Escaping the Gravity

Spacecraft - Satellite Crashing

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Group 14

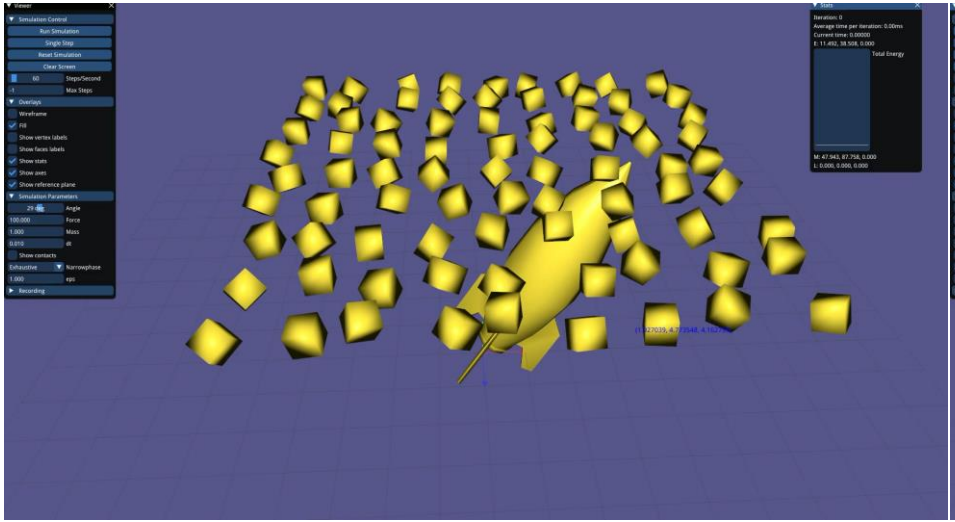
Overview

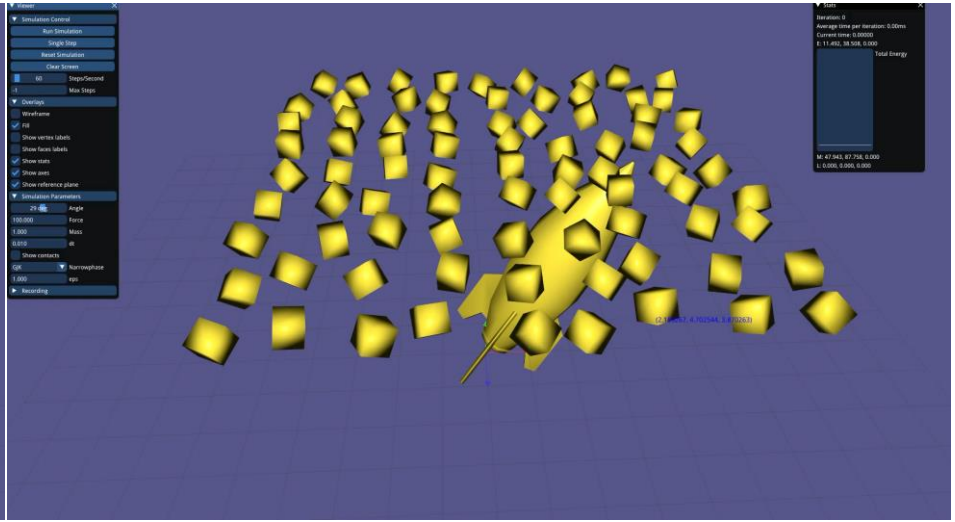
- Rigidbody Collision Detection & Handling
- Softbody using Mass-Spring System
- Final Scene Demo

