

More than 60 tools and counting...

- Conversion
- Filtering and Morphology
- Mathematical Transformation
- Combination
- Segmentation
- Geometric Transformation
- Level Set Processing
- Bitwise Boolean Operations
- Bitwise Morphology Operations
- Sparsity Management and Compression

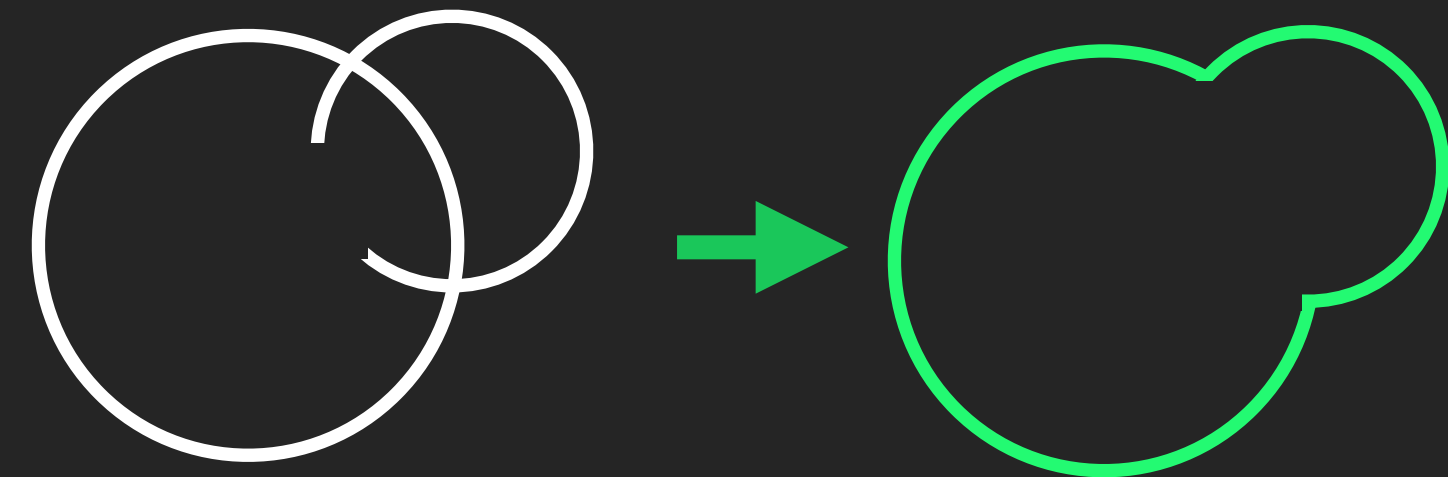
Conversion

From Polygons

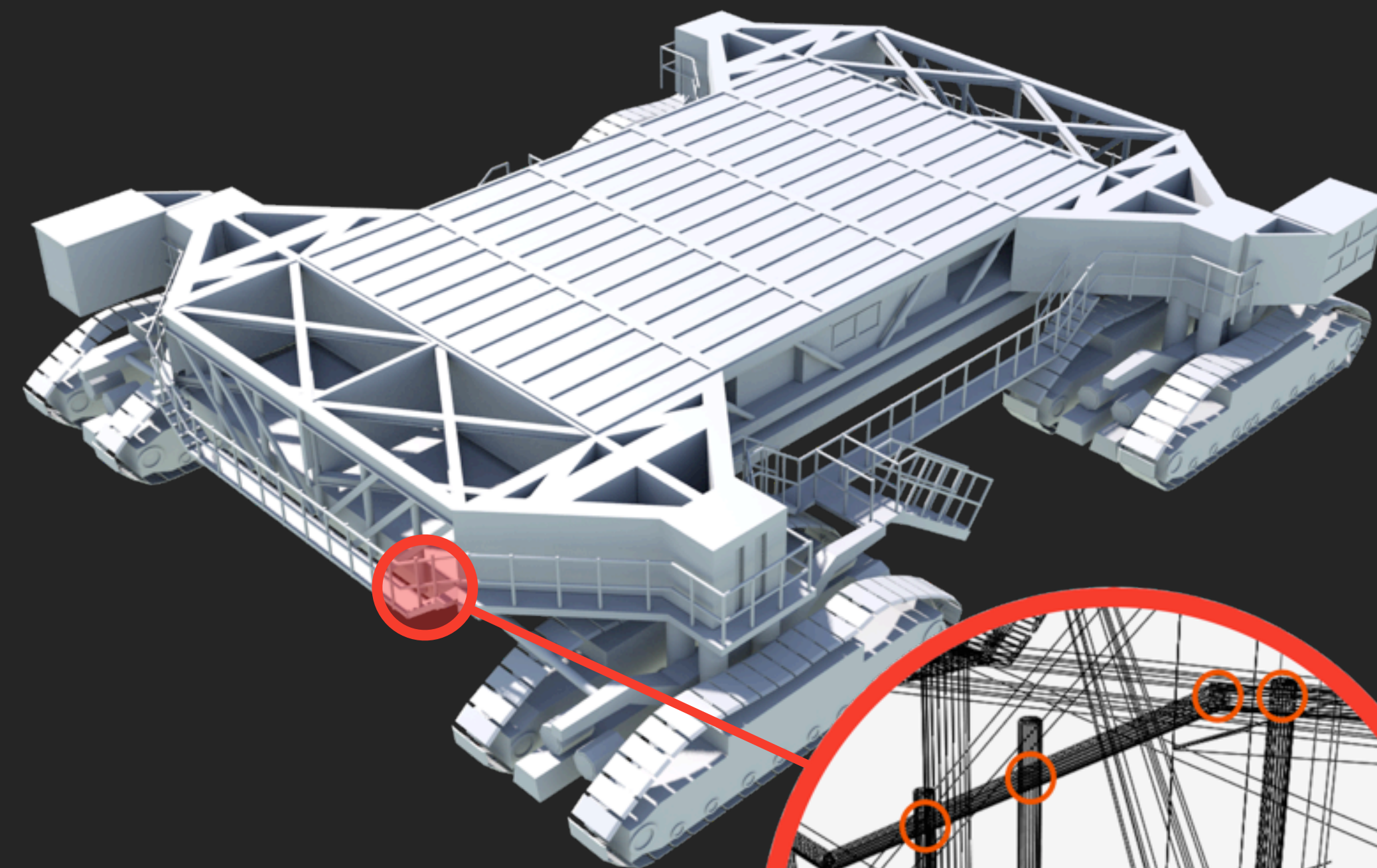
`tools::MeshToVolume`

- IN: Polygonal models (quads & triangles)
- OUT: Produces level set (SDF) or unsigned distance field
- Robust to non-manifold surfaces with internal self-intersections
- Requires closed (watertight) model for level set

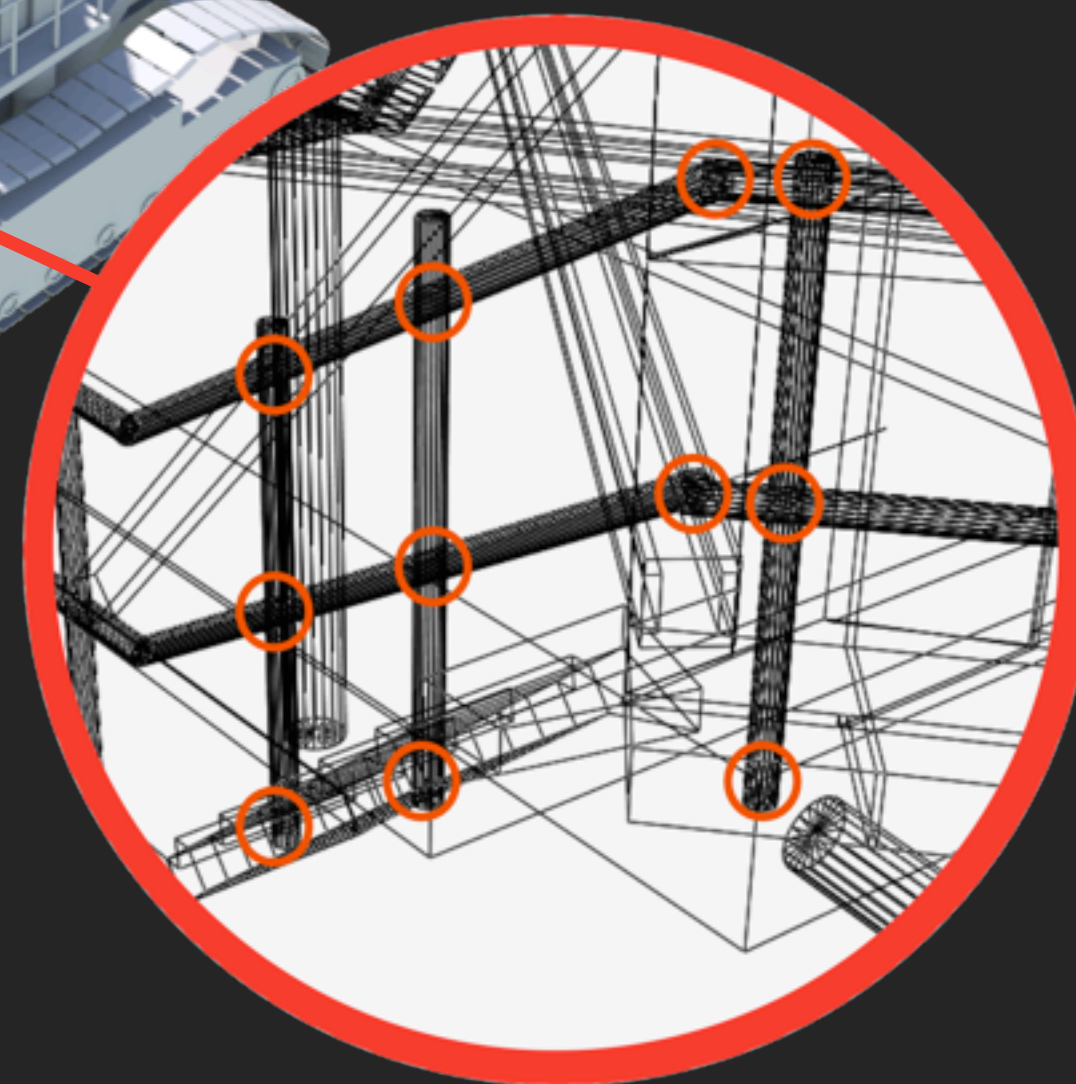
Level Set Conversion



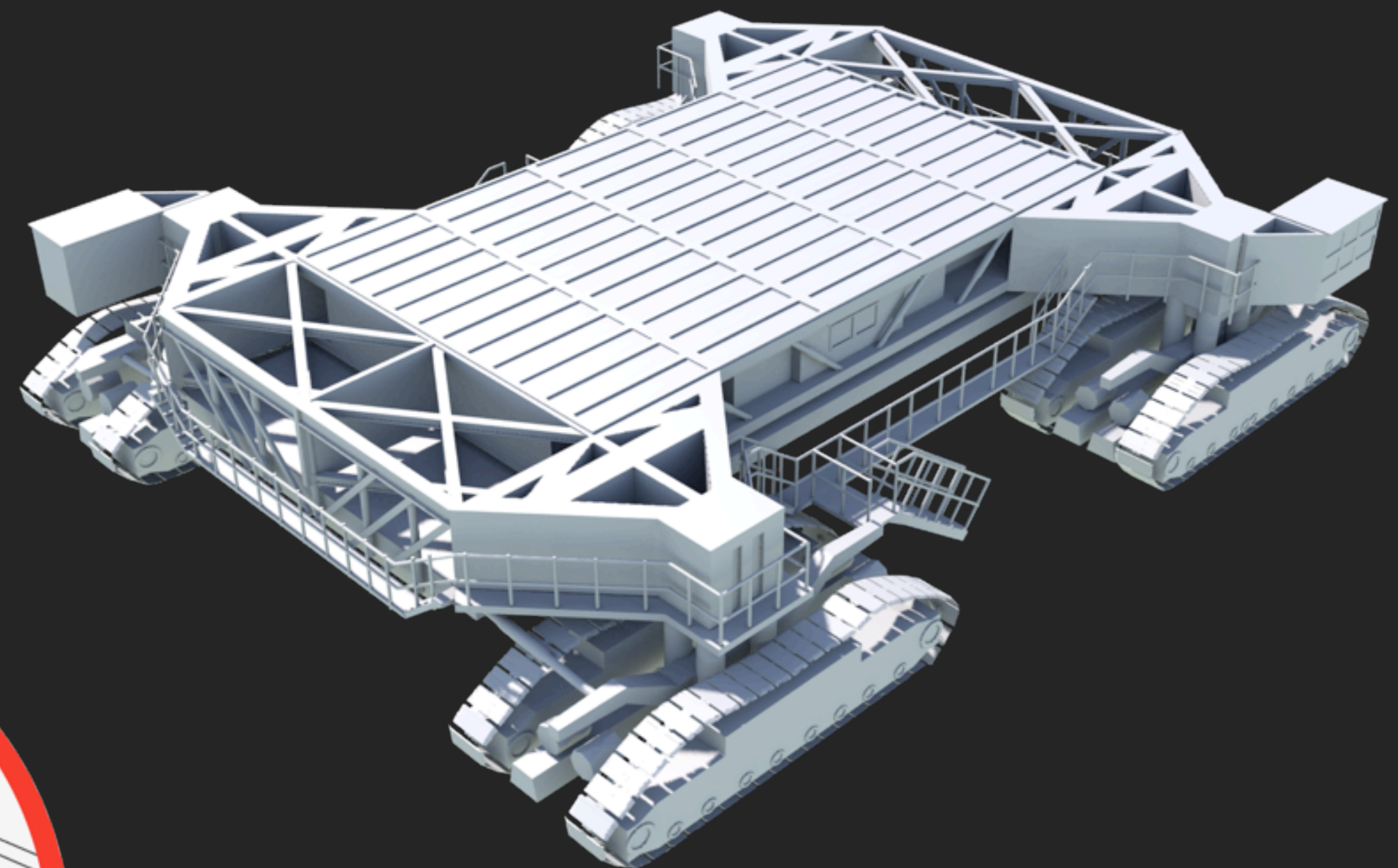
Conversion



Polygonal Model



internal self-intersections



Level Set

Resolution: 1051 x 208 x 863
Active Voxels: 8.9M (188.7M dense)
Memory: 172 MB
Conversion Time 2.7s
Threaded — very fast

