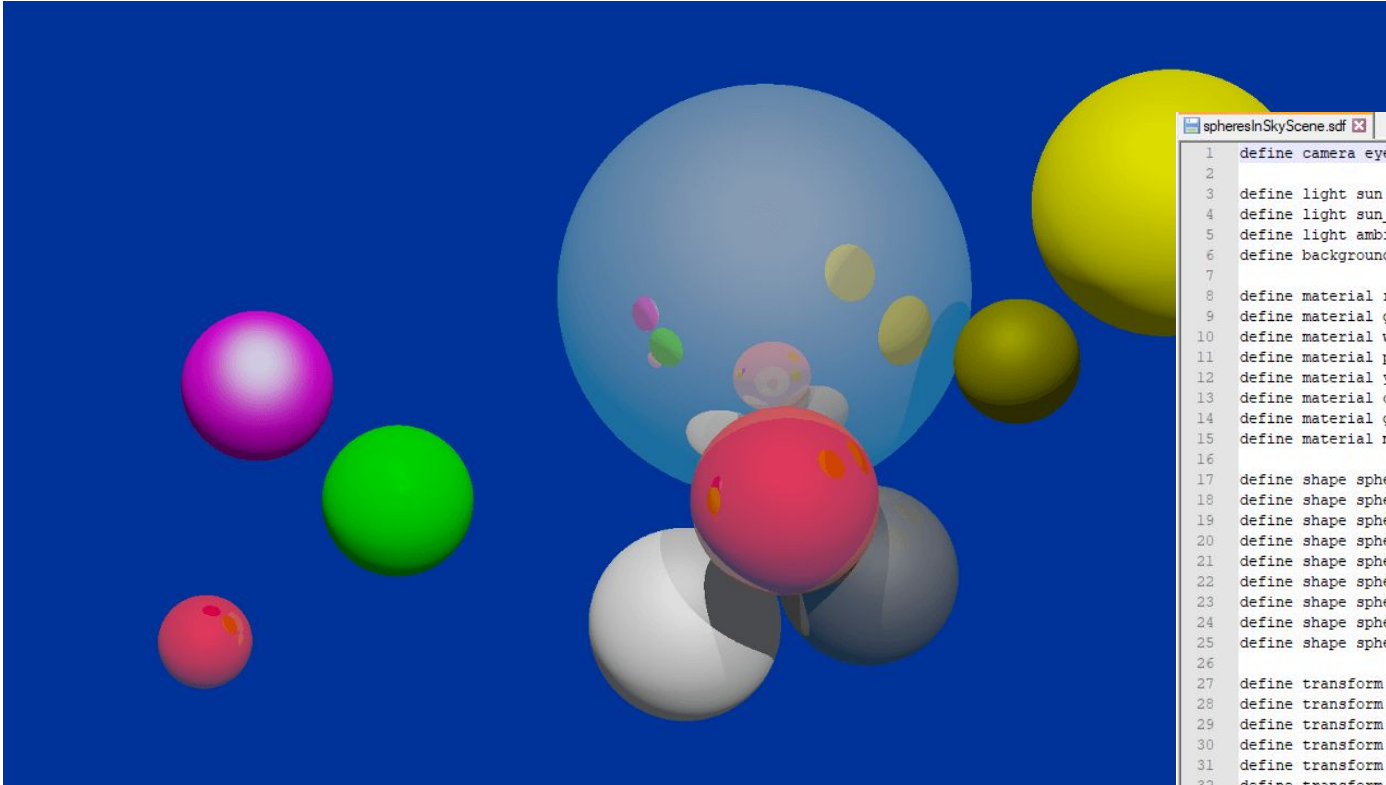


Raytracer

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 0 1 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 spherel 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 spherel 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 spherel sphere2 sphere3 sphere4 sphere5 sphere6 sphere7 sphere8 sphere9
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



Extended SDF-Parser

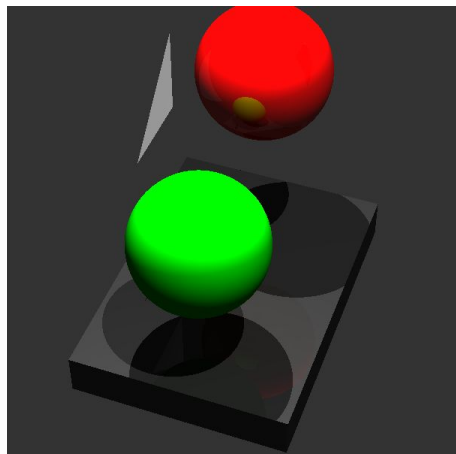
define

- background <color>
- camera <name> <fov> <pos> <right> <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>

