

Programming Assignment 4

Submission

Deadline: 23:59:59, Sunday, June 16th, 2019 (KST, +0900)

- Github server clock

To submit your assignment, you **must** do two things. **Both of them must be done BEFORE deadline.**

1. You should push your commit to your assignment repo before deadline.
2. You should comment the last commit (before deadline) id (SHA-1 hash) in github issue board. (See next slide)

The last commit **BEFORE** dead line will be considered as submitted assignment.

- Github server will track this for me.
- Timestamp in your commit (local time) will be ignored. (I will use github server timestamp instead)

Commenting Commit ID 1/2

The screenshot shows the GitHub repository interface for 'test2-lazysquid'. At the top, there are navigation links for 'Code', 'Issues 1', 'Pull requests 0', 'Projects 0', 'Wiki', and 'Insights'. Below this, it says 'est2-lazysquid created by GitHub Classroom'. A box highlights the '3 commits' link. Further down, there are buttons for 'Branch: master', 'New pull request', 'Create new file', 'Upload files', 'Find File', and 'Clone or download'. The file list shows 'lazysquid commit2' as the latest commit (3 hours ago) and 'README.md' as a file committed 3 hours ago.

1. Go to your assignment repository
2. Click commits
3. Click copy button of your last commit

This screenshot shows the commit history for the repository. It is titled 'Commits on Mar 9, 2019'. There are three commits listed:

- commit2**: lazysquid committed 3 hours ago. The commit ID is `c604214`. A box highlights the copy icon next to the ID.
- commit 1**: lazysquid committed 3 hours ago. The commit ID is `ea587c0`.
- Initial commit**: lazysquid committed 3 hours ago. The commit ID is `f8b1e5d`.

Commenting Commit ID 2/2

The screenshot shows the GitHub interface for creating a new issue. At the top, the navigation bar includes 'Code', 'Issues 1', 'Pull requests 0', 'Projects 0', 'Wiki', and 'Insights'. Below this, there are filter options: 'Filters' with a search bar containing 'is:issue is:open', 'Labels 8', and 'Milestones 0'. A green 'New issue' button is highlighted with an orange box. The main content area shows a 'Submit' button, a 'Write' tab, and a rich text editor. The commit ID 'c604214f6caaef9e22827010783d7716109a5fd8' is pasted into the text area and highlighted with an orange box. A 'Submit new issue' button is highlighted with an orange box at the bottom right.

1. Go to issue tab
2. Click "new issue"
3. Paste your latest commit id (Ctrl-v)
4. Click "submit new issue"

Policy

In the following cases, your grade for this PA will be 0

- Late submission (Late push before deadline or Late last commit id comment on issue board)
- Build/execution failure
- Making public of your assignment repository
- If you tried to push your commit with force option(Tried to change history of remote server)

Your final grade will be "F"

- Copy

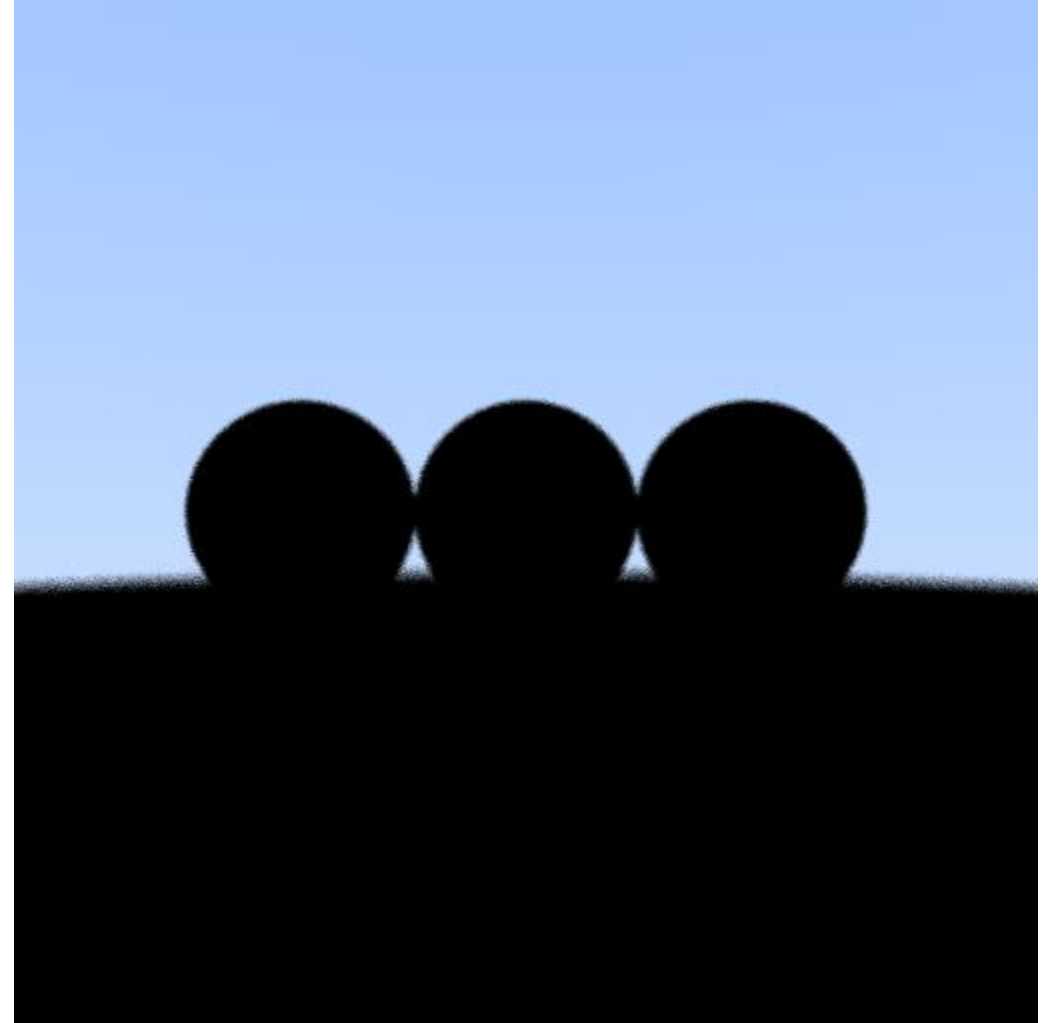
Task Lists

1. Materials (10 Points)
 - Lambertian, Metal, Dielectric, Area light(Emissive material)
 - Implement **scatter** function in each material class
2. Antialiasing (5 Points)
3. Indirect lighting (5 Points)
 - Multiple bounces, depth > 10
4. Direct light sampling (5 Points)
5. Defocus blur (5 Points)
6. Report (10 Points)
 - For this time, you need to write detailed report.
 - Add teaser image whenever you add new features(e.g. complete your task) and explain about it