01 Rigidbody Collision

- Broadphase – Sweep and Prune
- Narrowphase – GJK/EPA
- Rigidbody Destruction

GJK / EPA



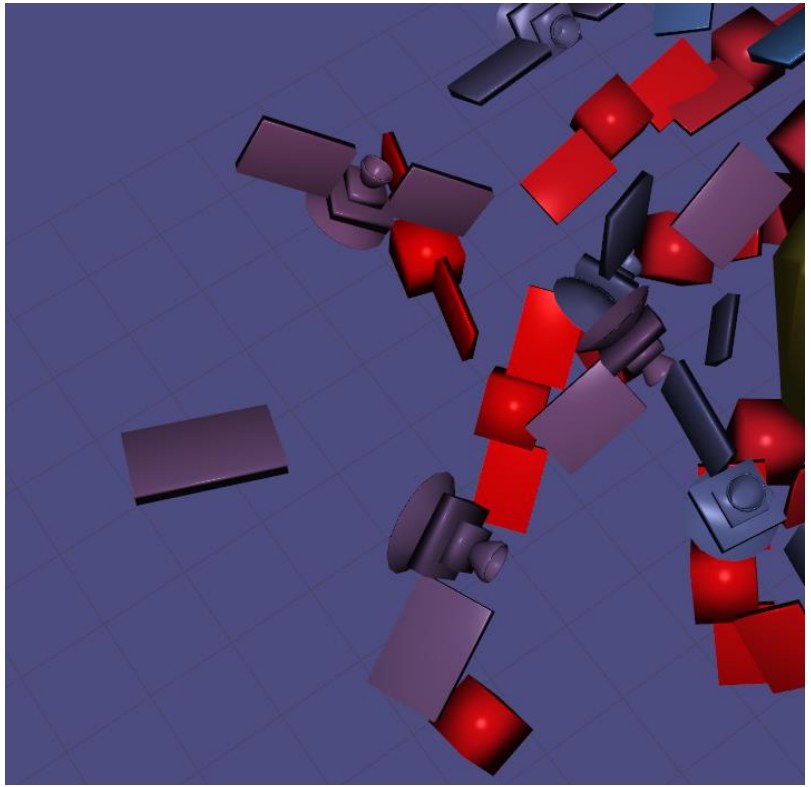


Exhaustive
~500 ms

GJK / EPA
~40 ms

Rigid Destruction

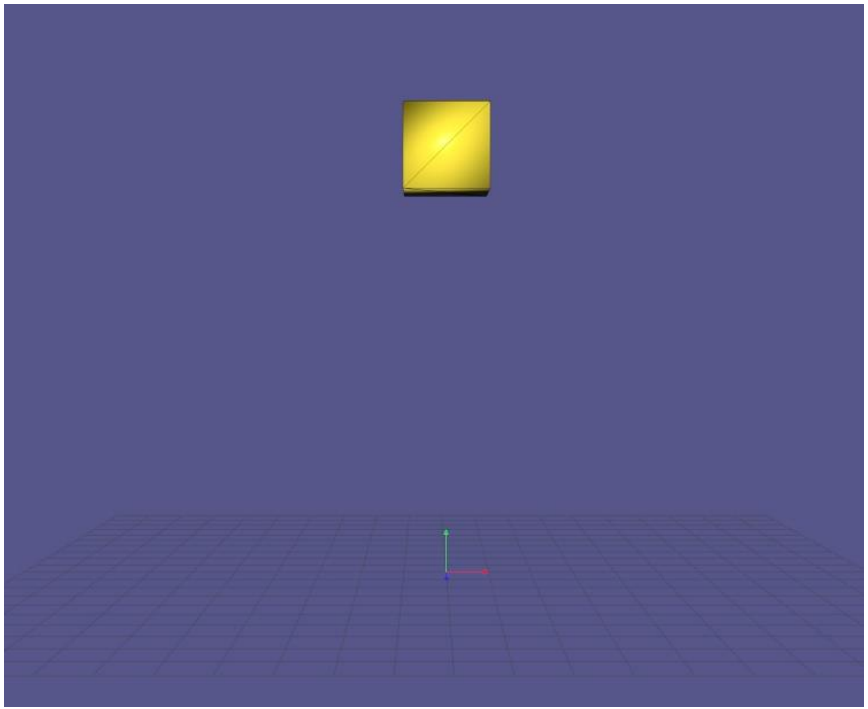
- groups of rigidbodies
- intergroup collision detection
- sum contribution of each part to compute overall motion
- set velocities based on global & local coordinates
- break group when collision force larger than threshold



