

BESS: BRep for Evolving Shape Simulations

*Extraction of boundary representation from
surface triangulation*

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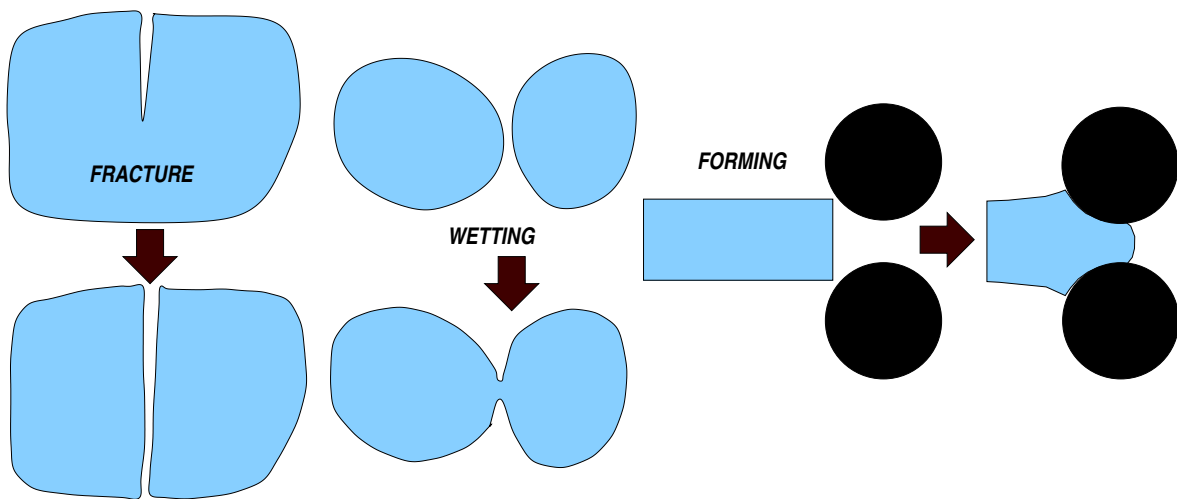


Outline

- Motivation
- Topological model
- Algorithms (faces, edges, loops, shells, regions)
- Examples

