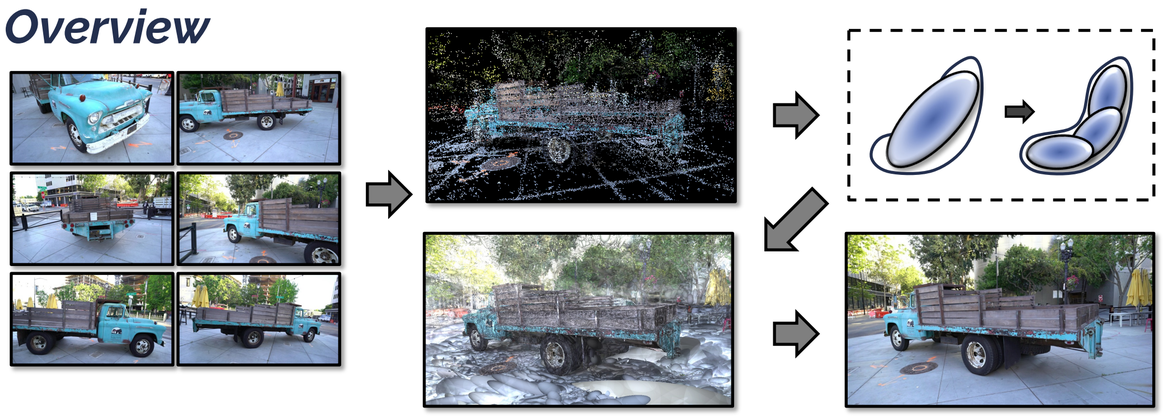
GSCore: Efficient Radiance Field Rendering via Architectural Support for 3D Gaussian Splatting

Junseo Lee, Seokwon Lee, Jungi Lee, Junyong Park, Jaewoong Sim
Seoul National University

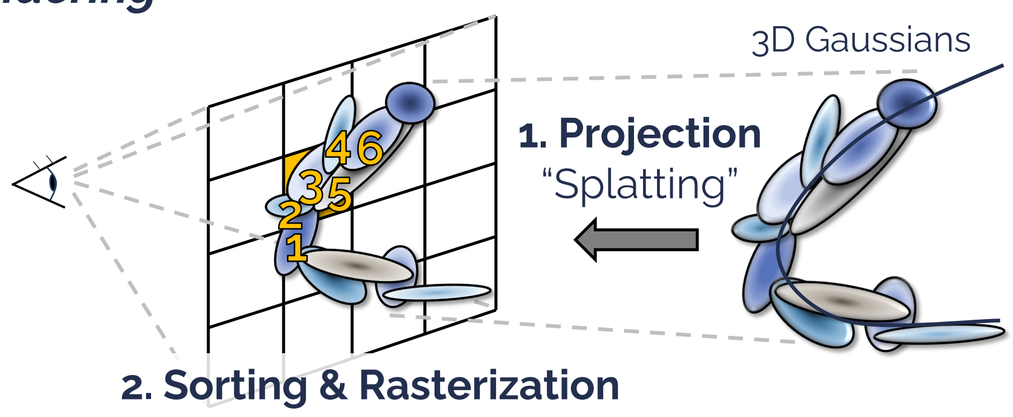
ASPLOS 2024

What is 3D Gaussian Splatting?

