

Ray Tracing On GPU

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Outline

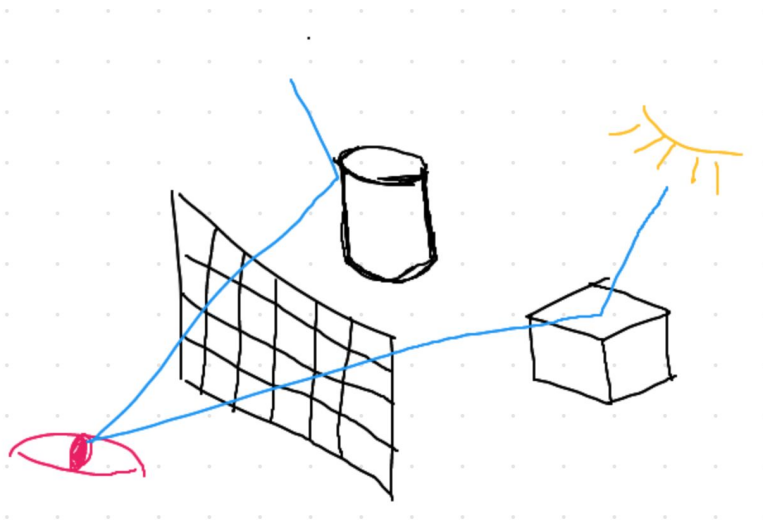
- Introduction
- Method
- Result
- Conclusion

Introduction - Ray Tracing

- Given a description of a scene
 - Camera
 - Objects
- Render a image

Introduction - Ray Tracing

- Trace ray from eye to object to light
- Every ray is independent

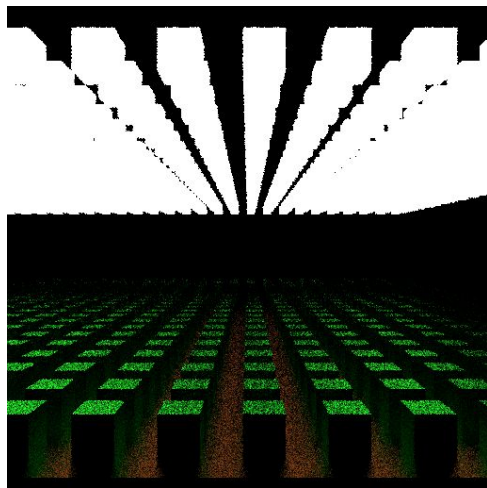


Method

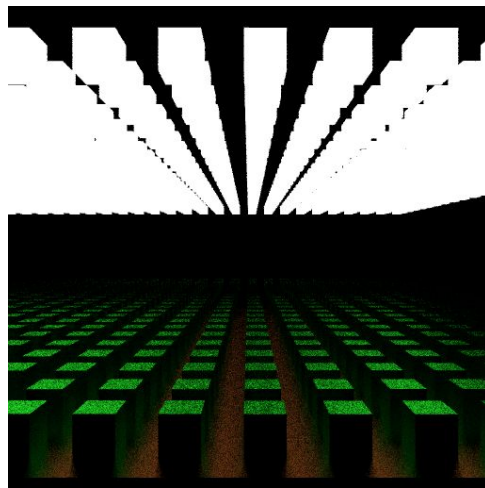
- Implement on CPU and GPU
- Cubes
- Compare
 - CPU vs CPU Threading vs GPU

Result

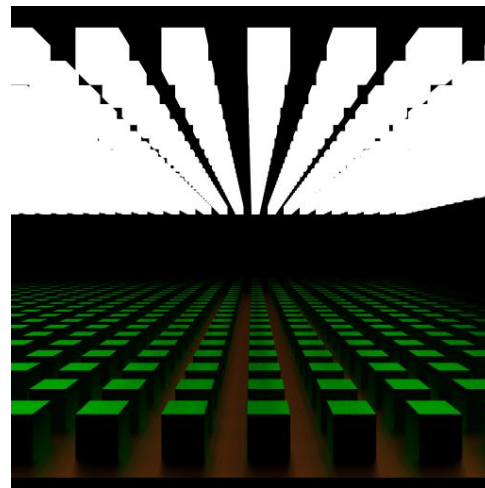
1 sample



4 samples



256 samples



Result - CPU Threading

| Samples\Threading | 1 | 2 | 4 | 8 | 16 |
|-------------------|-----------|-------------|------------|------------|-------------|
| 1 | 1.42 (1) | 0.82 (1.4) | 0.44 (3.2) | 0.25 (5.7) | 0.21 (10.1) |
| 4 | 5.28 (1) | 2.74 (1.9) | 2.08 (2.5) | 1.11 (4.8) | 0.62 (8.5) |
| 9 | 11.95 (1) | 6.27 (1.9) | 3.45 (3.5) | 1.81 (6.6) | 1.29 (9.3) |
| 16 | 21.00 (1) | 11.41 (1.8) | 5.96 (3.6) | 4.28 (5.0) | 2.22 (10.0) |
| 25 | 32.46 (1) | 18.50 (0.7) | 9.64 (3.7) | 4.72 (6.9) | 3.44 (9.4) |

Result - CPU v.s. GPU

| Samples\Type | CPU(1 Thread) | GPU |
|--------------|---------------|-------------|
| 1 | 1.42 (1) | 0.23 (6.2) |
| 4 | 5.28 (1) | 0.85 (6.2) |
| 16 | 21.00 (1) | 3.24 (6.5) |
| 256 | 348.10 (1) | 51.21 (6.8) |

Result - CPU v.s. GPU

| Samples\Type | CPU(16 Threads) | GPU |
|--------------|-----------------|-------------|
| 1 | 0.21 (1) | 0.23 (0.9) |
| 4 | 0.61 (1) | 0.85 (0.7) |
| 16 | 2.26 (1) | 3.24 (0.7) |
| 256 | 23.86 (1) | 51.21 (0.5) |

Conclusion

- CPU Threading :
 - Recursive depth of each ray isn't the same.
- GPU
 - Not fast