Motivation

Automatic mesh generation (remeshing) for *evolving shape* simulations

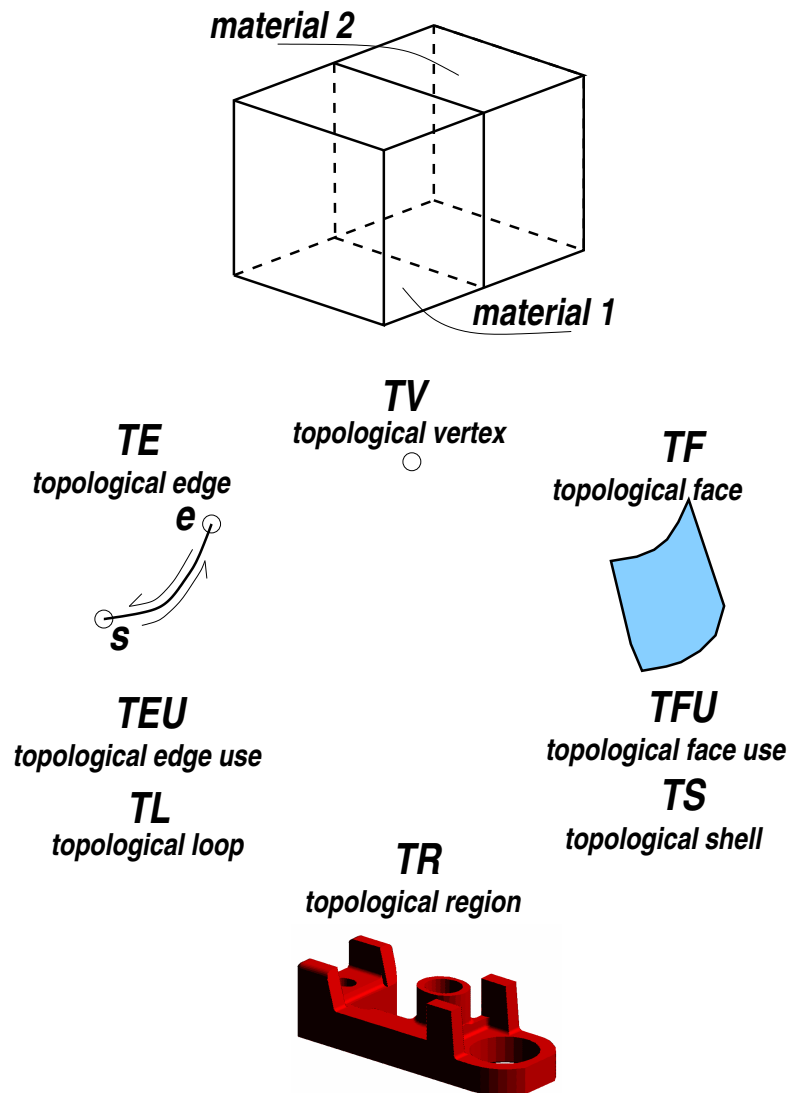


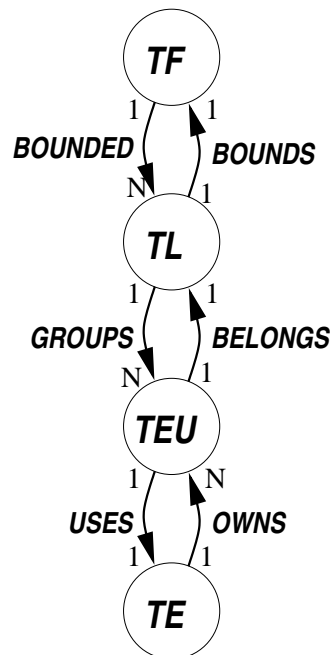
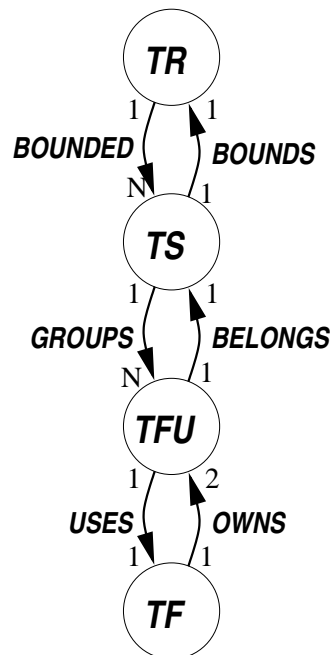
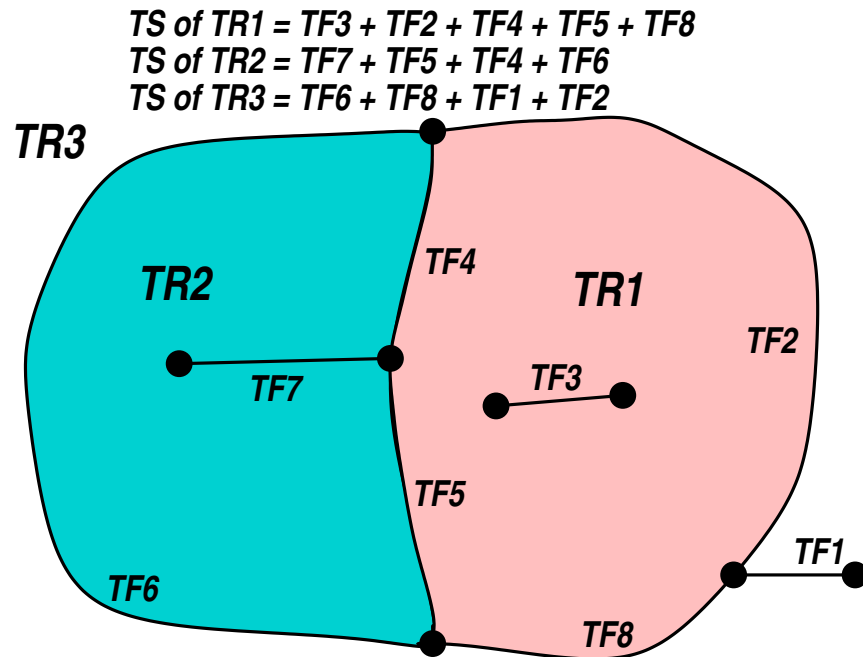
Automatic mesh generators rely on topological information (BRep)

