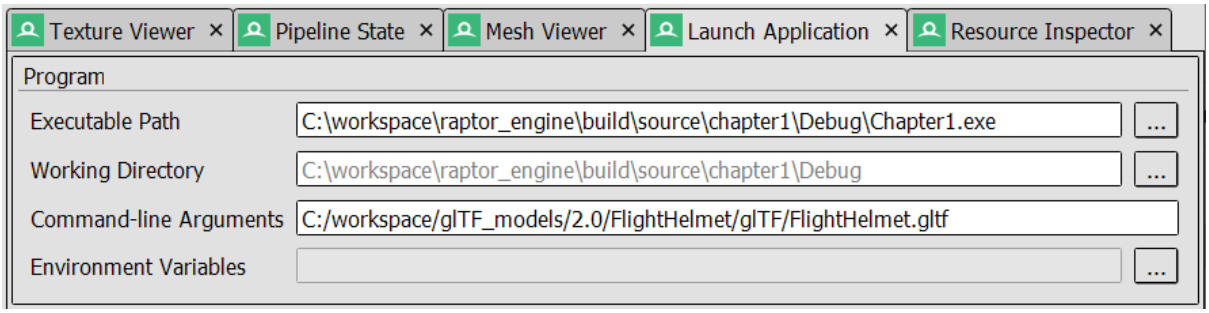
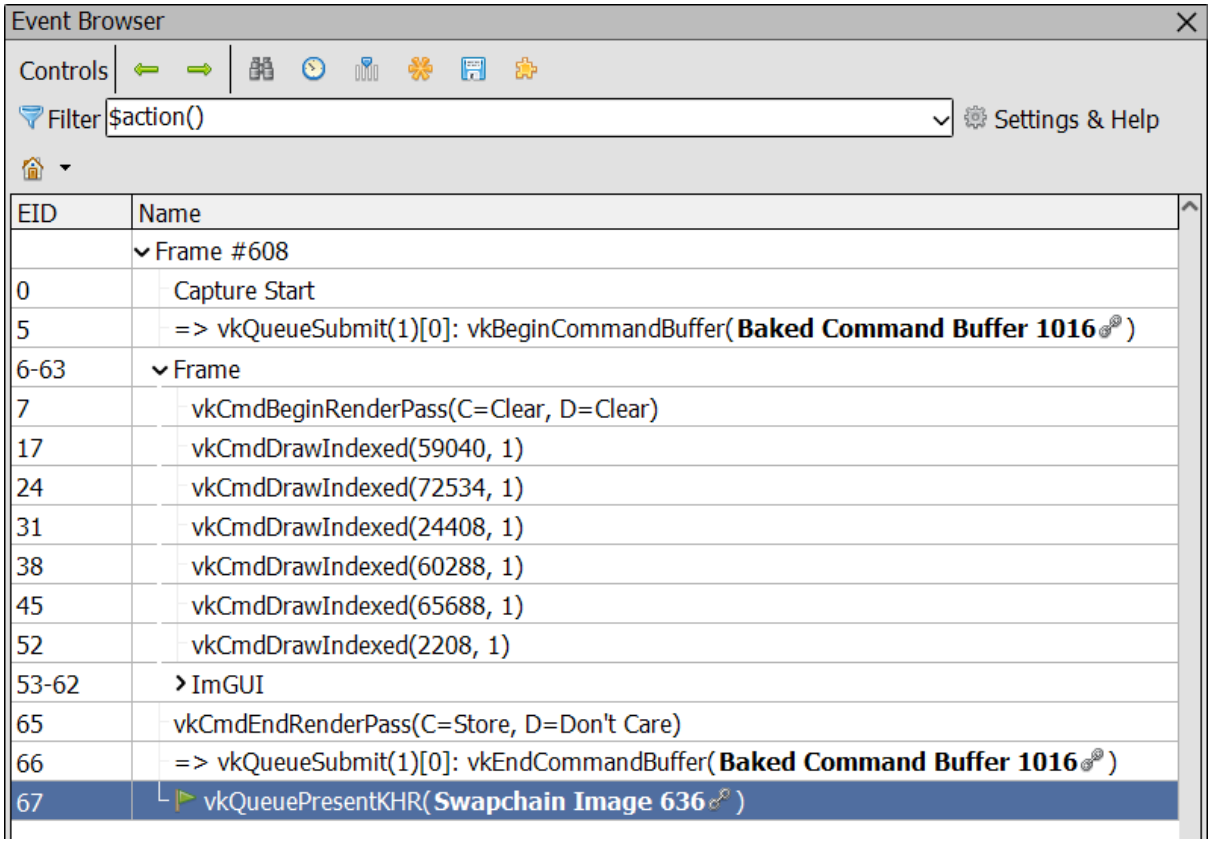
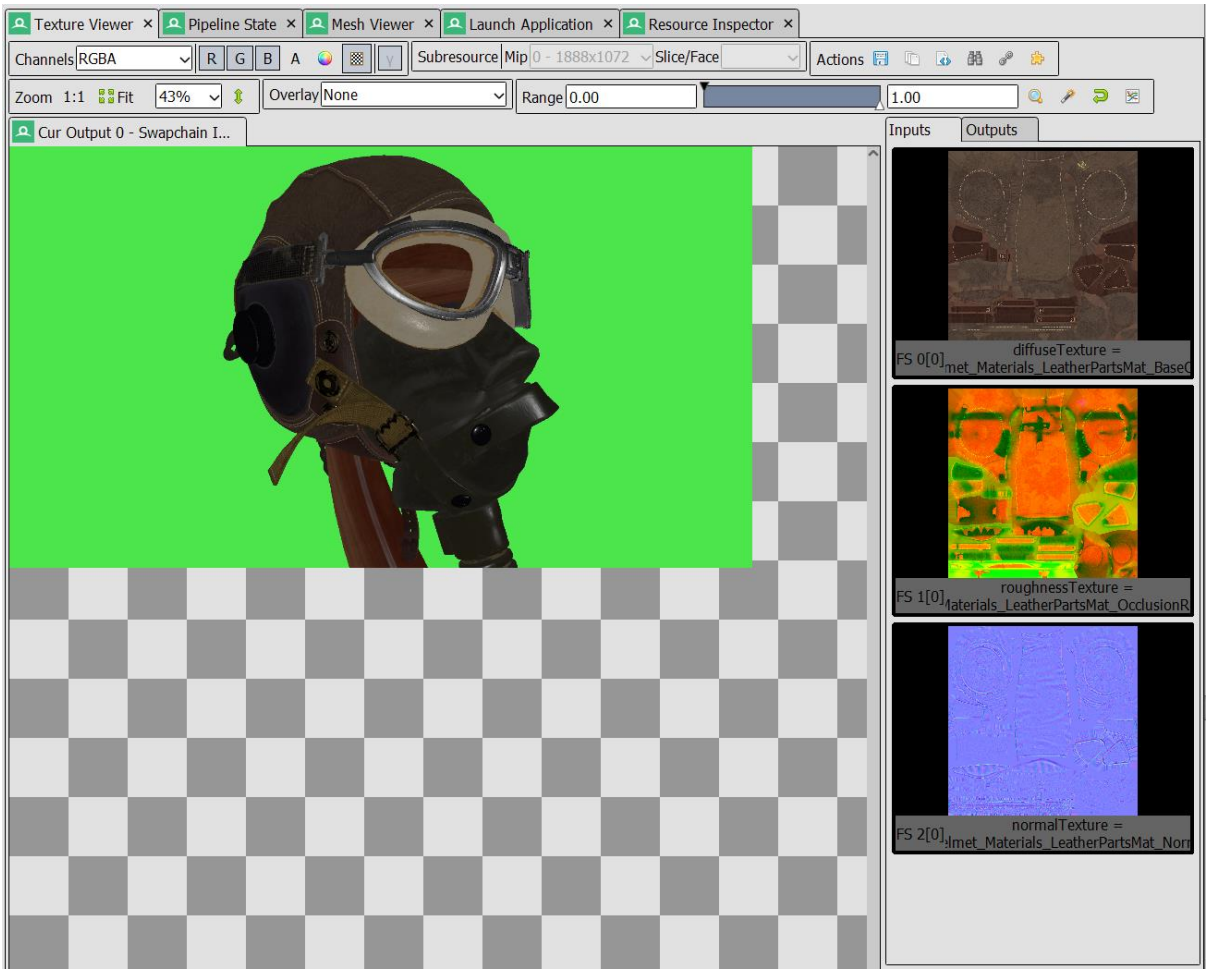
Chapter 01: Introducing the Raptor Engine and Hydra



