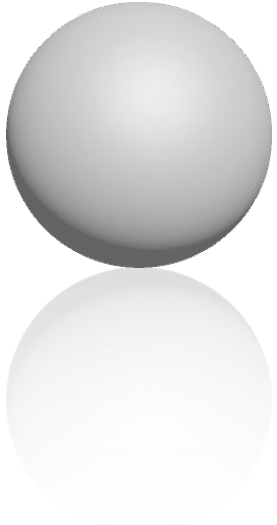
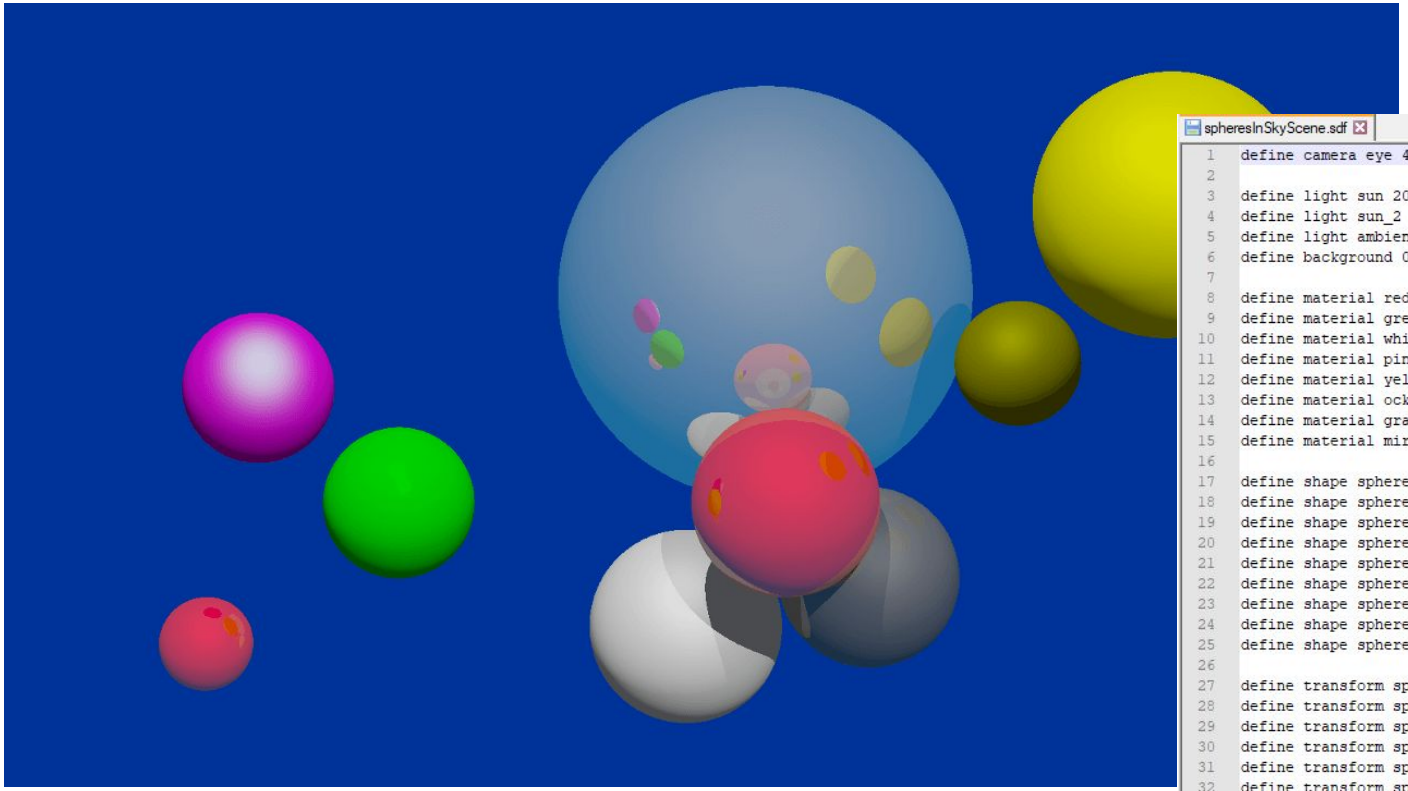