Conversion

To Polygons

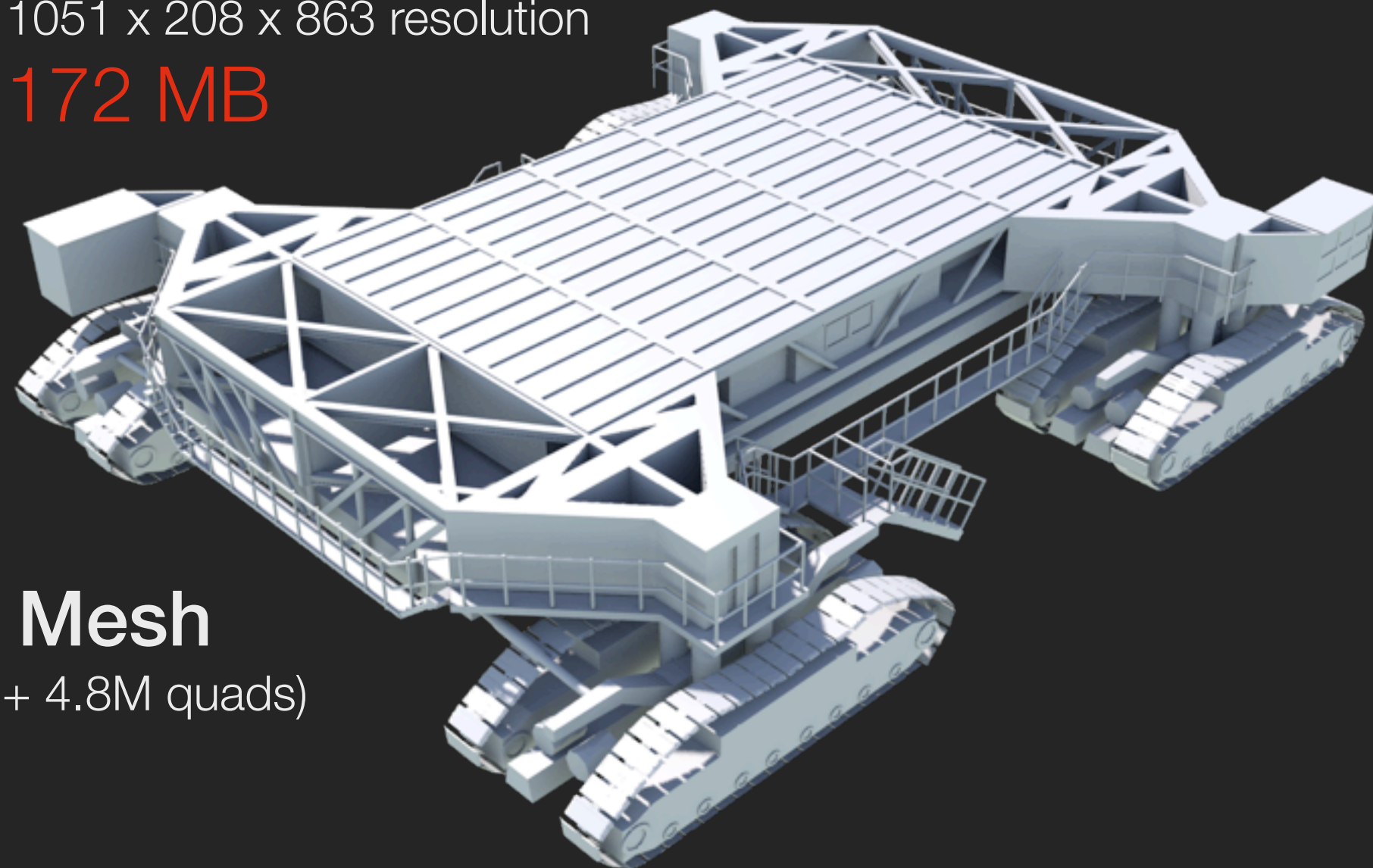
tools::VolumeToMesh

- Mesh any scalar field that has a continuous isosurface
- Threaded dual contouring scheme
- Adaptive, using local curvature
- Supports region masking and adaptivity field

Level Set

1051 x 208 x 863 resolution

172 MB



Uniform Mesh

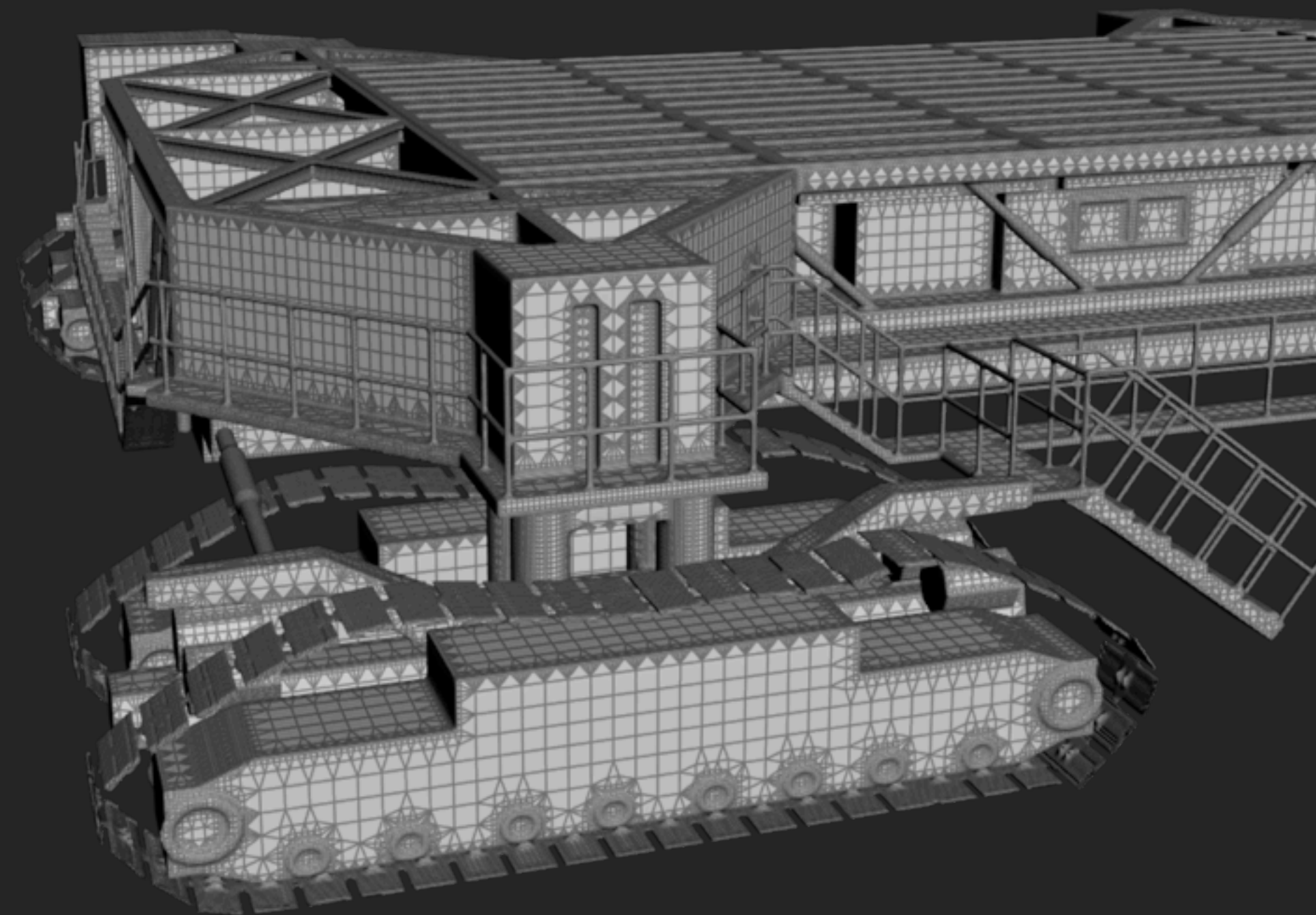
(4.8M points + 4.8M quads)

129 MB

Adaptive Mesh

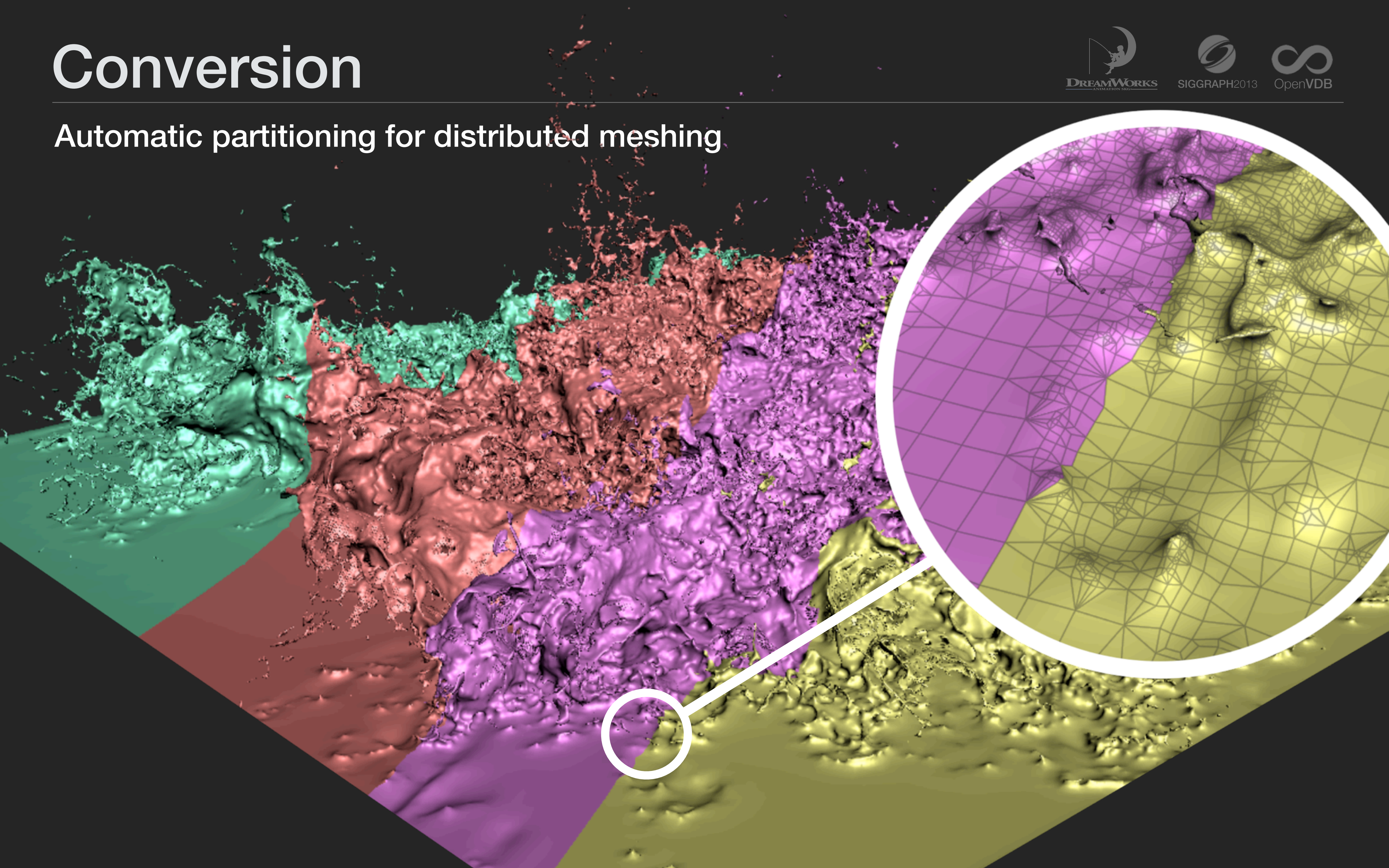
(1.7M points + 1.5M quads + 335K triangles)