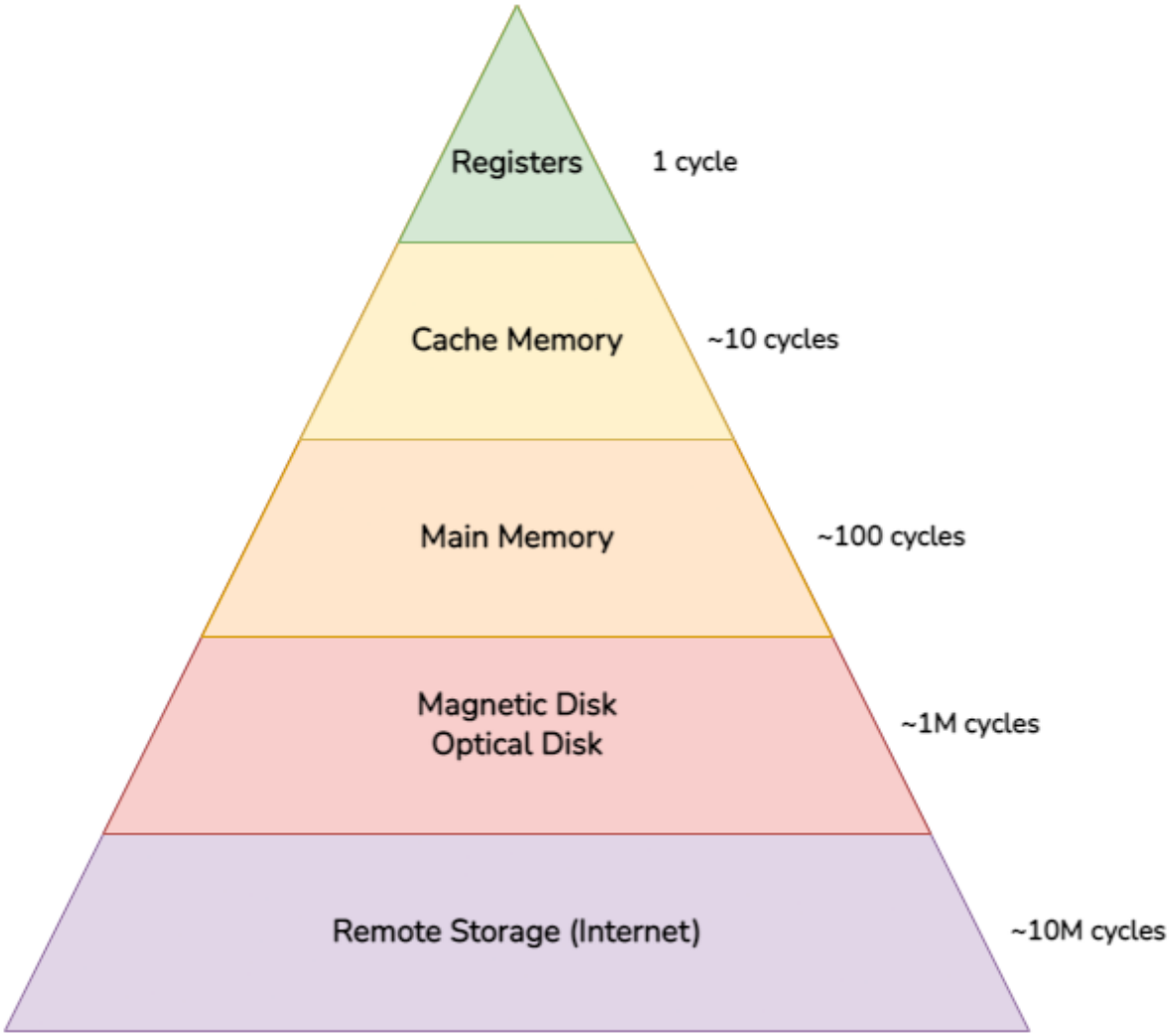

Event Browser
Controls
Filter
$action()
Settings & Help
EID
Name
Frame #608
0
Capture Start
5
=> vkQueueSubmit(1)[0]: vkBeginCommandBuffer(Baked Command Buffer 1016)
6-63
Frame
7
vkCmdBeginRenderPass(C=Clear, D=Clear)
17
vkCmdDrawIndexed(59040, 1)
24
vkCmdDrawIndexed(72534, 1)
31
vkCmdDrawIndexed(24408, 1)
38
vkCmdDrawIndexed(60288, 1)
45
vkCmdDrawIndexed(65688, 1)
52
vkCmdDrawIndexed(2208, 1)
53-62
ImGUI
65
vkCmdEndRenderPass(C=Store, D=Don't Care)
66
=> vkQueueSubmit(1)[0]: vkEndCommandBuffer(Baked Command Buffer 1016)
67
vkQueuePresentKHR(Swapchain Image 636)


Texture Viewer
Pipeline State
Mesh Viewer
Launch Application
Resource Inspector
Channels RGBA
R G B A
Subresource Mip 0 - 1888x1072 Slice/Face
Actions
Zoom 1:1 Fit 43%
Overlay None
Range 0.00
1.00
Cur Output 0 - Swapchain I...
Inputs
Outputs
diffuseTexture =
FS 0[0]
roughnessTexture =
FS 1[0]
normalTexture =
FS 2[0]

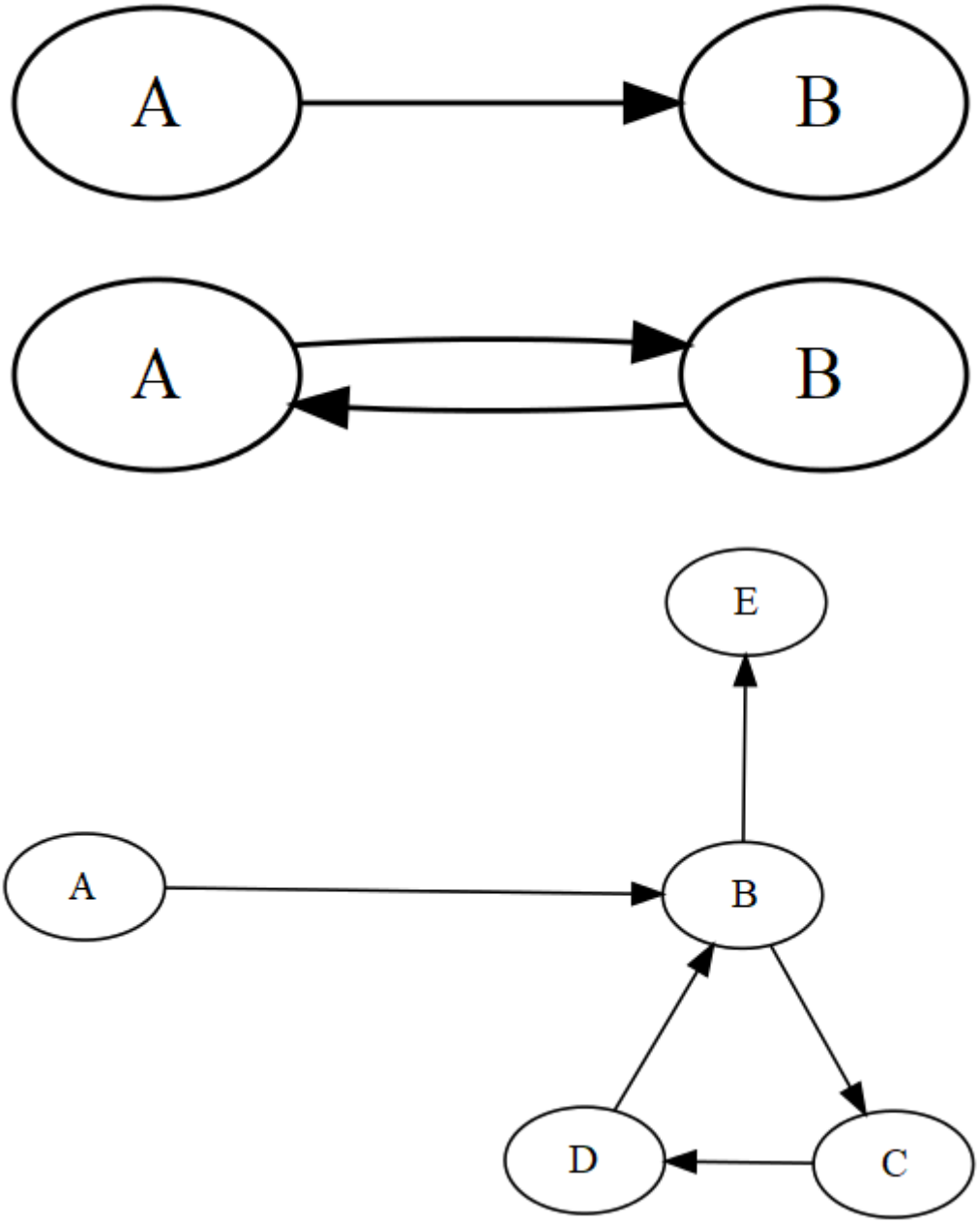
Chapter 02: Improving Resources Management