02 Softbody using MSS

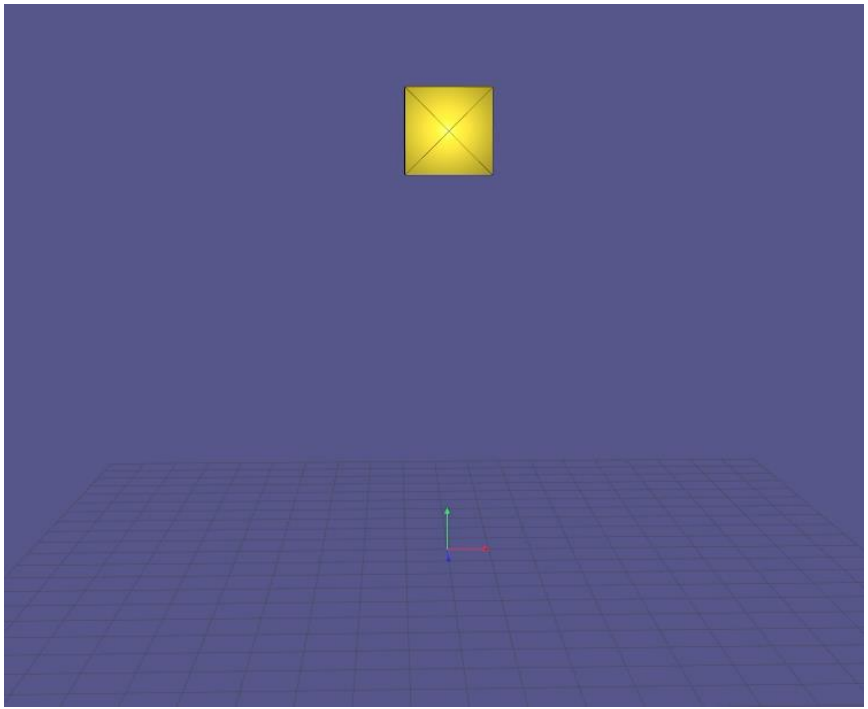
- Unstable Symplectic Euler Solution
- Fast Simulation of Mass-Spring Systems [Liu et al. 2013]
- Softbody Collision