Initial Appearance

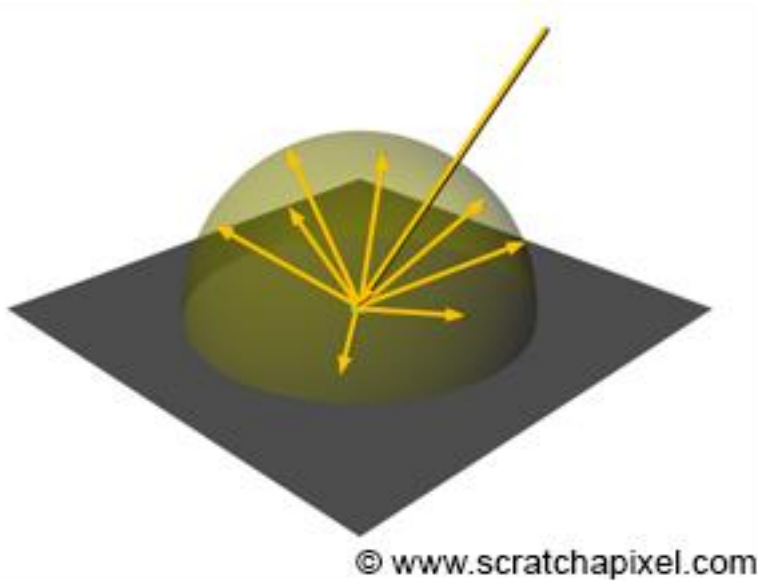
What you are going to see is...

Unlike OpenGL project the result will be png file.

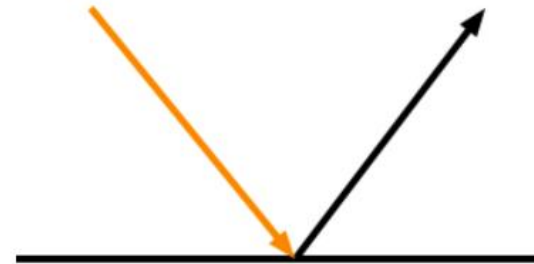


Material

See **scatter** method in each material class

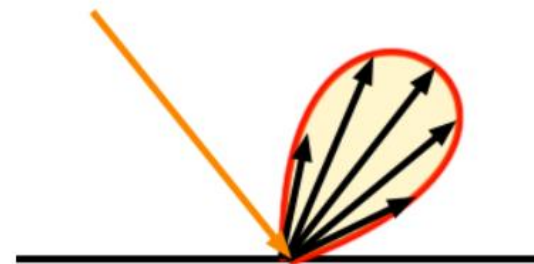


Lambertian



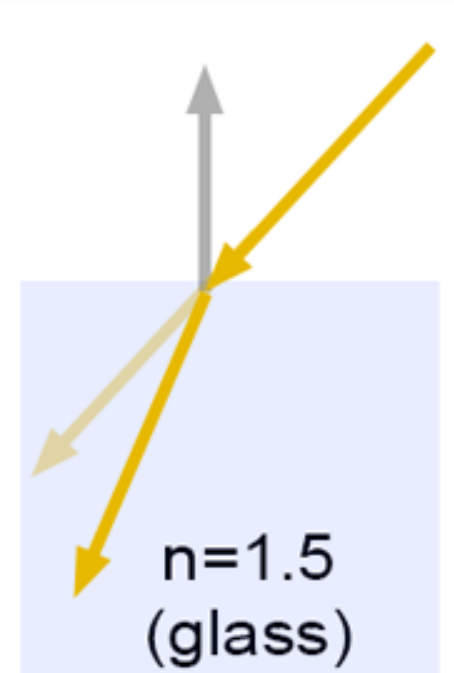
mirror reflection

Mirror



specular reflection

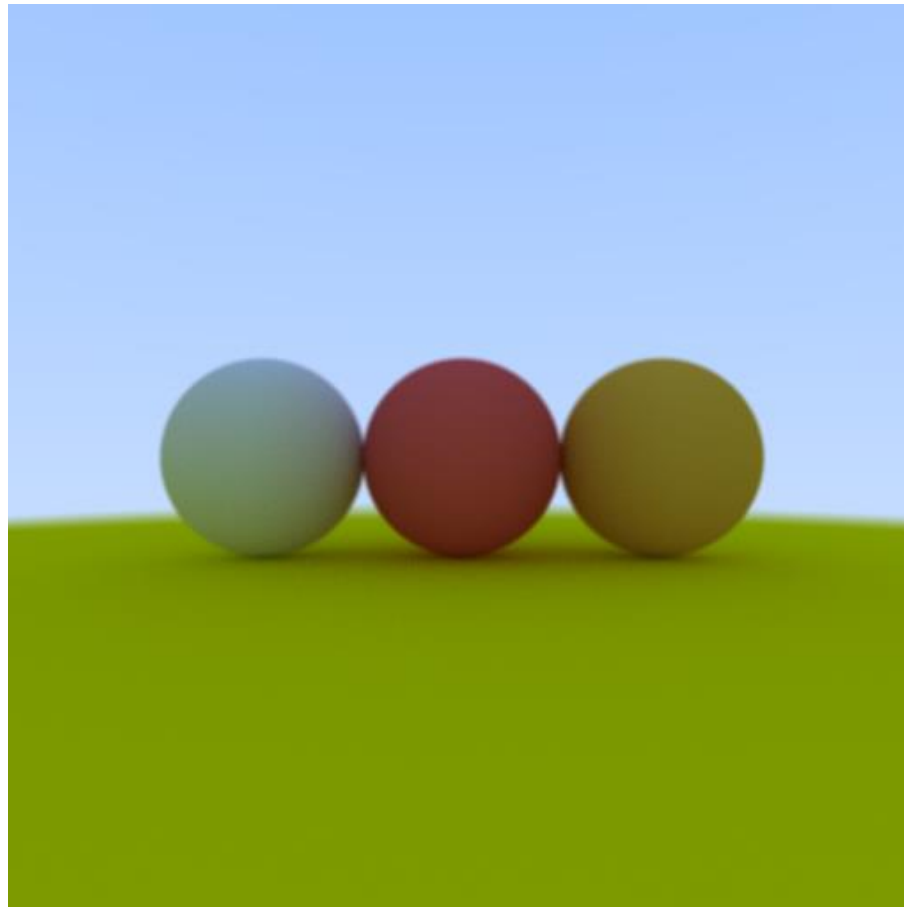
Metal(Mirror reflection with some randomness)