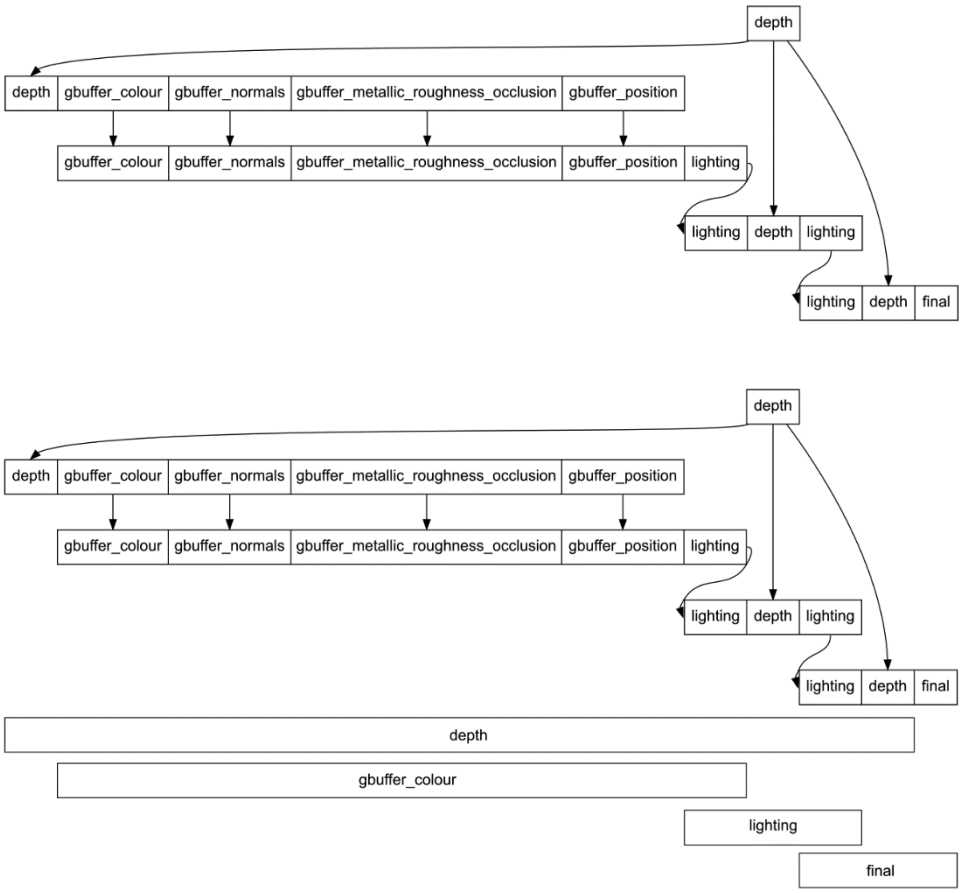
No-images…

Chapter 03: Unlocking Multi-Threading



Chapter 04: Implementing a Frame Graph

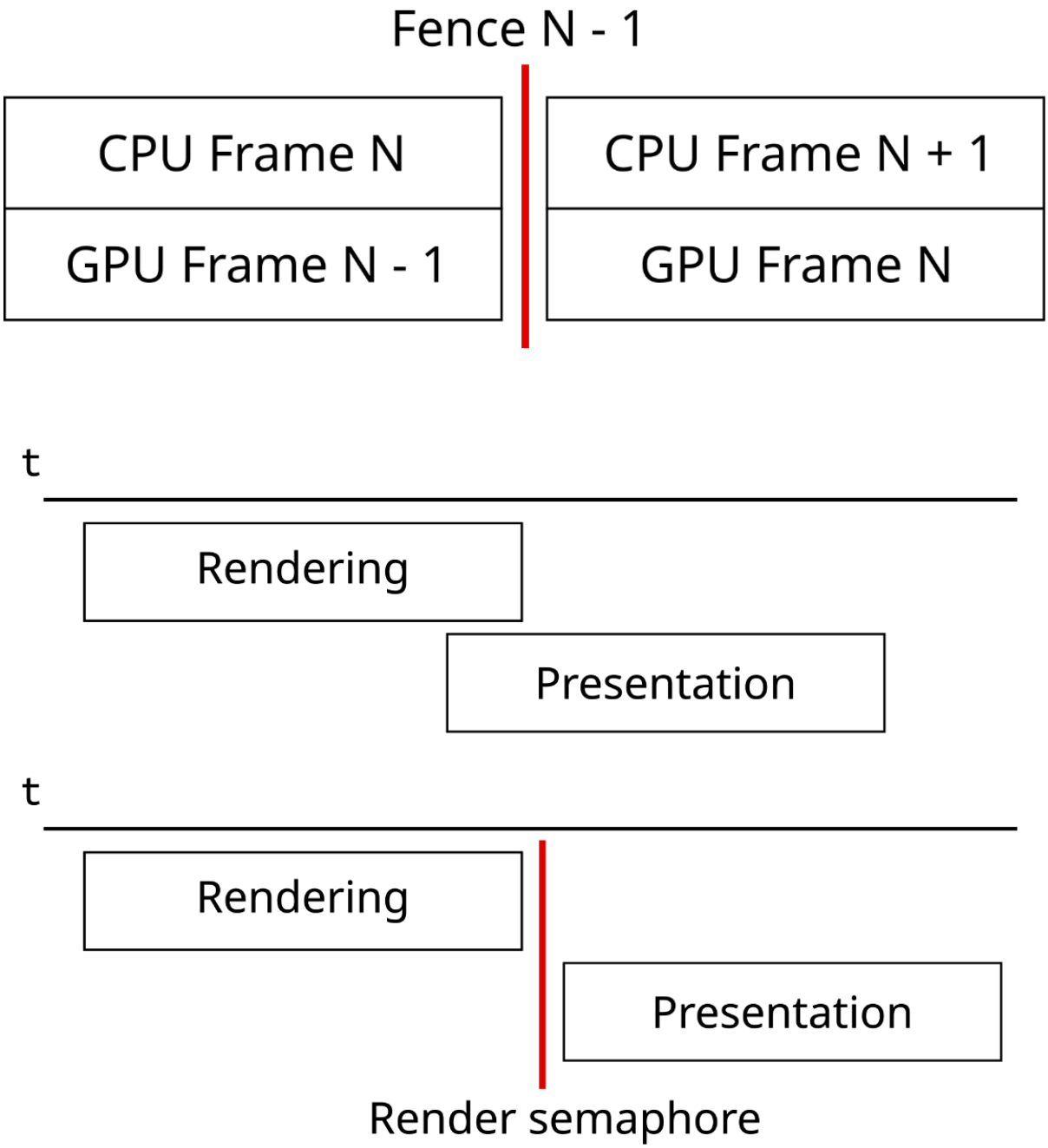


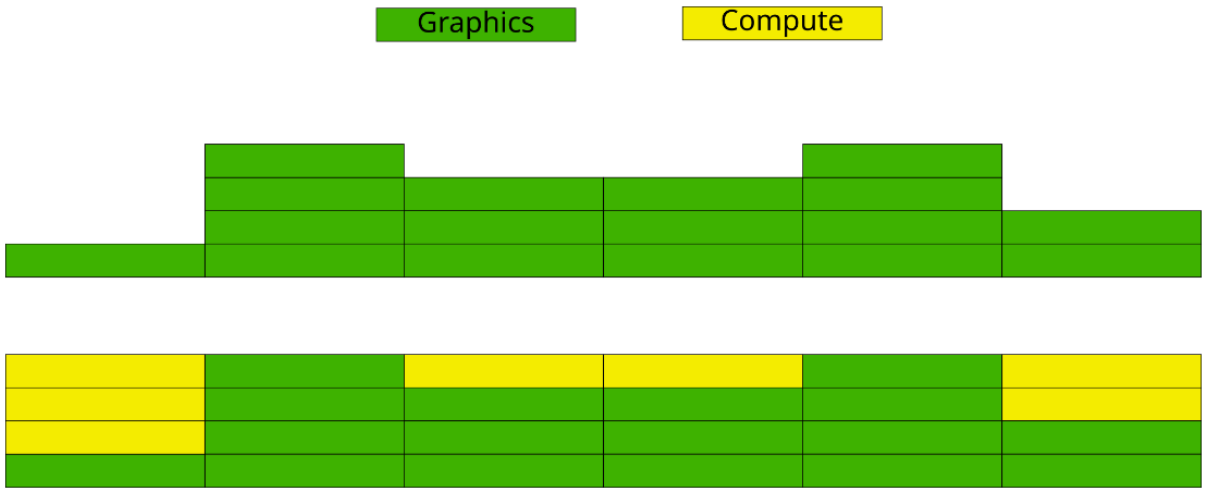

depth
depth
gbuffer_colour
gbuffer_normals
gbuffer_metallic_roughness_occlusion
gbuffer_position
gbuffer_colour
gbuffer_normals
gbuffer_metallic_roughness_occlusion
gbuffer_position
lighting
lighting
depth
lighting
lighting
depth
final

depth
depth
gbuffer_colour
gbuffer_normals
gbuffer_metallic_roughness_occlusion
gbuffer_position
gbuffer_colour
gbuffer_normals
gbuffer_metallic_roughness_occlusion
gbuffer_position
lighting
lighting
depth
lighting
lighting
depth
final