46 MB



Conversion

Automatic partitioning for distributed meshing



Conversion

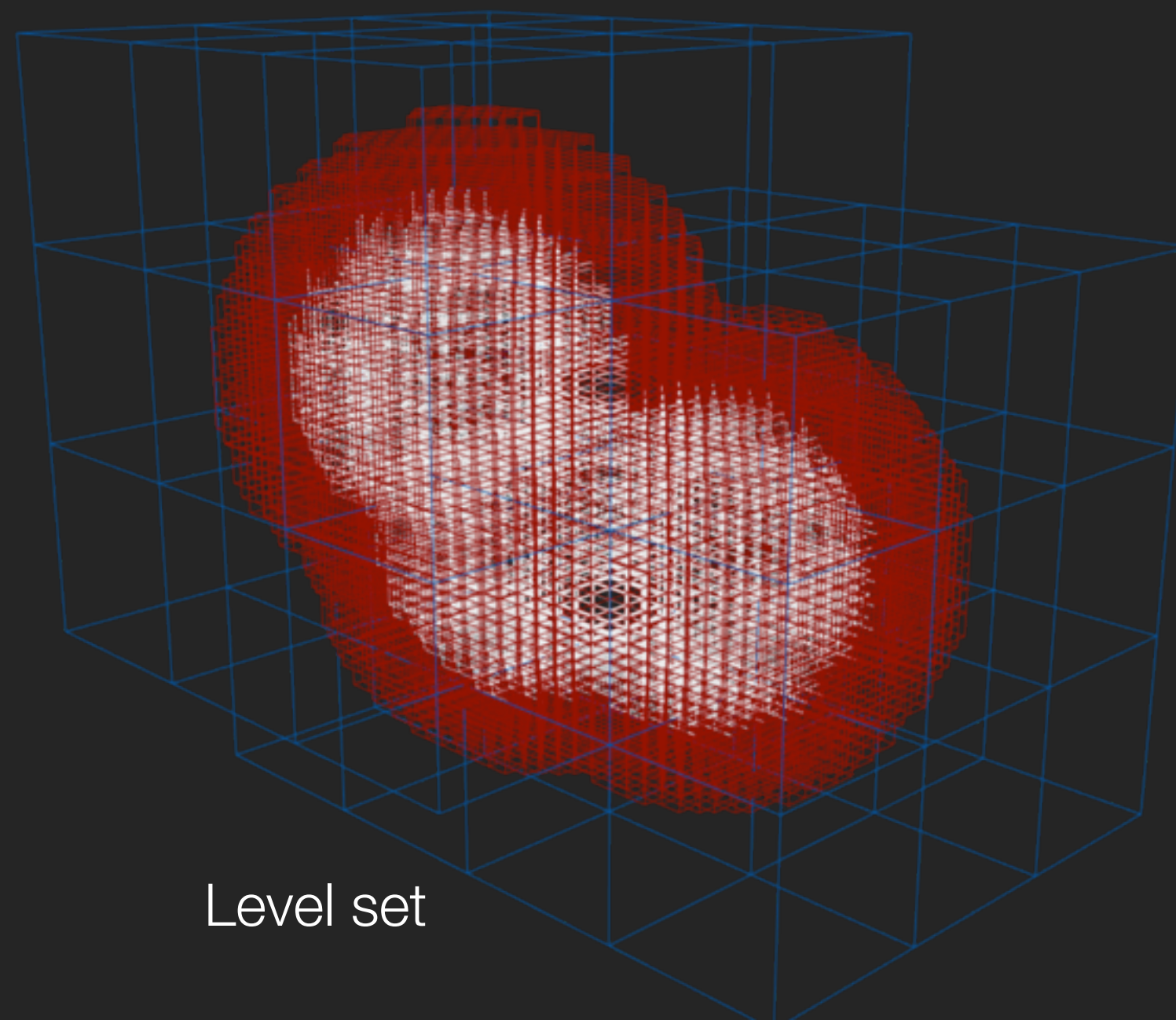
From Particles

`tools::ParticlesToLevelSet`

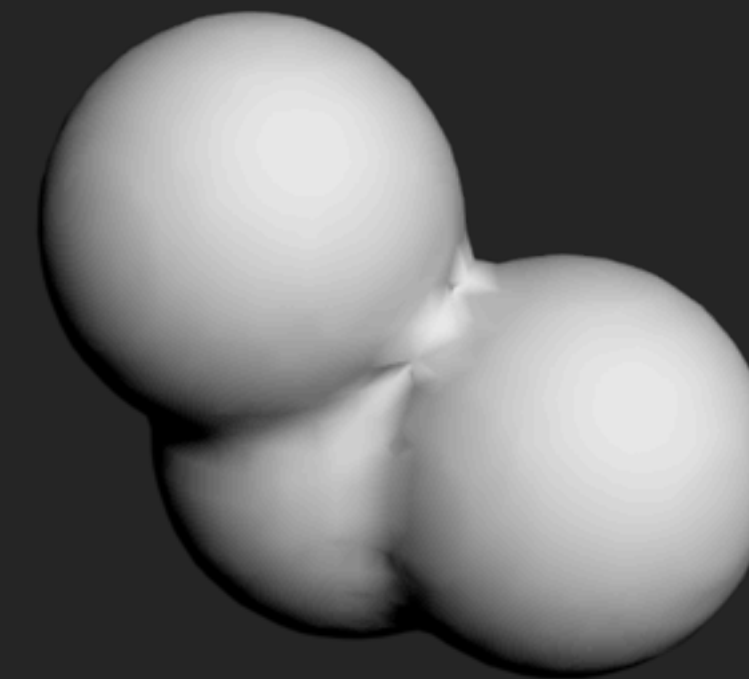
- Creates a level set from a list of points with position & radius
- Threaded
- Custom attribute transfer
- Optional velocity trails



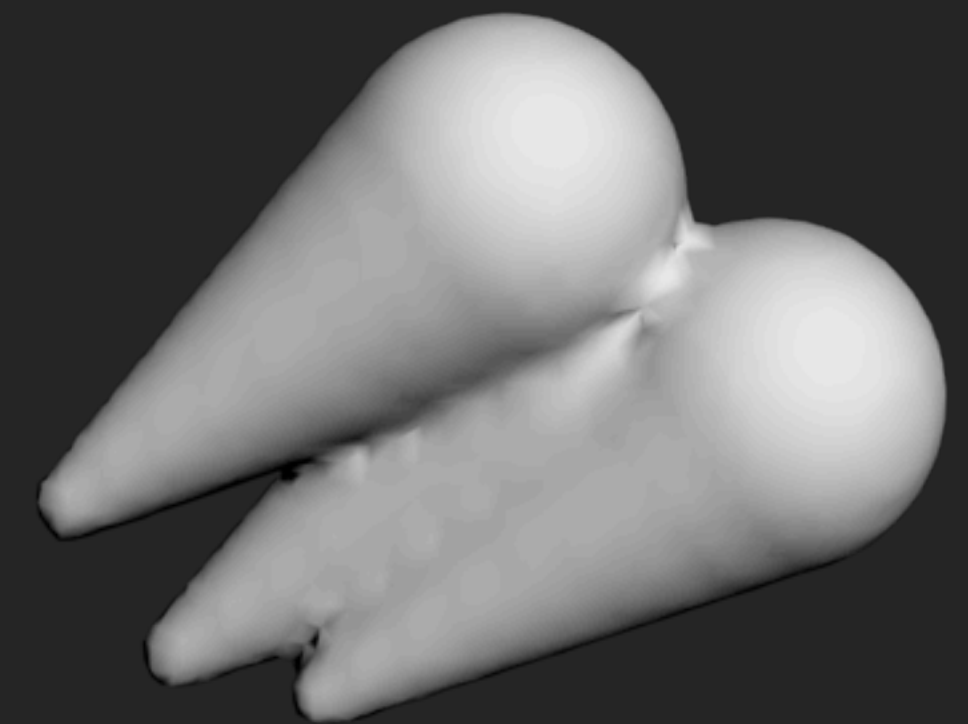
Particles



Level set



Surface



Velocity trails

More Converters



From SDF to Fog Volume

`tools::sdfToFogVolume`

Rebuild Level Set

`tools::levelSetRebuild`

Dense Volume Converters

`tools::copyFromDense`

`tools::copyToDense`

Scatter Points

`tools::UniformPointScatter`

`tools::NonUniformPointScatter`

Filtering and Morphology



Gaussian

`tools::Filter::gaussian`

`tools::LevelSetFilter::gaussian`

Median

`tools::Filter::median`

`tools::LevelSetFilter::median`

Mean

`tools::Filter::mean`

`tools::LevelSetFilter::mean`

Offset / Morphological

`tools::Filter::offset`

`tools::LevelSetFilter::offset`

Normalize

`tools::normalize`

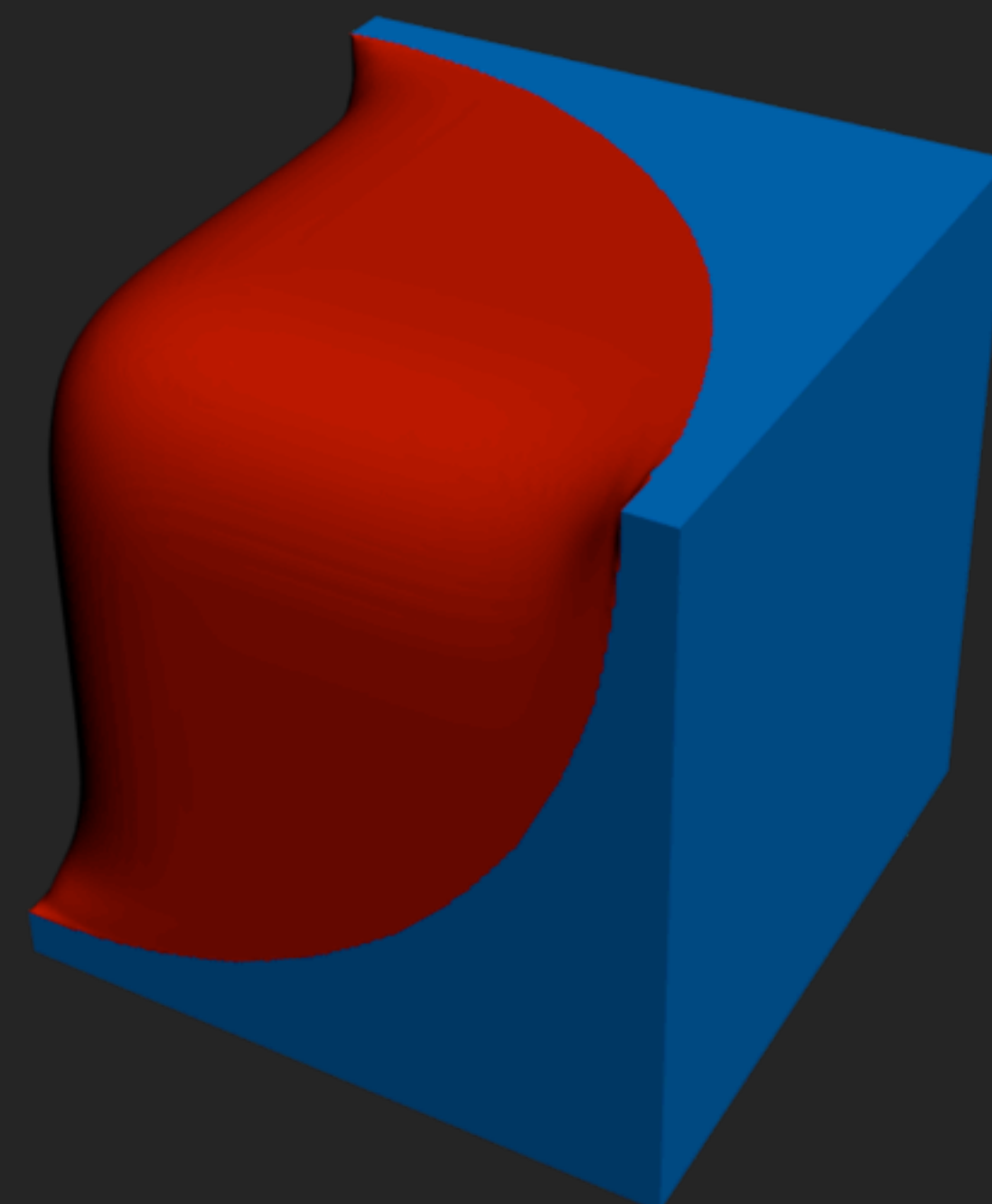
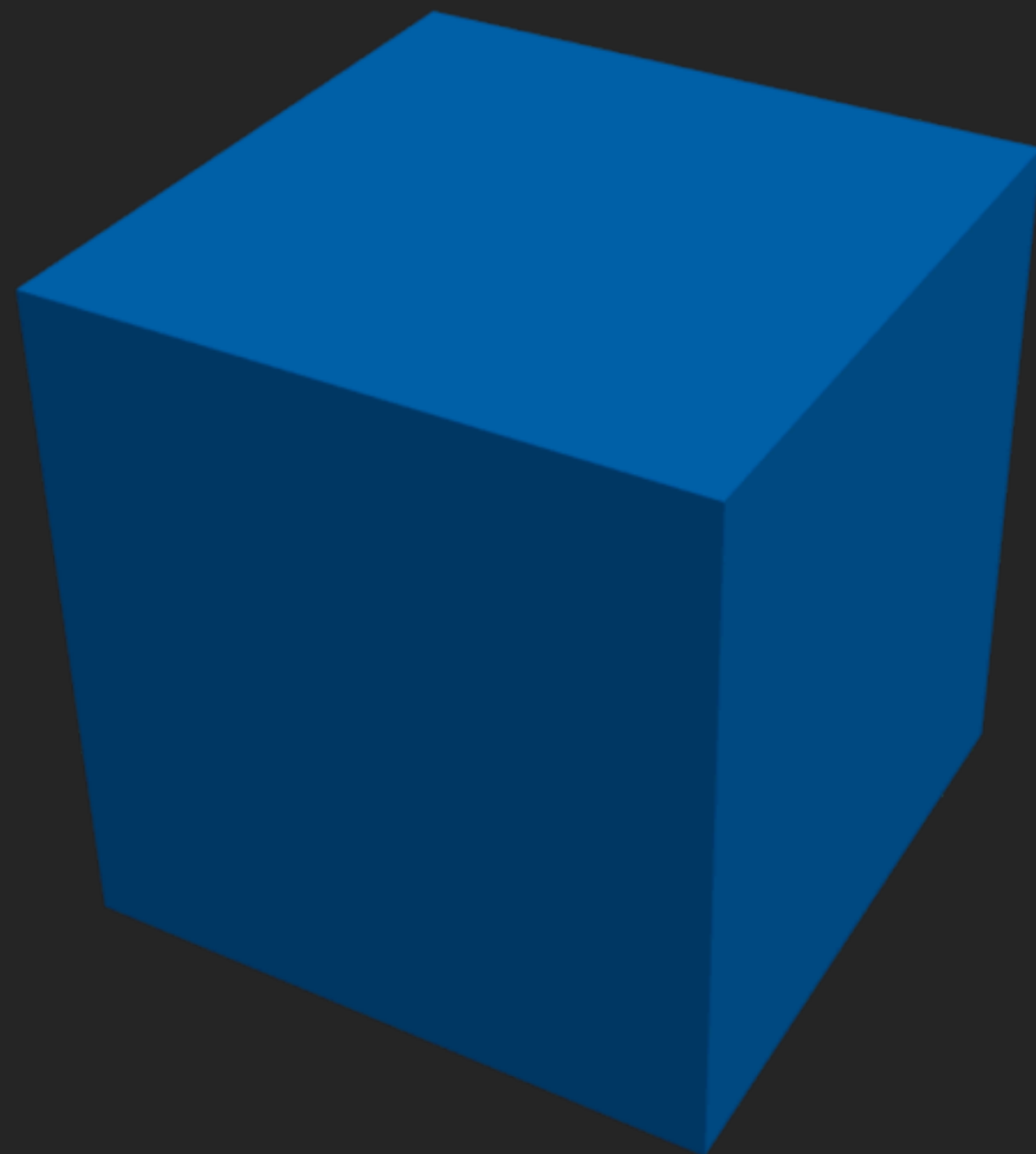
`tools::LevelSetFilter::normalize`