Overview

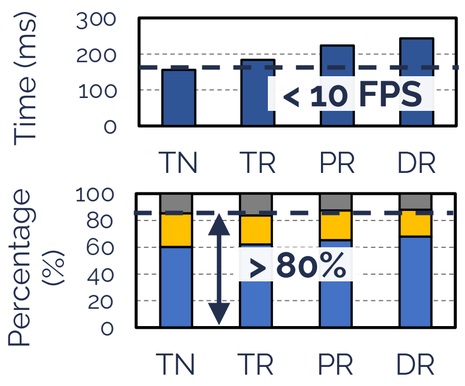


Rendering



Motivation: Inefficient Sorting & Rasterization

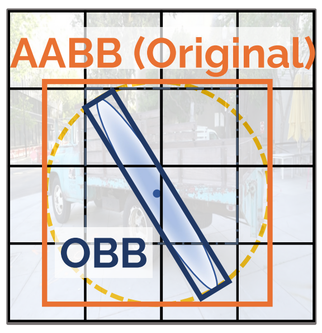
Bottleneck Analysis



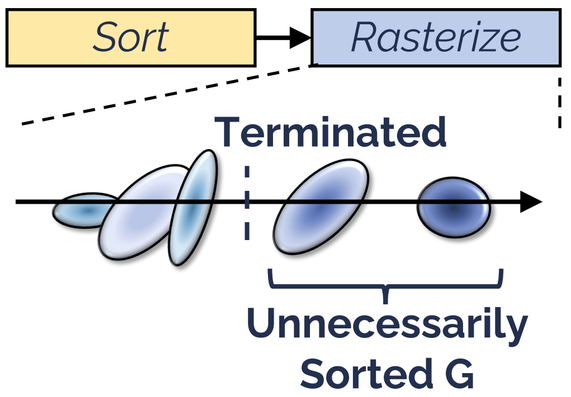
Still Slow on Edge Device

Bottlenecks: **Sort** & **Rasterize**

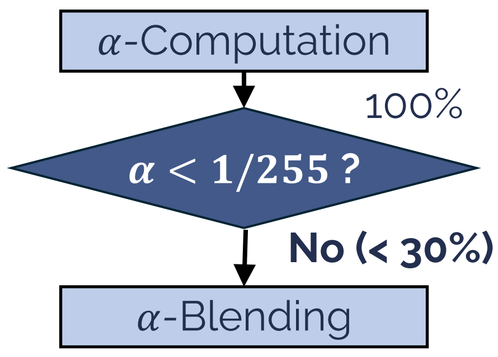
1) Unnecessary Tile Assignment



2) Unnecessary Sorting



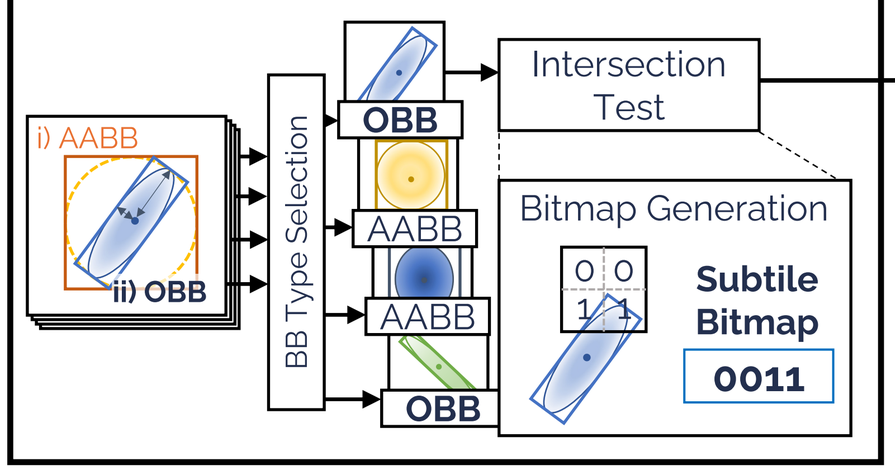
3) Ineffective Alpha Computation



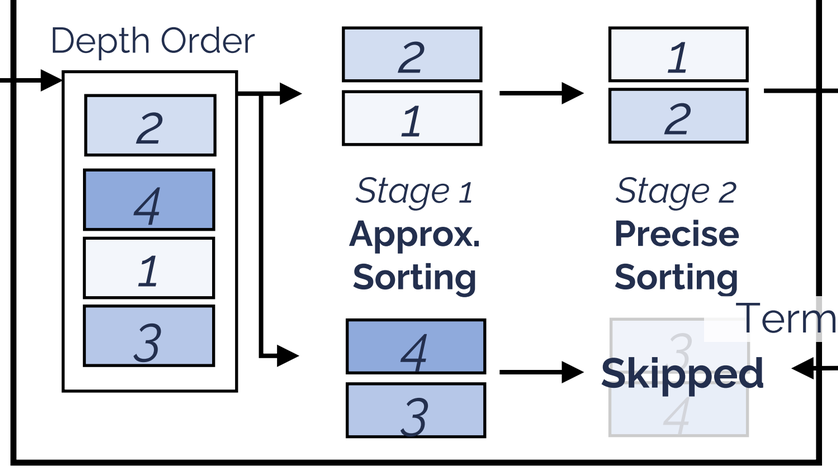
GSCore: Efficient Rendering Acceleration Unit