depth
gbuffer_colour
lighting
final

Chapter 05: Unlocking Async Compute

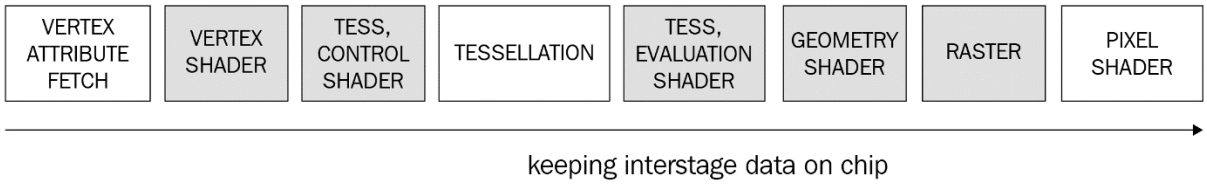



Graphics
Compute

Chapter 06: GPU-Driven Rendering

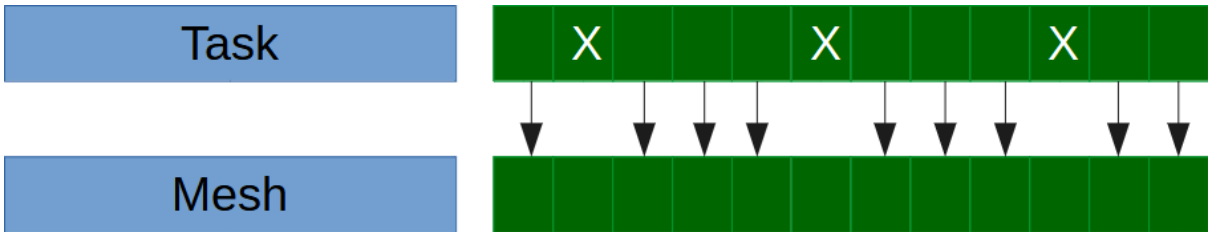
MESHLETS

TRADITIONAL PIPELINE

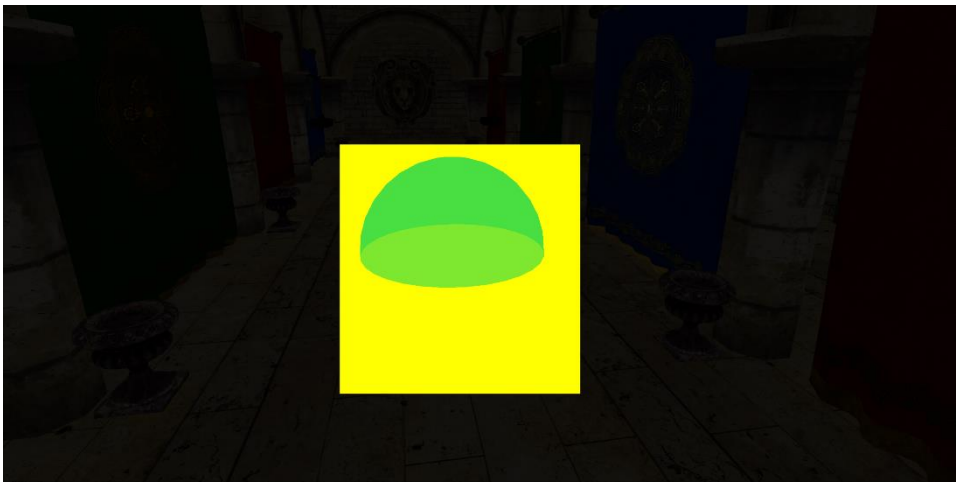


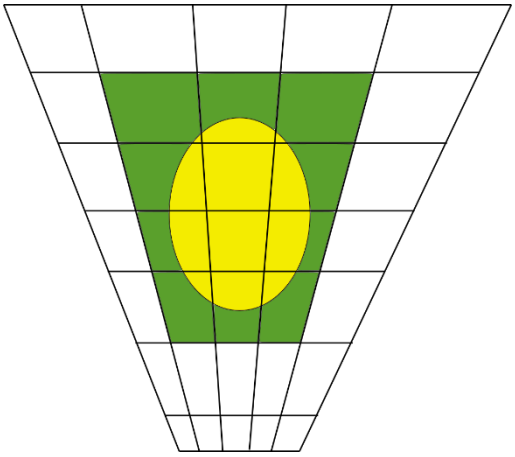
keeping interstage data on chip

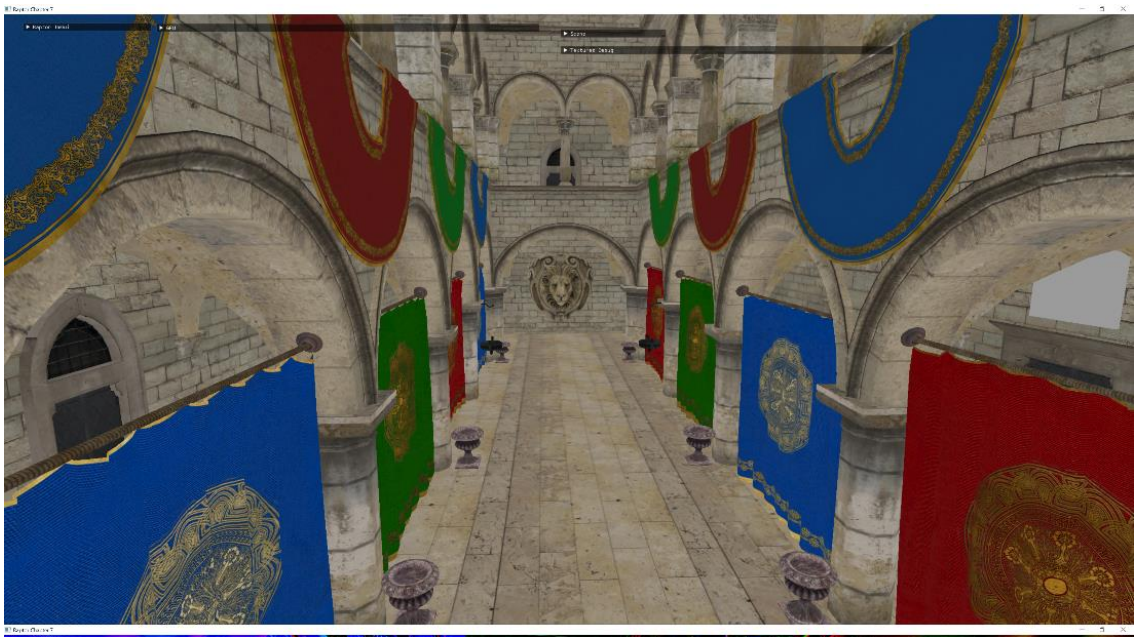
TASK / MESH PIPELINE

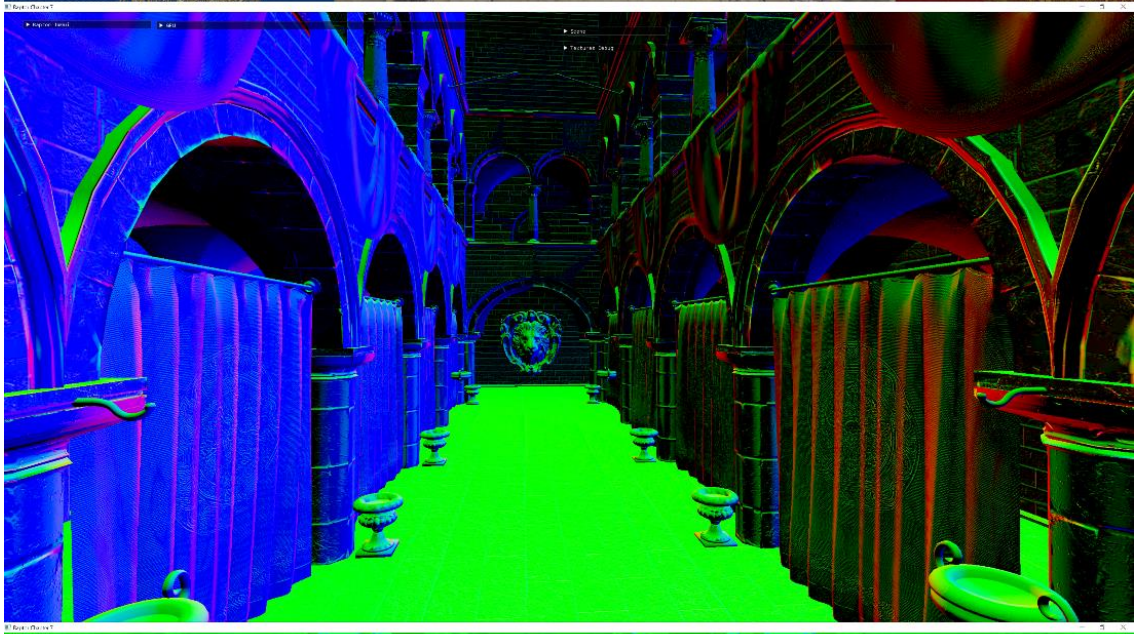


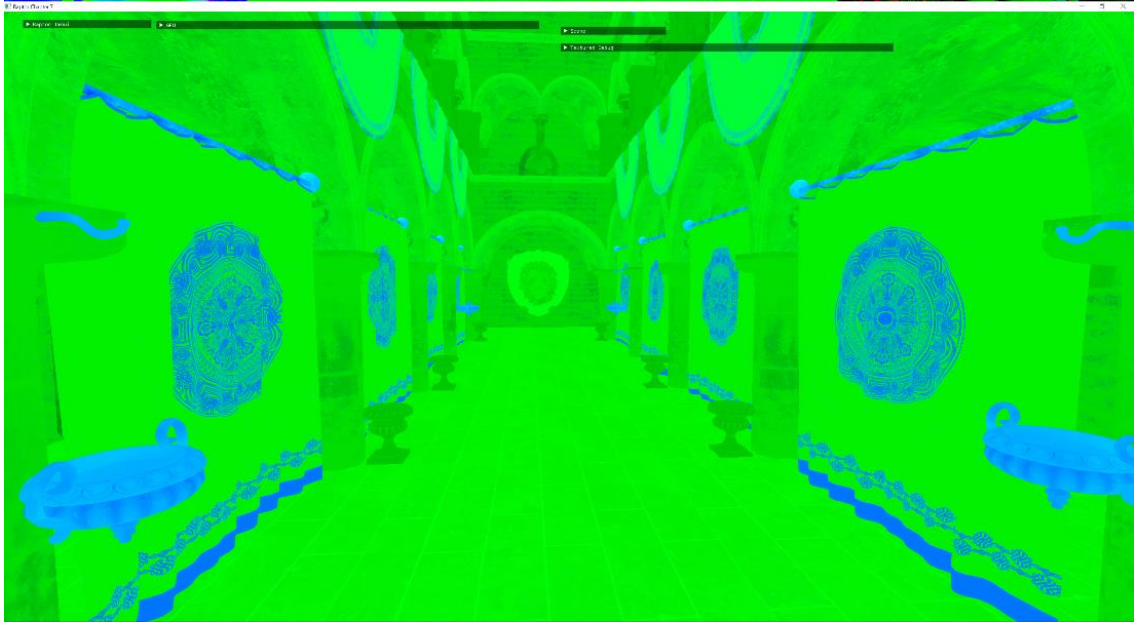
Chapter 07: Rendering Many Lights with Clustered Deferred Rendering









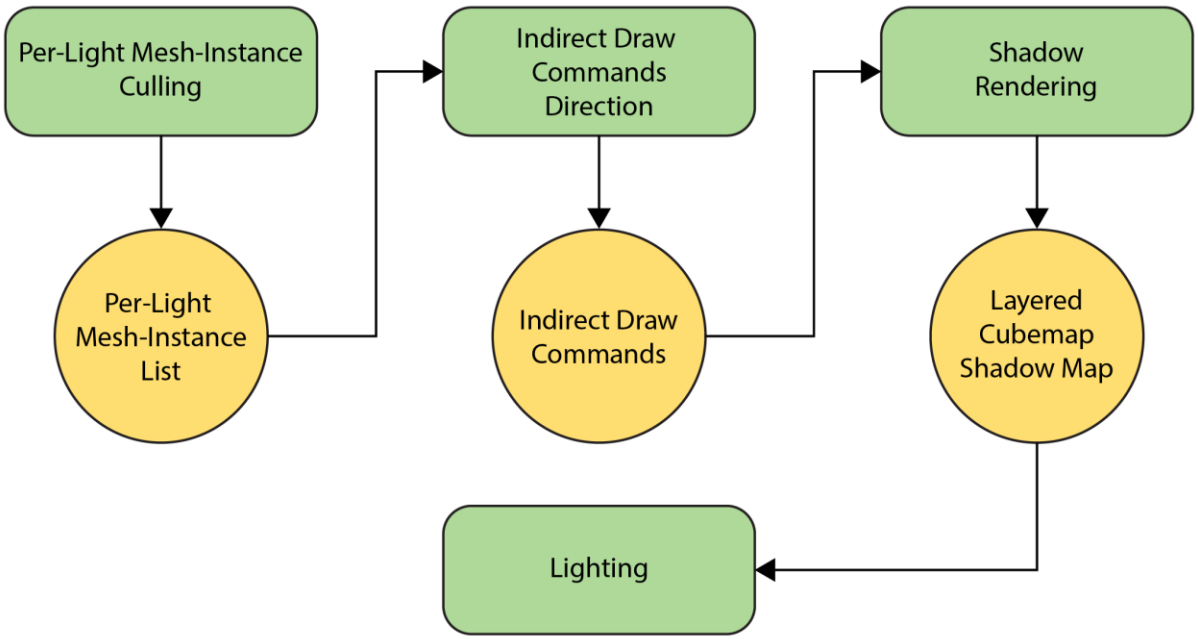


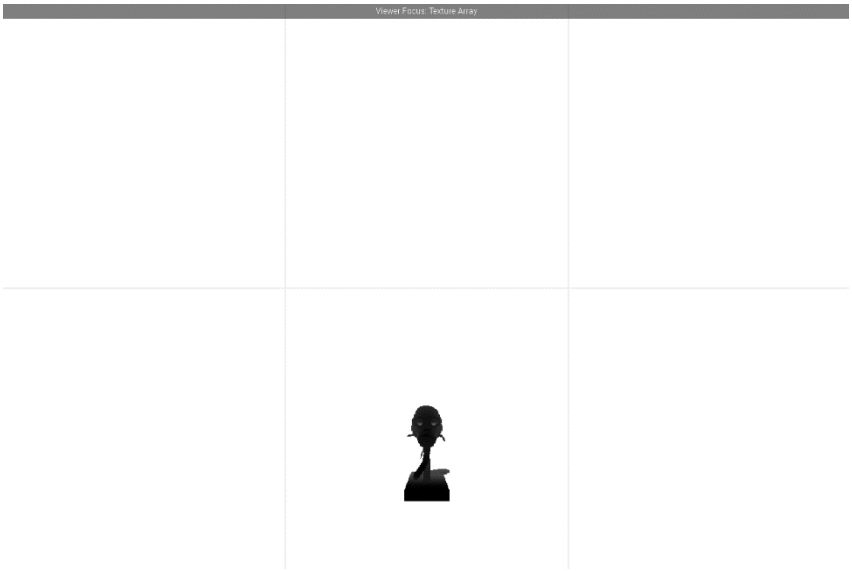
Albedo	R8	G8	B8	
Normals	R16		G16	
PBR	R8	G8	B8	

Slice Index	**MIN | MAX**
0	`MAX_LIGHT_ID` | `0` (empty)
1	`2` | `8`
2	`7` | `7`
3	`4` | `9`

Tile Index	**0**	**1**	**2**	**3**
0	`0010`	`0110`	`0110`	`0000`
1	`1000`	`1011`	`0011`	`1101`
2	`0110`	`1001`	`0001`	`0010`
3	`1111`	`0101`	`1100`	`1010`