Exercise Solution



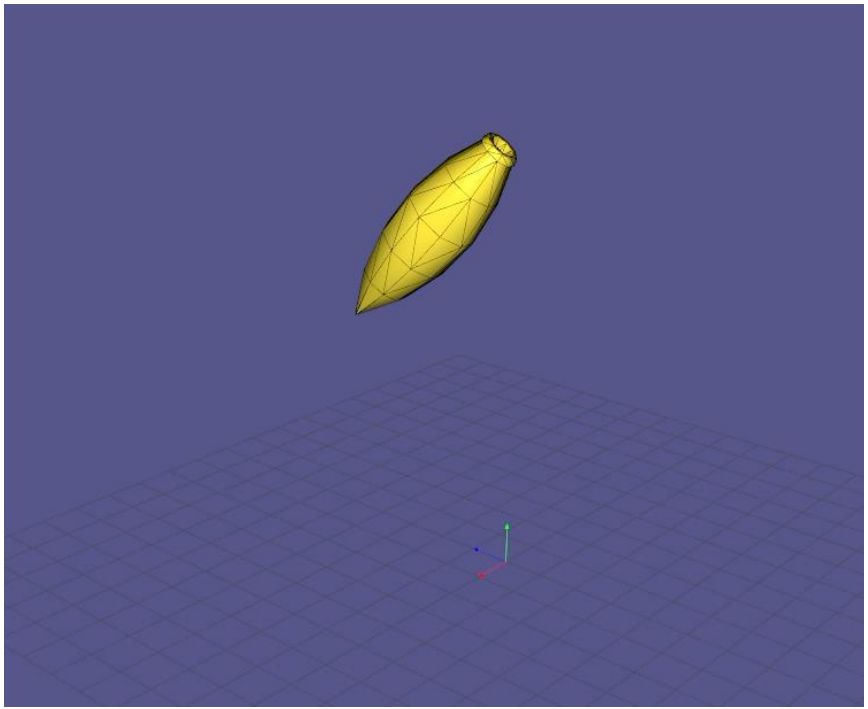
× regular connection

Exercise Solution



× high stiffness

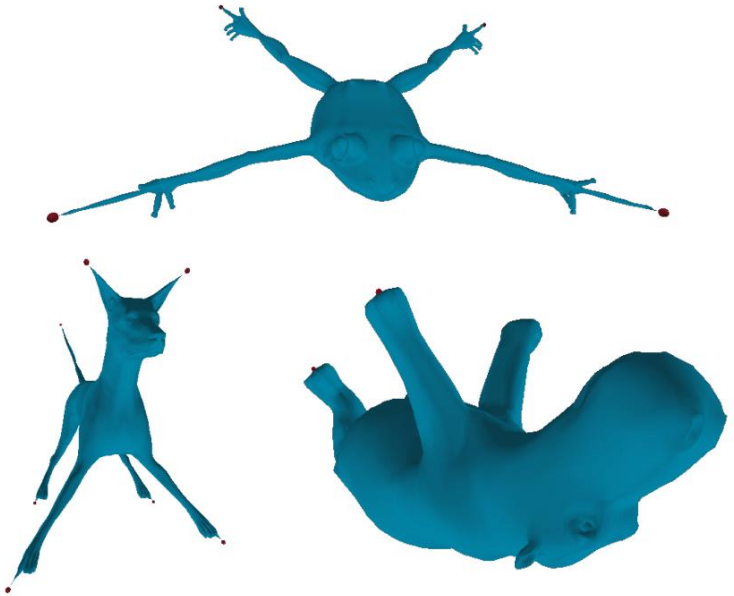
Exercise Solution



✕complex mesh

Fast Simulation of Mass-Spring Systems [Liu et al. 2013]

- energy minimization
- alternating optimization
- spring directions as auxiliary unknows
- pre-compute Cholesky factorization



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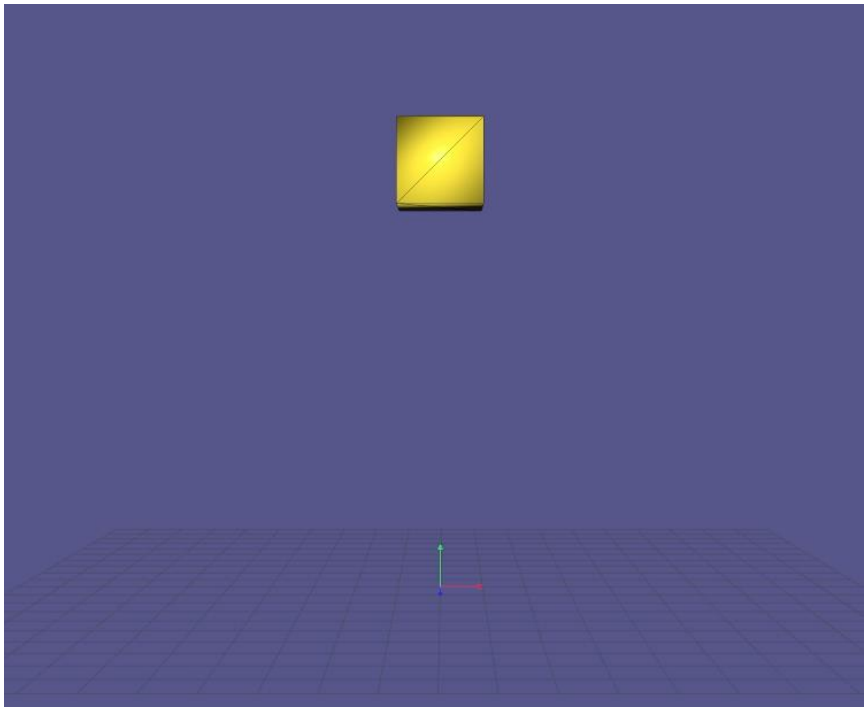