Dielectric

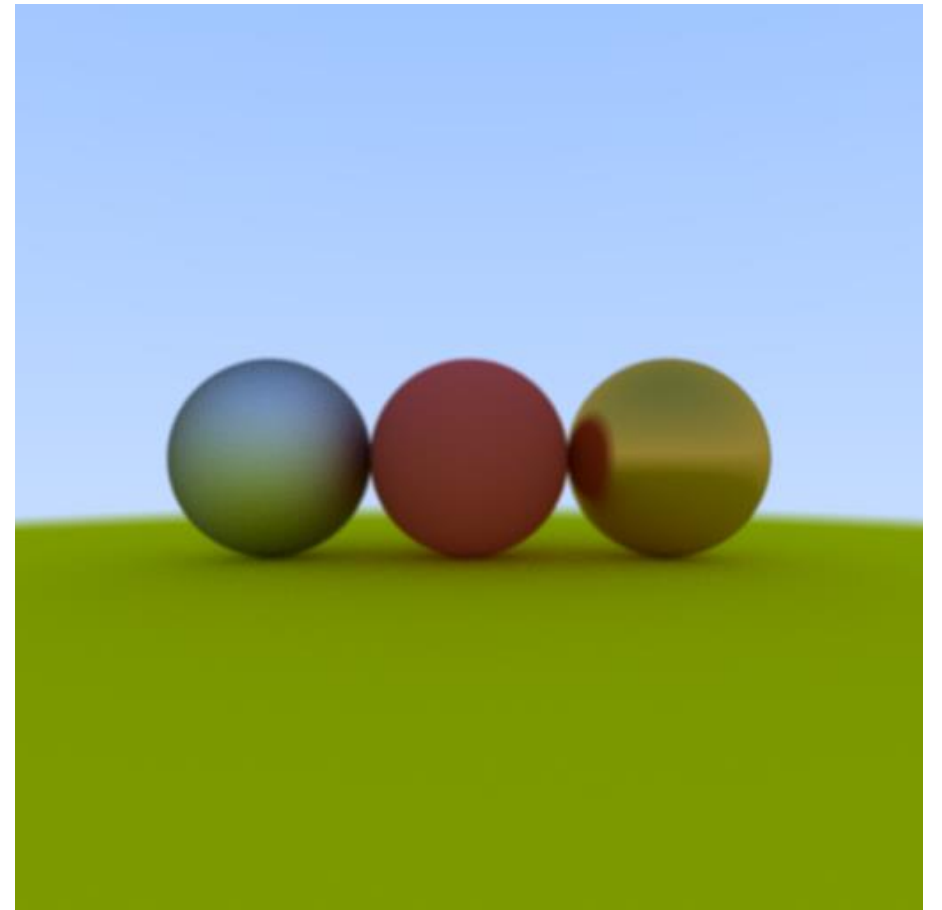
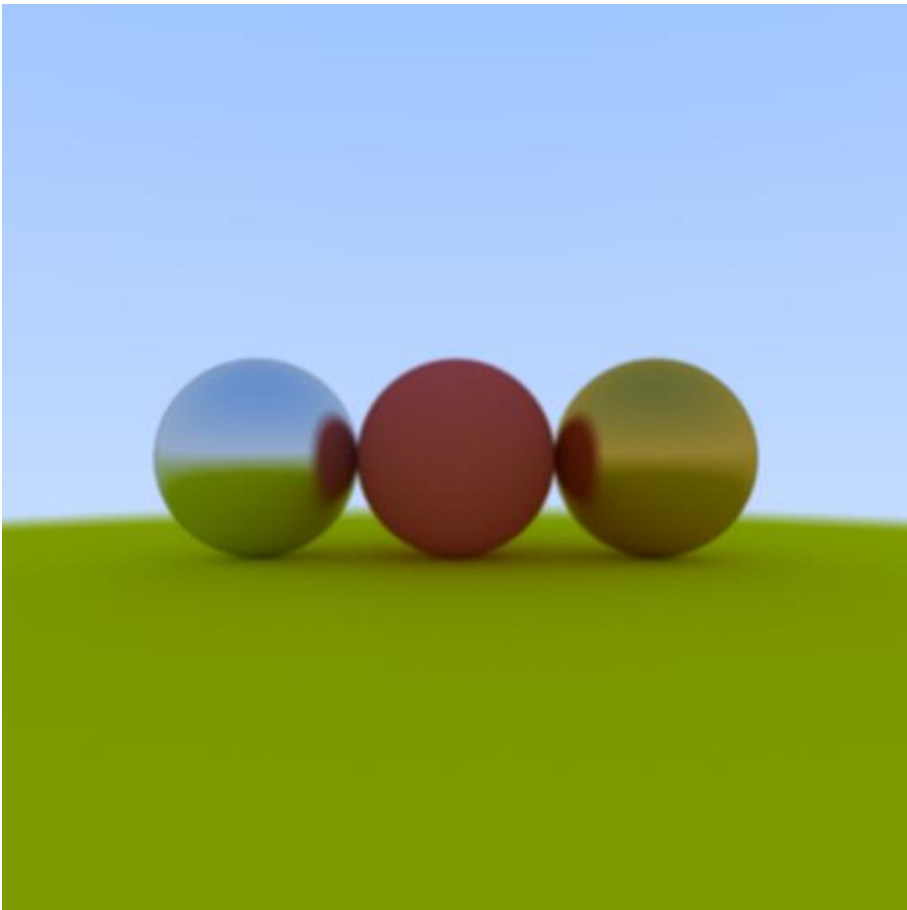
Material

After implement lambertian you are going to see...