Chapter 08: Adding Shadows Using Mesh Shaders





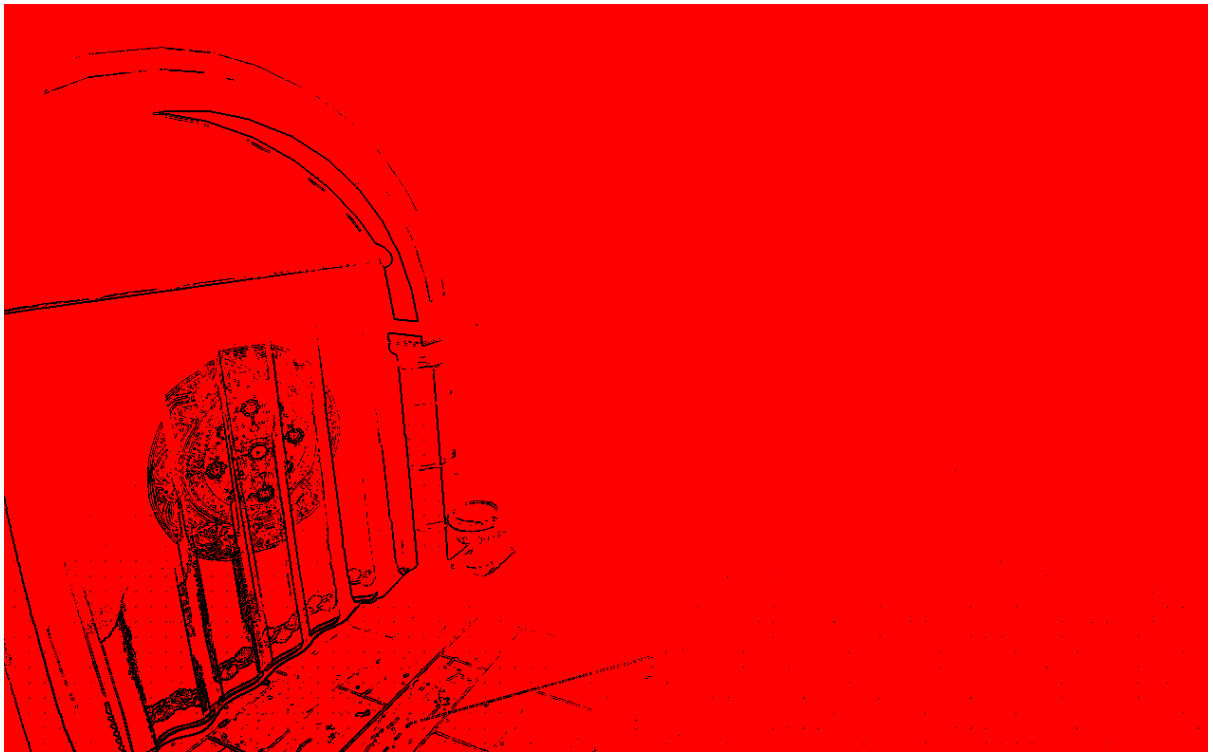
Mesh Instance 0	Mesh Instance 0	Mesh Instance 1	Mesh Instance 1	Mesh Instance 2	Mesh Instance 2
Light 0	Light 1	Light 0	Light 1	Light 0	Light 1
Dispatch 0	Dispatch 1	Dispatch 2	Dispatch 3	Dispatch 4	Dispatch 5

TEXEL SIZE (bits)	Block Shape (2D)	Block Shape (3D)
8-bit	256 × 256 × 1	64 × 32 × 32
16-bit	256 × 128 × 1	32 × 32 × 32
32-bit	128 × 128 × 1	32 × 32 × 16
64-bit	128 × 64 × 1	32 × 16 × 16
128-bit	64 × 64 × 1	16 × 16 × 16

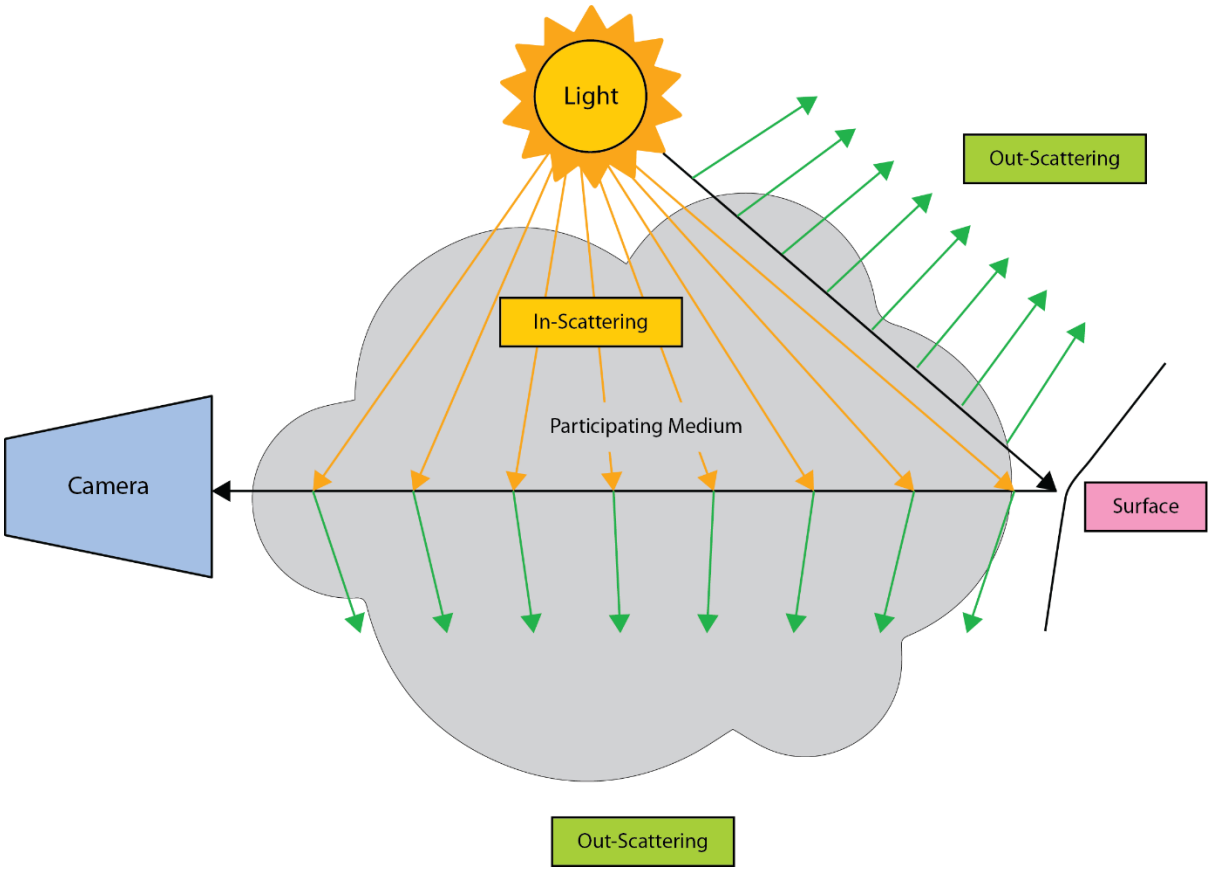
Chapter 09: Implementing Variable Rate Shading

$$G_x = \begin{bmatrix} +1 & 0 & -1 \\ +2 & 0 & -2 \\ +1 & 0 & -1 \end{bmatrix} * A \text{ and } G_y = \begin{bmatrix} +1 & +2 & +1 \\ 0 & 0 & 0 \\ -1 & -2 & -1 \end{bmatrix} * A$$

$$G = \sqrt{{G_x}^2 + {G_y}^2}$$

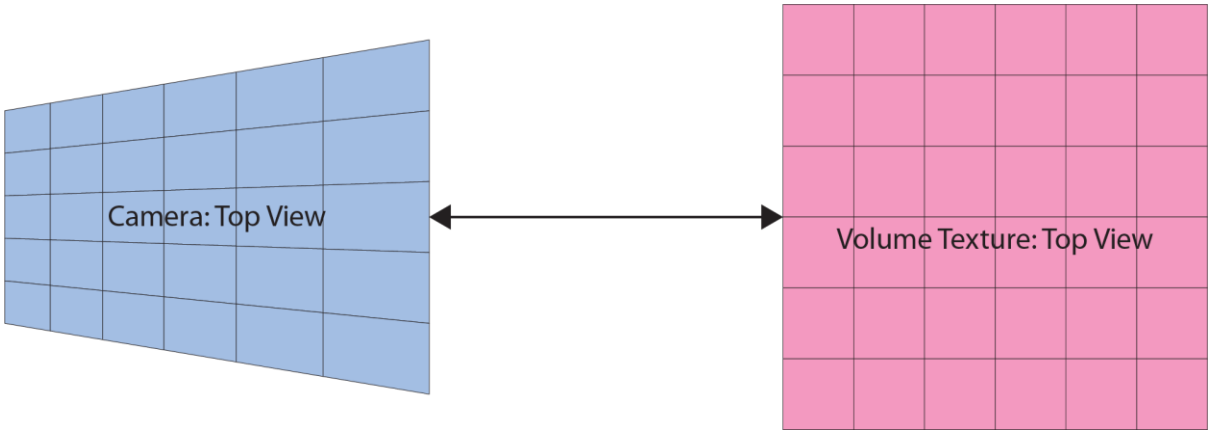


Chapter 10: Adding Volumetric Fog

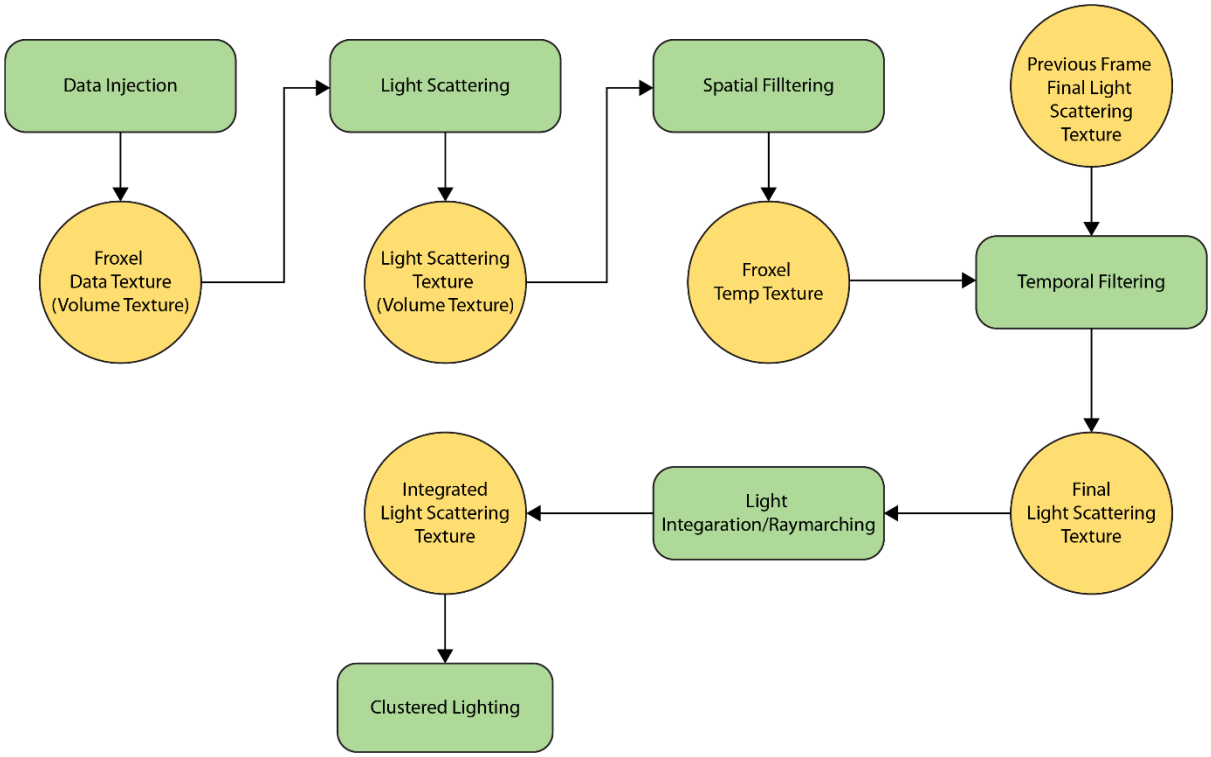


$$phase(\theta) = \frac{1}{4\pi} \frac{1 - g^2}{(1 + g^2 - 2g\cos\theta)^{3/2}}$$