Raytracer

Mini Project

Christian Dunkel
Christian Hilpert



spheresInSkyScene.sdf

```
define camera eye 40.0 0 200 140 0 -1 -0.8 0 1 0

define light sun 200 1000 200 0.2 0.2 0.2 0.2
define light sun_2 -20 200 -40 0.2 0.2 0.2 0.2
define light ambient1 0 0.03 0.1 0.1
define background 0 0.2 .6

define material red 1 0 0 1 0 0 1 0 0 16 0.2 0 0
define material green 0 1 0 0 1 0 0 1 0 248 0 0 0
define material white 1 1 1 1 1 1 1 1 1 16 0 0 0
define material pink 1 0 1 1 0 1 0 1 1 16 0 0 0
define material yellow 1 1 0 1 1 0 1 1 0 16 0 0 0
define material ocker 0.3 0.3 0 0.3 0.3 0 0.3 0.3 0 16 0 0 0
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
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

define shape sphere sphere1 0 0 0 10 red
define shape sphere sphere2 0 0 0 8 green
define shape sphere sphere3 0 0 0 11 white
define shape sphere sphere4 0 0 0 10 gray
define shape sphere sphere5 0 0 0 25 mirror
define shape sphere sphere6 0 0 0 8 pink
define shape sphere sphere7 0 0 0 13 yellow
define shape sphere sphere8 0 0 0 7 ocker
define shape sphere sphere9 0 0 0 5 red

define transform sphere1 translate 18 7 0
define transform sphere2 translate -23 7 0
define transform sphere3 translate 8 -17 0
define transform sphere4 translate 28 -7 0
define transform sphere5 translate 18 -5 -40
define transform sphere6 translate -38 14 -10
define transform sphere7 translate 54 40 -12
define transform sphere8 translate 45 6 -20
define transform sphere9 translate -44 -5 10

define shape composite root sphere1 sphere2 sphere3 sphere4 sphere5 sphe

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

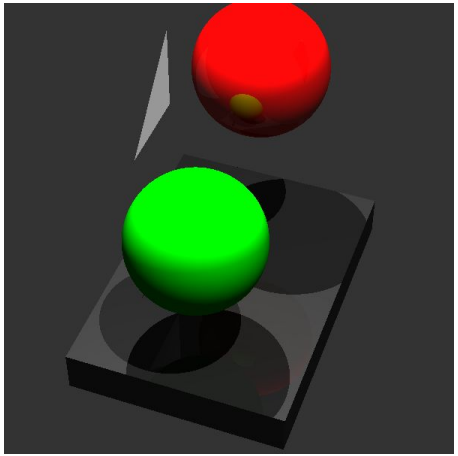
Extended SDF-Parser

define

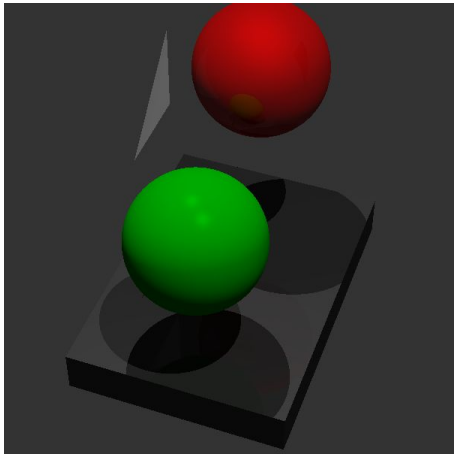
- background <color>
- camera <name> <fov> <pos> <right> <up>
- transform <shape> scale|rotate|translate <parameters>
- animation <shape> scale|rotate|translate <axes> <speed> <start frame> <last frame>
- shape composite <name> <1st shape> <2nd shape> . . . <nth shape>

  (requires one shape to be defined as root)

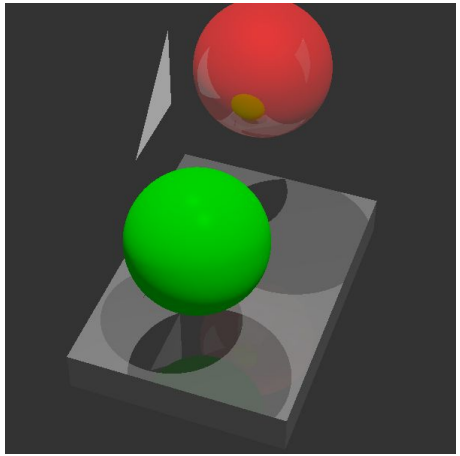
Renderer



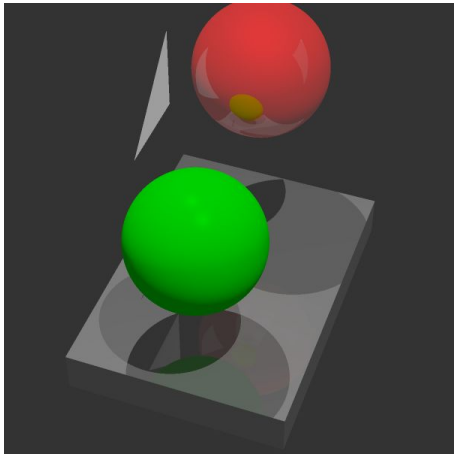
blinn phong
+ reflections



tone mapping

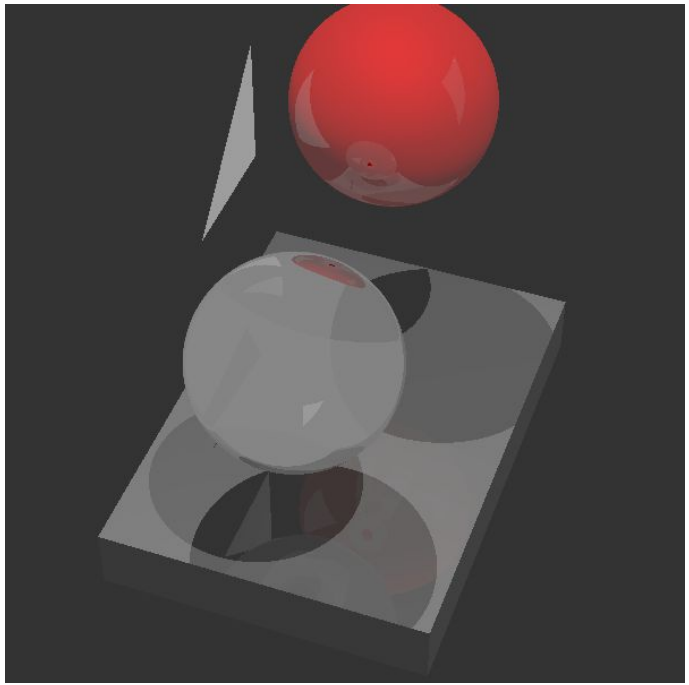


gamma correction
+ light attenuation



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
  (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)