Algorithmic Optimizations

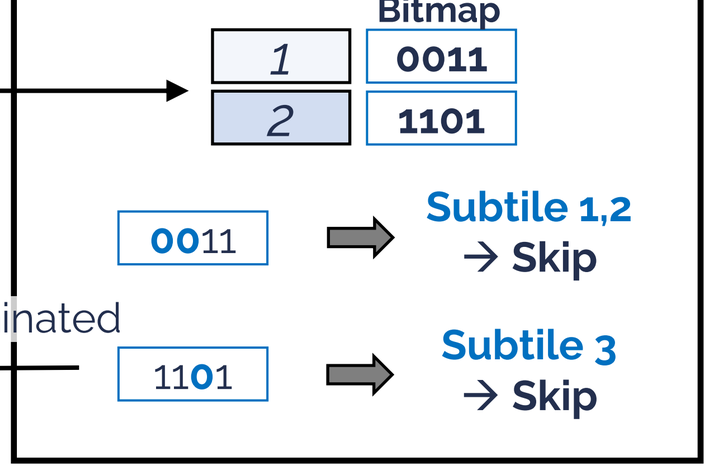
Shape-Aware Intersection Test



Hierarchical Sorting

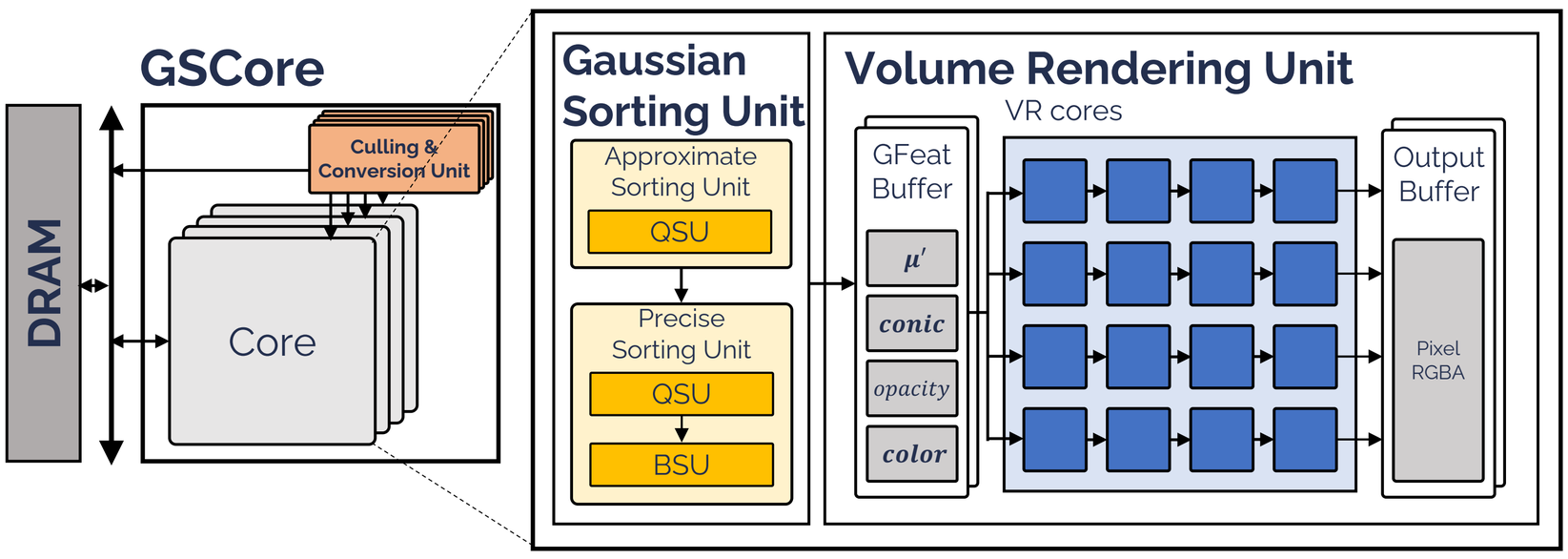


Subtile Skipping



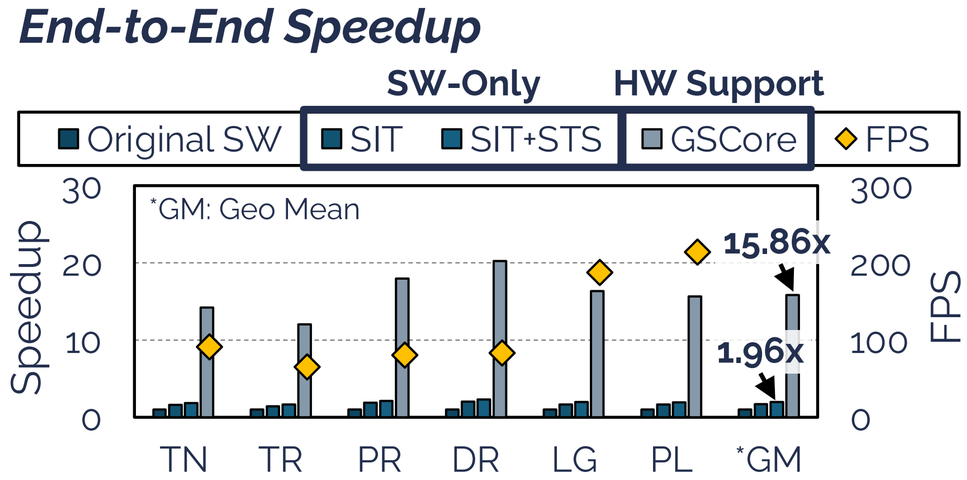
GSCore Architecture

1. Preprocess in
   Culling & Conversion Unit