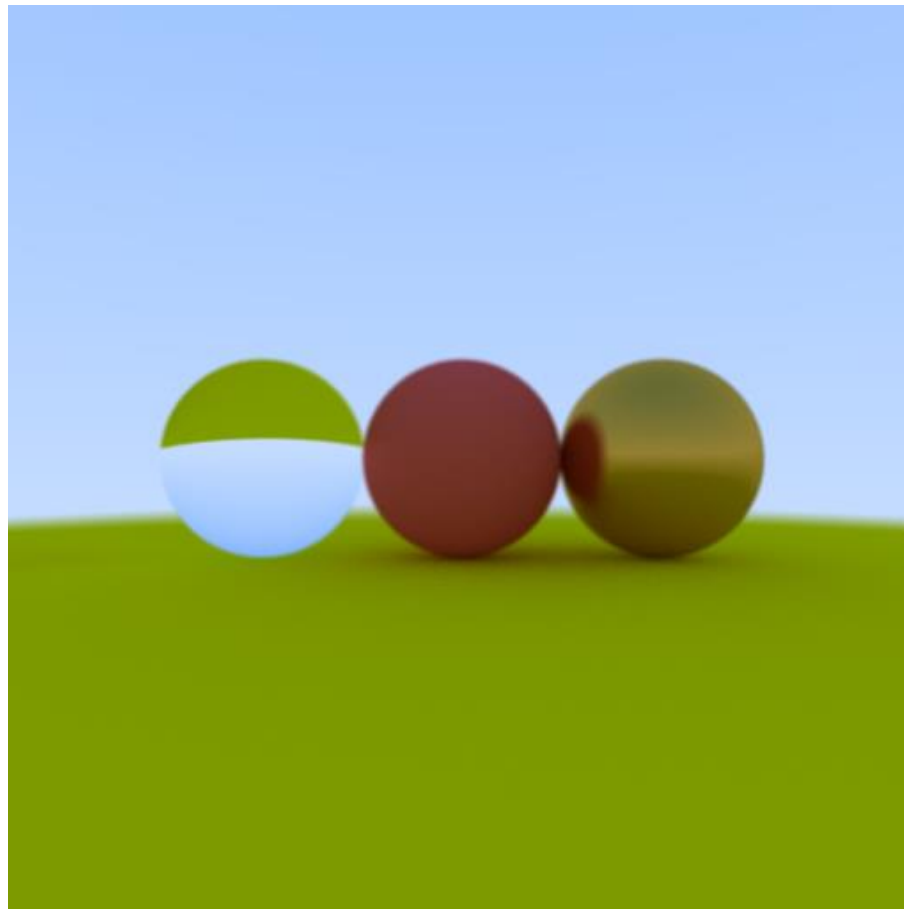
Material

Perfect mirror vs metal (mirror with randomness)



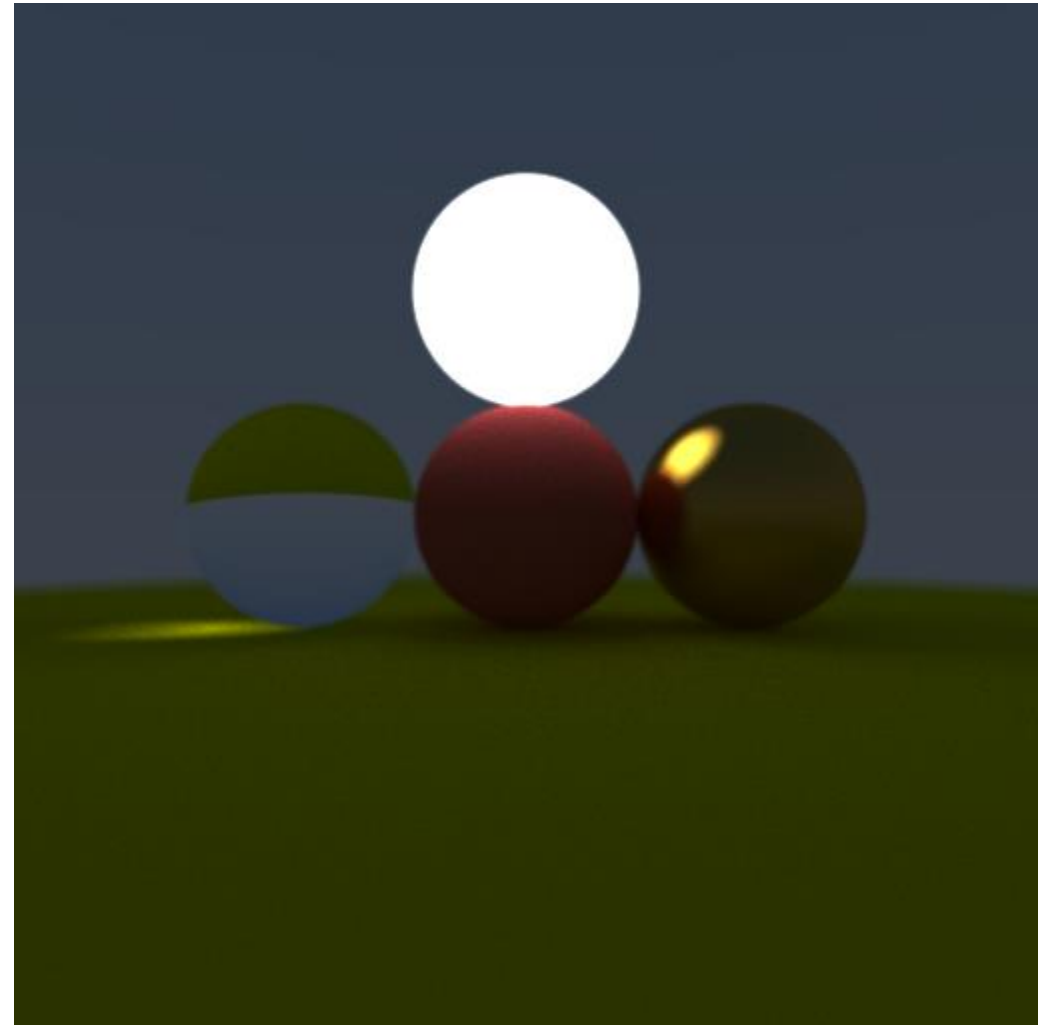
Material

After implement dielectric material you are going to see...



