Accelerated Ray Tracing
Using BVH Tree and CUDA

Final Project – ECS275A

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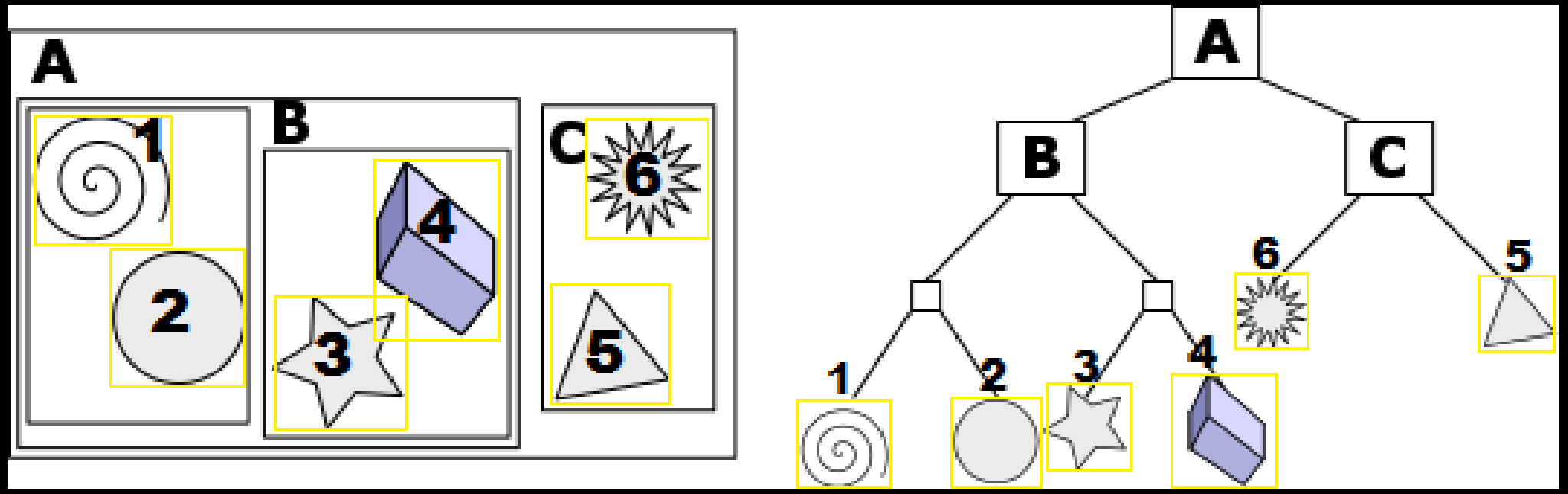
Part A: BVH Tree

- **Construction:**
  - Group objects in tight bounding volumes *(leaf node)*
  - Group nodes into larger bound volumes
  - Build hierarchy of bounding volumes in a recursive fashion
- **Traversal:**



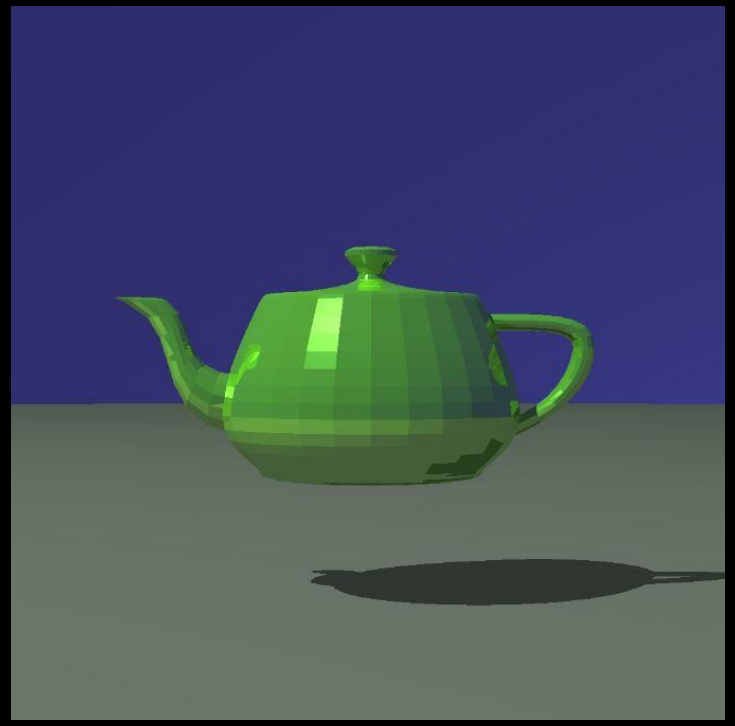
[https://en.wikipedia.org/wiki/Bounding_volume_hierarchy]