☑ regular connection

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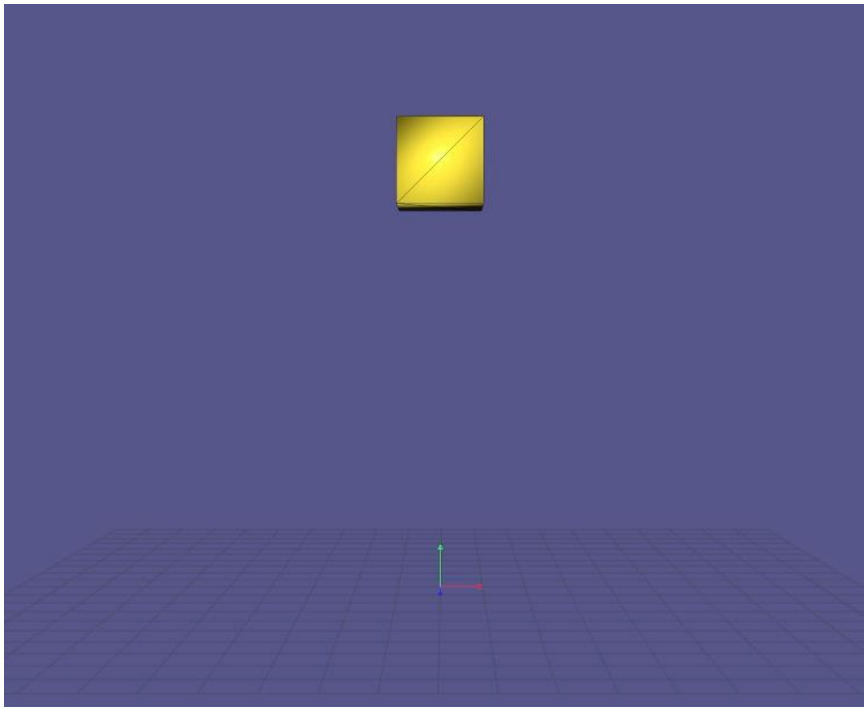