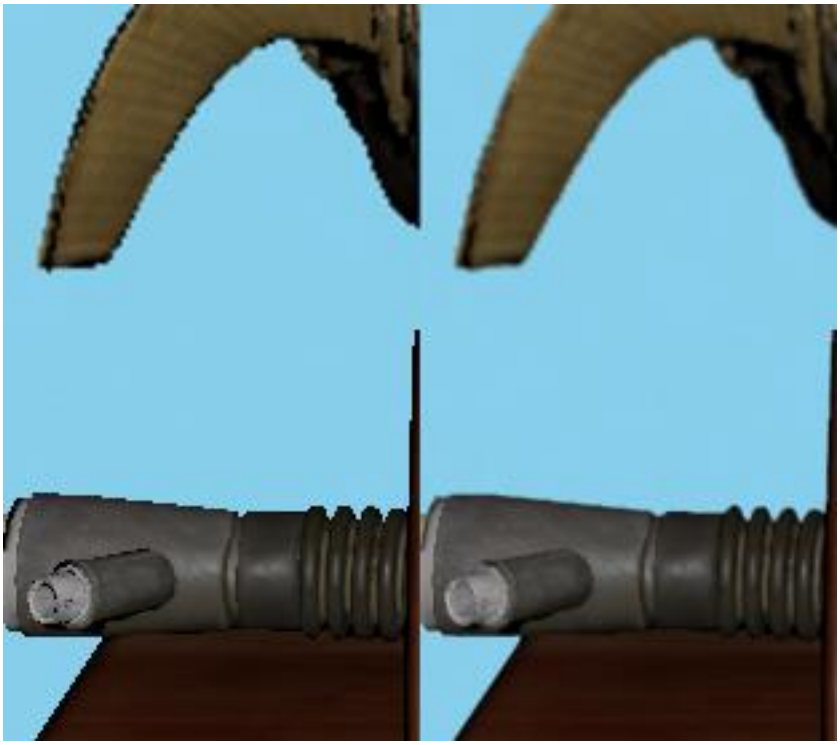
$$T(A \to B) = e^{-\int_A^B \beta e(x) dx}$$

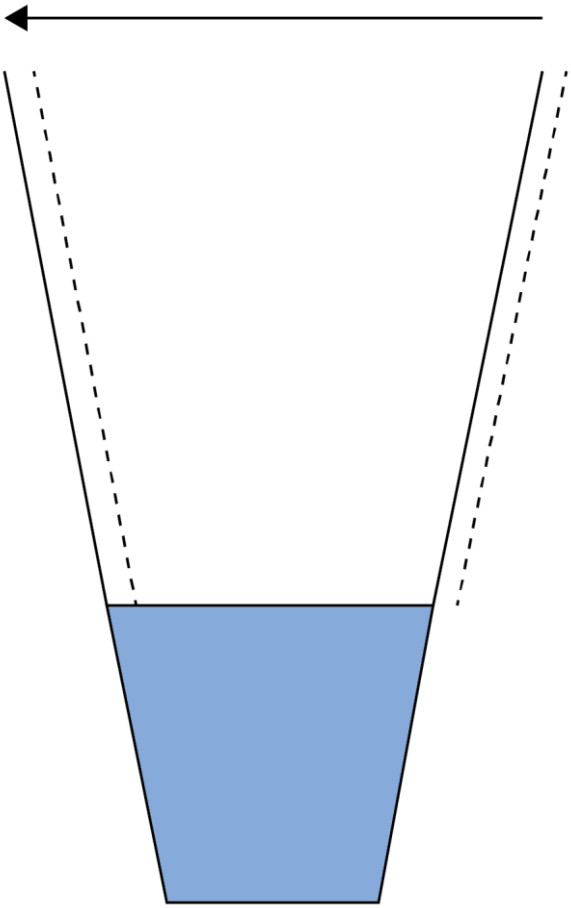


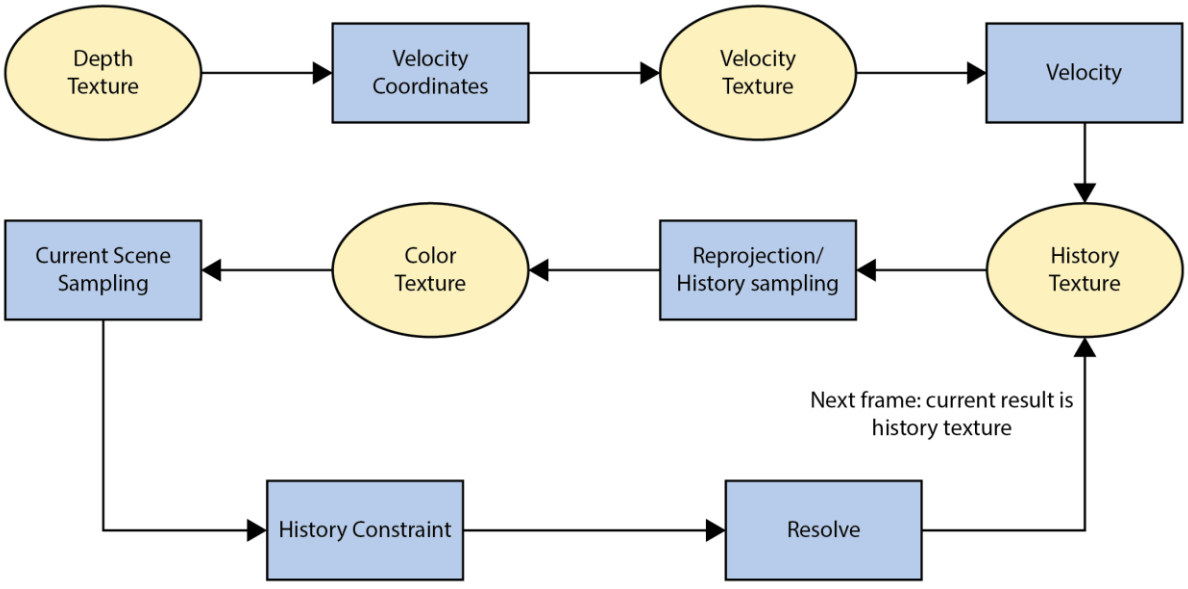
$$Zslice = Near_z * (Far_z / Near_z)^{slice/numSlices}$$