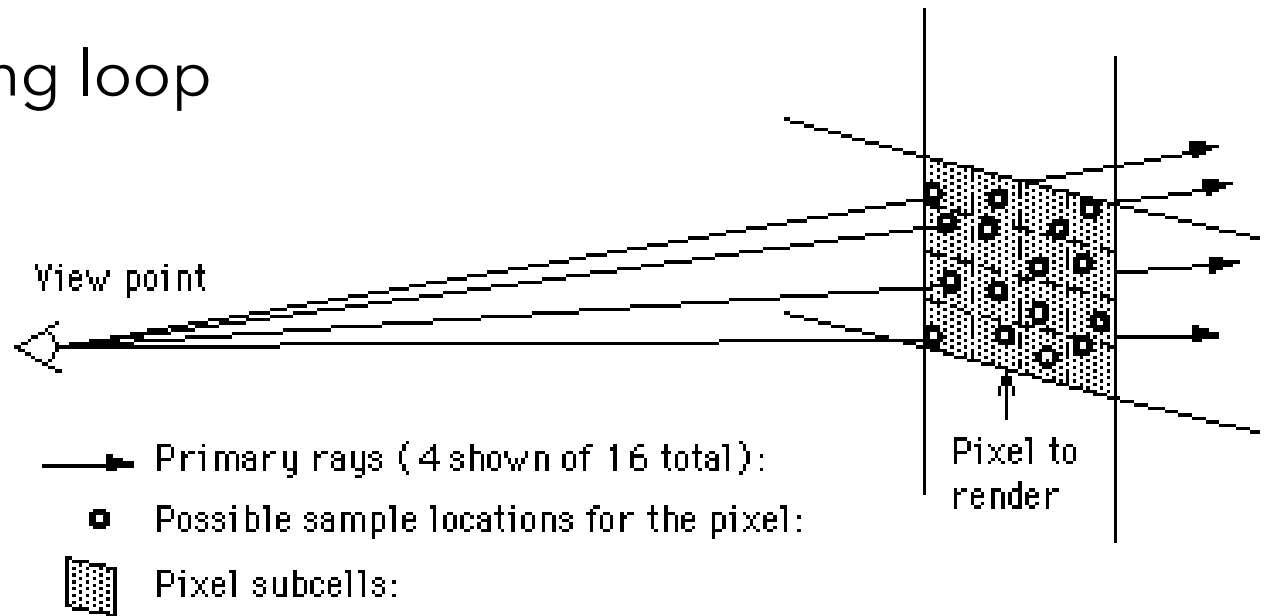
Material

- Light ball
- Perfect glass ball
- Perfect diffuse ball
- Glossy metal



Antialiasing

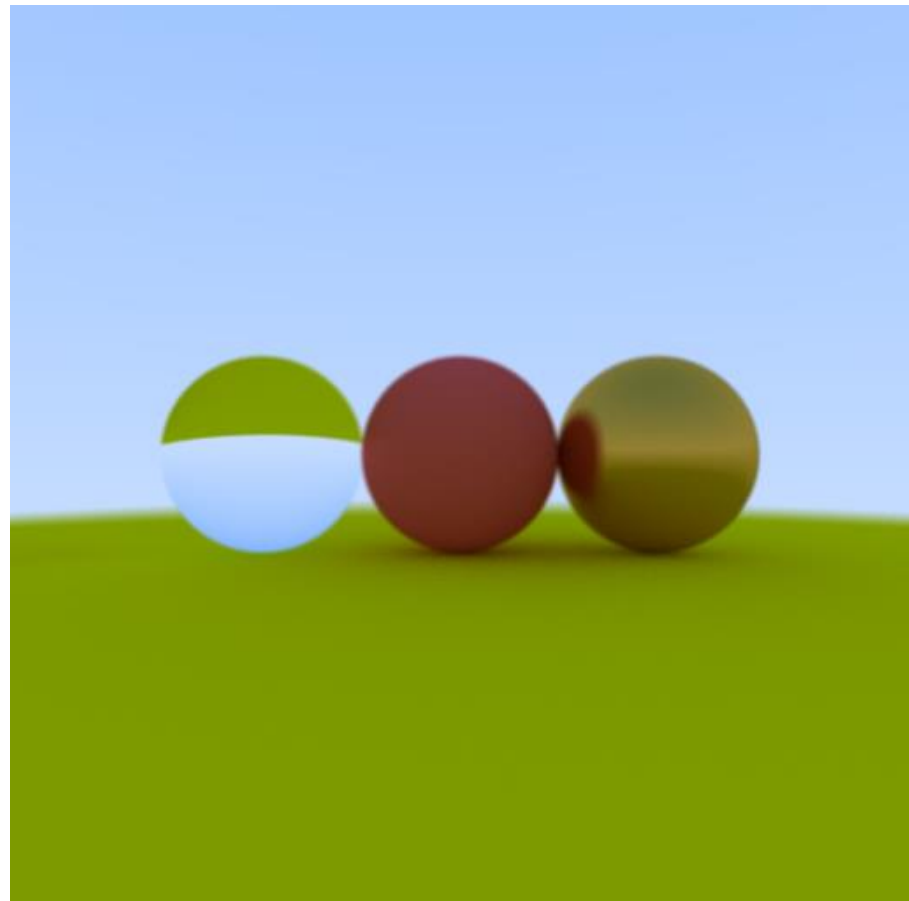
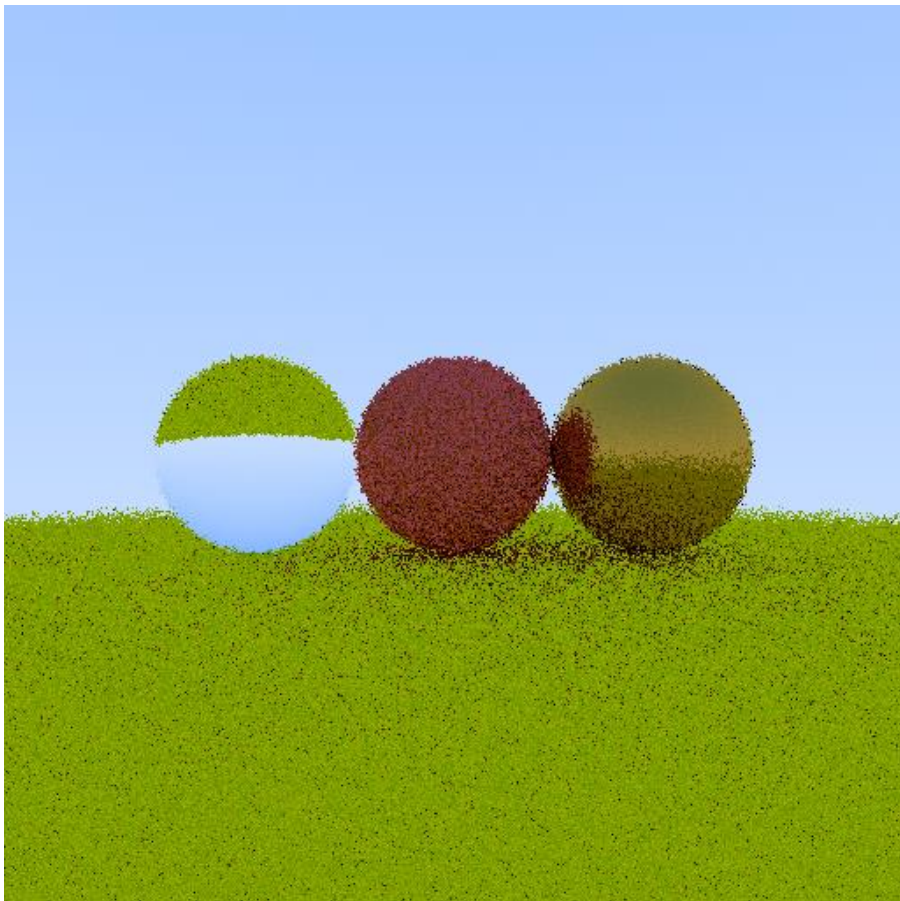
- Shoot multiple rays per pixel
- Final color will be average of those ray colors
- You can control this in rendering loop which is in main function.