Queries: *geometrical* (curve intersections, surface normals), *topological* (associativity).

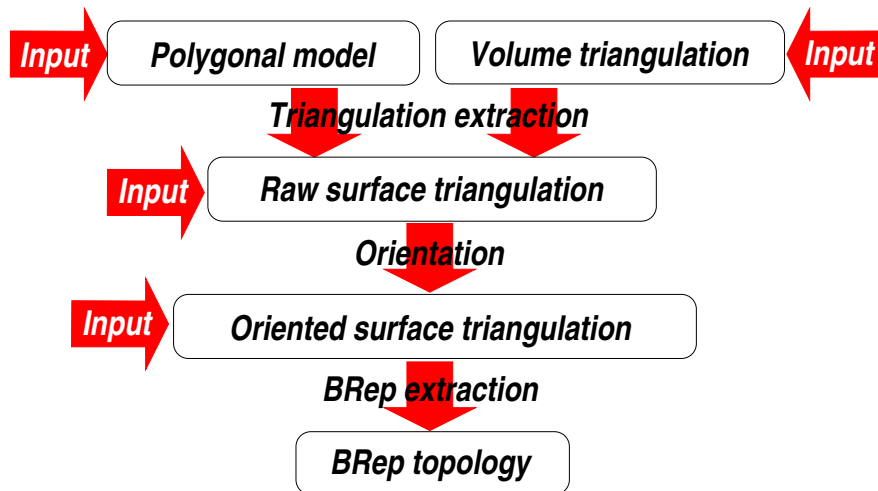
Topological model

Non-2-manifold BRep (material interfaces, embedded sheets)





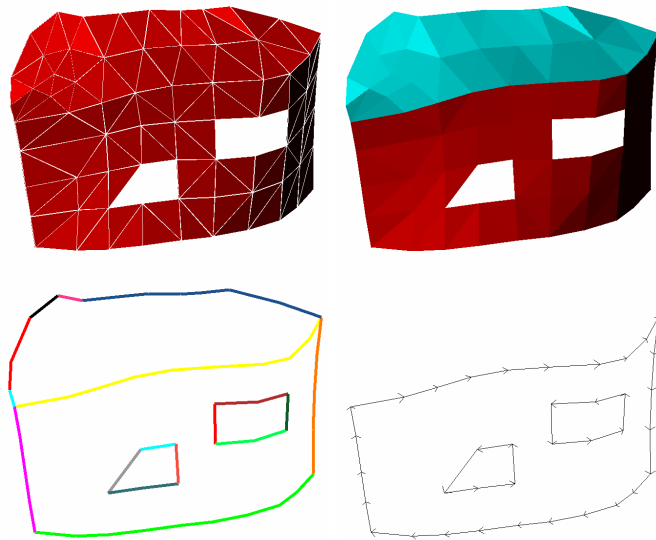
Algorithm



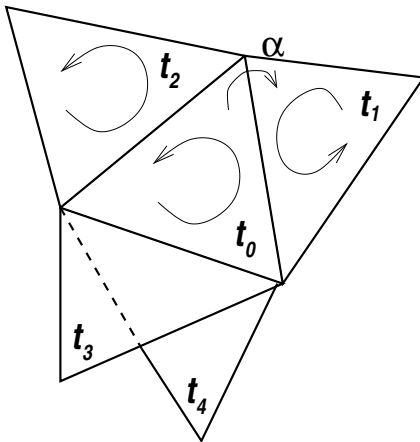
Euler operators (Weiler 1986).