2. Gaussian Sort in
   Gaussian Sorting Unit
3. Rasterize in
   Volume Rendering Unit

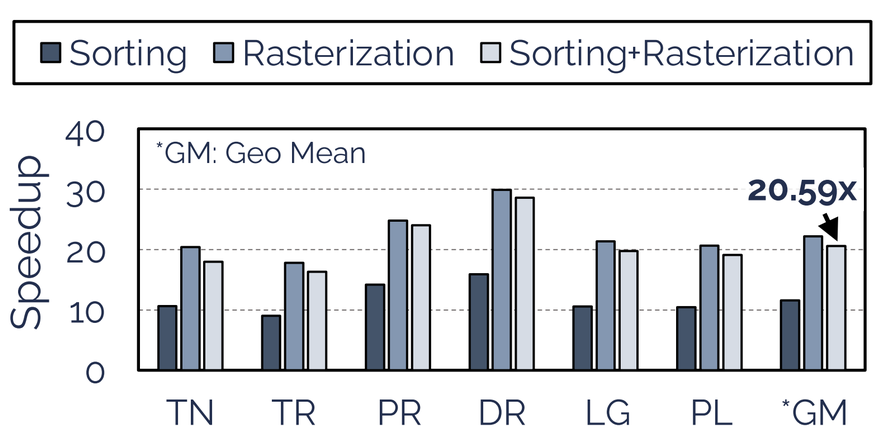


Evaluation

End-to-End Speedup



Operation Speedup



Area & Power

	Xavier NX	GSCore
Area	350mm²	3.95mm²
Power	10W	0.87W
Process Node	12nm	28nm

→ **Small**, but **Effective!**