<http://www.cs.montana.edu/~halla/cs525/intro.html>

Antialiasing

1 spp vs 1024 spp



Indirect Lighting

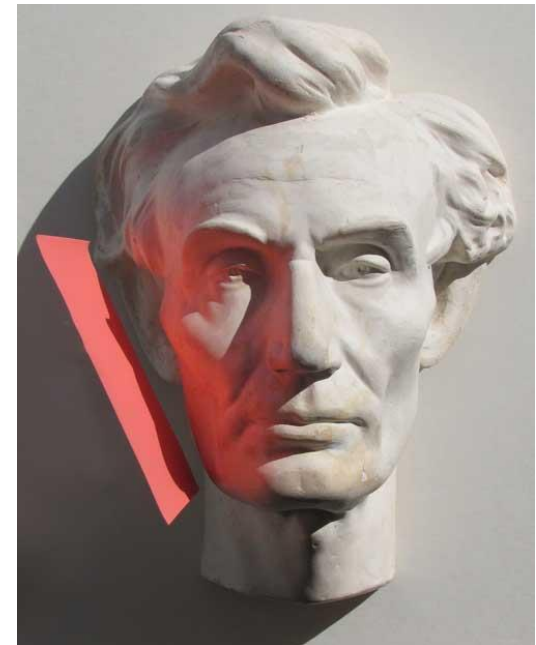
Simulate multiple bounce of light.

You can see color bleeding(Diffusive interreflections) after this!

See **integrate** method in **integrator** class to control this behavior



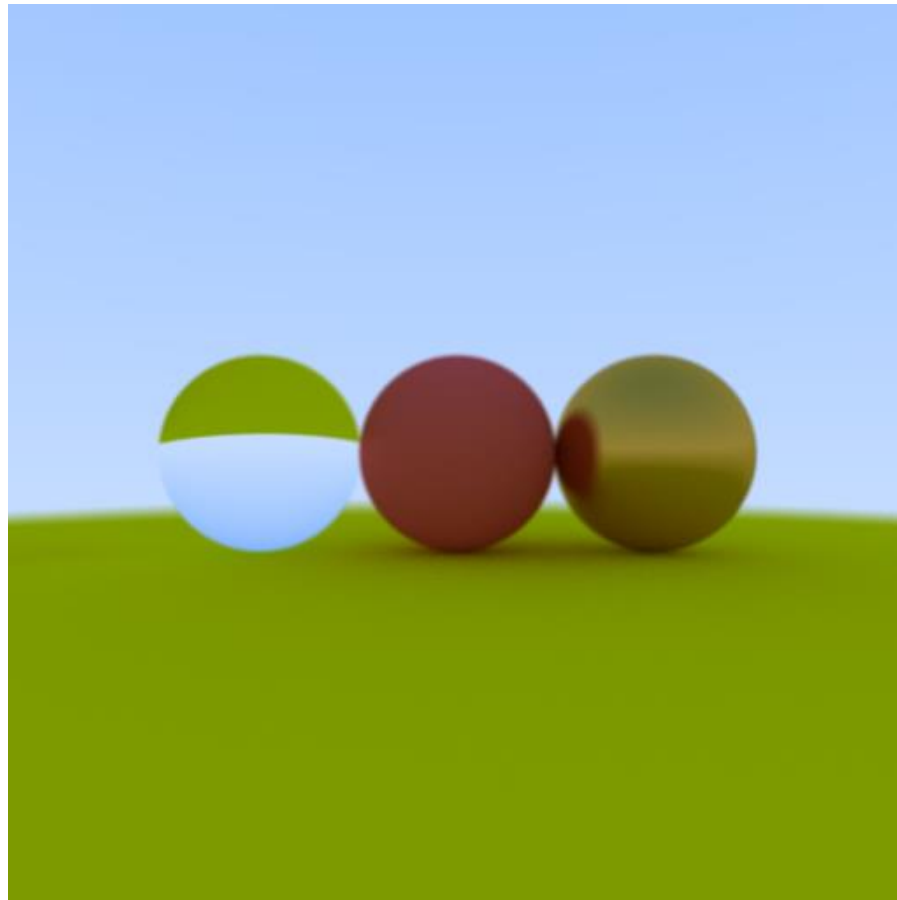
<https://www.pinterest.co.kr/pin/362117626263103458/>