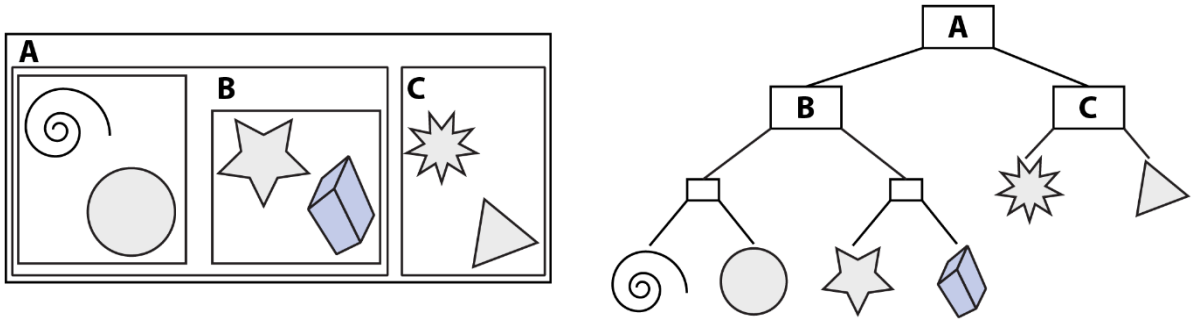
Chapter 11: Temporal Anti-Aliasing

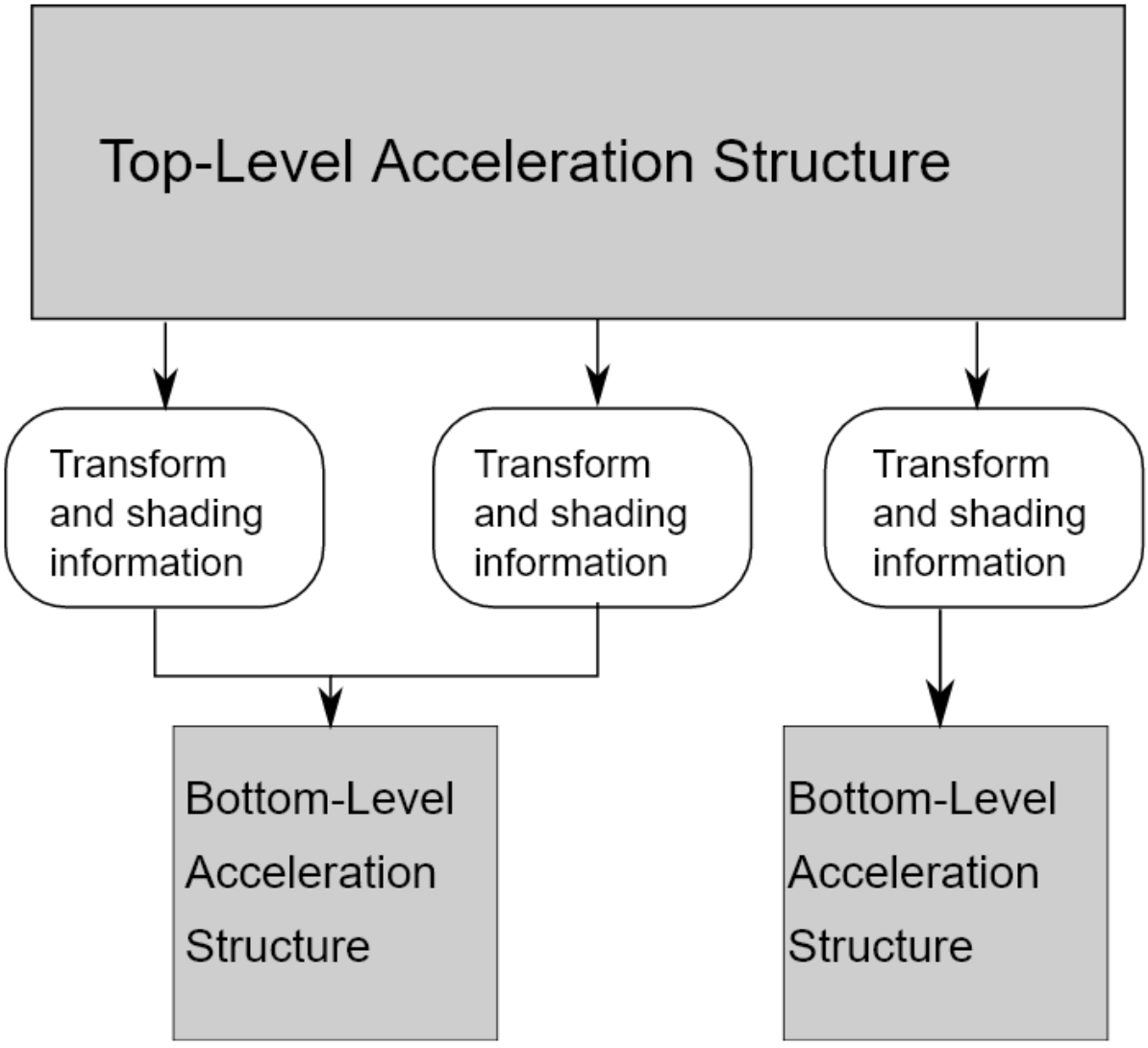


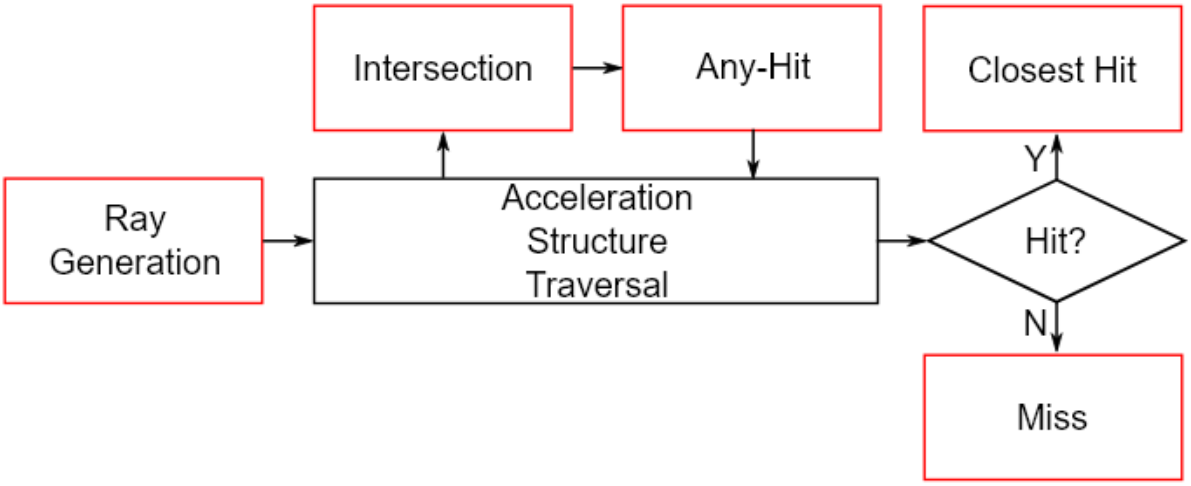



Depth Texture
Velocity Coordinates
Velocity Texture
Velocity
History Texture
Reprojection/ History sampling
Color Texture
Current Scene Sampling
Next frame: current result is history texture
History Constraint
Resolve