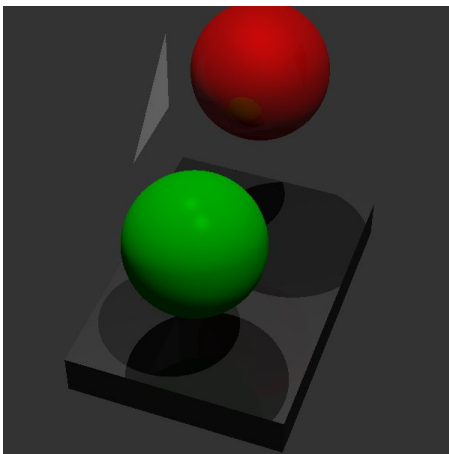
(requires one shape to be defined as root)



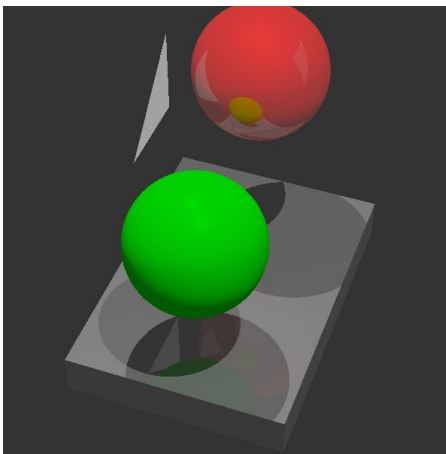
Renderer



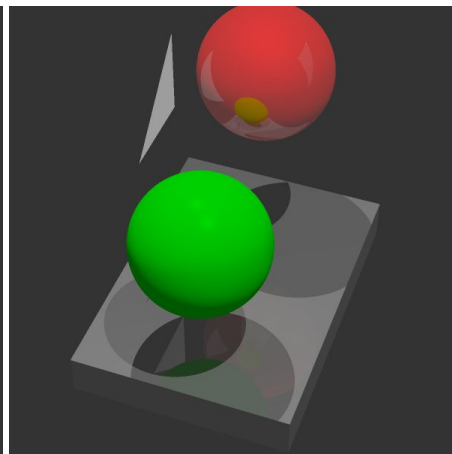
blinn phong
+ reflections



tone mapping



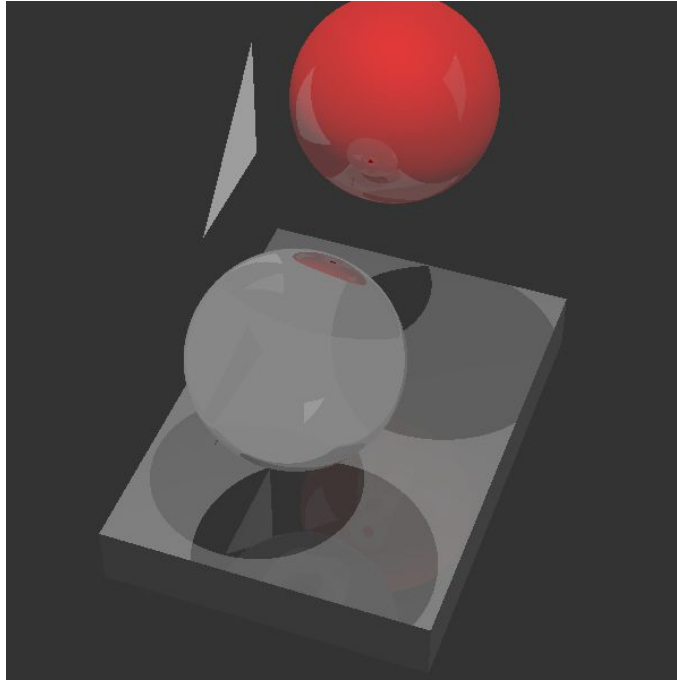
gamma correction
+ light attenuation



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
- 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)