Level set specific

`tools::LevelSetFilter::laplacian`

`tools::LevelSetFilter::meanCurvature`

Gaussian Filter with Masking

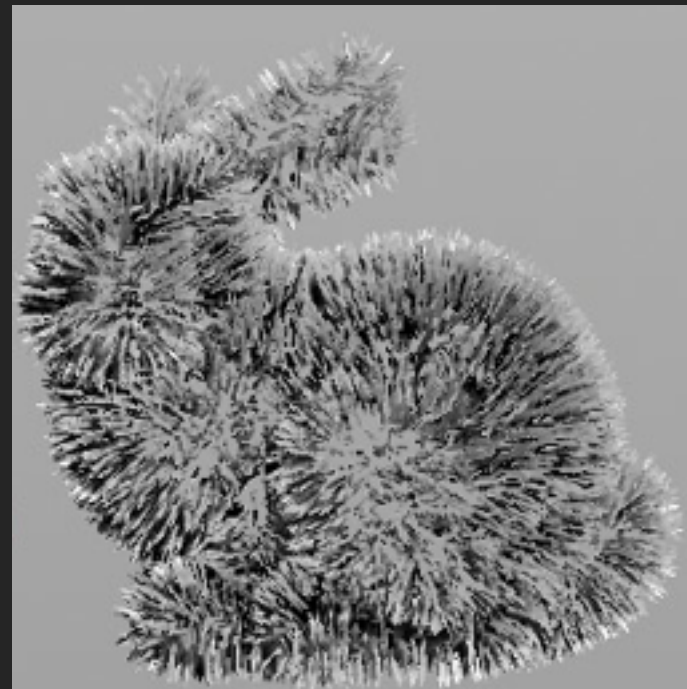
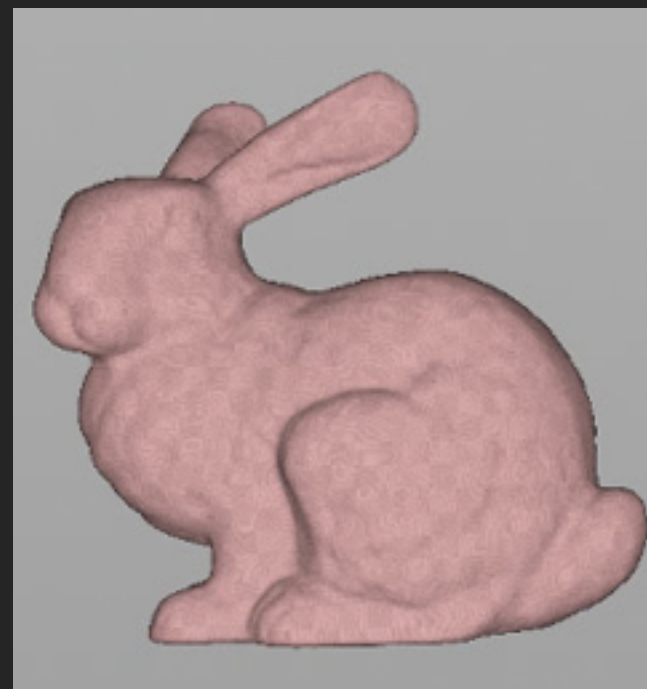


Mathematical Transformation

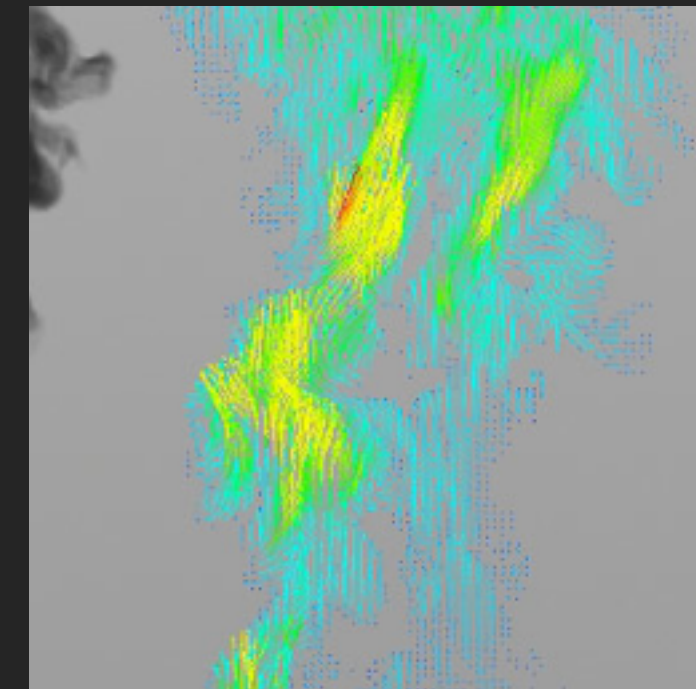
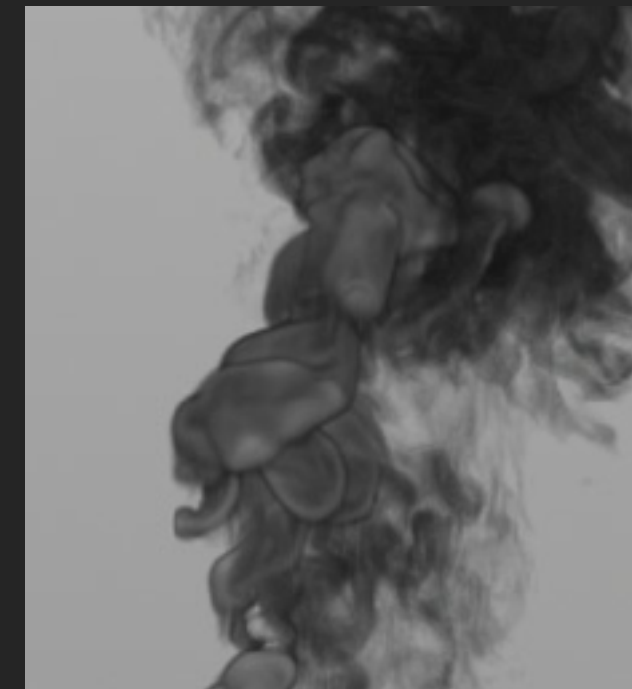
Gradient

`tools::gradient`

The implicit surface
(zero level set)