Major steps:

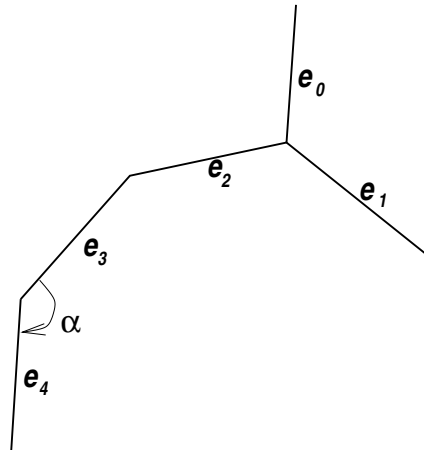
- Identify faces
- Collect edges
- Determine loops
- Gather shells
- Identify regions



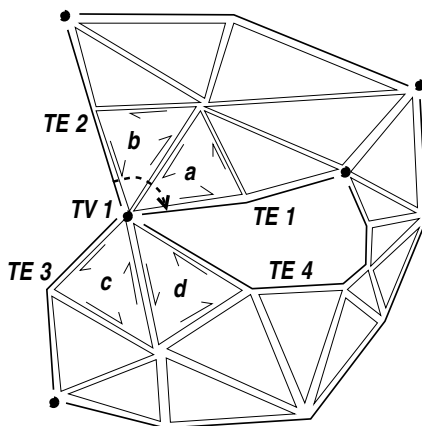
Collecting triangles
into a TF