Part A: BVH Tree

Experiments:

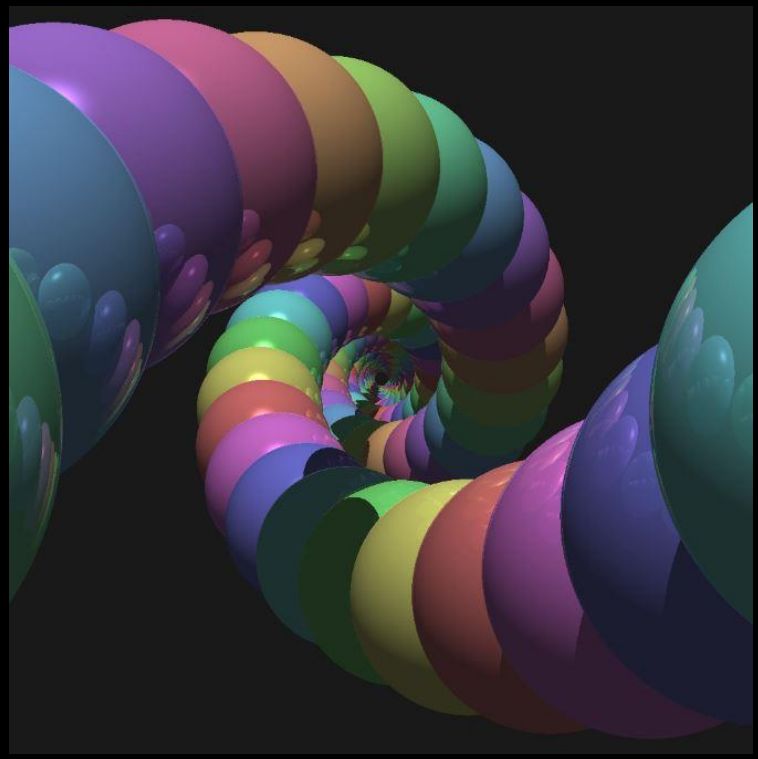
Teapot (3K Triangles)

- BVH →4.08 Sec
- No BVH → 476 Sec



Bunny (500 Triangles)

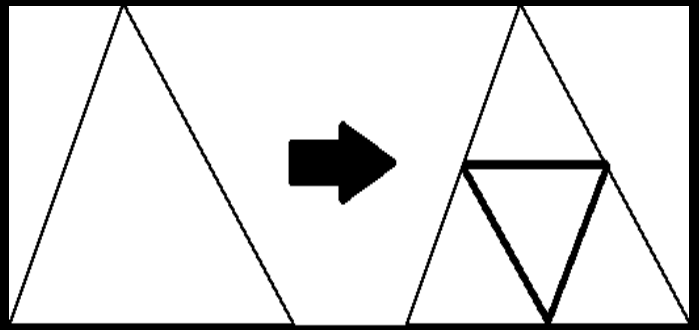
- BVH →1.32 Sec
- No BVH → 43 Sec



Spiral (260 Spheres)