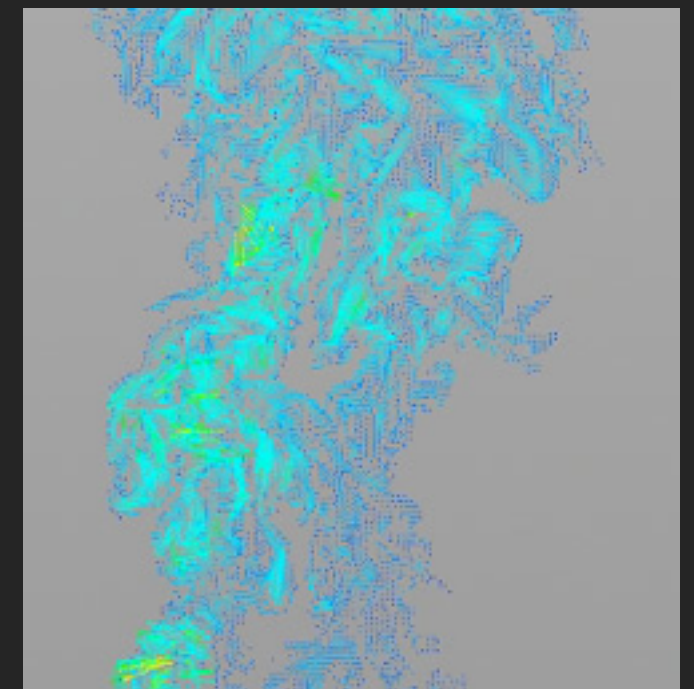


Buoyant density in an incompressible
fluid simulation



Curl

`tools::curl`



Mean curvature

`tools::meanCurvature`

Closest-point transform

`tools::cpt`

Divergence

`tools::divergence`

Laplacian

`tools::laplacian`

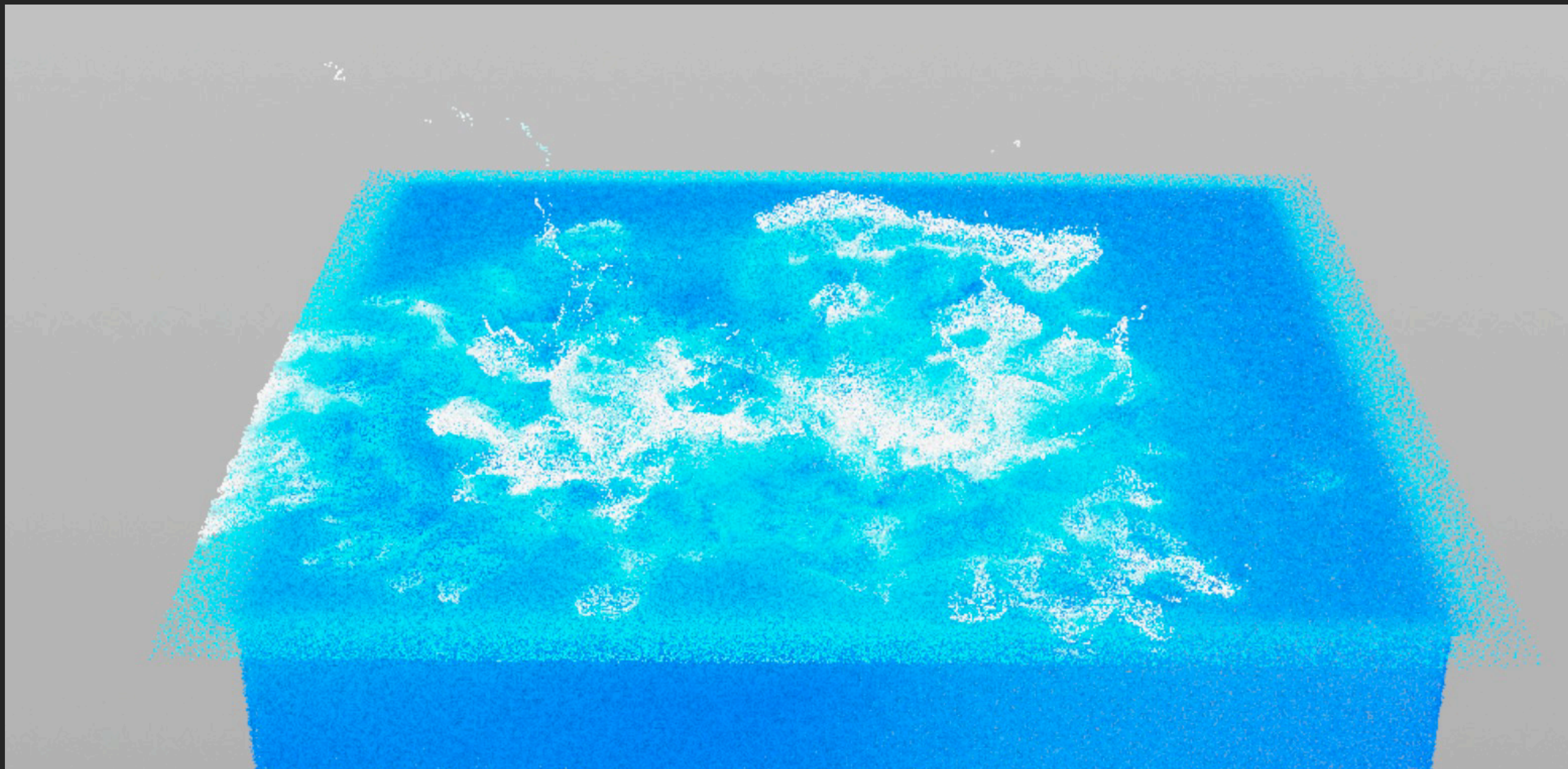
Magnitude

`tools::magnitude`

Liquid Surfacing

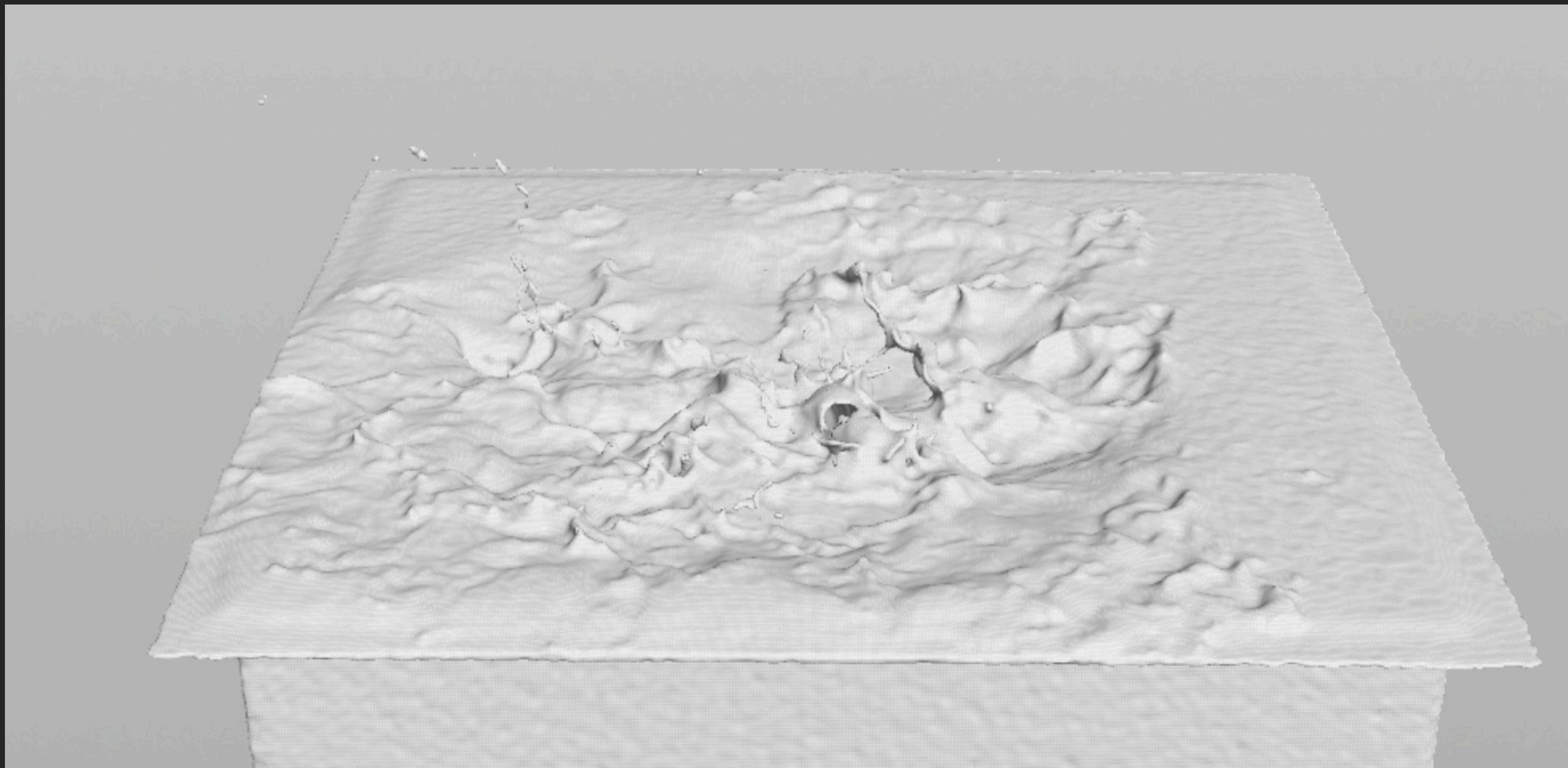


Particle Liquid Simulation



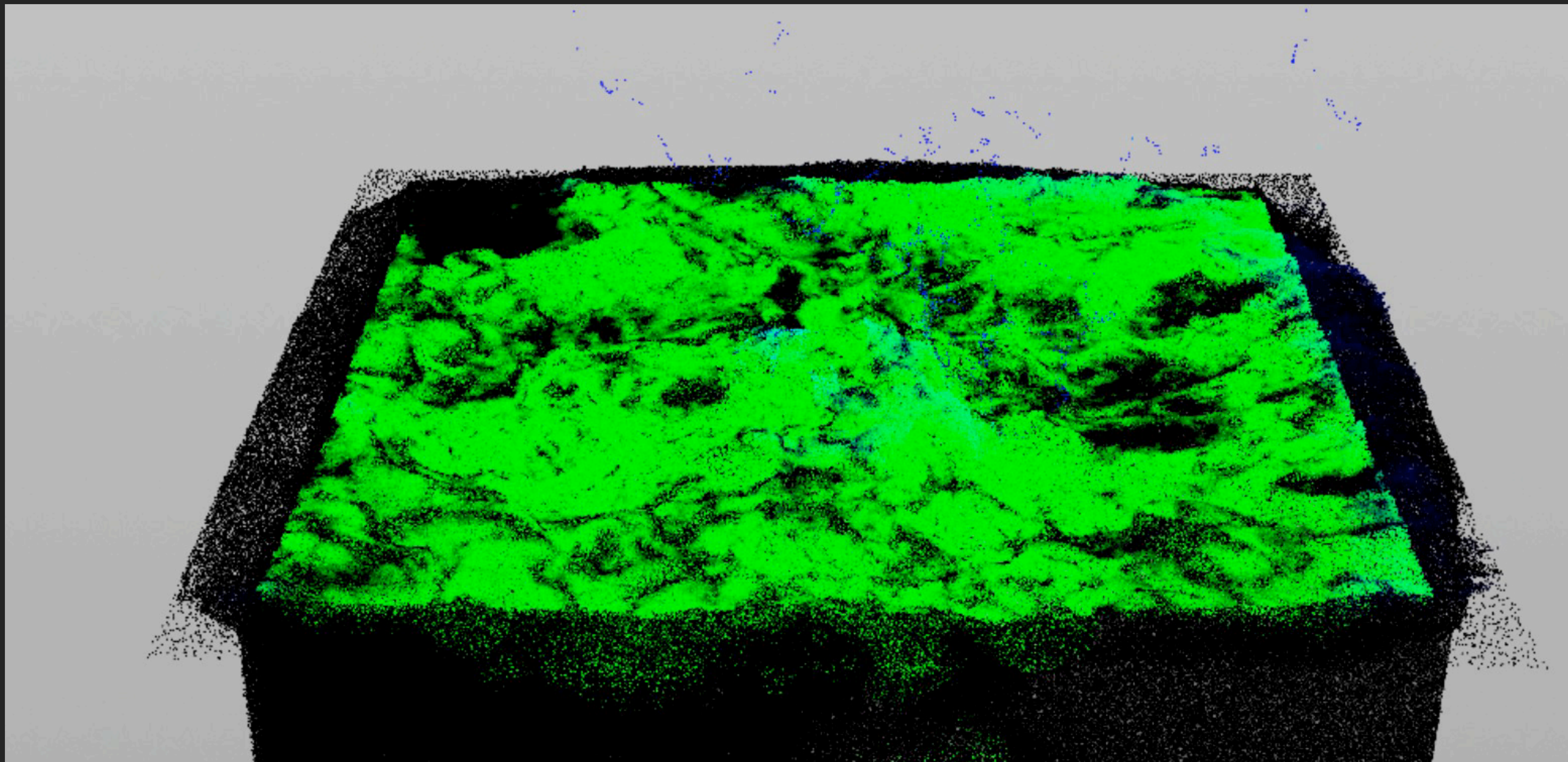
Liquid Surfacing

Fast initial surface (using only From Particles)



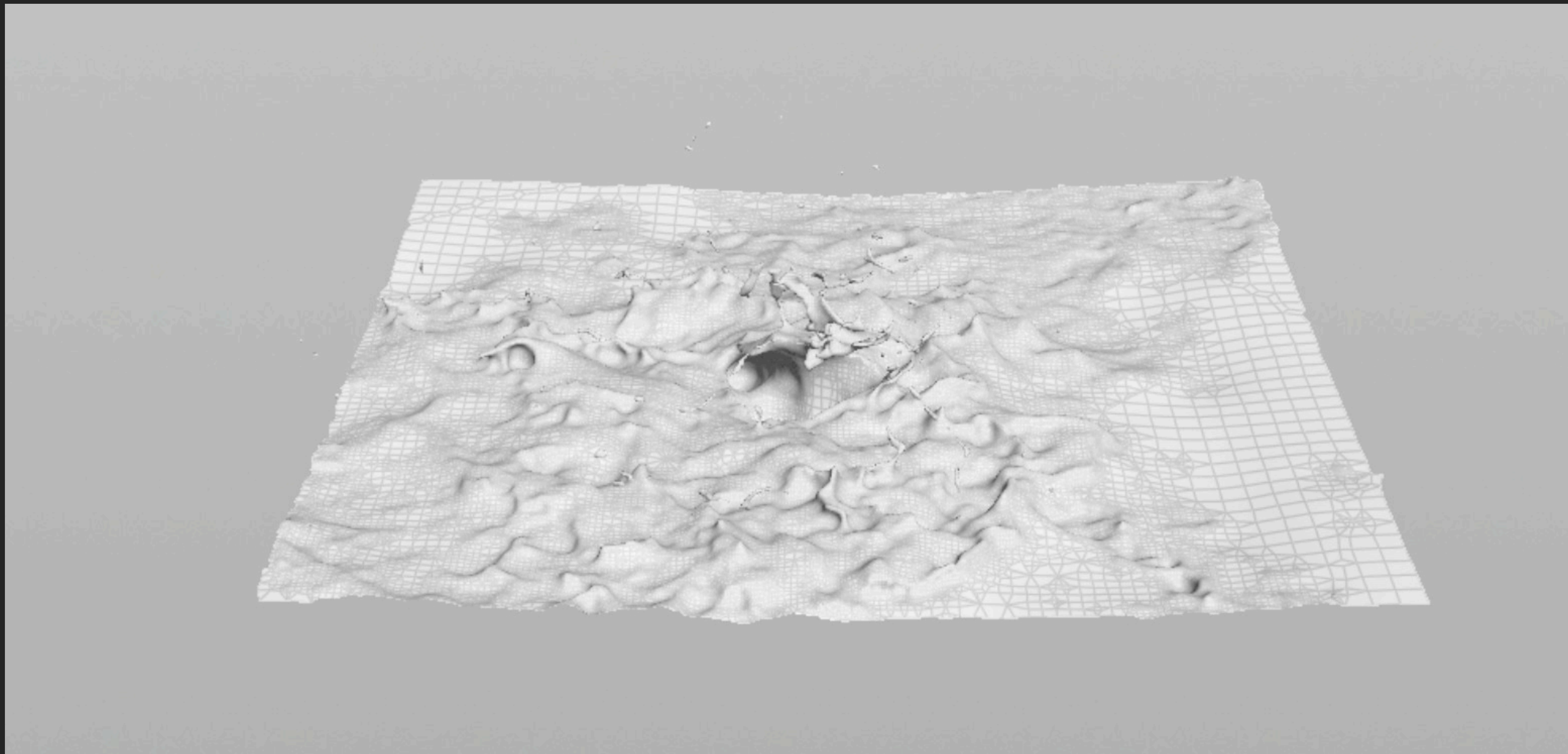
Liquid Surfacing

Vorticity Magnitude Mask (used for filtering)