<http://gurneyjourney.blogspot.com/2010/05/color-bleeding.html>

Indirect Lighting

See red color bleeding under the red sphere

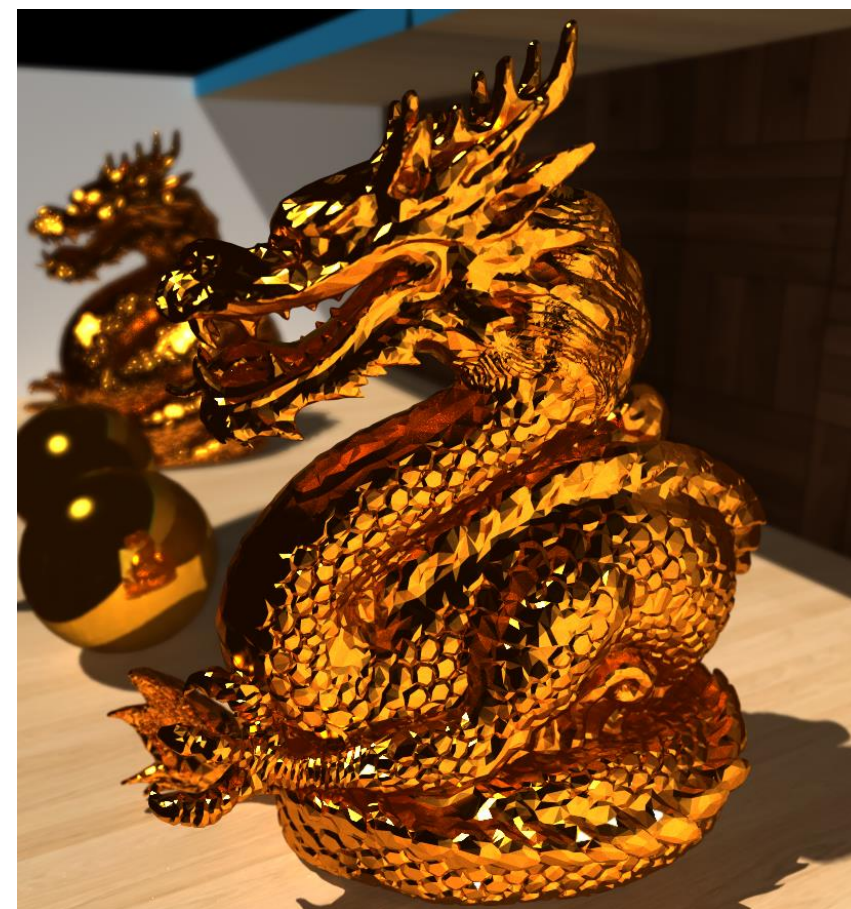
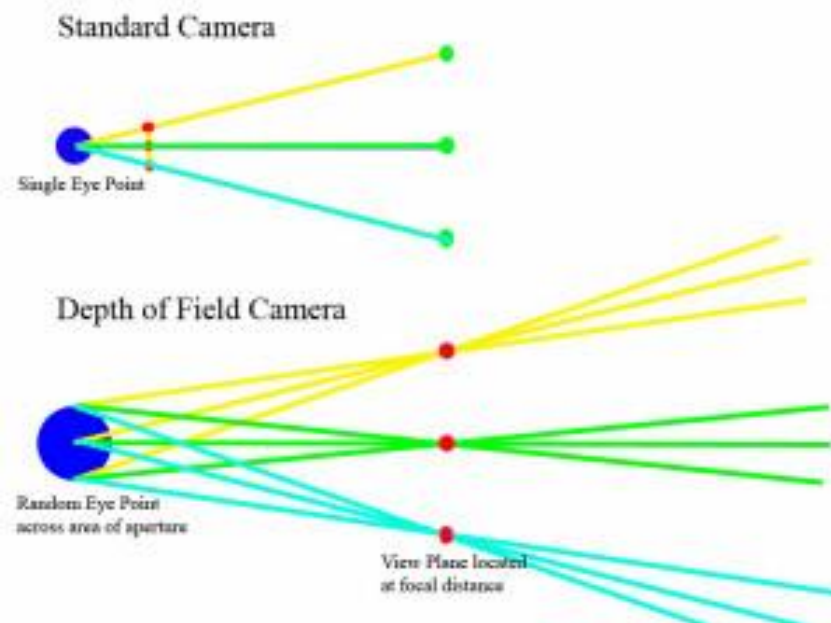


Defocus Blur

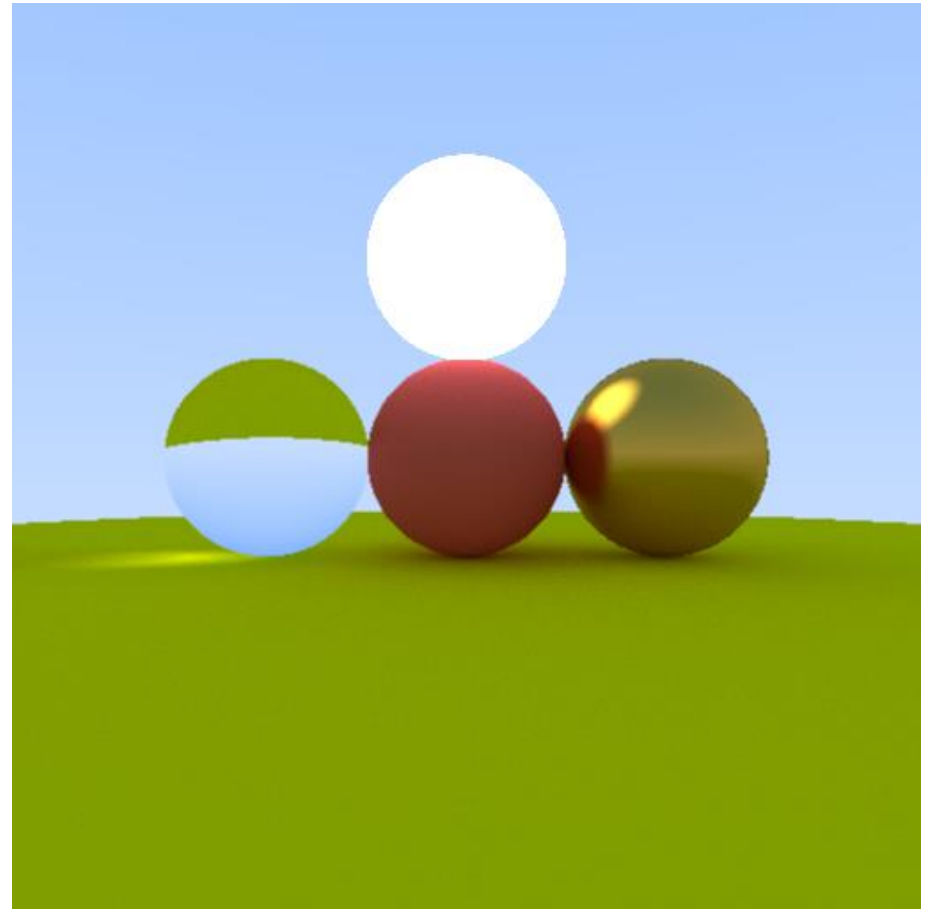
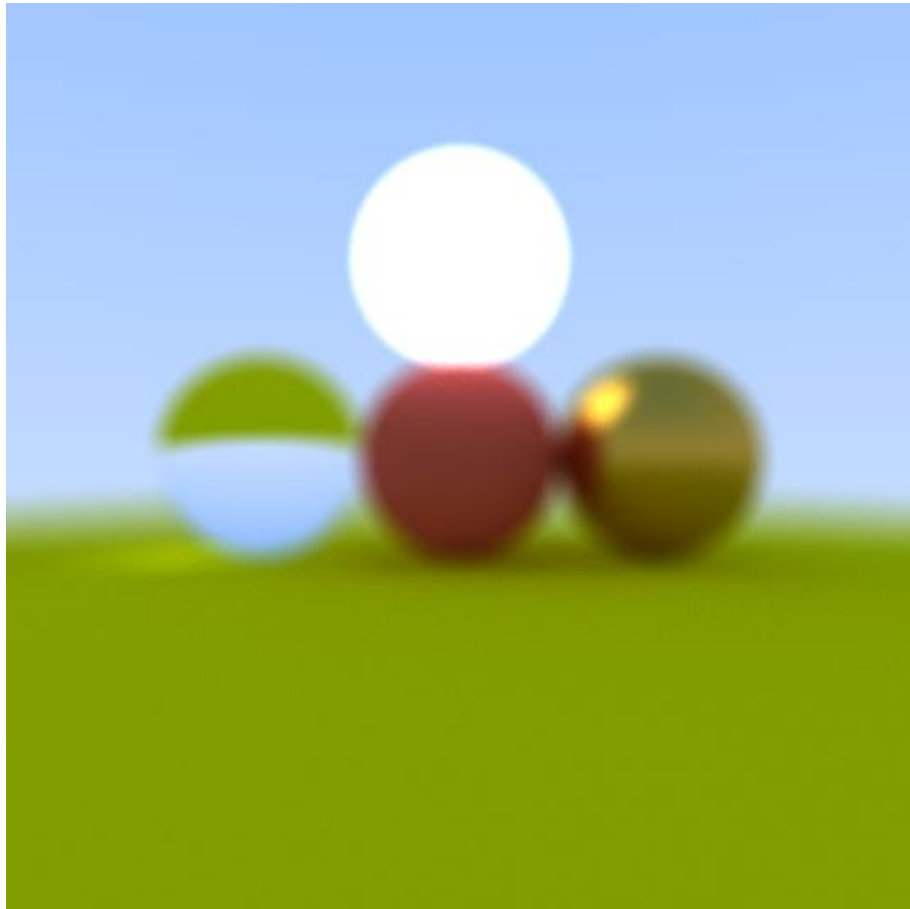
A.K.A Out focusing == Simulating lens effect