- BVH →1.71 Sec
- No BVH → 34.7 Sec

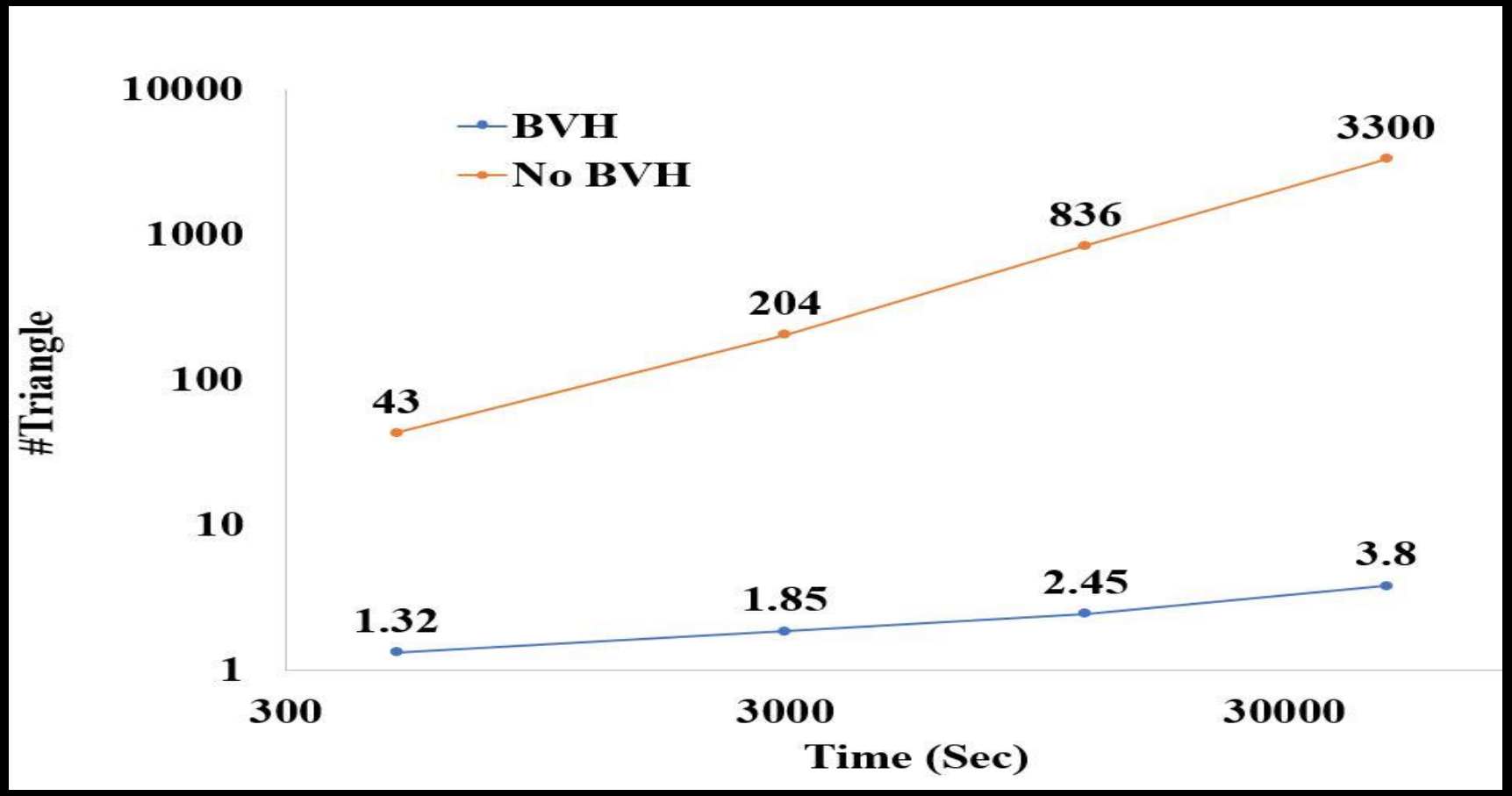
Part A: BVH Tree



Experiments:

-Dividing each triangle into four triangles

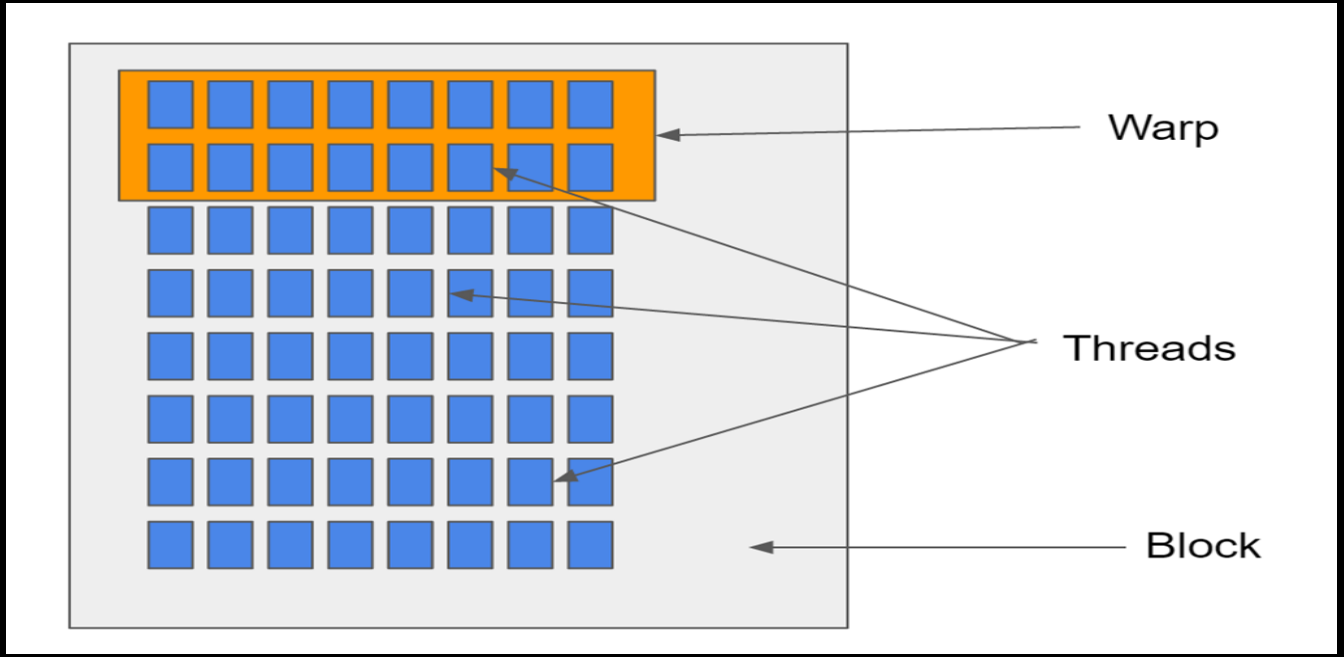
-Testing the performance with and without BVH



Part B: Path Tracing using CUDA

Big Picture:

- Divide the computation into multiple threads of execution
- Write the code for a thread such that each thread will run serially
- All thread run in parallel
- Care must be taken to avoid thread divergence and memory accesses