Liquid Surfacing

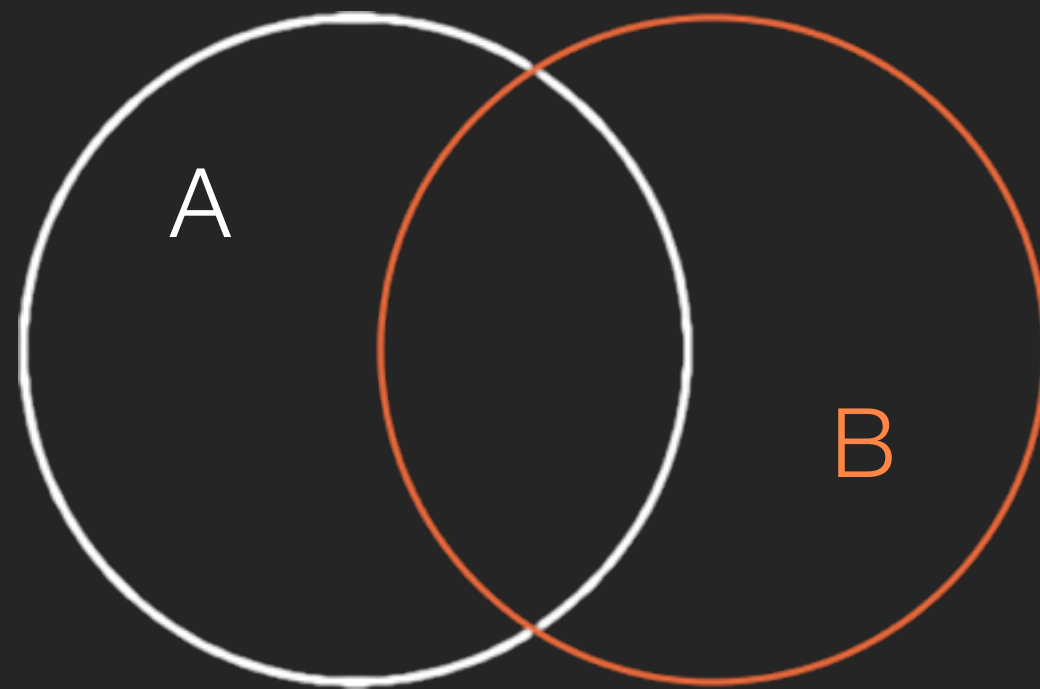
Putting it all together



Combination

Constructive solid geometry

- Hierarchical
- Branch stealing — very fast



`tools::csgUnion`

`tools::csgIntersection`



`tools::csgDifference`

More Combination Tools



Pairwise Hierarchical Combination

Maximum

`tools::compMax`

Multiply

`tools::compMul`

Replace

`tools::compReplace`

Minimum

`tools::compMin`

Sum

`tools::compSum`

Merge

`Grid::merge`

Generic Hierarchical Algorithms

Combine

`Tree::combine`

`Tree::combineExtended`

`Tree::combine2`

`Tree::combine2Extended`

Visit

`Tree::visitActiveBBox`

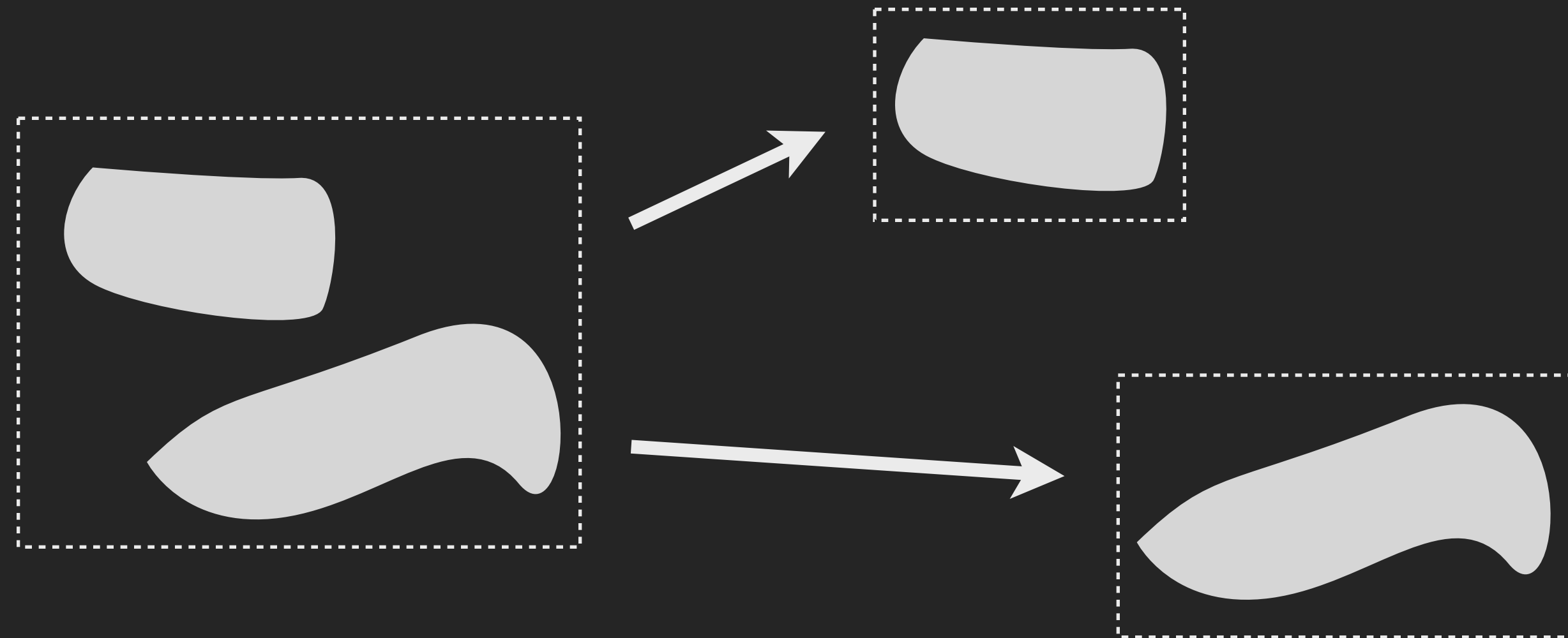
`Tree::visit`

`Tree::visit2`

Segmentation

Segment

tools::segment



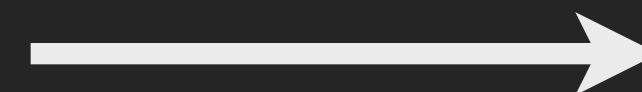
Interior mask

tools::sdfInteriorMask

Narrow band
level set

outside

inside



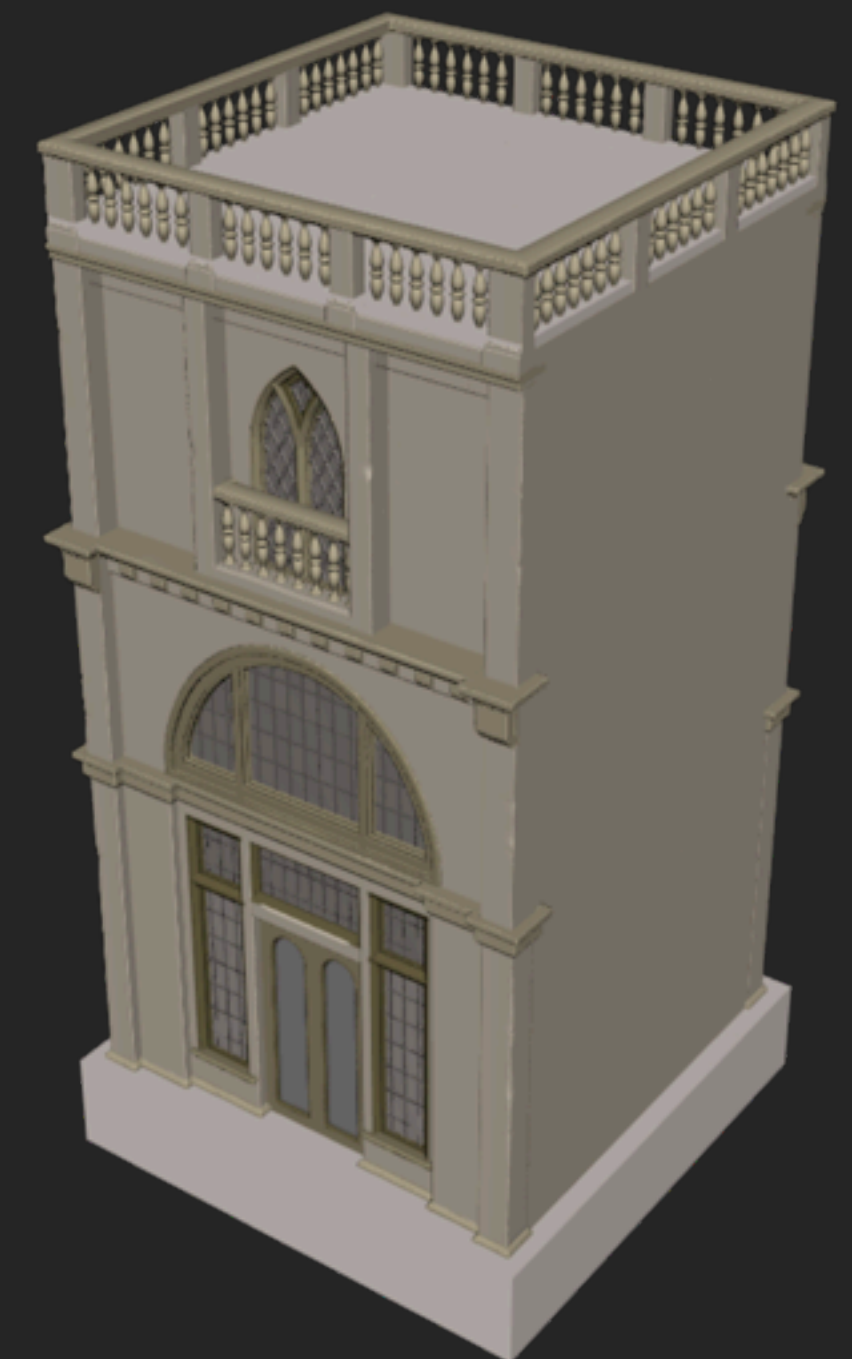
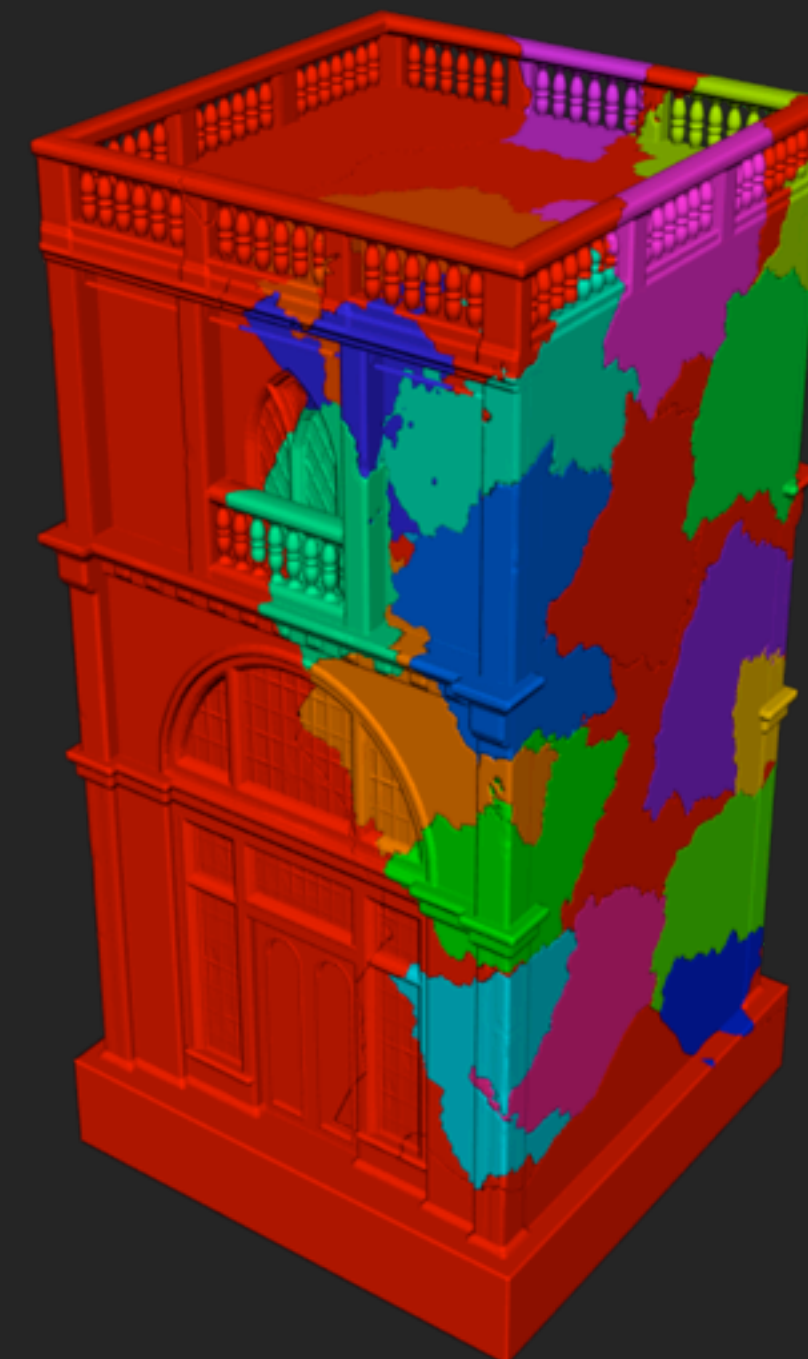
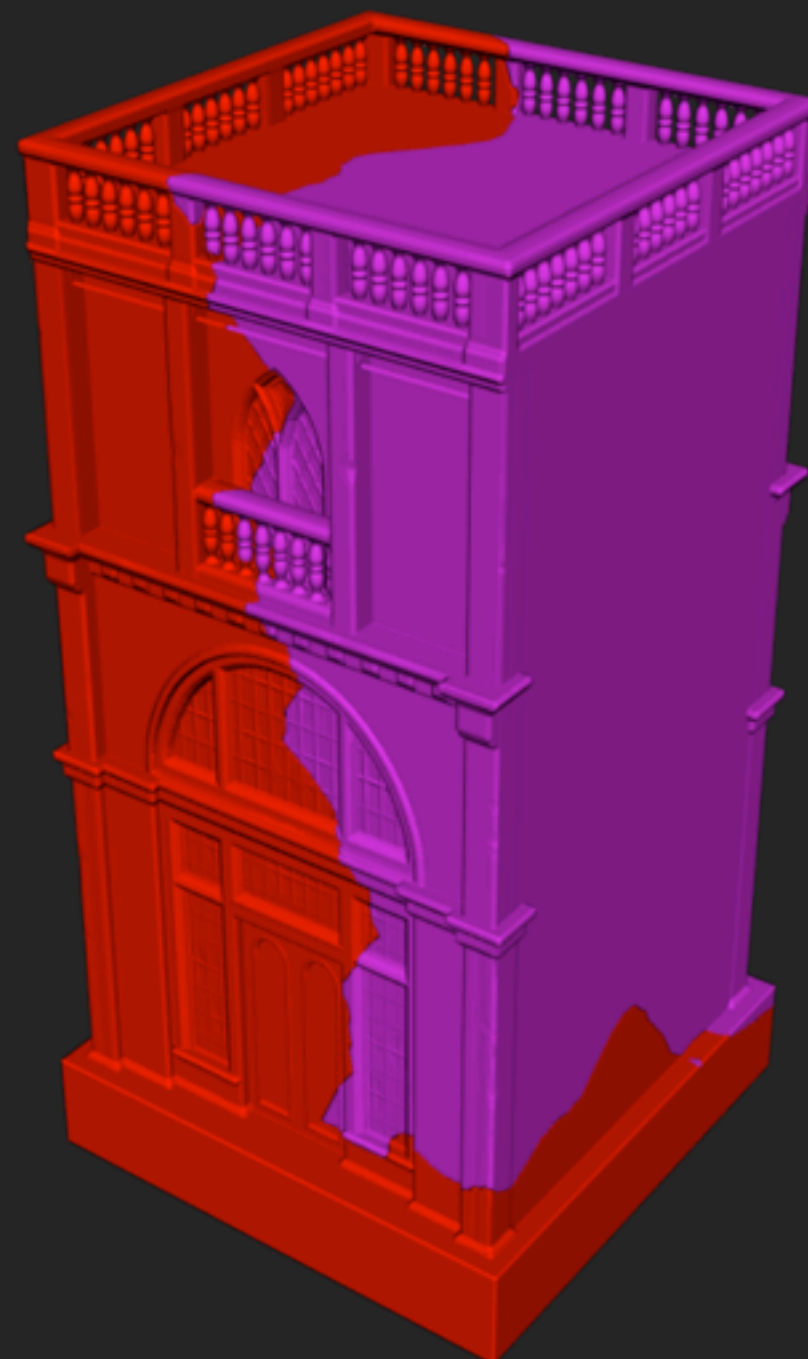
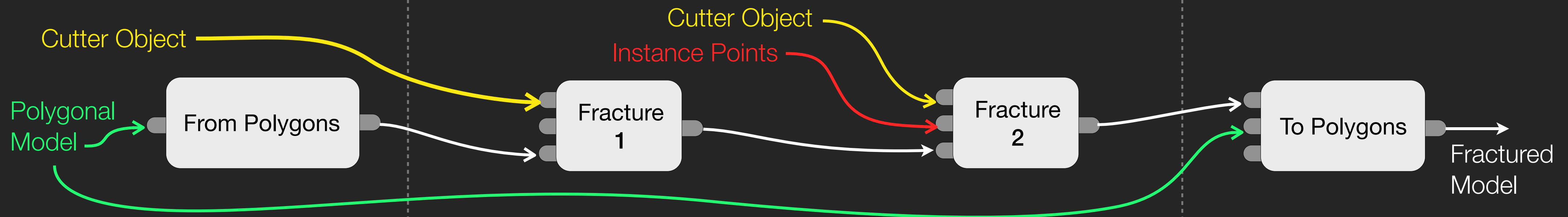
Level Set Fracture