Chapter 12: Getting Started with Ray Tracing

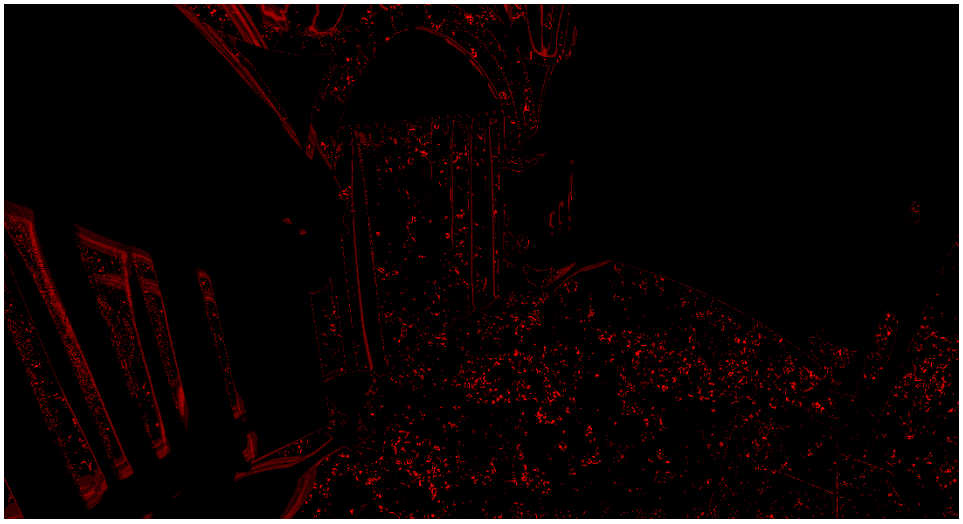


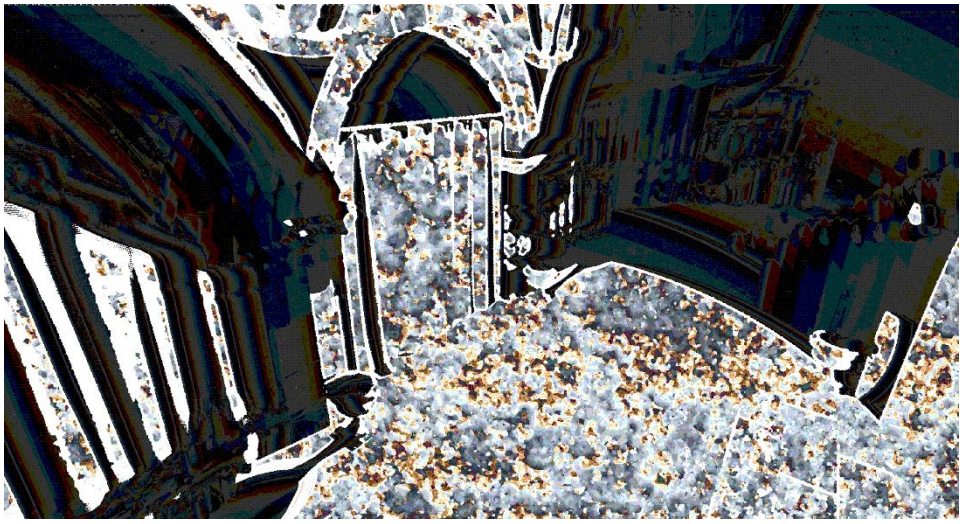


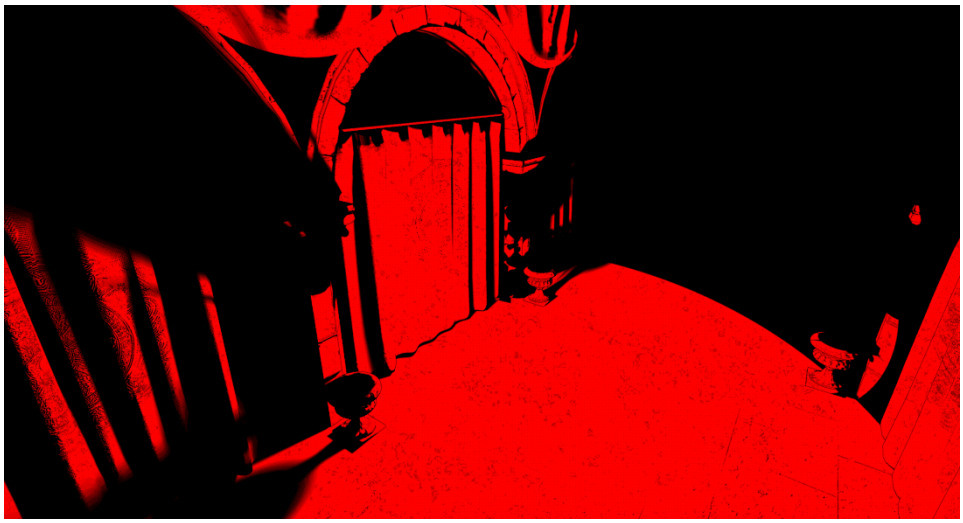


Ray Generation
Closest Hit
Miss

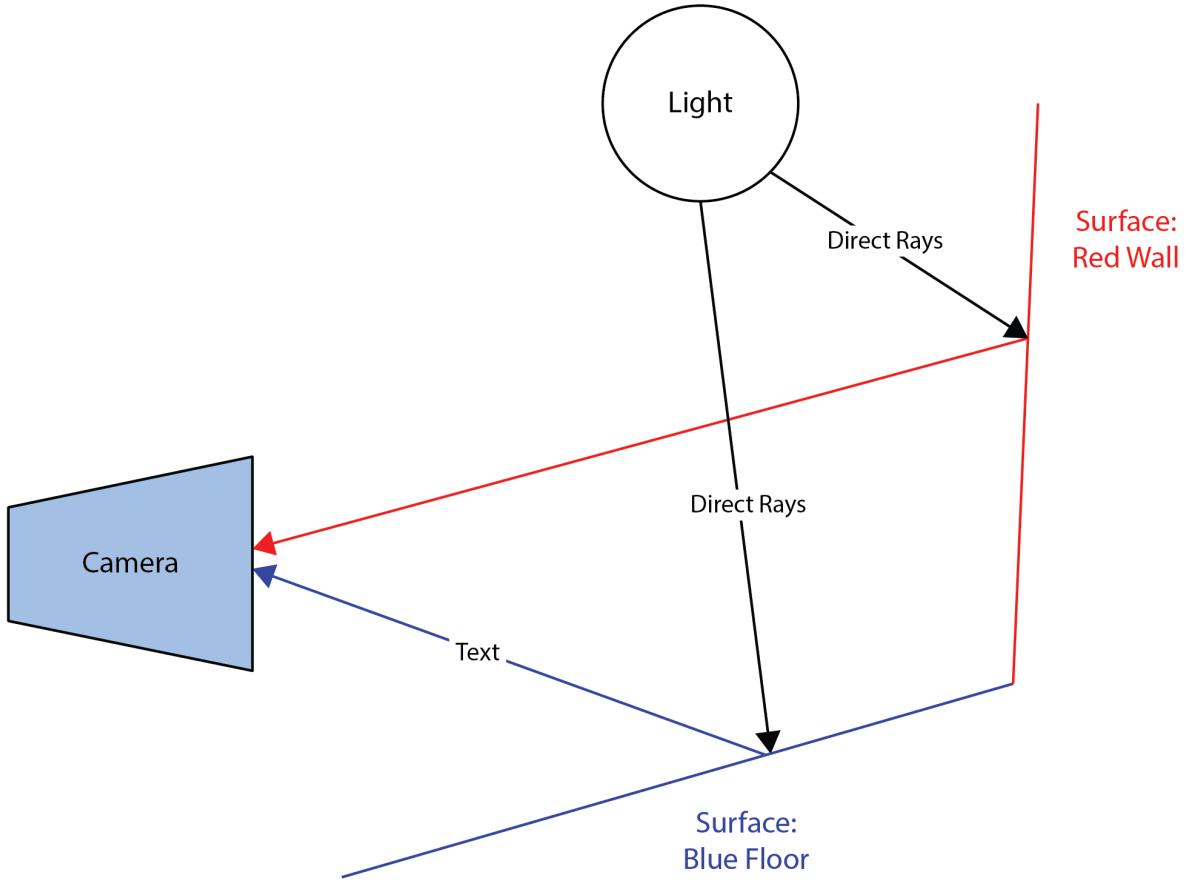
Chapter 13: Revisiting Shadows with Ray Tracing

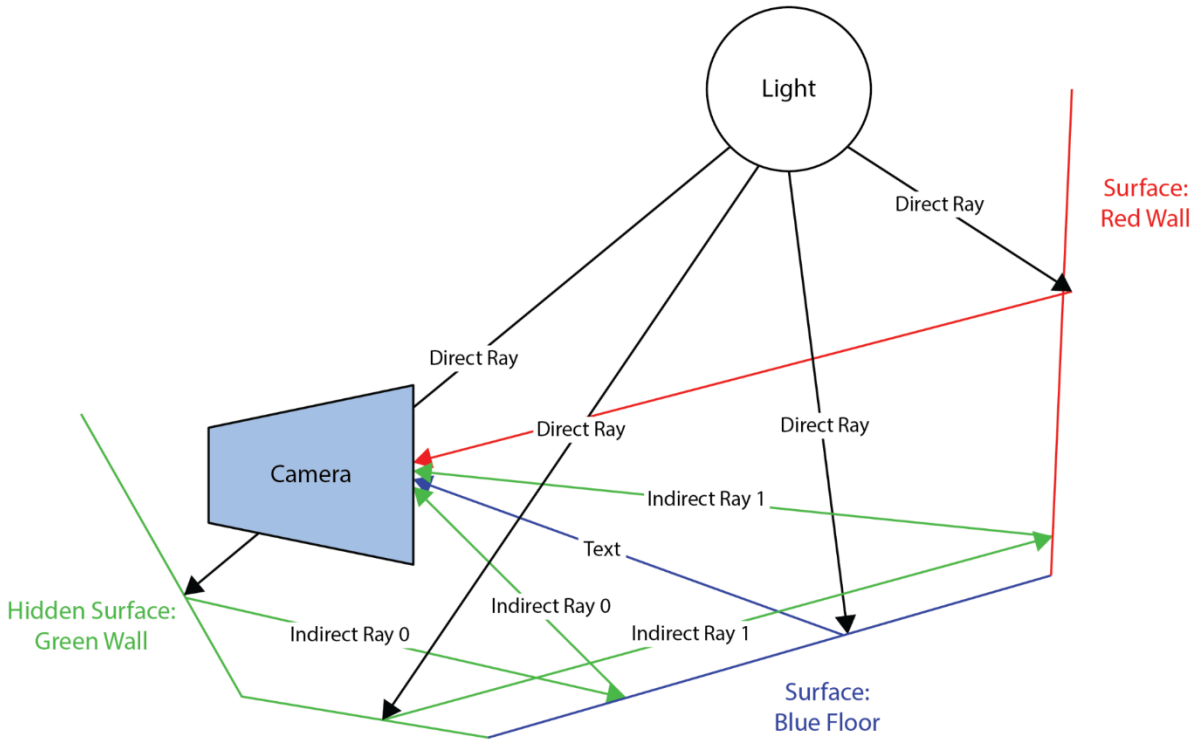


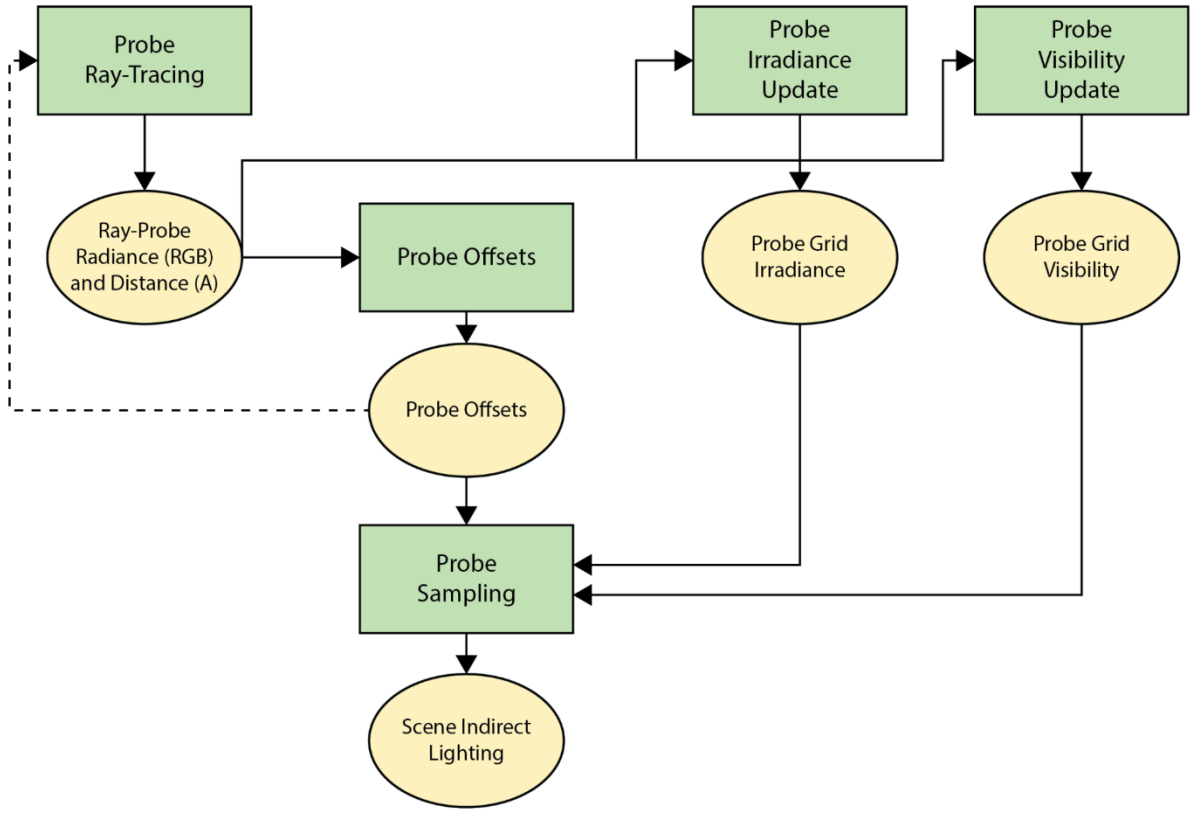


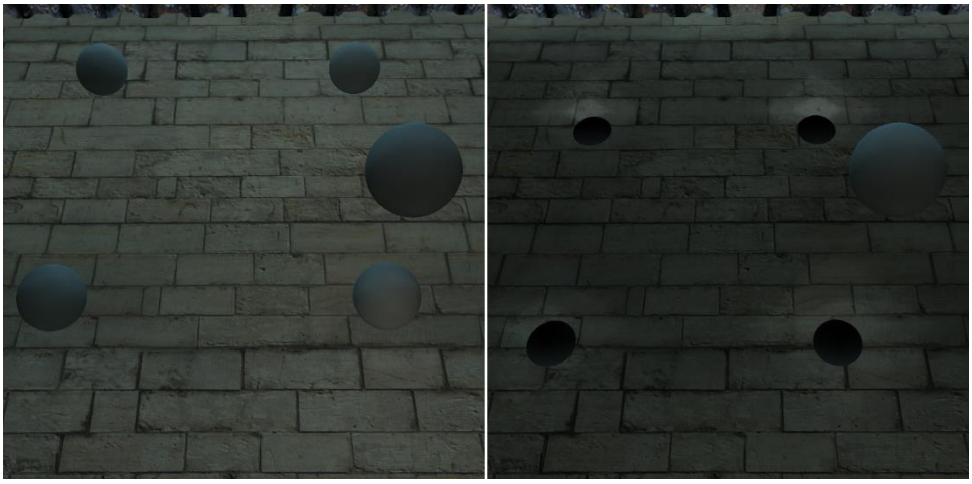


Chapter 14: Adding Dynamic Diffuse Global Illumination with Ray Tracing




Light
Direct Ray
Surface:
Red Wall
Direct Ray
Direct Ray
Direct Ray
Camera
Indirect Ray 1
Text
Indirect Ray 0
Hidden Surface:
Green Wall
Indirect Ray 0
Indirect Ray 1
Surface:
Blue Floor


Probe
Ray-Tracing
Probe
Irradiance
Update
Probe
Visibility
Update
Ray-Probe
Radiance (RGB)
and Distance (A)
Probe Offsets
Probe Grid
Irradiance
Probe Grid
Visibility
Probe Offsets
Probe
Sampling
Scene Indirect
Lighting



6,6	6,1	5,1	4,1	3,1	2,1	1,1	1,6
1,6	1,1	2,1	3,1	4,1	5,1	6,1	6,6
1,5	1,2	2,2	3,2	4,2	5,2	6,2	6,5
1,4	1,3	2,3	3,3	4,3	5,3	6,3	6,4
1,3	1,4	2,4	3,4	4,4	5,4	6,4	6,3
1,2	1,5	2,5	3,5	4,5	5,5	6,5	6,2
1,1	1,6	6,6	3,6	4,6	5,6	6,6	6,1
6,1	6,6	5,6	4,6	3,6	1,6	1,6	1,1

Chapter 15: Adding Reflections with Ray Tracing