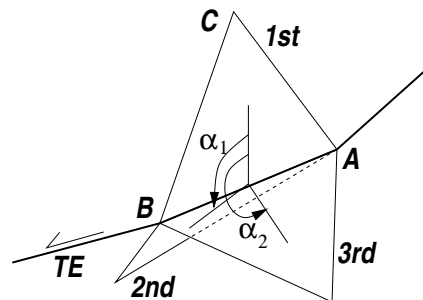
Collecting mesh edges
into a TE



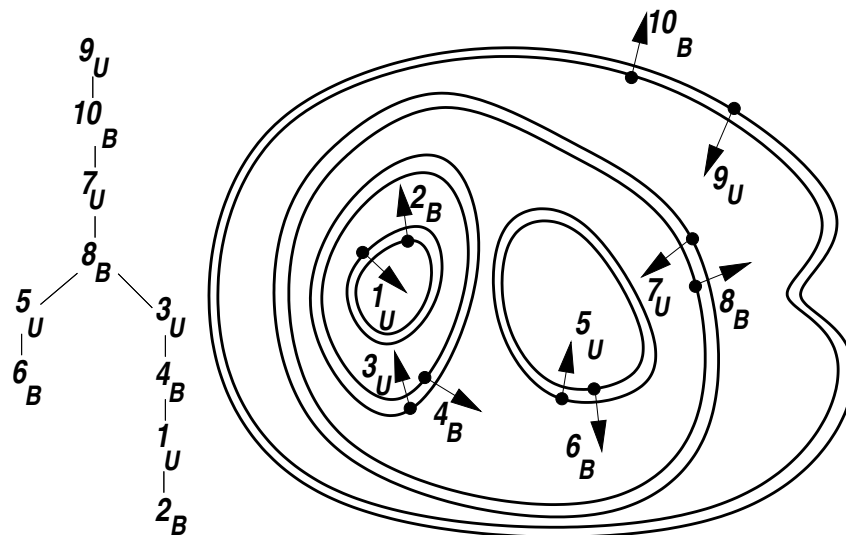
Collecting TEU's
into a TL



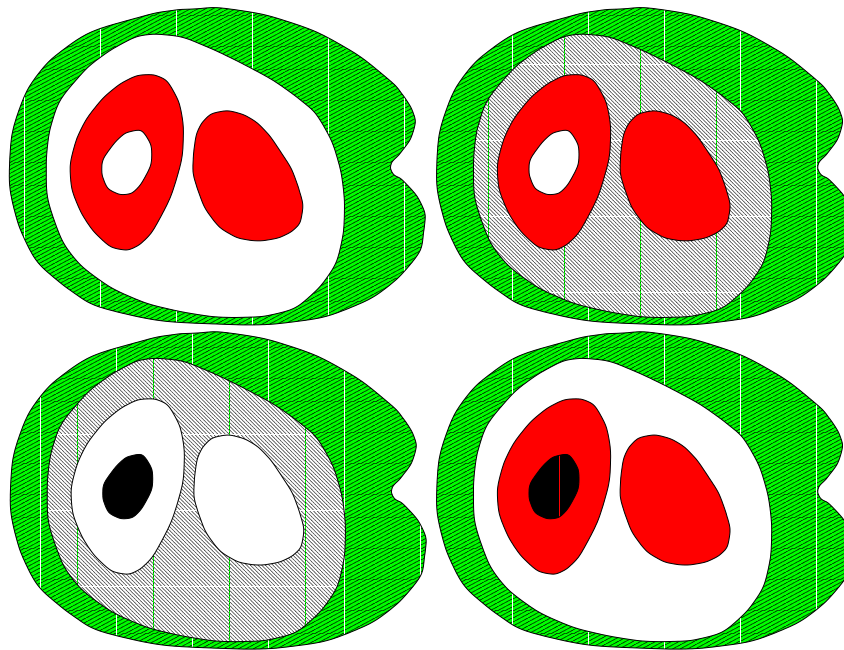
Radial ordering of TF's