Level Set Conversion

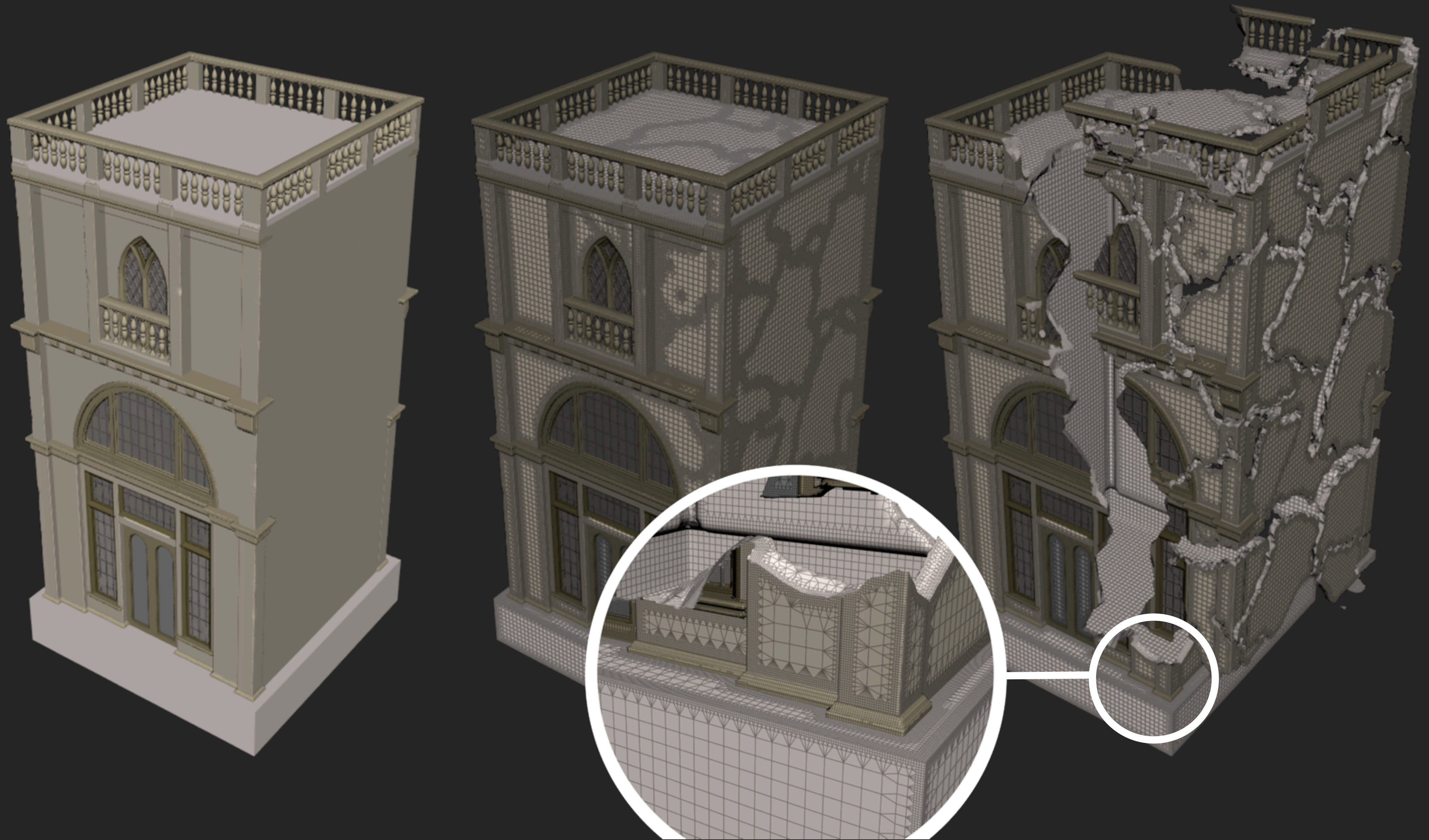
Fracturing

`tools::LevelSetFracture`

Surfacing

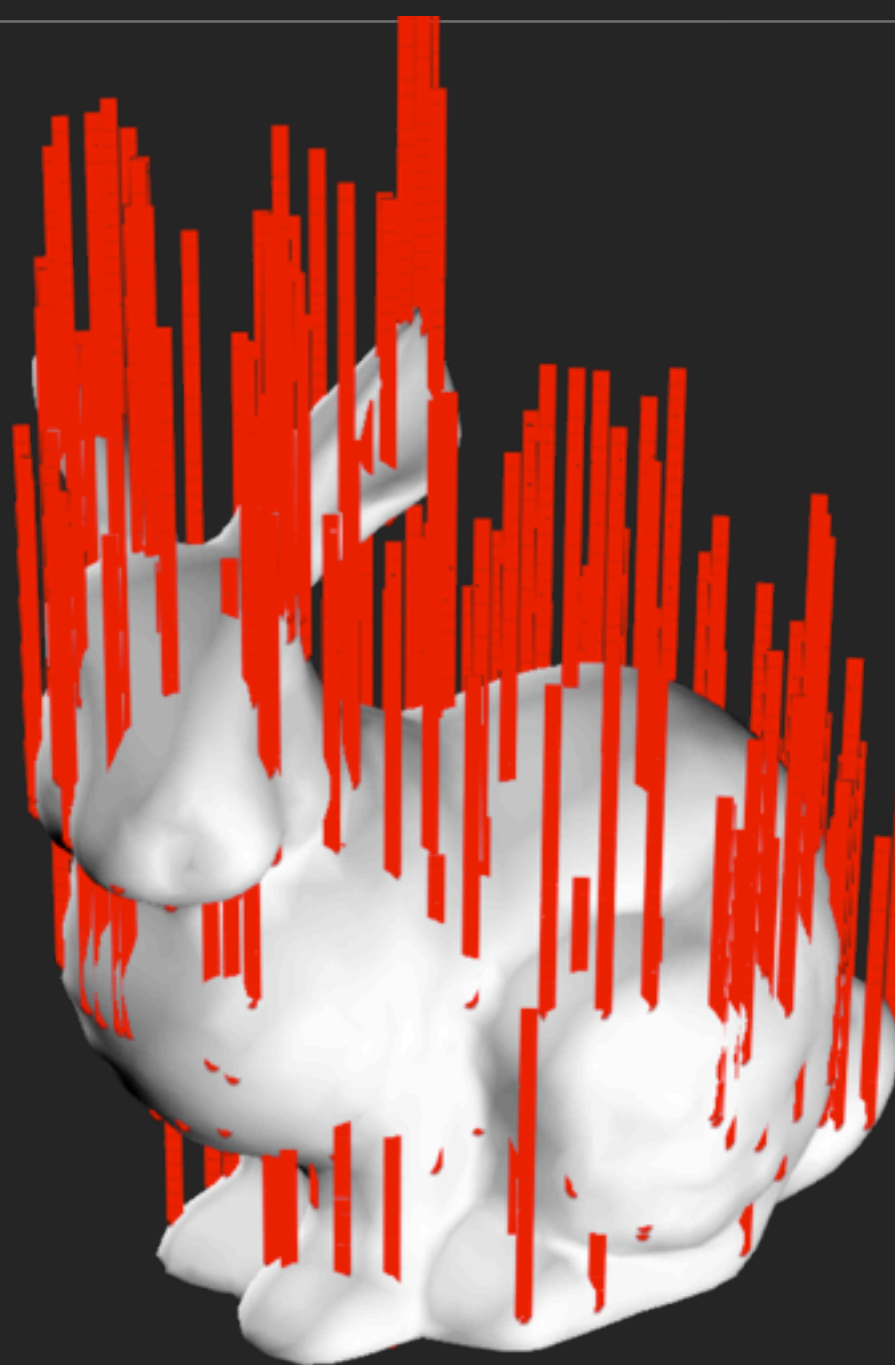
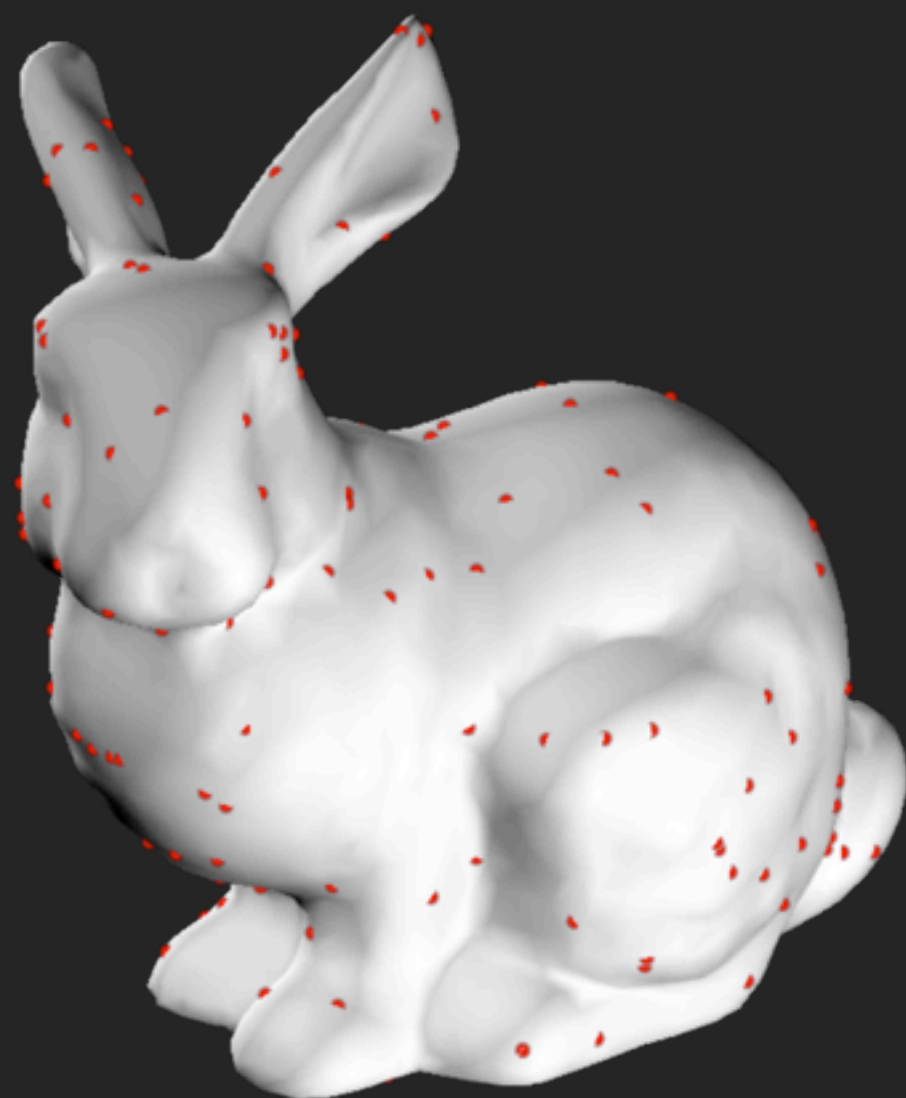