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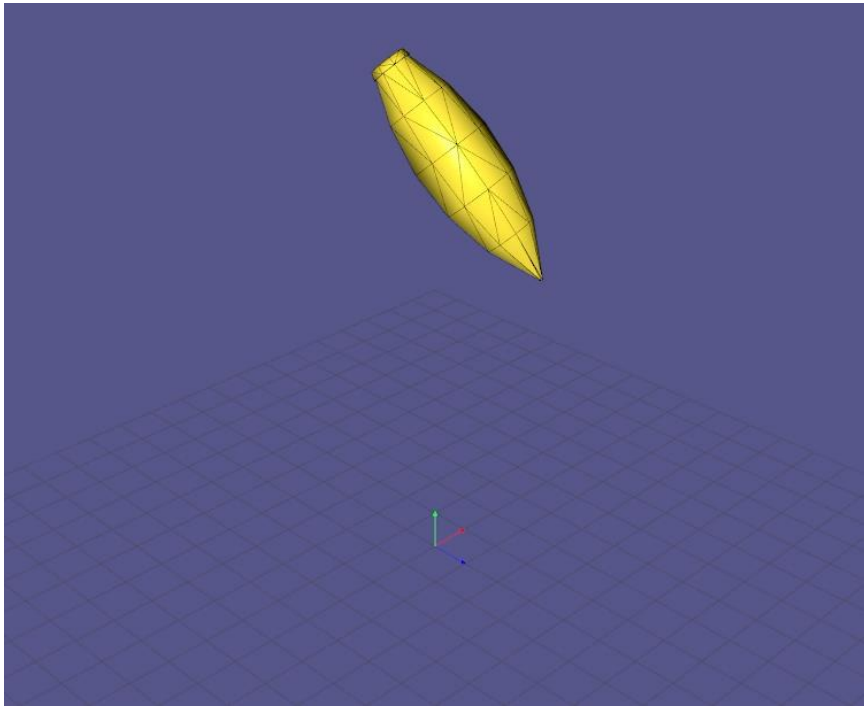
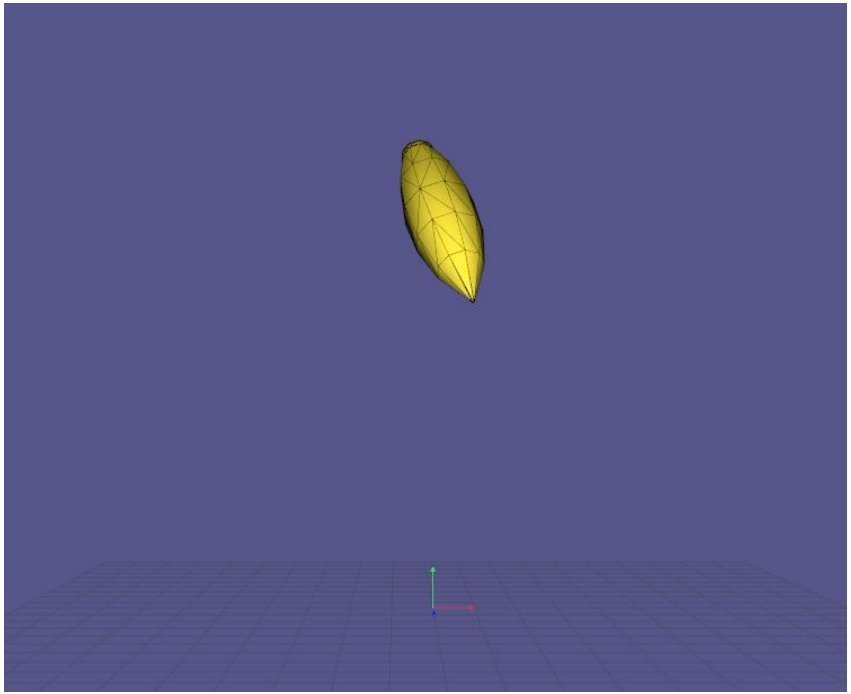
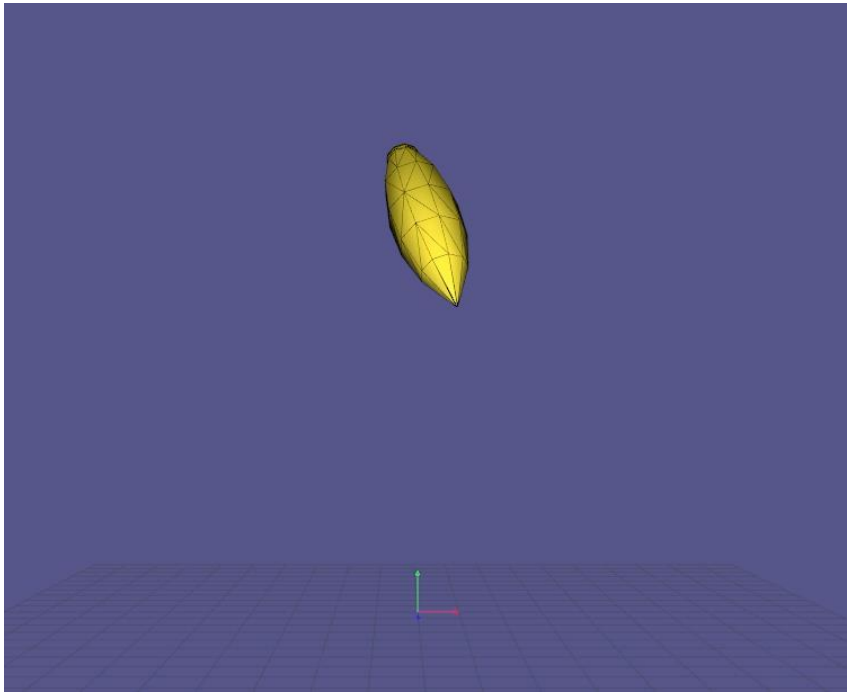