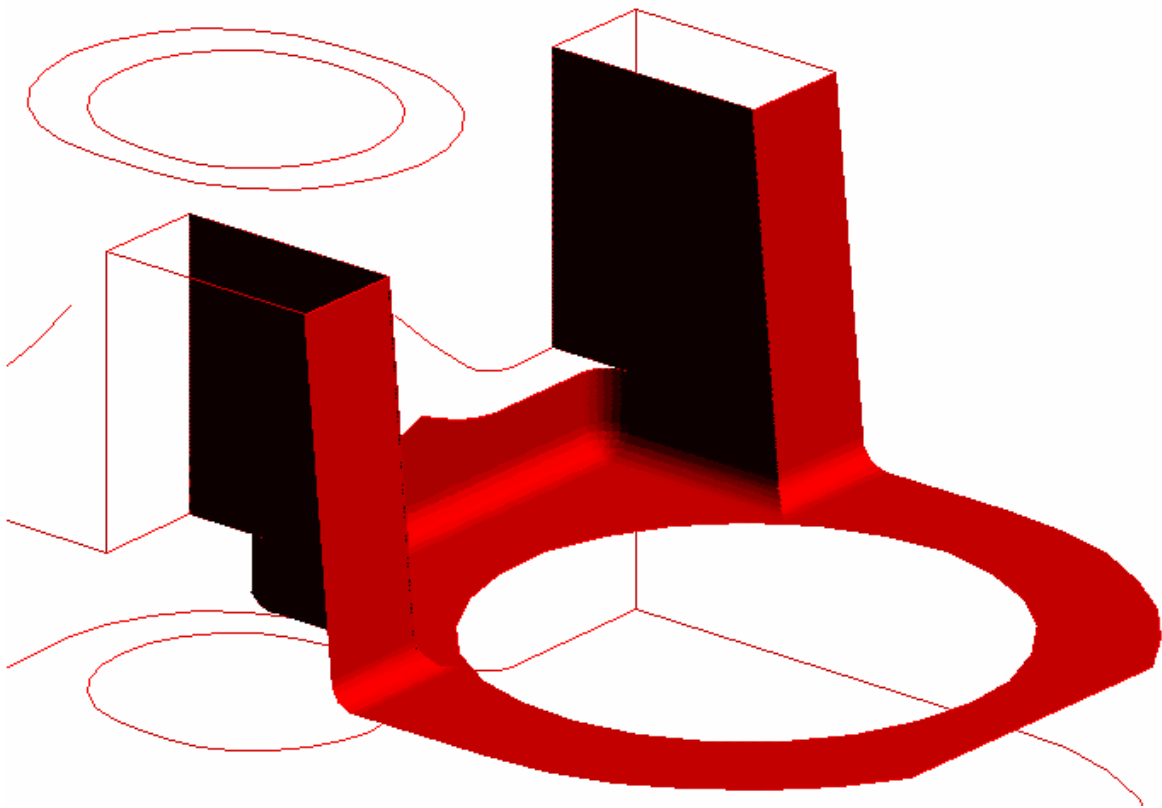
Containment tree



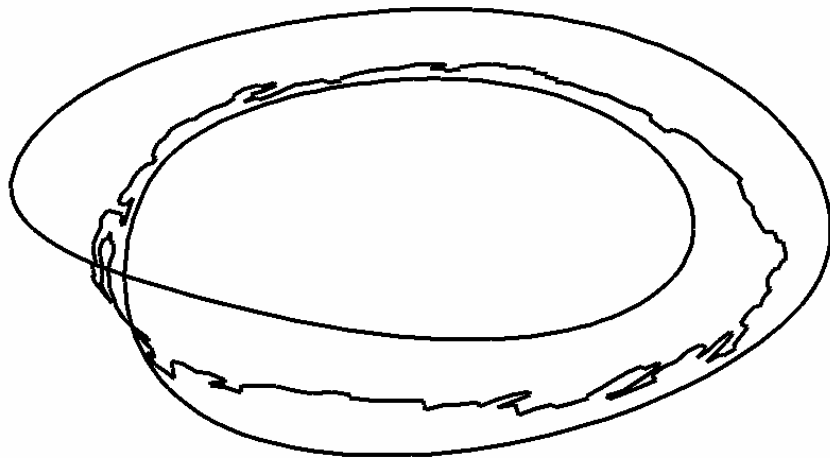
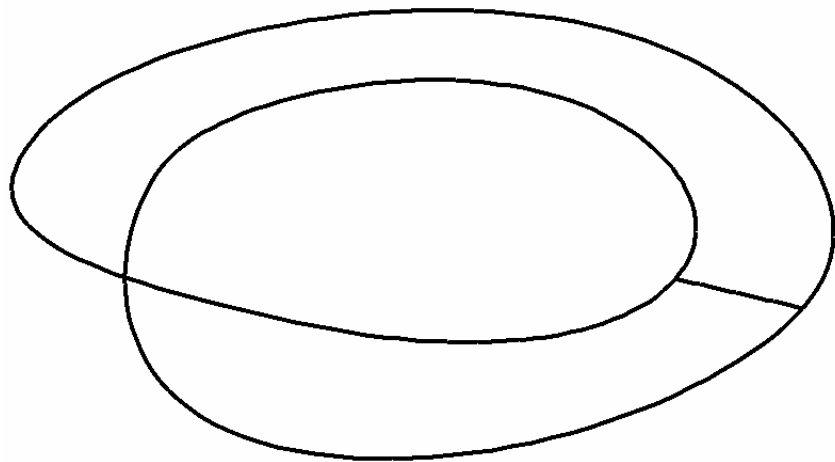
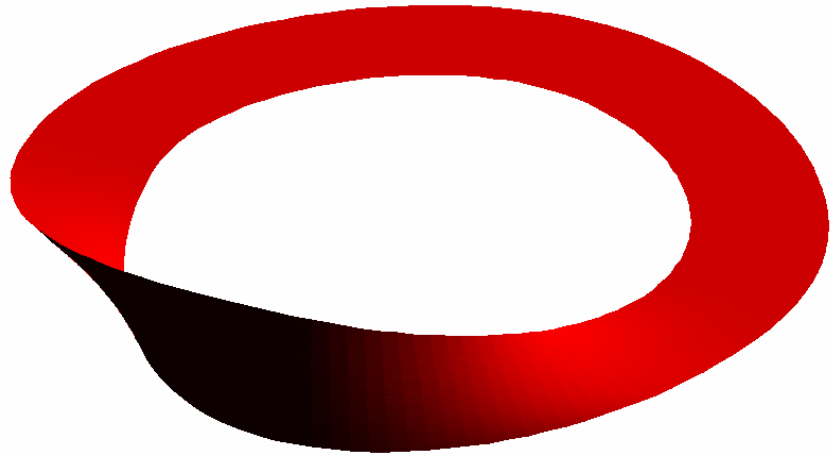
Identification of regions



