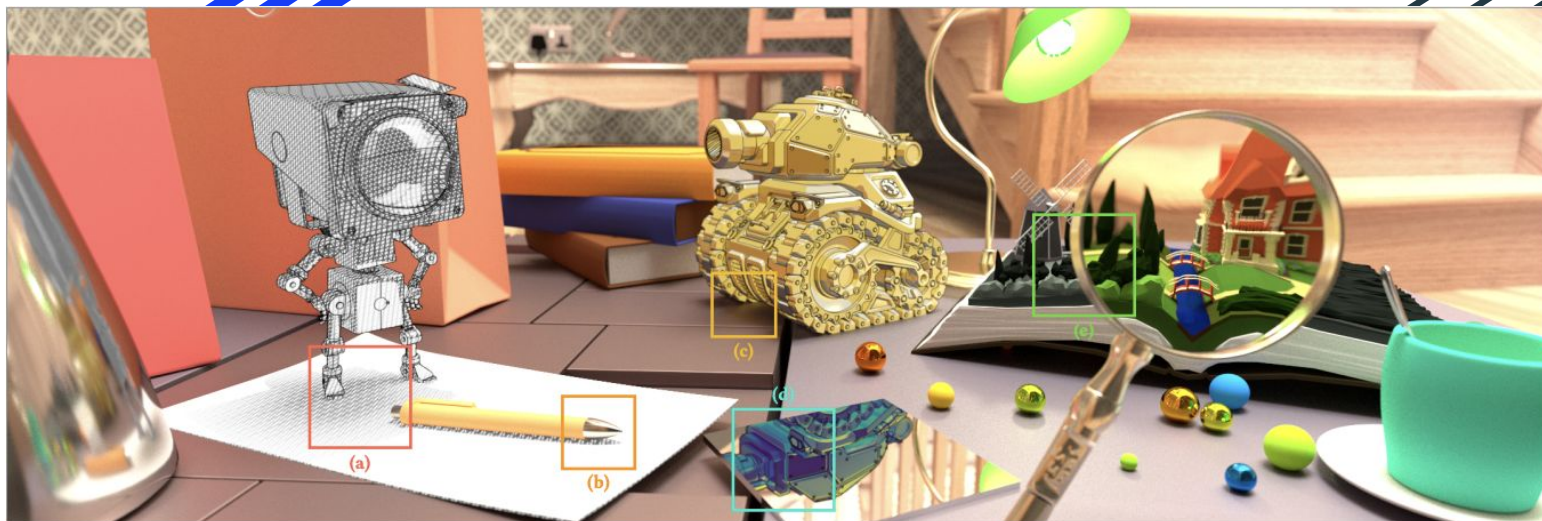


WebGPU Pathtracer + NPR + Cloth Sim **Milestone 1**

Alan Lee, Jordan Hochman, Maya Diaz Huizar





Base Path Tracer (link)

- Implemented based on CUDA pathtracer's architecture
- Camera ray generation, ray-scene intersections, material shading, stream compaction
 - Kernels implemented as compute passes
 - Ping-pong between GPUTexture objects for color accumulation
 - Final render pass uses last stored GPUTexture as our render texture
- Problems:
 - Updating intersection data after first bounce

GLTF Scene Loading + BVH (link)

- Implemented arbitrary GLTF mesh loading
 - Buffer to hold triangles in scene
- Implemented toggleable BVH for loaded meshes
 - Struct to represent volume hierarchy
- Problems:
 - WebGPU struct alignment
 - Binding textures in compute shader

Stream Compaction

- Implemented/Ported Stream Compaction/Work Efficient Parallel Scan to WebGPU
- Integrated with existing (written by Alan) path tracer compute pipeline
 - Added scan-based parallel stream compaction infrastructure
 - Implemented flag generation & compaction pipeline stages
 - Sanity check mini test suite to ensure correctness (test scenes so far have few lights, so little early path termination)
- Problems:
 - Initial issues with ray bouncing made it difficult to test, work around by writing small test suite
 - Initial test scenes are very simple (one cube, two small lights, and no other objects, so overhead of stream compaction outweighed benefits b/c few early terminated paths.

Milestone 2 TODOs

1. Fix Pathtracer
2. Add NPR Stylization to path tracer
 - a. Contact original authors for parameterization insights
3. Implement Progressive Dynamics Cloth Simulation