Generate random 2d point and add to ray origin.

See **camera** class to implement this

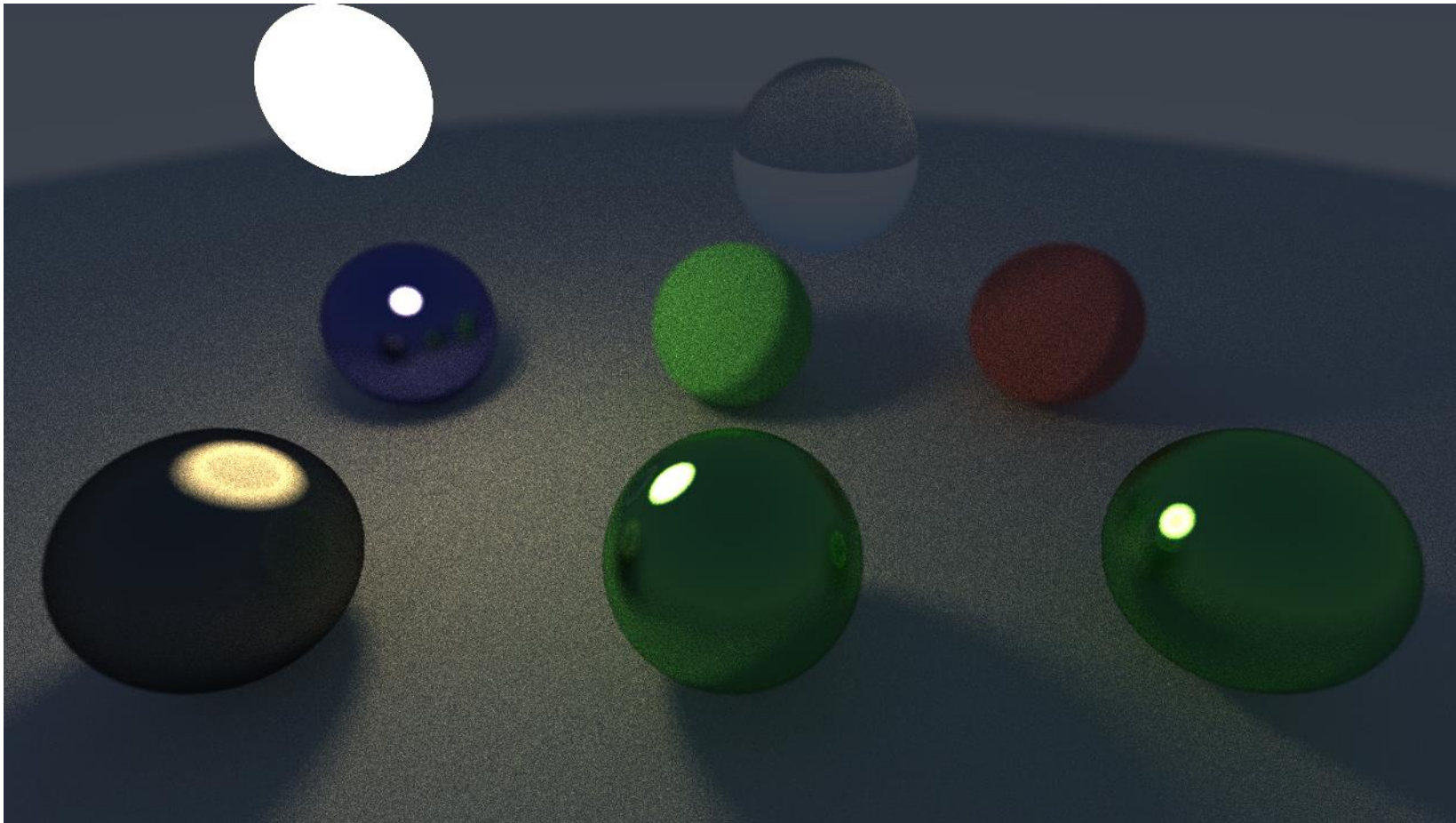


Defocus Blur



Direct Light Sampling

You can remove these noises if you are using direct light sampling



PA4 Link

1. Login to github
2. Go to following link -https://classroom.github.com/a/ydim_3R7
3. Accept the assignment