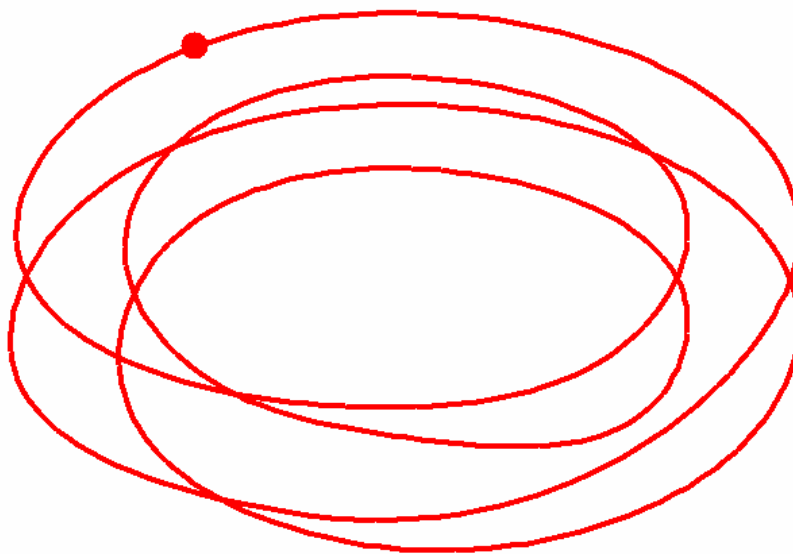
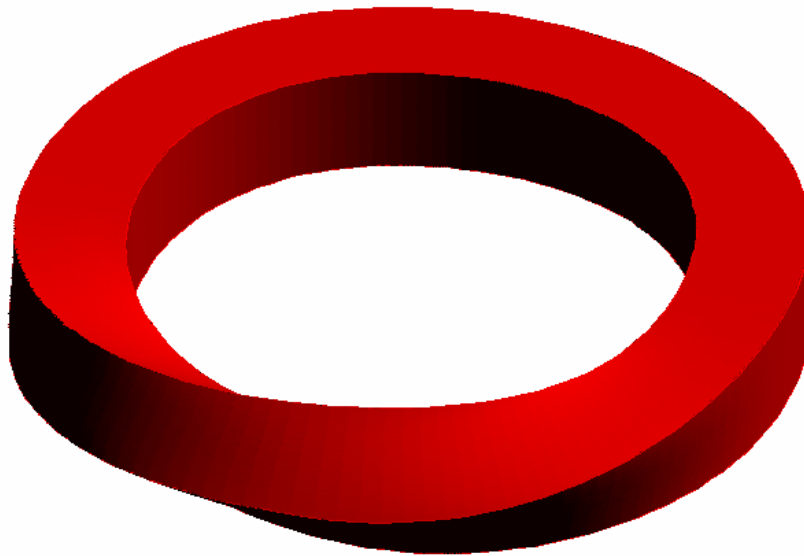
MBB Gehäuse



