

Project Flamenco

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Objective

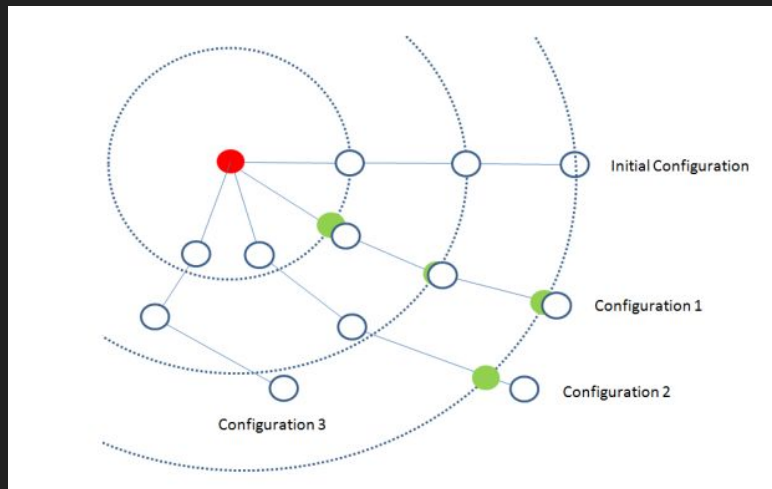
Implement a Position-Based Dynamics (PBD) cloth simulation algorithm on the GPU using predictive constraints – a technique introduced at GDC 2018 by EA's Frostbite team.

Currently, this runs on the Frostbite Engine but no game has shipped with this tech so far. Anthem may be the first.

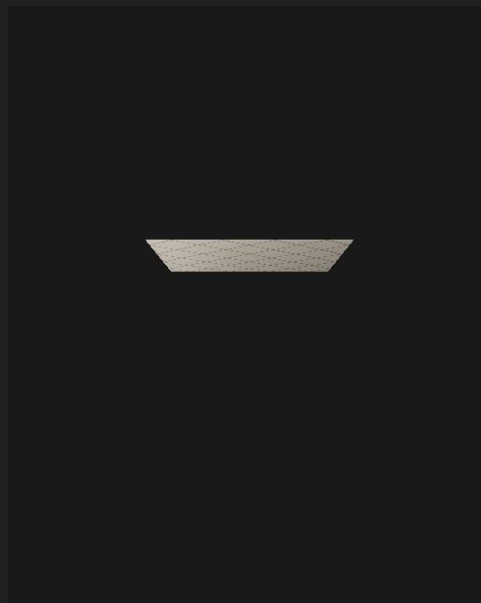
Project Milestones

- 11.19
 - (CPU) core PBD algorithm
 - Cloth mesh discretization
 - Distance + bending constraints
- 11.26
 - (GPU) core PBD algorithm
 - Jacobi-style constraint solver using D3D12 compute shaders
 - Environment collision constraints
- 12.03
 - Long Range Constraint *
 - Mesh Support *
 - Rendering pipeline
- 12.07
 - Self-collision constraints using predictive contacts
 - Acceleration structure using AABB

Long Range Attachment Constraint



Source: Position-Based Simulation Methods in Computer Graphics (Pg 15)

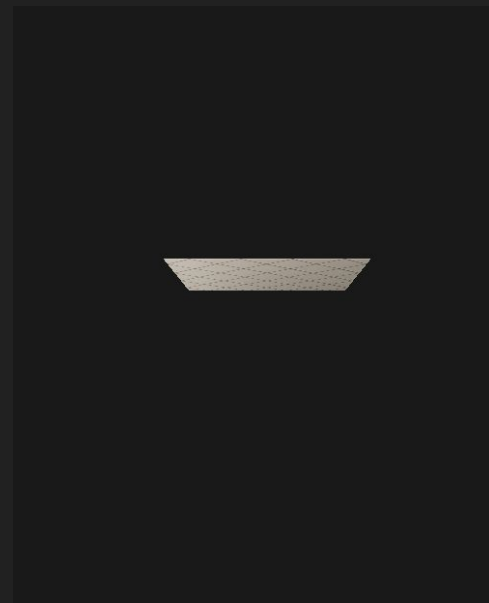


No LR Constraint

100 x 100

$$k_{\text{distance}} = 0.99$$

$$k_{\text{bending}} = 0.7$$



With LR Constraint

100 x 100

$$k_{\text{distance}} = 0.6$$

$$k_{\text{bending}} = 0.4$$

$$k_{\text{long range}} = 0.8$$

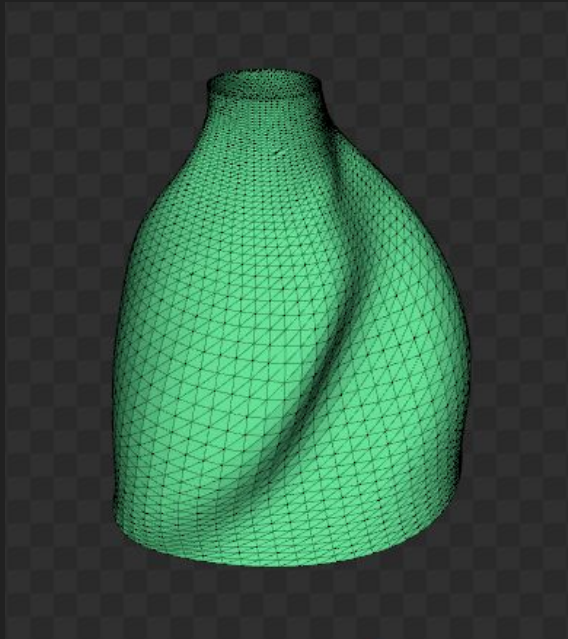
Mesh Support

- **GLTF 2.0 Support**
 - Using the Microsoft's GLTF SDK
 - Already built for Meshes but not for Cloth
- **Challenges:**
 - Vertex duplication due to UV cuts
 - Vertex duplication due to separate parts of mesh
- **Made PBD Algorithm aware of duplicates**
 - Aware of duplicates in Constraints
 - Aware of duplicates while iterating / solving



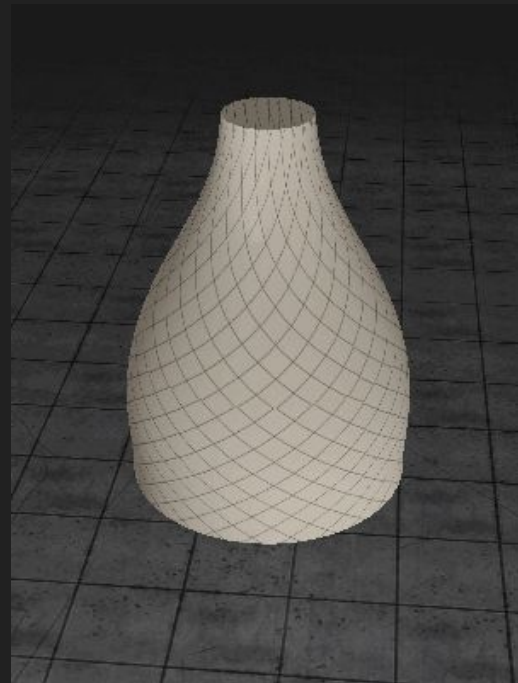
Mesh Support

- 8192 Triangles
- 4160 Vertices
- 8256 Edges
- ~ 24,576 Constraints in parallel



$$k_{\text{distance}} = 0.6$$

$$k_{\text{bending}} = 0.1$$



$$k_{\text{distance}} = 0.9$$

$$k_{\text{bending}} = 0.6$$

Mesh Support



Project Roadmap

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