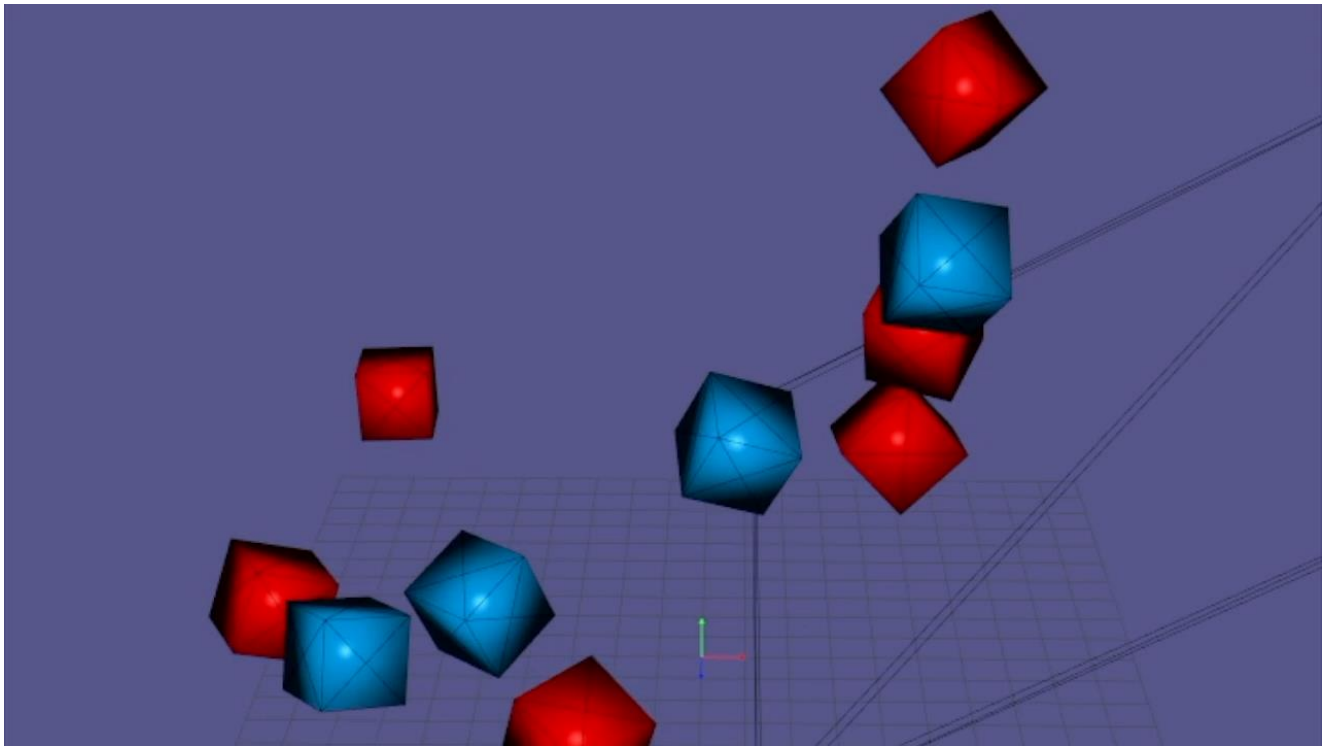
☑ complex mesh

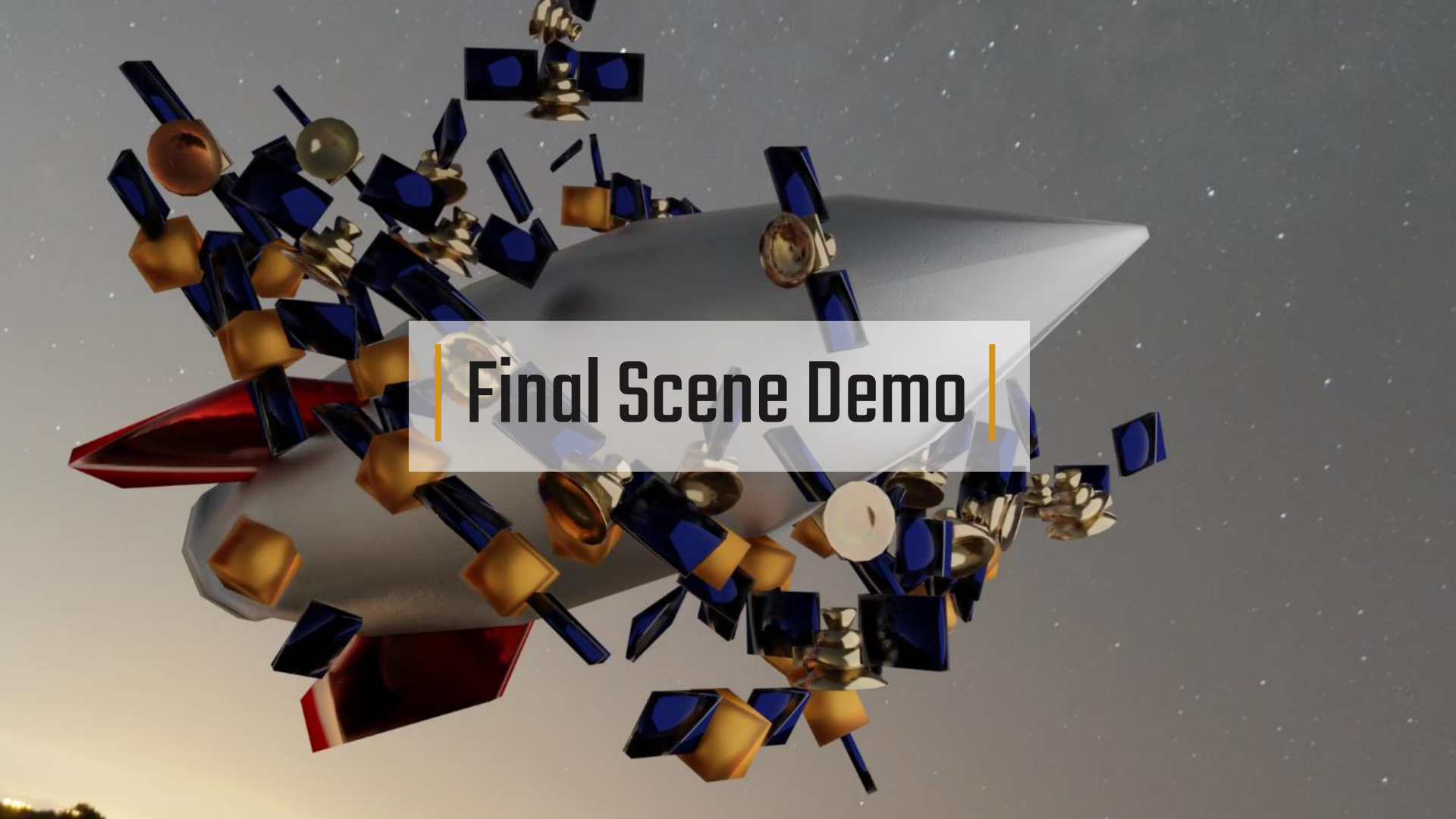
Effect of Pre-factorization





Softbody Collision




Final Scene Demo

THANKS