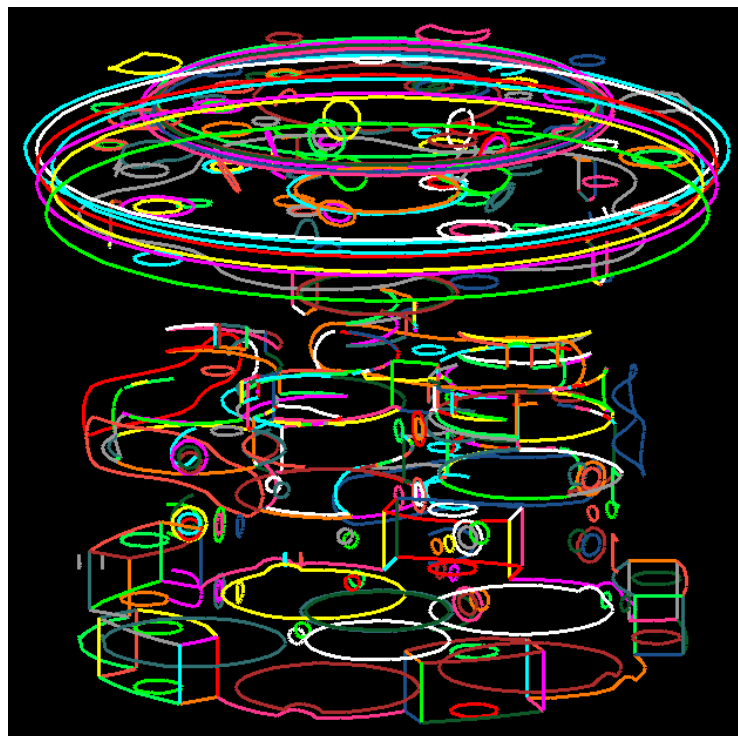
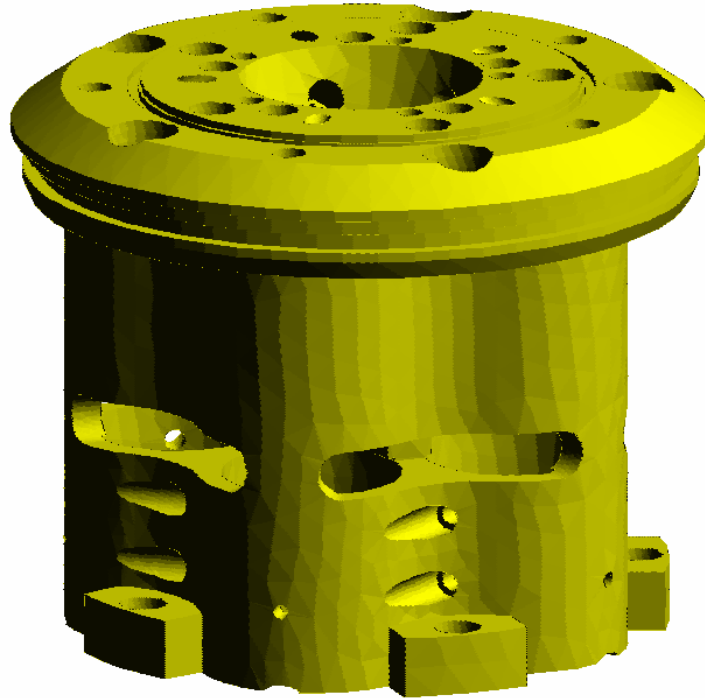
Möbius strip



Twisted ring



Torpedo motor



Conclusions

Algorithms:

- (i) robust and general,*
- (ii) efficient.*

Needs to be improved:

- (i) detection of “good” placement of edges and corners,*
- (ii) processing of noisy data.*

Coming soon:

application in fragmentation and fracture of solids