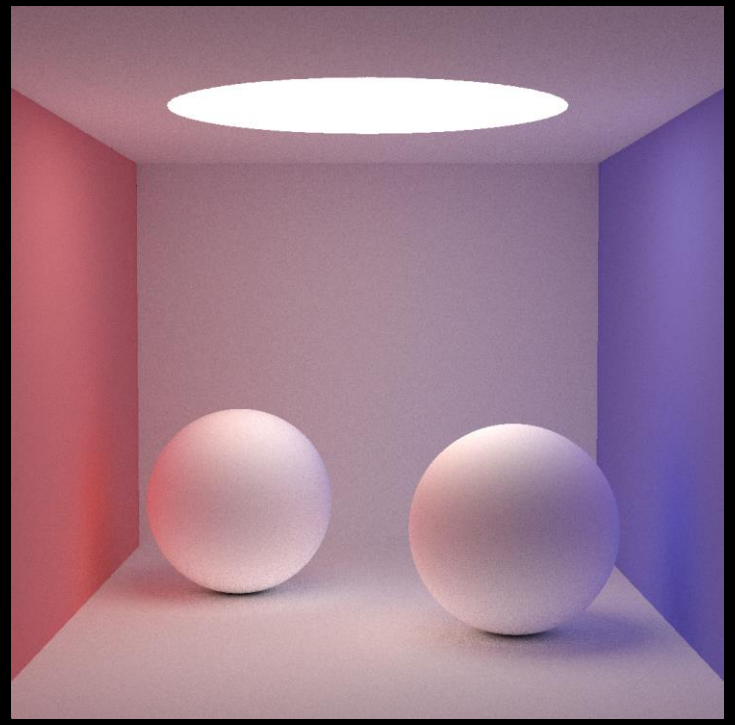


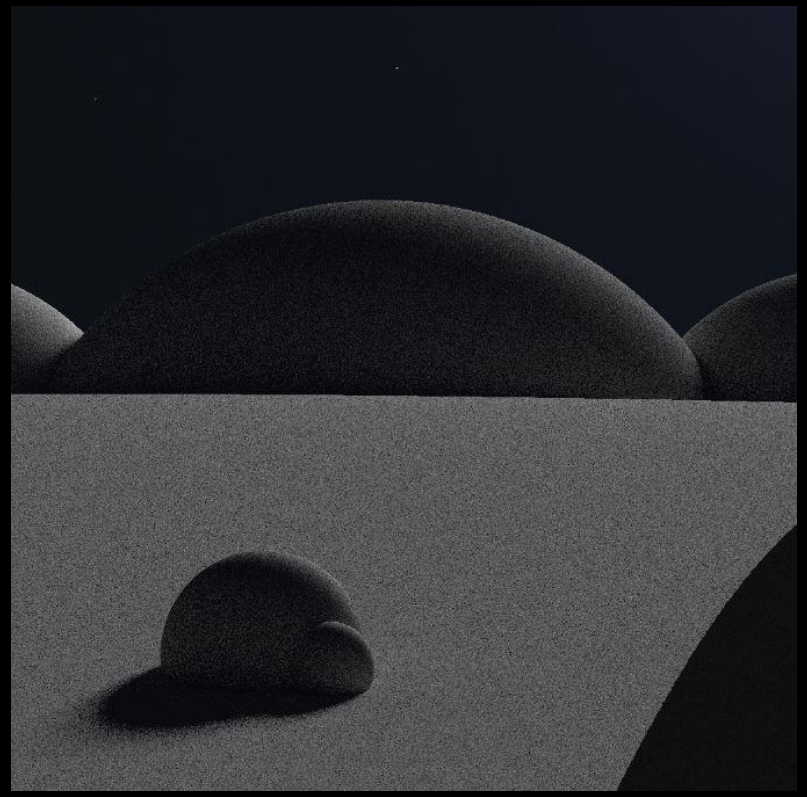
[http://blog.marcgravell.com/2016/05/how-i-found-cuda-or-rewriting-tag_9.html]

Part A: Path Tracing using CUDA

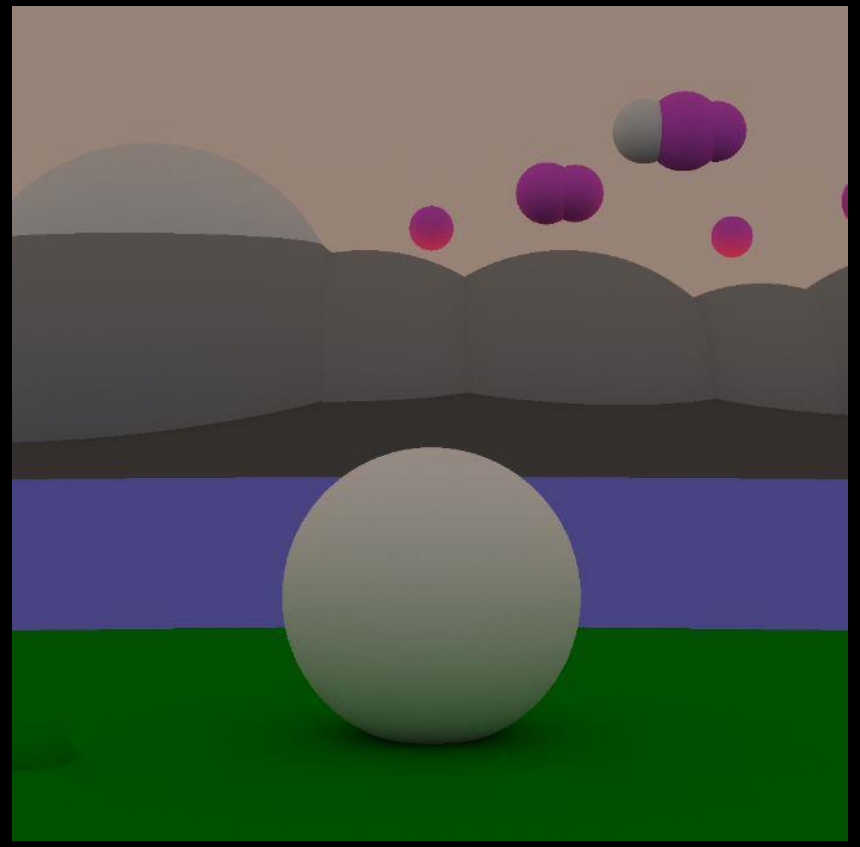
Experiments:

Cornell Box (9 Spheres)
1.489 Sec





Night Sky (12 Spheres)
1.4209 Sec



Vista (12 Spheres)
2.283 Sec