Level Set Fracture



Geometric Transformation

Advect points



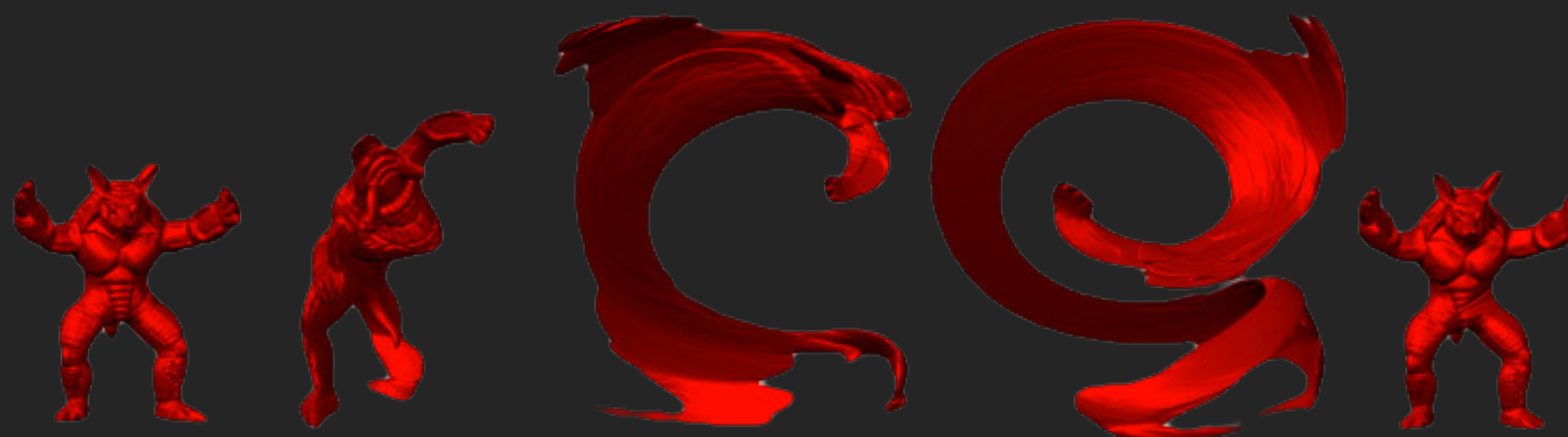
`tools::PointAdvect`



`tools::ConstrainedPointAdvect`

Advect level set

`tools::LevelSetAdvection`



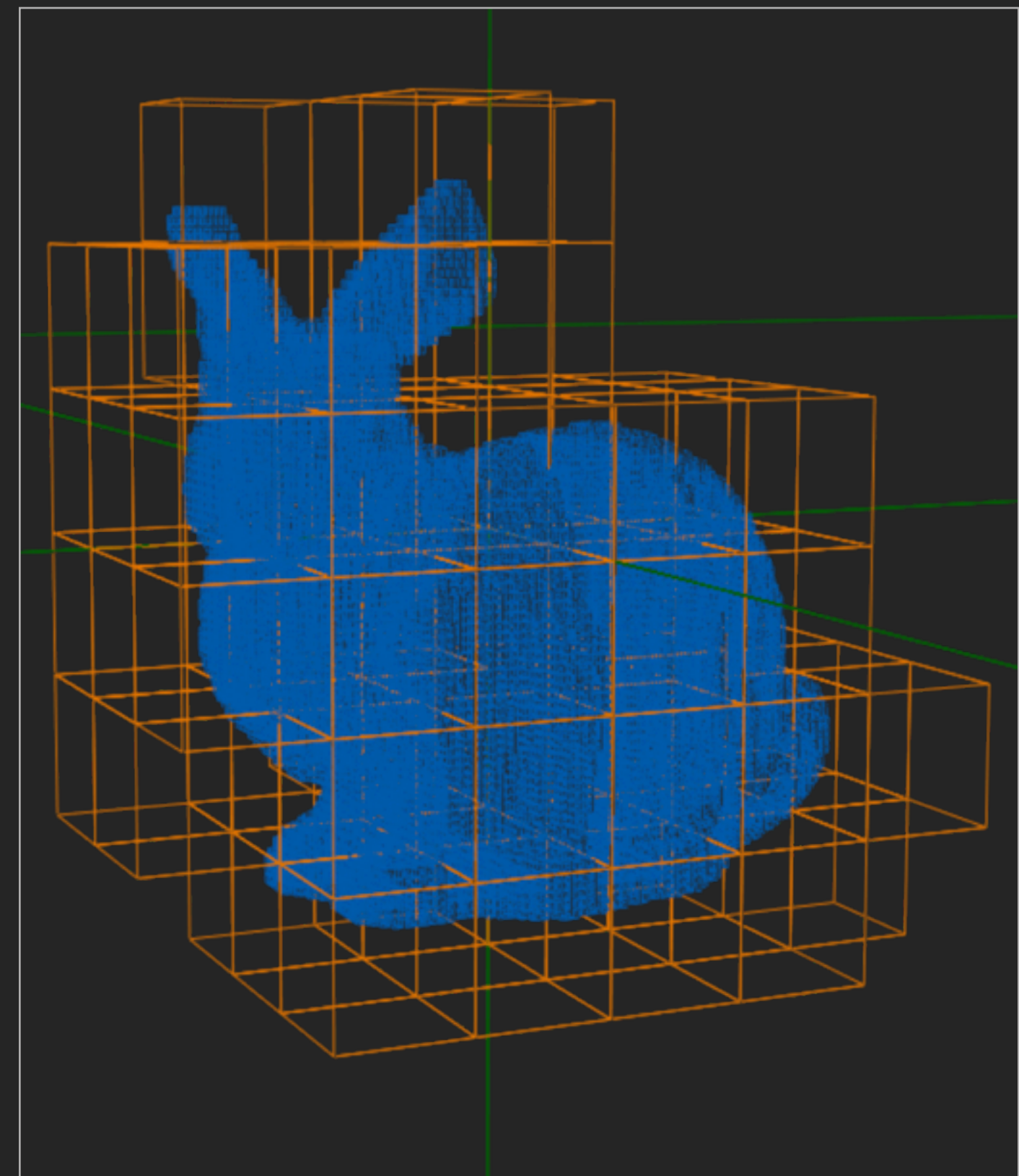
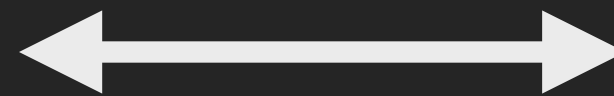
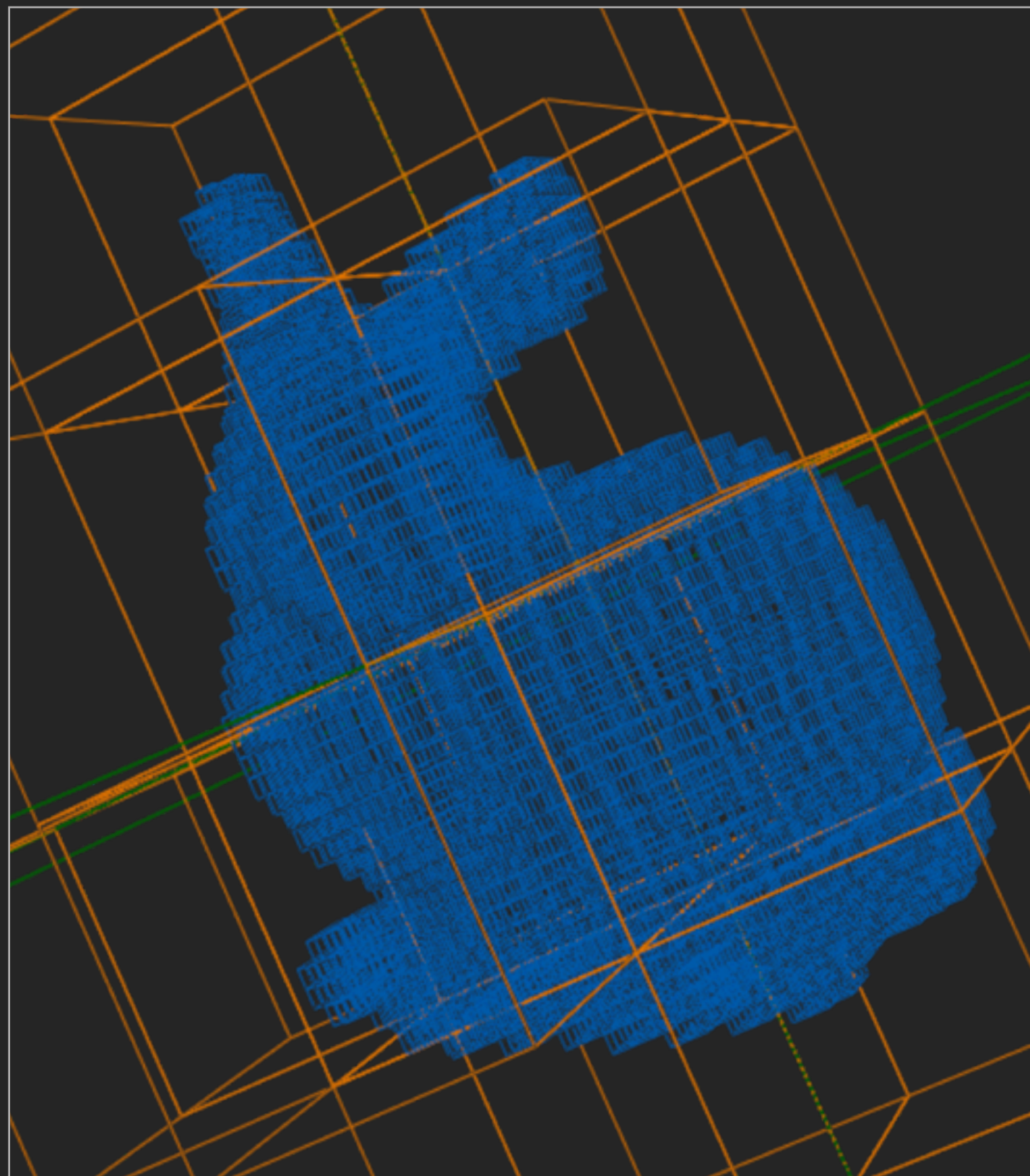
Geometric Transformation

Resample

tools::GridTransformer

tools::GridResampler

tools::resampleToMatch



Level Set Processing



Advection

tools::LevelSetAdvection
tools::LevelSetFilter::track

Ray intersection

tools::LevelSetRayIntersector

Constructive solid geometry

tools::csgDifference
tools::csgIntersection
tools::csgUnion

Conversion

tools::ParticlesToLevelSet
tools::MeshToVolume
tools::VolumeToMesh
tools::sdfToFogVolume

Filtering

tools::LevelSetFilter::gaussian
tools::LevelSetFilter::laplacian
tools::LevelSetFilter::mean
tools::LevelSetFilter::meanCurvature
tools::LevelSetFilter::median

Morphology

tools::LevelSetFilter::offset

Normalize

tools::LevelSetFilter::normalize

Platonic primitives

tools::LevelSetSphere

Rebuild level set

tools::levelSetRebuild

Segmentation

tools::LevelSetFracture
tools::sdfInteriorMask
tools::internal::segment

Signed flood fill

Grid::signedFloodFill

Data Structure Manipulation



Bitwise Boolean Operations

Topology Difference

LeafNode::topologyDifference

Topology Intersection

LeafNode::topologyIntersection

Topology Union

Grid::topologyUnion

Topology Comparison

Tree::hasSameTopology

Bitwise Morphology Operations

Topology Dilate

tools::dilateVoxels

Topology Erode

tools::erodeVoxels

Sparsity Management and Compression

Grid::prune

Tree::prune0p

Tree::pruneInactive

Tree::pruneLevelSet

Densify

tree::Tree::voxelizeActiveTiles

More information



Documentation

- FAQ
- Cookbook
- Doxygen

www.openvdb.org/documentation

Forum

www.openvdb.org/forum

E-mail

openvdb@gmail.com